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**The Role of Information and Incentives in Voluntary
Corporate Provision of Public Goods**

A dissertation submitted in partial satisfaction
of the requirements for the degree

Doctor of Philosophy
in
Environmental Science and Management

by

Patrick J. Callery

Committee in charge:

Professor Matthew Potoski, Chair
Professor Gary Libecap
Professor Sangwon Suh
Professor Magali Delmas

June 2018

The Dissertation of Patrick J. Callery is approved.

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June 2018

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by

Patrick J. Callery

I will return to the mountains...

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Abstract

The Role of Information and Incentives in Voluntary Corporate Provision of Public Goods

by

Patrick J. Callery

More than ever, corporations face pressure to act beyond their fiduciary duties to shareholders and regulatory requirements to reduce their environmental impact and improve social conditions, yet frequently produce empty symbolic measures with no benefit to societal welfare or their own financial performance. This research program examines both external incentives for firms to engage in strategic provision of social and environmental goods and information strategies to harness sustainability motivations and influence perceptions among employees and other stakeholder groups. The dissertation consists of four chapters, each comprising a standalone empirical research study grounded in strategic management, economics, and behavioral theories. The first two studies use field experimental methods to examine the tendency for individuals to alter attitudes and behavior in response to information about relevant peers; the first study in a residential community and the second in a corporate workplace. The third study extends these behavioral phenomena to corporations, evaluating the degree to which more profitable or more rivalrous industry peers influence firms engagement in corporate social responsibility initiatives. The final study examines microdata contained within a prominent third-party corporate greenhouse gas emissions disclosure program, finding evidence of widespread reporting inconsistencies that suggest systematic efforts by companies to mislead stakeholders about actual carbon management performance. The outcomes of this research program inform corporate strategies for leveraging social and environmental goods for improved financial performance — the triple bottom line — and policy prescriptions to enhance incentives for companies to provide truthful disclosures of environmental performance.

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Chapter 1

Introduction

This introduction offers a brief summary of the background, motivations, and outcomes of a doctoral research program completed in support of a Doctor of Philosophy degree in Economics and Environmental Science & Management.

1.1 Theme and motivation

Solutions to grand environmental problems require us to address the collective action problem: in order for entities to consistently contribute to the public good, there must be a private benefit to contributing that outweighs the private cost. Moreover, an entity must perceive itself to be pivotal — that is, understand that its contribution is necessary to ensure the public good is provided. Problems such as climate change will require not only the top-down leadership and cooperation of international governments, or the bottom-up efforts of individuals to make small yet psychologically difficult changes in behavior, but also the connective tissue of global commerce created and sustained by for-profit enterprise. But how can companies seeking higher profits possibly provide a critical link in creating solutions to this collective action problem?

The central guiding theme of my research addresses the question of why economic agents

engage in costly behaviors to provide collective goods. Neoclassical economic theory suggests self-interested, utility-maximizing agents will not engage in altruistic behavior (costly actions for the benefit of others), whereas advances in behavioral economics allow for such deviations as bounded rationality and social preferences. Contemporary research acknowledges the joint validity of such models, considering that the two are not necessarily mutually exclusive. My research first considers the role of social preferences and biases that lead individuals to change behavior when encountering new information regarding their social environments; these studies explore the “micro-foundations” of pro-environmental and pro-social behaviors. Recognizing that corporations — while traditionally modeled as profit-maximizing agents — are run by people, my research next evaluates the tendency for firms to seek both conformity between own performance and performance of relevant peer firms and congruence between stakeholder expectations and perceptions of firm performance.

With this baseline understanding of individual and corporate behavior with respect to the potential for public goods provision to increase privately captured value, the following discussion explores the nature of corporate motivations to engage in pro-social and/or pro-environmental behavior from standpoints of both strategic adaptation to the competitive environment and crafting information strategies to differentiate from competitors in the markets of public opinion and shareholder sentiment.

Market solutions to collective action problems

Many social and environmental problems are the direct result of some market failure – the failure of market mechanisms to reach efficient outcomes. Types of market failures resulting in such problems include externalities, information asymmetry, and principal-agent problems, among others. Government regulation has traditionally been seen as the primary tool to correct market failures. For example, regulatory action can force firms to internalize externalities

through mechanisms such as taxes or limits on harmful emissions and other pollutants. Regulations can correct information asymmetry problems by mandating certain types of verified information disclosure. While regulation is sometimes effective, it is also politically difficult to implement, particularly when the interests of multiple stakeholders are in conflict. Such conflicts often lead to compromises that detract from the economically efficient ideal and often add additional burden to market efficiency. Global collective action problems, such as climate change, are particularly relevant and exposed to these problems.

Free market adherents suggest that markets, left to their natural progression, will develop solutions more efficiently than government regulation. This may certainly be true when incentives are properly aligned to reward solutions and penalize sources of the problem. However, when the incentive structures remain oriented towards propagation of the problem — for example, the non-internalized costs of greenhouse gas emissions and their resulting impact on climate change — some regulation is demanded, unless markets begin to reward firms and individuals for implementing solutions.

Corporate strategy and externalities

The primary objective of a firm is to maximize return to shareholders; whereas multiple theories of the firm have emerged to contest this basic view, many of them are arguably consistent with the incentives of managers to satisfy the demands of shareholders first. If the purpose of the firm is to maximize returns for its shareholders, the role of a firm's managers is to determine how to best accomplish this objective. A firm's corporate strategy may be simply defined as the nexus of plans devised by the firm to maximize returns. Owing to heterogeneity of firms and efficiency of markets (and other behavioral concerns such as agency theory), no two firms adopt or implement an identical strategy. How a firm develops its unique strategy is driven by myriad factors; though all strategies may be considered to be a collection of projects or

investments designed to maximize the net present value of future returns. All firms therefore undertake some benefit/cost calculus in determining how to choose among different investment opportunities.

Two general theories of corporate strategy have taken hold in modern strategy research. The external view, that a firm's strategies are molded by its external competitive environment, holds that opportunities for successful formulation and execution of strategies are bounded by the power exerted upon it by its customers, suppliers, and competitors, as well as threats of new market entrants and substitute products. The corresponding internal view, that a firm's strategies are shaped by its unique resources and capabilities (loosely, anything owned by a firm that may be considered a strength or weakness), holds that the ability to develop a sustained competitive advantage is constrained by the inherent value, rareness, imitability, and substitutability of its strategic resources. In both general views of strategy (which may be complementary and not contradictory), activities of a firm are centered on its ability develop a sustained competitive advantage through strategic investment in projects or resources that will allow it to deliver long-run returns to its shareholders.

In the pursuit of generating returns to shareholders, firms invest resources in projects or activities that will return positive net private benefits — where the firm's expected private benefits associated with the project exceed its corresponding expected private costs. Likewise, if the firm expects a particular investment opportunity under consideration will not yield a positive net private benefit, the firm will not invest in the project. In this project investment framework, we consider the discrete choices of firms among multiple investment opportunities to pursue profit-maximization strategies based on their competitive environment, internal resources and capabilities, and stakeholder interests; in this context, one may overlook the firm's continuum of choices over profit-maximizing production levels that take place after strategic investment choices have been made.

If a project undertaken by the firm results in some net social cost or public bad not borne

directly by the firm, the result is a negative externality, which does not enter into the firm's decision making process (to the extent its actions are not directly attributable to the externality). A firm, in its pursuit of maximizing return to shareholders, will still undertake a project with maximum expected net private benefit regardless of any social cost imposed. Likewise, if the firm's project results in some net social benefit or public good not accruing directly to the firm, the firm does not consider this net social benefit in its decision. If the addition of the net social benefit to the decision calculus is sufficient to turn a project with net private cost into one with net total benefit, the firm will regardless not undertake the project as its main concern is for private benefit accruing to the firm. In this sense, it matters not whether the social externality is positive or negative; it matters whether the firm has some incentive to consider the externality in its production or investment decisions.

This illustration is indicative of many environmental problems. Public goods are under-provisioned (or public bads over-provisioned) when firms do not obtain private benefits (or incur private costs) from provisioning public goods. Market forces can be harnessed to solve such environmental problems by assigning property rights over externalities and giving affected parties incentives to reach a socially desirable outcome. An open market in itself does not contain the mechanisms to independently reach these solutions; rather the use of market-based policy instruments to change equilibrium outcomes and correct market failures requires some regulatory body to prescribe the appropriate property rights structures and associated rules that will change incentives. But new laws and regulations are costly and difficult to implement. Many environmental problems can be addressed when firms have incentive to independently and voluntarily provide public goods.

Creating and capturing value by private provision of public goods

Firms can be forced by law or regulation to provide costly public goods. However, as noted above, market failures and insufficient regulation often result in negative externalities passed on to society by profit-maximizing firms. However, as societal awareness and concern of social and environmental issues have increased, so too have expectations of firms' positive contribution (or reduction in negative impacts) to social and environmental goods. While such goods have traditionally been seen as costs to be borne by individual actors for the benefit of society at large (with requisite opportunities for individuals to free ride on the efforts of others), more firms now include some corporate social responsibility (CSR) or environmental sustainability strategy as part of their overall strategic plans. A useful definition of CSR is a set of activities voluntarily undertaken by the firm to contribute to public goods, above and beyond what is required by law or regulation. At face value, a firm's investment in some public good — such as cleaner air or water — beyond the degree required by law or regulation might be seen as a charitable act. However, multiple theories of the firm suggest that individual shareholders of the firm may allocate returns from the firm to charitable causes according to their own preferences, and do not seek ownership in firms to achieve these ends. A firm undertaking this activity on behalf of its shareholders is not efficient; the shareholder simply expects the firm to produce maximum profits. For a firm to decide to voluntarily provide some public good at net private cost, outside its calculus of maximizing net private benefit, may suggest a failure of the firm to act in the interests of its shareholders.

So, whereas the ostensible aim of CSR is to produce some public good, some firms are able to successfully integrate CSR into their strategy for profit maximization. Profit expectations are influenced by a great deal more than simple projections of revenue and costs; the value of intangible assets and effective risk management of potential stakeholder sanctions also drive a firm's strategy. This concept of strategic CSR suggests that firms seek to improve their

social and/or environmental performance as a means to enhance their competitive advantage and thereby improve financial returns. Strategic CSR is, then, another category of investment opportunities chosen by a firm — alongside other strategic investments in physical assets, technology, human resources, product markets, and more — as part of its overall competitive strategy. But how is strategic CSR different from other strategic choices made by firms?

Some investments in strategic CSR initiatives may be estimated to deliver direct financial returns to the firm, as with any other strategic investment. For example, a firm may invest in measures to reduce waste effluent from a manufacturing process, above and beyond the limits set forth by relevant government regulation. A primary result of such a project is likely to be a reduced cost of operations through improved efficiency; a secondary result may even be the establishment of a future competitive advantage in anticipation of future tightening of regulations. The improvement in wildlife habitat or better health outcomes for residents of local communities may appear to be benefits of limited importance to a firm's financial performance. However, in other cases, the public goods produced may be the only directly measurable outcomes from strategic CSR projects. When will a firm invest in projects that produce public goods but not measurably reduce costs or increase revenue? A firm that invests in such projects may seek to increase intangible benefits associated with its public reputation or reduce risk of negative impact to future profits through retaliatory action from an activist stakeholder.

A firm will engage in CSR when its corporate strategy informs ways in which it can obtain additional private benefit from the provision of public goods. If the firm is able to capture enough value by providing the public good to turn a net private cost into a net private benefit, or to make one project or investment more profitable than another, the practice of CSR will increase net private benefits to the firm as well as generate public goods. It follows then that CSR, when properly implemented, can result in a “win-win-win”: good for the environment, good for society, and good for the firm.

In order for firms to generate private benefits through voluntary provision of public goods,

two main conditions must first be met. First, the public must inherently value those goods; there must be some relevant stakeholder group that incurs a net social benefit from the provision. Second, the public must be able to properly attribute those public goods as being provided by the firm; receiving goods of value invariably invokes some measure of gratitude or obligation from the recipient to the provider.

Any group or individual that enjoys the public goods provided by a firm (or bears part of the net social cost of a firm's public bads) may be considered a stakeholder of the firm. When a firm provides public goods that are not valued by its stakeholders, or provides public bads, no goodwill is generated by stakeholders on the firm's behalf; the firm has failed to create conditions for the creation and appropriation of new private benefits associated with those public goods. For example, a firm may provide public goods by planting forests in a remote region, which may not be valued by the local community living downwind from the firm's air and water-fouling factory. Those stakeholders may interpret the forest planting as a misuse of the firm's resources, for which other public goods — such as reduced particulate emissions from its factory contributing to lower health risks in the community — may be valuable.

The firm's act of providing public goods must also be attributed to the firm by its stakeholders. A stakeholder that recognizes a public good has been provided by the firm will be more willing to view the firm in a more favorable light, all other factors being equal. A stakeholder that enjoys some public good, but is unaware that the firm provided that public good for the stakeholder's consumption, will not attribute any of the social surplus to the firm and less likely to direct private benefits to the firm.

When a firm provides public goods that its stakeholders both value and attribute to the firm, it is positioned to generate incremental private benefit. One simple way a firm may take advantage of this social surplus is by simply recognizing greater revenue. When a firm embeds public goods in the offering of a private good for sale, it may either increase its sales by appealing to a greater number of customers that value the public good, or it may also command

higher prices in the market place than competing private goods without the embedded public good. A basic example of this is a “green” product that claims to provide some environmental amenity not typically obtained by consumers in its direct product market. More consumers may be drawn to the environmental attributes of the product, and still others may exhibit a higher willingness to pay for the product in order to claim the embedded public good. Another way in which firms might generate incremental private benefit for providing public goods is by reducing its costs. For example, a firm that invests in projects to improve the efficiency of its operations may, in so doing, also reduce its environmental impact through lower waste streams or greenhouse gas emissions.

There are more intangible private benefits available to firms through provision of public goods as well. A firm may generate a more favorable reputation among certain stakeholder groups by investing in projects that produce public goods that are specifically desired by those stakeholder groups, and by making its investment known to that group. In turn, stakeholders who value the public good and are able to attribute its provision to the firm will look upon the firm more favorably. Numerous benefits may accrue to the firm through this reputation enhancement.

A firm’s reputation is a potentially valuable intangible asset. Firms with greater reputation enjoy distinct competitive advantages across multiple stakeholder groups; customers may perceive their products as higher quality and pay premium prices, they may have lower employee recruiting costs and higher employee retention, be subject to less scrutiny from activist non-governmental organizations, and enjoy more favorable access to capital markets. Reputation is also a valuable asset in terms of its relative inimitability; competitors may replicate its products and services, but a superior reputation is difficult to replicate.

Firms enjoy multiple reputations in that different stakeholder groups may form different perceptions of the firm and its performance along multiple dimensions. A firm’s financial reputation is critical to its value in capital markets, but it can also be an important asset that signals

stability and success to consumers, while also making it a more prominent target for activist intervention. Strong reputation for product quality or customer service among consumers can be a positive signal to capital markets. Or, a firm with a poor environmental reputation among consumers and non-governmental organizations (NGOs) may have a negative draw on valuation of its equity shares by the capital markets.

Stakeholder management and messaging

Stakeholder theory posits that firms incorporate management of all stakeholder groups — shareholders, customers, suppliers, employees, and public stakeholders — into corporate strategies in order to fulfill the primary obligation of maximizing financial returns for shareholders. Stakeholder theory may be seen as an extension to either the external or internal views of corporate strategy, from the standpoint that profit-maximizing activities may also include costly efforts to reduce the risk that stakeholders may act against the interest of the firm. Firms that act counter to the interest of any sufficiently organized stakeholder group to reap short term gains put themselves at risk of profit-destroying retaliatory action by the offended stakeholder group. Different stakeholder groups with different agendas will place different demands on different firms with different corporate objectives and resources. For example, shareholders who disagree with policy and strategy implemented by a firm's managers may simply divest from the company (or, in the case of activist shareholders, sometimes increase their stake to force management change). Customers may turn to competitors for superior satisfaction. Employees who are not treated well may resign and bring their experience and talents to competing firms. Public stakeholders — broadly defined as any group or entity with some interest in the operations of a firm — that disagree with a firm's strategy or performance along some social or environmental metric may engage in actions that can be deleterious to the firm's profitability.

In the firm's profit-maximization calculus, public goods will be provided when the expected

incremental private benefits accruing to the firm exceed its private costs of provision, all other factors being equal. Firms will maximize expected profits by strategically choosing to provide certain public goods based on perceived stakeholder value and communicating the provision of value to the stakeholders. This strategic selection of public goods projects or investments is just one component of a firm's competitive strategy. Firms will invest in strategic CSR when, in combination with other components of its overall strategy, the expected returns to those projects or investments justify the costs.

A firm's corporate strategy is informed by both its external, competitive environment, and its internal resources and capabilities. The external constraints on a firm's strategy for generating shareholder returns include the market power exerted upon it by its customers, suppliers, and competitors, as well as the threats of new market entrants and substitute goods or services. The degree to which CSR initiatives are included in a firm's strategy will depend on the level of CSR provided by its competitors, demanded by its customers, or otherwise provided by its suppliers. A firm is also constrained by its own internal capabilities. Competitive strategy is driven by the inherent value, rareness, imitability, and substitutability of its strategic resources; a firm with such resources that translate well into CSR will seek to exploit them for competitive advantage. From both standpoints, the activities of a firm are centered on its ability develop a sustained competitive advantage through strategic investment in projects or resources that will allow it to deliver long-run returns to its shareholders.

Another view of the importance of CSR to a firm's overall corporate strategy is driven by its stakeholder relationships. Different stakeholders will demand different levels of CSR (or public goods) from a firm. Customers increasingly seek to do business with firms that meet certain social or environmental criteria, such as sourcing conflict-free metals or carrying ISO 14001 certification. A firm whose customers demand a certain level of environmental performance will incur costs to attain that level if the expected net benefits – such as a long-term supply contract — are sufficiently positive relative to other investment opportunities. Con-

sumers may seek to purchase goods or services from companies that are seen to support or promote their social or environmental values, whether those values are related to specific product attributes or not. A firm whose employees express strong social and environmental values will also invest in CSR if it determines the benefits of employee engagement and retention outweigh the costs. Firms with a track record of producing negative social or environmental externalities may invest in CSR if powerful environmental organizations make it the target of public information campaigns. All these examples represent cases of stakeholder management — where firms implement strategic CSR in order to maximize expected profits by meeting the public good demands of a powerful stakeholder group. With so many stakeholders applying pressure on firms to improve their environmental performance, it is no wonder that corporate social responsibility (CSR) and corporate sustainability are high priorities for firms in most industries.

With so many stakeholder demands on a firm's environmental performance, it is reasonable that a firm's strategic calculus may involve investing resources in projects that improve its environmental performance. Firms have myriad choices of where to invest in environmental performance; projects may contribute directly to improvement along key environmental metrics and have a direct financial return on investment — such as improving energy efficiency of buildings and operations, or building on-site renewable energy generation — or instead support some sophisticated strategy of stakeholder management, such as purchasing voluntary market credits to offset its carbon footprint. Advantages of investing in direct improvements to environmental performance metrics include the prospect of positive financial returns to investment, proactive management of a firm's environmental footprint under uncertain future prospects of costly regulation, and development of corporate environmental management resources and capabilities that can lead to sustained competitive advantage in an industry. Advantages of purchasing voluntary market credits include a relatively low commitment, strategic flexibility, and the potential for marketing certain charismatic attributes of offset projects, such as a joint

environmental and social philanthropic contribution (e.g. funding the purchase of low-carbon cook stoves for underprivileged communities in developing countries).

As discussed above, not only must firms adopt CSR measures to provide public goods that are valued by specific stakeholder groups, they must also communicate that provision to those stakeholders. Effective stakeholder management requires congruency between the public goods provided, the stakeholder groups themselves, and the message content and channel. A firm investing in a particular CSR project will choose appropriate messages to address the public good demands of target stakeholder groups, and implement communication channels that more effectively reach those target groups. Firms may even use multiple messages and channels for a single case of public goods provision, if there are multiple target stakeholder groups with different characteristics demanding those public goods. For example, a firm that invests in on-site renewable energy with the dual objectives of reducing the greenhouse gas footprint of its energy use and reducing exposure to uncertain future energy price fluctuations may choose to issue a press release directed to the institutional investor community outlining the financial security provided by the hedge, while also trumpeting the environmental credentials of the investment on corporate blogs or mass media news outlets directed towards consumers or employees with environmental values and concerns.

Asymmetric information and message credibility

When choosing message content and channels for communication of social or environmental merits of public goods provided, information asymmetry plays a significant role. Generally, when buyers are unable to verify the level of quality of a product, good and poor products will command the same prices in a competitive market. Since the expected value of a randomly selected product will be less than the value of a good product, sellers of good products will not be able to obtain a fair price and will be crowded out of the market. Since buyers know

that only poor quality products will be sold, no transactions will be made and the market will dry up. In this stylized example, the result is that suppliers of good products are driven out of business; a more generalizable outcome for real markets is that overall efficiency is reduced, as buyers become more skeptical of claims of quality, resulting in an overall reduction in market demand. This chilling effect on market demand results in lower surplus for legitimate suppliers, and potentially lower surplus for consumers who will unwittingly purchase inferior goods with some positive probability.

When firms are faced with the challenge of communicating environmental performance to various stakeholder groups, those firms are in possession of private information regarding their environmental performance that is unknown to those stakeholder groups. The presence of this information asymmetry offers a potentially perverse incentive to the firm: as noted above, if the firm is able to credibly convey its message to its target audience, it may likewise be able to convey a deceptive message of environmental performance to that audience. The stakeholder audience, in part, is left with the decision to accept or reject the validity of that message based on the information available. If we assume that stakeholders have no recourse with which to validate the firm's claims, those stakeholders must assign some probability that the information communicated by the firm is valid or not. Their subsequent actions — whether or not to bestow incremental private benefits upon the firm in return for the public goods — will therefore be determined by the degree to which they accept or reject validity of the message.

The incentive to exploit information asymmetry in its level of environmental performance can yield misinformation on both the goods provided and the messaging employed to communicate the goods. Firms with private and unverifiable information about the level of public goods bundled with a private good — particularly credence goods, which consumers have difficulty inferring quality even after purchase — face incentives to oversell the public good value; the degree to which consumers accept a firm's claims may increase demand as well as the firm's ability to charge premium prices. The firms more likely to perform and publicize perfunctory

environmental improvements are those whose environmental record may be most suspect. This opens the door to the potential for relatively high levels of deceptive messaging on corporate environmental performance.

Product or company certifications may be seen as one way to neutralize the information asymmetry problem. Independent, third party assessments of environmental performance or related product attributes offer a means for stakeholders to validate claims made by a firm. But certifications themselves can also serve to further secure a level of information asymmetry as desired by a firm employing misleading messaging. If the positive environmental attribute selectively disclosed as has a trusted third party validation of that performance, this may increase the likelihood that a stakeholder accepts the firm's level of disclosure as genuine.

The above discussion centers on the extent to which stakeholder groups find firm messaging credible and how those stakeholder groups may respond. The firm has two objectives in mind with respect to delivering credible messages of strategy or performance. The first is to credibly convince stakeholders of their actions, so that the firms are better positioned to capture private benefit from their provision of public goods. The second is to credibly convince the market (shareholders/investors) of their likelihood for success with the first, so that the market will tacitly endorse of the strategy and assign a higher value to the firm's equity stock.

Summary

The above discussion serves as background for the main question motivating my research: what factors drive firms to engage in voluntary private provision of public goods, and what incentives are available to align the firm's objective of profit-maximization with the interests of broader society for a cleaner environment and equitable social conditions. More than ever, firms face pressure to act beyond their fiduciary duties to shareholders and regulatory requirements to improve social conditions and reduce their environmental impact. However, firms are

often unsuccessful in creating and capturing value through socially responsible actions, and sometimes produce empty symbolic measures with no benefit to societal welfare or their own financial performance. To help firms and society realize the promise of this triple bottom line, my research shows when and how firms profit by voluntarily providing substantive social and environmental goods. The motivations described here, and the research streams presented in this dissertation, will ideally form the basis for a lifetime of scholarly and practical research dedicated to harnessing market mechanisms, the power of the corporate profit motive, and effective policy prescriptions to hasten resolution of society's greatest collective action problems.

1.2 Dissertation structure

The proposed dissertation will take the canonical form of three essays on this theme, though I present a total of four essays here. The individual chapters explore the pro-environmental or pro-social behaviors of different types of agents (namely, individuals and corporations) in different contexts, derive hypotheses of expected behaviors based on extant and new theoretical constructs, and use data (both experimental and observational) to empirically test those hypotheses. The four chapters are discussed in more detail further below.

My research explores the incentives for corporations to engage in behaviors or strategies related to the provision of public goods under a profit motive. While some incentives produce the proverbial win-win outcome or feed the triple bottom line, others may lead to unintended consequences through misalignment of private and social outcomes. More specifically, my research considers the role of information in creating incentives for either type of agent to engage in pro-environmental behaviors or strategies. Agents may obtain, through active or coincidental observation, information on the behavior of relevant others and use this information to update or adapt their own private strategies for utility maximization. Another way in which an agent's behavior may be affected by information is via its perception of how relevant others may view

its prior behaviors when those behaviors are publicly observable. In this context, there is value in understanding the role of incentives in shaping corporate information strategies to influence external perceptions of behavior.

These two general patterns of behavior — strategic adaptation and information strategies — motivate and exemplify the unifying theme of my research. Consider a simple framework organized around these two dimensions: strategic adaptation (reactive behavior) versus information strategies (proactive behavior), and individuals versus corporations. The four chapters of this proposed dissertation roughly align with the four cells suggested by the interaction along these two dimensions. Chapter 3 studies the effects of private information about relevant others on subsequent individual behaviors; chapter 4 studies the effect of corporate communication strategies on individual perceptions of quality. Meanwhile, chapter 5 studies the effects of indirect information about the performance of relevant peer firms on strategies, and chapter 6 studies the effects of corporations’ strategies on proactive information disclosure to relevant others. Table 1.1 below illustrates the framework. The four individual chapters are discussed in more detail below.

Table 1.1: Unit of analysis and strategic behavior

	Strategic adaptation	Information strategies
Individual / organizational (“Micro”)	Chapter 3	Chapter 4
Corporate / industrial (“Macro”)	Chapter 5	Chapter 6

1.3 Chapter previews

1.3.1 Chapter 3: Norm proximity and optimal social comparisons

Research question and contributions

This study addresses two key research questions: (1) what effect does the provision of individualized information feedback regarding quantitatively measurable behaviors have on subsequent behavior, particularly when that information contains comparative information on the behavior of a relevant peer group? And, more importantly, (2) what differential effect does an individual's distance from the comparison group have on subsequent behavior?

The study contributes to our understanding of the effect of social norms on individual behavior by using quantitative information feedback on an individual's behavior and by isolating the normative influence from other potential confounds, such as economic incentives and different levels of baseline technology. A potentially more impactful contribution is the identification and evidence of what I term a "norm proximity" effect, wherein an individual's subsequent behavior is significantly affected by the relative distance between the individual's own behavior and the reference behavior provided by the social comparison information.

Methodology

The study uses a randomized control trial (RCT) field experiment design that randomly assigns a treatment condition to a subset of individual subjects while leaving the remainder of subjects in an untreated control condition. The subjects in this experiment are residents of two UCSB student apartment complexes. The behavior measured is the electricity consumption of individual apartment units within the complexes, which is obtained via high frequency (hourly) data feeds from unit-specific electricity smart meters. The treatment consists of a weekly, personalized email message containing information on the subject's hourly apartment-level

electricity consumption over the prior week, with a direct comparison to the consumption of a specific peer group within the complexes over the same period. The control group receives no information feedback.

Two levels of treatment are non-randomly assigned. The treatment group is divided into two subgroups based on the baseline level of electricity consumption measured over 10 weeks before the start of the treatment period. Subjects with baseline consumption above the median level receive social comparisons calculated as the median level of its relevant peers. Subjects with baseline consumption below the median level receive social comparisons calculated as the 10th percentile level of its relevant peers. In this way, we generate a condition wherein most subjects are provided an aspirational level of performance (in the form of the peer group comparison), which we expect (based on results of related studies in the literature) to offset any potential “boomerang” (i.e. mean-reversion) effect.

The overall average treatment effect is estimated by ordinary least squares (OLS) regression using a difference-in-difference specification. The difference-in-difference estimation compares the change in behavior of the treatment group over the course of the treatment period to the change in behavior of the control group over that period. Because the control group is randomly assigned, it serves as a valid counterfactual for the treatment group behavior in the absence of any treatment, and thus allows for an unbiased estimate of the average treatment effect.

The effect of norm proximity on subsequent behavior is measured by an equivalent analysis but by assigning individuals an indicator variable for their inclusion in exactly one of four subgroups based on their baseline consumption quartile. Subjects in the 1st and 3rd quartiles have baseline behavior “close” to their respective social comparisons, whereas subjects in the 2nd and 4th quartiles have baseline behavior “far” from their respective social comparisons. Finer resolution of consumption quantiles is desirable but the available experimental sample limits statistical power for such resolutions.

Key findings

The average treatment effect from this study was approximately 6%; meaning that treatment group subjects reduced their energy consumption by 6% more than the control group. Furthermore, individuals “close” to their respective social comparisons significantly reduced consumption (by approximately 7 and 12%, respectively), while the change in behavior of individuals “far” from their respective social comparisons was not significantly different from zero. These findings confirmed the two hypotheses that the awareness of social norms is a powerful motivator for behavior change, and that an individual’s distance from the norm has an effect on behavioral response.

This manuscript is being prepared for submission to academic peer-reviewed journals in behavioral economics and policy.

1.3.2 Chapter 4: Peer Communication Improves Environmental Employee Engagement: Evidence from a Quasi-Experimental Field Study

Chapter 4 analyzes the results of a quasi-experimental field study conducted in a corporate setting that evaluates the effectiveness of peer communication strategies on employee engagement and firm reputation. This is joint work with Matthew Potoski.

Research question and contributions

This paper shows how companies can harness the credibility of peer communication to improve the effectiveness of their environmental employee engagement programs. Peer communication is the purposeful dissemination of corporate information to employees through a network of line-level peer employees to complement existing corporate broadcast communications. The finding that this peer communication program improved employee engagement provides important lessons for companies on how to design and implement effective environmental

employee engagement programs. The company's core program objectives – increased engagement towards the employer, greater employee participation in its environmental programs, and improved employee attitudes and behaviors – are typical of environmental employee engagement programs.

Methodology

To demonstrate how peer communication increases the effectiveness of environmental employee engagement programs, we analyze data from a field trial of a peer communication program implemented by a large retail bank in the United States. Our analytic approach uses a quasi-experimental field research design with pre- and post-treatment measurements of a treatment group of employees working in regions that received the peer communication program and a control group that did not. The analyses show that the peer communication program improved the effectiveness of the company's existing environmental employee engagement programs across several outcome dimensions important to the company. Employees in the treatment group exposed to the peer communication program were more proud of the company's environmental efforts, more aware of its environmental initiatives, more likely to actively participate in its environmental employee programs, and more confident in communicating the company's initiatives and performance with external stakeholders. While not direct measures of financial gain, the company deemed that improvements along these lines positively contributed financial value by enhancing employee recruitment, retention and productivity.

Key findings

The results show that employees in the treatment group increased their pride in their employer's environmental accomplishments and initiatives, confidence in discussing its environmental record with external stakeholders, awareness of and participation in its environmental employee programs, and congruence with company values on key environmental issues. These

changes were significantly greater than changes that occurred in the control groups, suggesting that the peer communication program was generally effective at improving these target outcomes. The effects of the peer communication program do not appear to be due to pre-treatment differences between the treatment and control markets or to unique ways that the program was implemented in the treatment markets.

This study has been published in the Journal of Cleaner Production.

1.3.3 Chapter 5: Competing Motivations for Corporate Social Responsibility: Identification Through Peer Group Selection

Chapter 5 examines firm strategic motivations to engage in corporate social responsibility (CSR) through the lens of peer effects.

Research question and contributions

Do firms exhibit peer effects in strategic corporate social responsibility (CSR)? To what extent does strategic context affect firm motivations to improve corporate social performance (CSP)? Are firms more oriented by profitability or legitimacy concerns when observing relevant peers for information on success of strategies?

The contributions of this study are fourfold: first, the study proposes and empirically demonstrates a new theoretical framework for the analysis of firm strategic motivations using the concept of peer effects as a lens through which to observe strategic behavior. Applied here to the context of strategic motivations for CSP, the framework may be generalized to other areas of strategic management. Second, the study demonstrates the importance of thoughtful selection of peer groups relevant to the strategic context under study. Third, the study highlights the importance of more thoughtful characterization of CSP along individual dimensions or initiatives. Finally, the study employs advanced econometric techniques to address and over-

come the problem of endogeneity bias present in any model that includes explanatory variables based on averages of a peer group or social network.

Methodology

This study seeks to understand firm strategic motivations to improve CSP through observation and analysis of firm behavior relative to the performance of relevant peer firms. The study proposes a novel theoretical framework of firm motivations based on performance feedback and peer group selection. The framework suggests that strategic motivations may be inferred based on firm behavior relative to the observable performance of a group of purposefully selected peer firms relevant to a particular strategic context. In order to test hypotheses generated from this framework, an empirical model is developed based on a rich peer effects literature in economics and education, edited and framed in the context of the behavioral theory of the firm and performance feedback theory. The model is analyzed using widely accessible data on corporate social performance, dynamic and non-transitive industry peer group associations based on product market rivalry, and robust dynamic panel estimation using instrumental variables to control for endogeneity endemic to peer effects models.

Key findings

The results of the empirical analysis yield unexpected observations about firm strategic motivations for CSP. By selecting subsets of broadly defined peer groups based on characteristics relevant to a particular strategic context, and by disaggregating CSP into multiple dimensions with different operational and stakeholder contexts, substantial differences in firm behavior emerge that were not observable through aggregate analysis. These results indicate that firms exhibit profit-maximizing behavior along environmental and social dimensions of CSP when legitimacy motivations tend to drive firms to satisfice — do no more than the minimum required to satisfy perceived stakeholder expectations. The results also provide evidence for the

importance of differentiating among specific areas of CSP or even individual initiatives; adopting CSP as a general, aggregate construct in empirical analyses may mask important subtleties in CSR activities at a finer scale.

An abridged version of this manuscript is being prepared for submission to academic peer-reviewed management journals.

1.3.4 Chapter 6: Unmasking Symbolic Management: Evidence from Voluntary Corporate Carbon Disclosures

Chapter 6 evaluates the propensity of firms to participate in voluntary environmental performance disclosure standards, and explores incentives for firms to misrepresent their performance in such disclosures. This is joint work with Jessica Perkins.

Research question and contributions

Information intermediaries have emerged as credible institutions for voluntary corporate disclosures of non-financial performance. However, research suggests that these mechanisms do not always lead to corresponding improvements in substantive performance or transparency. This study evaluates whether voluntary disclosure intermediaries and their explicit endorsements of firm performance can serve as “credibility shields” that can serve to deflect stakeholder scrutiny of symbolic disclosures.

This study makes several contributions to knowledge of symbolic management in voluntary corporate disclosures. First, we synthesize disparate theory of voluntary disclosure and introduce new theory of intermediaries as “credibility shields” to improve stakeholder management. This theory also describes the motivation for firms to attain higher levels of endorsement beyond minimal disclosure, and to signal that motivation using different levels of assurance. Second, we apply rigorous quantitative analysis of detailed individual firm disclosures to a

prominent disclosure intermediary and develop empirical measures of both this motivation for endorsement and symbolic management. Our analytic results provide new empirical evidence both of symbolic management through voluntary disclosure intermediaries and of the use of different quality levels of third-party assurance by firms to either signal substantive management or provide additional external credibility for symbolic management. The study offers practical guidance both for design of disclosure institutions and methods and for investors and other stakeholders that make use of endorsements that may help reduce the incidence of symbolic management and its resulting inefficiencies.

Methodology

Whereas prior research on symbolic voluntary disclosure has relied on limited subsets of firms with available data on actual performance, this study takes a novel approach. Using data from a well known voluntary disclosure intermediary, CDP (previously the Carbon Disclosure Project), we perform detailed analysis of microdata embedded in individual firm disclosures and identify patterns in the data that are consistent with symbolic management. Our approach is unique among a substantial literature exploring CDP disclosures; rather than focus on the binary decision to disclose or not, we take a deep dive into the content of disclosures and CDP's scoring methodology, evaluate the effect of CDP performance rank scores, and consider disclosure data over a period of several years, taking advantage of small perturbations in disclosure format and scoring for identification purposes. From this detailed analysis we develop and validate measures of symbolic disclosure as well as overall motivation to obtain CDP's explicit endorsement.

Key findings

This study provides empirical evidence that firms respond to incentives and engage in undetected symbolic management through third-party disclosure intermediaries. Symbolic man-

agement may be pervasive considering that intermediated voluntary disclosures face heterogeneous and often lower standards of verification and audit. We also find that a prominent means of signaling substantive performance (third-party assurance) sometimes predicts substantive disclosure, but that evaluators often fail to sufficiently reward the value-relevant information contained in those signals. We offer insights gleaned from this analysis that may motivate more rigorous standards of voluntary disclosure programs in the future.

An abridged version of this manuscript is being prepared for submission to academic peer-reviewed management journals.

1.4 Permissions and Attributions

The content of chapter 3 is the outcome of a collaboration with Chris Goodwin and Daniel Moncayo. The field experiment was conducted with the cooperation and support of the University of California, Santa Barbara Housing and Residential Services. Funding for the project was provided by the University of California, Santa Barbara Department of Economics, Housing and Residential Services, and The Green Initiative Fund (TGIF).

The content of chapter 4 is the outcome of a collaboration with my PhD Advisor and Committee Chair, Matthew Potoski. The field experiment was conducted with the cooperation and support of employees of TD Bank. This article has been published in the *Journal of Cleaner Production* (Potoski and Callery, 2018), and is reproduced here with the permission of Elsevier.

The content of chapter 6 is the outcome of a collaboration with Jessica Perkins. Funding for the project was provided by the H. William Kuni Bren Fellowship Program.

Chapter 2

Literature Review

The following literature reviews address fundamental questions that motivate and provide context for my research goals. The first section addresses the role of corporations in addressing global collective action problems, namely greenhouse gas emissions and their effects on climate change. As measurement standards are needed to monitor the participation and contribution of individual entities to resolving such problems, the second section evaluates corporate environmental measurement and reporting standards and corresponding motivations to participate in and influence standards development. The third section begins to address the fundamental question driving my research: the incentives and capabilities of firms to both create and capture value through provision of public (environmental or otherwise) goods.

2.1 Global Collective Action Problems and the Role of Corporations

The first literature review evaluates the nature of the global greenhouse gas (GHG) emissions problem — one of the most pressing environmental problems of our time — in terms of collective action and externalities.

2.1.1 Collective action and transboundary greenhouse gas emissions

Institutional solutions to collective action problems

Climate change caused by anthropogenic greenhouse gas emissions (GHGs) is perhaps the most challenging global collective action problem of our time (IPCC, 2014). It is a collective action problem in the sense that solutions will require action from multiple (or, myriad) individual entities, and those solutions are expected to bring about some optimal collective net benefit, but that action imposes costs on the individual entity that exceed (or are perceived to exceed) the amount of benefits appropriable by that entity. It is exemplary in some ways of the problem famously asserted by (Hardin, 1968) in *The tragedy of the commons*; in terms of Hardin's metaphor, the pasture is the the global climate, and the cattle are the greenhouse gas emissions of each individual herder. *The tragedy of the commons* and the prisoner's dilemma game have been used to characterize many smaller scale environmental collective action problems (Ostrom, 1990). The global nature of the problem is relatively unique in that all individuals inhabiting the planet are potentially affected; GHGs pool at a global atmospheric level (IPCC, 2014) and alter the climate experienced by all (though specific changes to regional climates and the subsequent damages or benefits to individuals are not uniformly distributed).

The specific nature of this global collective action problem is that individual and collective behaviors that generate GHGs contribute an externality; costs associated with damages caused by GHGs are borne (non-uniformly) socially and globally and not incorporated into prices of GHG-generating activities faced by individuals. This externality is a classic example of market failure commonly addressed by environmental economics (Baumol and Oates, 1988). Because there is a lack of property rights over the externality (or the general good impaired by the externality), there is no incentive for the producer of the externality to change behavior (Demsetz, 1967). There is demand from those negatively affected for regulation to require the producer to internalize those social costs, and that regulation is (expected to be) supplied by governments.

In theory, where such market failures exist, governments can intervene to assign property rights and either impose fees on the producer equivalent to the marginal social cost of the externality (Pigou, 1920) or allow parties to bargain over the property right (Coase, 1960). However, numerous factors, such as uncertainty over the distribution of costs and benefits, conspire to impede bargaining between rational, self-interested parties (Libecap, 1993). Furthermore, the global atmosphere is not under the purview or jurisdiction of any one governmental organization, and thus the problem extends to the scale of international relations. One government may prescribe such property rights and related market mechanisms within its jurisdiction, but unless all other global governments act similarly, the actions of the one government will not deter other actors outside its jurisdictions from continuing to generate GHG emissions that impose global social costs.

Therefore, the key arguments about this global collective action problem may be summarized as follows. First, GHG emissions can be characterized as a global public bad, and so it follows that GHG emissions abatement is a global public good; the benefits of abatement are available to all. Second, there are currently no internationally recognized property rights over this global public good, a necessary condition for addressing the externality. Third, the nature of transboundary GHG emissions and the associated costs and benefits of abatement lead to very high transaction costs associated with executing any potential agreement. Finally, owing partly to these contributory factors, the ability of parties to free-ride on the costly actions of others may render potential agreements ineffective. I address each of these factors and their implications for the actions firms in separate sections below.

GHG emissions abatement as global public good

Public goods are generally characterized by two key features: non-excludability and non-rivalry (Kolstad, 2011). GHG emissions abatement meets these basic criteria.

First, the ability of any party to enjoy the benefits of GHG abatement does not reduce the

amount of benefits available to other parties. Rivalry of a non-excludable resource such as clean water or the (Hardin, 1968) pasture produces incentives for users of the resource to over-consume; if one party does not consume it, then it will be consumed by another party. An important caveat to the non-rivalry of GHG emissions abatement - that benefits of abatement are distributed non-uniformly (geographically and socially) and with uncertainty - is discussed further below. In any case, the question of rivalry is less relevant than the matter of non-excludability.

It is not possible to exclude any party from participating in the benefits of another party's abatement; GHGs are regionally unbounded, they aggregate globally. Because no party is able to effectively exclude other parties from the benefits of abatement, it is not feasible for any party to assign a price to its abatement activities and sell them in a market¹. The inability of private actors to profit from provision of public goods is one primary reason why provision has historically been under the purview of governments, which have the ability to either impose taxes in order to fund that provision, or to create other market incentives (through complete and clearly defined property rights) for private actors to engage in provision.

The main implication of the non-excludability of GHG emissions abatement is that private parties will not engage in costly emissions abatement without incentives to do so. One solution to address this issue is for government to assign of property rights over the good (or the externality that impedes production of the good) and thus allow the holder of those property rights to exchange that good at the market value. However, GHG emissions abatement is a *global* public good. Any government may choose to provide the good or to establish property rights over the good within its jurisdiction, but cannot completely appropriate the benefits of that provision for its constituents. The benefits of provision are shared by all other governments, while

¹In practice, entrepreneurs (aided in some cases by government regulation) have found ways to privatize the provision of public goods by appealing to social preferences of individuals; see (Murray and Dey, 2009) and (Smith, 2007) for commentary on carbon offsetting as commodity. See (Rabin, 1998) for a review of social preferences.

no other governments are obligated to contribute to the costs. In the case of GHG emissions abatement, each one of Hardin's herders is a national government, and the collective action problem ascends to the international level. Addressing the global collective action problem necessarily involves the establishment of property rights.

The importance of property rights

Property rights are a fundamental component of civilized society. In a general sense, property rights encompass a set of expectations that individual agents can rely upon in dealings with other agents (Demsetz, 1967). More specifically, property rights are often referred to with the "bundle of sticks" metaphor that defines the specific ways in which an owner can benefit from property ownership. The individual "sticks" - the rights of possession, control, exclusion, enjoyment, and transfer - may be separated from the original bundle and still retain some value (Merrill and Smith, 2012). Without the existence of property rights, there is no means for resolution of disputes; they delineate what an individual or entity is entitled to do with property.

A body of literature is oriented around the lack of clearly defined property rights in modern institutions that are expected to benefit (in terms of reduced dissipation of rents and improved economic efficiency) from the presence of clearly defined property rights. One basic intuition and common result of this literature shows that property rights are generally established only when the benefits of establishing property rights outweigh the costs (Libecap, 1993). The costs associated with establishing property rights are often substantial. Many of the more significant costs that act to impede the establishment are related to uncertainty and enforcement; such costs are referred to as transaction costs, and are discussed in the following section.

A market failure occurs when property rights are present, but not clearly defined. Market failures are all around us, and occupy substantial attention in the literature. One of the most interesting market failures from the standpoint of environmental economics is that of externalities (Buchanan and Stubblebine, 1962; Dahlman, 1979). An externality occurs when the exercising

of an individual property right violates the property right of another party. In the context of GHGs and climate change, the externality occurs when an individual engages in some activity that releases greenhouse gases. The addition of marginal GHGs to the atmosphere causes some climatic change that may adversely affect the quality of life of another (or many) individuals. (Coase, 1960) argued that (absent transaction costs) establishment of property rights over the externality enables parties to negotiate a price at which both parties are satisfied; this assumes there is some price at which the emitter is willing to abate the externality, and there is likewise some price at which the affected party is willing to endure the externality. One impediment to bargaining (a transaction cost not discussed in detail below) is the asymmetric relationship between the bargaining parties. For GHG emissions, there are multitudes of emitters and there are billions of affected parties, all with heterogeneous preferences and varying willingness to pay for abatement or willingness to accept for non-abatement. This coordination problem is at the heart of the transboundary GHG emissions problem and is discussed further below.

In the case of GHG emissions, there are no globally defined (let alone enforced) property rights of relevance to the problem. We might think of a relevant property right (or bundle of rights) as the right of any individual to a general chemical composition of the atmosphere in line with historical expectations. Such a property right is of critical importance to civil society in the sense that the atmospheric composition partly dictated the development of local and regional cultures and economies and provided a stable expectation of normal climatic conditions (to the extent that weather can be reliably stable over time). If a group had property rights to this atmospheric composition, it could theoretically place a value on that composition and properly evaluate tradeoffs of the value of other goods and services in exchange for changes in that composition. However, in human history there have been no property rights established that protect an individual's expectation of consistent atmospheric concentration. Incomplete property rights are beginning to be established through a patchwork of global regulatory programs designed to correct externalities of GHG emissions by establishing a price on that externality

and overcome the asymmetric bargaining problem.

Governments have sought to address the issue at an international level, reducing the scope of coordination required to bargain effectively. Regionally, many unilateral and multi-lateral agreements have been formed that propose distribution of costs and benefits via assignment of property rights to the non-uniform rents arising from GHG abatement. However, the barriers to effective negotiation (transaction costs) remain large even at the inter-governmental level.

Transaction costs approach

The above section discussed the concept of property rights in the context of global GHG emissions, necessary conditions for the development of property rights, and their subsequent necessity for effective bargaining over levels of externalities (impacts of increased GHG concentration in the atmosphere). Many environmental problems have been resolved where institutions formed around the creation, assignment, and enforcement of property rights (Ostrom, 1990). But if establishment of property rights were a panacea for solving environmental collective action problems, why do we see large-scale instances of major global problems without clearly defined property rights? As discussed above, property rights are often established when the benefits of doing so exceed the costs. (Coase, 1937) suggested that firms arise when the cost to an entrepreneur of entering into a contractual relation exceeds the cost to achieve the same goal by hiring. The costs of contracting often involve more than just the basic provision of goods and services; there are other costs (costs of information, bargaining, enforcement; collectively referred to as transaction costs) that must be taken into account in finding the lowest cost solution. Transaction costs can take many forms and the economic value of those costs is often uncertain.

Transaction costs are therefore also an important concept to understand in terms of the propensity of governments to enter into international environmental agreements (IEAs). In this context, IEAs are similar to those institutional arrangements to resolve collective action prob-

lems cited by (Ostrom, 1990) and others, but between national governments and on a larger scale. (Libecap, 2013) provides an extensive review of the literature on IEAs and argues that IEAs are more likely to be executed when transaction costs are low. He develops hypotheses that suggest four general categories of transaction costs that act to inhibit the formation of IEAs to address major global environmental collective action problems: (1) uncertainty over the magnitudes and distribution of costs and benefits associated with action, (2) heterogeneous preferences and perceptions between bargaining parties and their constituents, (3) information asymmetry between parties, and (4) enforcement of contractual obligations. I briefly summarize and comment on each of these issues below; see (Libecap, 2013) for a detailed review with relevant citations.

While scientific consensus regarding the causes and general expected climatic shifts regarding climate change is increasing (IPCC, 2014; Stern et al., 2006; Nordhaus, 2007; Weitzman, 2007), the uncertainty over specific outcomes and the distribution of impacts around the globe remains extremely high (Weitzman, 2009; Pindyck, 2013). The impacts of climate change on known sensitive regions (e.g. low-lying coastal areas subject to sea-level rise, wildlife habitat and agricultural regions sensitive to temperature and moisture perturbations, areas with high dependency on snow melt for fresh water supplies) is difficult to predict, with climate and economic models delivering divergent results. Furthermore, the costs of abatement are also highly uncertain; shifting to a low-carbon economy requires massive changes to energy infrastructure (electricity generation, heavy manufacturing, transportation) as well as human behavior. In the face of this uncertainty, global leaders and constituents have a lower willingness to pay for abatement; there is insufficient data to reliably predict a return on investment in abatement. Without sufficient certainty over costs and benefits of action, let alone the potential costs of inaction, international parties are less likely to commit to a substantial change in course of action. This level of uncertainty is realized as a high transaction cost barrier to negotiated IEAs on climate change.

Another roadblock serving as high transaction cost of bargaining over GHG emissions reductions at the international level is the varying preferences in individual nations for such action. Democratically elected governments generally must answer to their constituents, and polling indicates many nations are narrowly divided on the need to shift economic resources to combat climate change through reduction of GHG emissions. At an individual level, climate change has high public awareness and support for abatement and mitigation policy, but individual actions are muted given reduced salience. The forecasted impacts of climate change, particularly in developed countries, are generally seen as distant in time and disproportionately affecting other nations; individuals tend to view issues of psychological distance more abstractly, while maintaining higher concern over issues more proximate in time and place (Trope and Liberman, 2010). There is also considerable debate over the best policy means to achieve efficient levels of abatement. While economists generally favor policy modes that include a price on GHG emissions, other regulatory mechanisms such as technology mandates, output limits, and research and development subsidies have proven more politically palatable. Furthermore, the question of liability for past emissions is a divisive one. Developed nations (with much more invested in existing energy infrastructure and lower growth rates in economic output, population, and emissions intensity) tend to look toward developing nations (with less developed infrastructure and significantly higher growth rates) as the larger opportunity to make changes in the emissions intensity of economic growth, while developing nations tend to place responsibility for the current state of affairs on the past actions of developed countries with carbon-intensive growth. Beyond notions of responsibility, it is also generally acknowledged that marginal abatement costs are higher in developed countries leading to more economically efficient abatement activities in developing nations. Formalizing policy (such as the European Union Emissions Trading Scheme) to address this cost imbalance through transfer programs (such as the Clean Development Mechanism) may lead to substantial transfers to developing nations, which may or may not be politically feasible in developed countries. This

issue is often cited for high-level impasse at global climate negotiations.

Asymmetric information presents high transaction costs to executing IEAs on climate change due to differing opinions on the distribution of costs and benefits, similar to the points discussed above. Another form of information asymmetry is the perceived risk by some parties of manipulation of emissions performance data by others. This leads to higher costs of enforcement, another deterrent to bargaining. The matters of information asymmetry and enforcement are also related to greater concerns of free-riding.

The free-riding problem

In collective action problems over public goods or common pool resources, the inability to exclude any one agent from receiving benefits of collective action leads to incentives for an agent to “free ride” on the actions of others (Olson, 1965; Ostrom, 1990). In the context of IEAs over GHG emissions, firms and governments will generally participate only when it is in their interest to do so. Free riding on IEAs can occur at the national level; in fact, the current existence of a patchwork of national and regional regulatory policy that impose prices on GHG emissions is an indication that nations without such controls are technically already free riding on those nations imposing the policies². Free riding can also occur at the sub-national level through similar jurisdictional regulatory patchwork (e.g. the cap and trade programs in California and Quebec). Jurisdictional free riding can be addressed through regulatory design, such as the imposition of border tax adjustments (Fowlie et al., 2012), though such heterogeneous regulation causes shifts in production and consumption, resulting in non-uniform distribution of costs and benefits. Though this can be addressed through transfers, albeit imperfectly. Scholars have suggested a “bottom-up” patchwork of regulations may be more effective than international agreements (Keohane and Victor, 2011). In the absence of a comprehensive IEA or regulation, are there incentives for sub-national bodies (e.g. regional

²Implications of this issue are discussed further below.

governments, firms) to act unilaterally? This question is addressed in the next section.

2.1.2 The role of firms in addressing global externalities

Governments, corporations, and individuals variably assume “leadership” roles in addressing collective action problems by assuming some private cost, despite their aggregate contributions often coming short of levels required to generate public goods in excess of the private costs. An appropriate definition of leadership may be the actions undertaken by an entity (government, firm, or individual) with cost and risk, and without external coercive influence (such as a law or regulation), to set an example for others to emulate. As such, in this section I will explore the incentives to governments and firms to taking costly actions to provide public goods in the absence of IEAs or regulations mandating such provisions; we can refer to these types of actions as “voluntary”. The risk of exercising such leadership may be the failure to attract others to act in kind (resulting in economic loss as well as loss of reputation or legitimacy), whereas the payoffs may be intangible, or at best, an attractive strategic position to generate some first-mover advantage (Lieberman and Montgomery, 1988) under changing market dynamics.

It is also important to define appropriable in this context; a public good that is not appropriable would be one that is not bounded, such as abatement of GHG emissions. It is not physically possible for one entity to appropriate the direct benefits of abatement, since the benefits are dispersed globally with substantial uncertainty (as discussed above). However, as I will address below, governments and firms have the demonstrated ability to create their own benefit streams from action, outside their small share in the direct global benefits of reduced emissions; that is, firms can enhance their value without directly and disproportionately appropriating the social benefits of their actions.

The classical economic view states that firms exist to maximize profits, and that any action

contrary to this purpose is a dereliction of fiduciary duties to shareholders (Friedman, 1970). However, in practice, firms often act in ways that may seem at odds with optimization, and multiple theories have been advanced to explain these apparent deviations (Simon, 1955; Cyert and March, 1963; Jensen and Meckling, 1976). I would argue that a common feature to all economic theories of the firm are that the managers of a firm will only incur costs to the extent that resultant benefits are expected. A firm's failure to profit from the course of its actions are a reflection of market imperfections and the ability of managers to both correctly predict the future state of the world and formulate and execute an effective strategy to take advantage of that future state.

In general, firms and governments do not seek to bear costs of providing global public goods solely in the name of leadership. Though some such entities do act, and those actions can be framed in the context of forward-looking strategy. The entity must have some long-term view of positive expected second order benefits under a new structural regime. Governments can foster the establishment of competitive industry under expectations of a future shift in global economic structure; firms can exploit "leadership" on emissions abatement through enhanced reputation (Fombrun and Shanley, 1990) in addition to strategic positioning under dynamic competitive environments (Teece et al., 1997). Critically (as discussed below), firms may find methods to extract private benefits associated with GHG emissions abatement without substantively reducing their emissions.

Political Economy of Abatement Policies

Leadership in the context of national and regional GHG abatement policies is a difficult concept to reconcile. The literature on GHG emissions abatement does not address the concept of "leadership" to any significant degree. Rather, the literature (to the extent of which I am familiar) is generally oriented around the economics of various policy approaches and political climates in which they are debated. The idea of leadership by governments and firms in

addressing the impacts of climate change is often expressed in visionary verbiage from those entities communicating the benefits of action to stakeholders³. Policies implemented are often a reflection of the political ideology of the group in control, and a government exercising leadership by implementing costly policies to reduce carbon emissions within its borders may have several practical reasons for doing so. Major economic policy is rarely implemented without a cost-benefit analysis demonstrating benefits exceed costs, though such analysis is often justified (or decried) through the estimation of second order economic impacts, which are more easily manipulable due to confirmation bias. For example, economic analyses may suggest that such regulations have economic benefits outside of the avoided damages thru abatement (Fine et al., 2012).

Governments tend to justify policy through benefit cost analysis, and benefits falling outside their jurisdiction are commonly ignored, as constituents tend not to be concerned with subsidizing economic improvements of foreign nations. So a government may claim “leadership” on a climate issue, or use moralistic language in its communications, as an auxiliary to its main economic justifications. Just as a government may use colorful language to rationalize its actions in terms relatable to a broad base of constituents, so to may a firm do so to rationalize costly investment in GHG abatement to appeal to various stakeholder groups. However, both types of entities must ultimately answer to their primary stakeholders (government to its constituents, firm to its shareholders) to maintain legitimacy; in both cases, the institution must demonstrate its activities effectively meet the demands of the relevant stakeholders. In the context of climate change and GHG emissions, it is difficult for stakeholders to evaluate performance, since the benefits are accrued over long periods of time and may be difficult to trace back to the original policy or strategy (this matter is discussed in section 2.1.4 below).

³For example, see California AB32 Economic Analysis, page ES-3: “While California acting alone cannot reduce emissions sufficiently to change the course of climate change worldwide, our leadership has played and continues to play a critical role in moving federal and international climate policy forward...”
See also the World Bank Carbon Pricing Leadership Coalition.

While government officials and corporate managers may be long retired before the outcomes of their policies in this regard become clear, the stakeholders typically judge performance based on perceptions of future outcomes; thus, government officials and corporate managers must act with those perceptions in mind.

Below I will address the incentives of voluntarily investing in costly abatement of GHG emissions from the perspective of unregulated firms.

Voluntary action by firms

The discussion in section 2.1.1 regards the use of government regulation to establish prices for non-market externalities associated with firm production decisions, with the intent of correcting market failures and converging toward social optimum outcomes with respect to anthropogenic climate change. The government policies analyzed in (and proposed by) the literature generally assign property rights to these externalities and thus induce firms to provide a higher level of costly environmental public goods (i.e. a lower level of socially harmful pollution) in the course of seeking a profit-maximizing level of production. Beyond government-imposed regulation, firms are also observed to undertake investment in voluntary environmental initiatives (e.g. industry alliances, certifications, etc) as a second level of regulatory response. Such self-regulatory bodies are often formed with clear collective self-interest in mind, as they provide a platform for firms to signal to stakeholders that firms will take the social interest into account in the course of operating profitable businesses; these institutions have been shown to provide numerous benefits to firms including social appeals to product quality attributes, maintenance of collective reputations, and mitigation of activist risks. A third level of response to these market failures is the voluntary, proactive, and individually competitive decisions firms make to invest in public goods for strategic motives. Firms employ strategy to invest in the provision of public goods to enhance private returns; strategic motives can include risk management (the proactive mitigation of risks to future profitability through anticipated changes in

market conditions and stakeholder demands) and reputation management (the proactive management of stakeholder perceptions about a firm's overall or context-specific quality).

Risk management

Firms employ risk management to mitigate the threat of negative impacts to future profits pending uncertainty regarding future states of the world. In the absence of regulation, firms may be compelled by activist pressure to improve environmental performance (Baron, 2001). A firm may approach management of carbon risks⁴ by viewing various emissions abatement activities as real options (Dixit and Pindyck, 1994). The incentives for firm action based on risk management vary by individual firm context and are driven by the perceptions of management and firm stakeholders on the potential future conditions. This matter is discussed further in section 2.1.4 below.

Reputation management and voluntary disclosure

Firms compete in a market for reputation by sending strategic signals to influence stakeholder perceptions (Fombrun and Shanley, 1990). The inimitable nature of reputation (Barney, 1991) enables firms to achieve sustained competitive advantage through reputation management (Roberts and Dowling, 2002). A firm's corporate environmental performance has also been shown to be a strong predictor of corporate reputation, and the ability of firms to develop and foster a reputational advantage in their unique competitive environment depends on the strategic fit between a firm's investment in corporate environmental performance and relevant stakeholder concerns (Brammer and Pavelin, 2006).

⁴Carbon risk is a general term referring to the risk to future value of the firm in light of changing global expectations regarding climate change and GHG emissions. Firms may carry varying degrees of carbon risk based on investor perceptions of the firm's susceptibility of potential future and economic conditions such as changing oil prices, global demand for fossil-based and renewable energy, the future marketability of long-term assets such as proven and unproven fossil fuel reserves, as well as other factors.

Research has shown that the presence and persistence of asymmetric information has a deleterious effect on the efficient functioning of markets (Akerlof, 1970). In the sense that firms rely on imperfect information in markets to execute profitable strategy, a firm's ability to proactively manage information asymmetry between it and its stakeholders also lends to a firm's competitive advantage. Firms manage information asymmetry through the process of corporate disclosure; economic theory has predicted that firms will always choose to disclose good news and selectively disclose bad news (Milgrom, 1981). The transaction costs of providing voluntary disclosure further determine the degree to which a firm will disclose or withhold information (Verrecchia, 1983), which presents a noisy signal to investors regarding the presence of good or bad news. Firms using greenwash⁵ to manage their environmental reputation may be deterred from selective disclosure by the threat of audit from activist stakeholders deters greenwash, but also induces firms to underdisclose positive environmental performance (Lyon and Maxwell, 2011; Delmas and Burbano, 2011).

In the context of GHG emissions performance, participation in formalized voluntary disclosure programs are increasing. While studies have shown that firms tend to benefit in the reputation marketplace from increased disclosure of GHG emissions (Clarkson et al., 2011; Lyon and Shimshack, 2015a), those voluntary disclosure programs have tended to not improve overall emissions performance (Matisoff, 2013; Cho et al., 2012). Following these results, the literature suggests that firms seeking to demonstrate leadership on addressing climate change concerns may find means to use selective disclosure to improve their reputation, without making substantive changes in performance. In this sense, one may surmise that the incentives for firms to proactively abate GHG emissions are not complete, and that firms seeking to demonstrate "leadership" may currently do so at lower cost by investing in strategic disclosure and corporate communications than by substantively improving emissions performance.

⁵Scholars increasingly define greenwash as the selective disclosure of positive environmental information to hide or distract from the presence of negative environmental information (Lyon and Montgomery, 2015).

2.1.3 Market structure and firm incentives under heterogeneous regulation

Given the disperse and heterogeneous nature of regional regulations on GHG emissions, firms operating globally face unique incentives to manage their emissions. Regulation (with some exceptions noted below) imposes direct costs on firms that they may not otherwise face when operating in unregulated jurisdictions. A firm's motivation to maximize profits will induce a regulated firm to find avenues of cost relief in the face of new regulation. Under regulation, firms do not have incentive to go "above and beyond", let alone meet, the minimum regulatory requirements unless they have significant advantage in marginal abatement cost relative to other domestically regulated firms. While some firms find ways to reduce costs through improved operational efficiency (see (Porter and Van der Linde, 1995)), other firms may find it less costly to shift operations from regulated to unregulated markets, decreasing overall economic activity in the regulated jurisdiction as well as failing to reduce overall global emissions. Furthermore, regardless of whether firms shift production away from regulated jurisdictions, regulated firms are likely to partly pass the costs of regulation onto customers in order to maintain profits; this effect can cause shifts in consumption away from goods produced in regulated jurisdictions to goods produced in unregulated jurisdictions, having a similar effect on both local economy and global emissions as the production shifts.

In this context, regional regulations over GHG emissions tend to go to great lengths in establishing incentives (or subsidies) to firms that may be negatively affected by unregulated competition. Regulators have substantial incentive to minimize leakage, particularly for unbounded pollutants such as GHGs, to both minimize any negative impacts to economic growth within their jurisdictions, and also to demonstrate that the costly regulation has positive global net benefits (Fowlie, 2009). Many regulatory designs have been put forth in the literature, and some of these have been implemented in substantial regulation, yielding empirical estimates of

their effectiveness at combatting the leakage problem.

The majority of active regional regulations on GHG emissions involve some variation on cap and trade, while others use a carbon tax. I will not explore the various arguments in favor or against the use of one policy mechanism or the other in this space (see Weitzman, 1974 for a seminal analysis and Goulder and Schein, 2013 for a more recent review); however, as much of the literature on program design and evaluation has focused on existing cap and trade systems and their various design features, my commentary will emphasize the market structure factors associated with cap and trade.

Incentives of regulated firms

Before discussing market structure factors that affect firm incentives, and to complement the previous discussion on voluntary incentives for unregulated firms, it is useful to briefly summarize the general incentives faced by firms in the face of regulation. Regulated firms are obligated to follow the rule of law imposed by regulation, and may develop further incentives proactively. Under regulation, the primary actors that determine the level of abatement are the firms that either directly generate emissions (e.g. heavy industry and electricity generation) or provide combustible fuels for downstream consumption (e.g. oil refineries). *Prima facie*, firms will seek to comply with the requirements of regulation, under threat of sanction that can impact profits. In practice, lax enforcement or unclear requirements may allow loopholes by which firms may increase profits by deviating from regulatory requirements. The susceptibility of regulation to market manipulation has been discussed in the literature (Stocking, 2012) but little empirical knowledge exists regarding the extent to which firms can exploit such loopholes. The importance of closing such loopholes for regulatory integrity is the source of one major transaction cost in establishing global cooperation on the GHG emissions problem, as was discussed above.

Assuming loopholes of design and enforcement are closed, near universal participation and

compliance with regulation is required for the regulation to achieve its desired impact. Since abatement is supplied by private sector actors, those actors have the ability to migrate business out of higher cost areas and into lower cost areas (termed “leakage”). Where international or regional agreements add private costs, firms have incentive to relocate to jurisdictions without those costs. Beyond direct firm incentives, price effects may induce users in regulated areas to reduce consumption of a regulated commodity, thus depressing demand for that commodity. If the shock to demand is sufficiently large, this in turn lowers prices in unregulated areas, thus increasing consumption in those regions.

Firms directly affected by regulations have been found to suffer, particularly in competitive markets such as energy generation (Linn, 2010; Meng, 2017), which further provide incentives to deviate or lobby against the passage of new regulation. Other research has suggested that firms subject to regulation tend to develop competitive advantage through forced attention to cost inefficiencies (“induced innovation”) (Porter and Van der Linde, 1995) and development of unique and inimitable resources and capabilities (Barney, 1991).

Market structure considerations for greenhouse gas emissions regulation

In cap and trade systems, prominent market structure factors that play an important role in influencing the actions of firms include initial allocation of permits, market price containment mechanisms, banking of allowances, and availability of offsets. Another factor common to both cap and trade and carbon taxes is the border tax adjustment. Because GHG emissions regulations are heterogeneous in design and geographically disperse, a major factor potentially limiting their effectiveness are the various modes of leakage, as defined above. As such, these market factors enter into the design of a regulatory mechanism largely for the purpose of combatting leakage.

The initial allocation of permits to firms is a primary tool policy makers have for influencing the incentives for regulated firms to relocate business outside of the regulatory jurisdiction. As

emissions allowances under a cap and trade system are effectively fiat currency issued by the government, the government has the option of how to release this currency into the market. The regulator may reduce the risk of leakage by minimizing the costs to firms of complying with regulation. One way to achieve such an objective is by freely allocating allowances to the regulated entities. Under such a “grandfathering” arrangement, leakage is reduced (Fowlie, 2010). Regulators may find this approach convenient not only for purposes of reducing leakage but also winning valuable support from constituents potentially affected by increasing costs to regulated firms.

However, this approach is at odds with the concept of applying carbon pricing mechanisms as revenue-neutral consumption tax for the purpose offsetting other distortionary taxes, a concept known as the “double-dividend” (Goulder, 1995; Fullerton and Metcalf, 1997); under this approach, regulators sell a fixed number of allowances under an auction format, which helps establish a baseline carbon price based on the willingness to pay of regulated entities for the permission to emit GHGs (which in theory will mimic the marginal cost of emissions reductions). According to (Coase, 1960), absent transaction costs, the efficient outcome of bargaining over externalities is independent of the initial allocation of allowances (property rights), known as the independence theorem. While earlier studies have raised concerns of failure of the independence property to hold in practice (Hahn, 1984; Stavins, 1995), more recent work has empirically demonstrated validity of the independence theorem cap and trade systems (Fowlie and Perloff, 2013; Hahn and Stavins, 2010).

Another concern leading to potential leakage effects in a cap and trade system is related to the variation in market price for allowances. While low prices have been a cause for regulator concern over the effectiveness of markets at reducing emissions (Ellerman and Buchner, 2008; Burtraw et al., 2010), the potential for unanticipated exogenous price shocks can induce leakage or shirking, and reduce the credibility of a regulation in the eyes of constituents. Regulators have begun to implement price containment features that blend the features of a carbon tax with

a cap and trade system to allow for release of additional allowances under market constraints (Fell et al., 2012).

A more subtle market structure factor influencing firm incentives is the point of regulation, also known as vertical targeting: determination of the point in the supply chain where it is most effective to apply the pricing mechanism (Bushnell et al., 2008). This factor has been analyzed in simulation models and found to be irrelevant with respect to leakage (Chen et al., 2011), and in theoretical economic models (Bushnell and Mansur, 2011) and found to exhibit outcome dependence on price elasticities of inputs.

At face value, the most effective approach may be to establish a border tax adjustment (BTA), which effectively increases the domestic price of imported goods to reflect the cost of regulation on the regulated domestic goods. Under this mechanism, firms operating outside the regulated jurisdiction have no cost advantage over domestic producers when selling in the regulated market. Lesser examined are border subsidies, or rebates, the counterpart of BTAs; domestic firms may receive a government rebate on exported goods to unregulated jurisdictions, again neutralizing the negative competitive effects imposed by the regulation. While both mechanisms together theoretically offset the negative competitive effects (Fischer and Fox, 2009), in practice these mechanisms are rarely implemented due to their conflict with existing laws or other international trade agreements prohibiting tariffs and subsidies.

2.1.4 Return on investment in abatement and stakeholder preferences

Context of costs and benefits to firms and to society

Some stakeholders (e.g. environmental advocacy groups) are more interested in the social benefits of corporate efforts to abate GHG emissions, while other stakeholders (e.g. shareholders) are more interested in the returns accruing to the firm from their costly efforts to abate. In terms of the former, these stakeholder groups are more likely to demand corporate *inputs* to

GHG emissions abatement (where inputs may be thought of as efforts - programs, initiatives, capital outlays - to reduce emissions) and less on the long-term outcomes. The reason for this is that the stakeholder groups that demand abatement from firms are expected to have a basic understanding that all GHG emissions reductions will have some positive effect on long-term climate outcomes, and that each subsequent unit of emissions abatement has the same marginal social benefit as the previous (e.g. the social cost of carbon); thus, such stakeholder groups care about the immediate and permanent reduction of emissions from business as usual, and rely on climate science to estimate the long-term social benefit of those emissions. In terms of the latter, these stakeholder groups are more likely to demand a cohesive strategy for demonstrating positive net benefits from costly abatement activities. In this context, emissions abatement may be thought of in the same way as any corporate strategy - a firm estimates the expected returns over time to its upfront and recurring investment in light of its specific context (firm resources and capabilities, competitive environment, and stakeholder pressure), and stakeholders (e.g. shareholders) judge the value of that strategy based on their expectations of its worth. As such, I have framed my response to this question in terms of the latter: stakeholder concern over long-term benefits to the firm of incurring costs to reduce emissions.

Stakeholder theory of corporate strategy

Stakeholder theory posits that a firm's choice of strategy is driven by its need to satisfy the demands of multiple stakeholder groups, where stakeholders may be defined as any individual or group that can affect or be affected by a firm's objectives and activities (Freeman, 1984). While the traditional view of a firm's responsibility is that it is solely beholden to the financial interests of its shareholders (Friedman, 1970), the development of the stakeholder view suggests that a firm may not blindly seek profitable returns for shareholders without considering the interests of other stakeholder groups that may not hold a direct ownership stake in the firm. The stakeholder view is not inconsistent with the traditional view of firm obligations,

because a firm's failure to address the demands of these stakeholder groups exposes the firm to increased risk of attack or other action that may threaten a firm's future profitability or legitimacy (Jones, 1995). A firm thus practices stakeholder management in order to preserve its ability to conduct profitable activity in perpetuity. Under this mode of strategy, a firm may then make substantial investments in projects or activities that seem (on the surface) to generate no direct returns on investment. Two general ways in which firms apply stakeholder management are then (a) for mitigation of risks to profitability or legitimacy, and (b) for improvement of "reputation" among stakeholders to enhance profitability through more traditional measures such as increased revenue (through higher market share or price premiums; see (Reinhardt, 2000)) or reduced regulatory oversight (Hong and Liskovich, 2015).

Heterogeneous stakeholder demands

In general, stakeholders are recognized in the literature as one of six general groups: shareholders, employees, customers, suppliers, regulators, and the general public⁶ (Clarkson, 1995). Research on corporate environmental management has also identified the natural environment as a stakeholder, with environmental non-governmental organizations (eNGOs) as its proxies. Stakeholder groups tend to be categorized based on the influence they have on management decisions; managers are thus sensitive to the varying demands of different stakeholder groups based on the perceived power of those groups, and tend to respond to stakeholder influence heterogeneously (Frooman, 1999; Delmas and Toffel, 2008). The degree to which certain types of stakeholders have power or influence over a firm's actions depends highly on the firm's context. Firms operating in environmentally sensitive industries tend to be subject to more scrutiny both in terms of regulatory oversight as well as public pressure. Larger firms are inherently more publicly visible and thus also tend to draw heightened public scrutiny over

⁶Numerous groupings and subgroupings of stakeholder types have been used in the strategic management literature for various analytical purposes.

environmental performance. Because firms must make upfront investments in GHG emissions abatement with private benefits that accrue over time and are difficult to track (i.e. intangible benefits such as reputation and long-term market and regulatory risks), firms that have greater organizational slack may have more latitude from shareholders in (Sharma, 2000; Russo and Fouts, 1997)

Different stakeholder groups tend to have different preferences with respect to social and environmental performance of the firm. Employees are a key resource and many firms go to great lengths to attract and retain higher quality employees as a basic course of strategy. Recent surveys suggest more employees value company environmental programs and corporate social responsibility above other, more traditional metrics⁷. While employee preferences for environmental performance are generally aspirational and may be oriented more toward programs and initiatives than to measurable performance (Potoski and Callery, 2018), recent empirical work has suggested that employees (as measured by employee satisfaction rankings) tend to be more oriented towards avoidance of corporate environmental damages than to positive environmental achievements (Zink, 2014). Customers, and to a lesser extent suppliers, may also exert substantial influence on environmental activities of firms, though often more structural (i.e. implementation of environmental management systems) than to general programs or specific performance metrics (Potoski and Prakash, 2005; Delmas and Montiel, 2009). Although each of these stakeholder group types are expected to have some interest in the long-term financial viability of a firm, given the preferences and influence demonstrated in the literature one may surmise that employees, customers, and suppliers are less concerned over long-term uncertainty in return on firm investment in environmental performance, such as GHG emissions.

The relationship of public stakeholders and “environmental” stakeholders (eNGOs, as described above) to firm environmental performance is decidedly more distinct. To the degree

⁷See United Nations Environment Programme - Finance Initiative and Net Impact for survey results of firm management and employees, respectively.

that members of the general public are not otherwise direct stakeholders (e.g. employees, customers, shareholders), this stakeholder group generally demands higher levels of environmental performance, or at least tends to reward firms that do so⁸ (Brammer and Pavelin, 2006; Cho et al., 2012), even though the general public is decidedly divided on environmental preferences in general⁹. There exists a multitude of studies examining the extent to which corporate environmental performance affects corporate financial performance (for reviews, see (Orlitzky et al., 2003; Margolis et al., 2009; Albertini, 2013)), however the literature does not demonstrate whether public stakeholders expect firms to make a positive return on investment from their environmental initiatives. Likewise, while environmental NGOs do not place overt expectations on the long-term profitability of firm investments in GHG emissions abatement, a number of high profile eNGOs have arisen to take as their charter mission the advocacy and demonstration of the long-term profitability of environmentally sustainable business models¹⁰.

Though these stakeholder groups are generally not sensitive to firm financial performance in terms of their demands¹¹, they may have different expectations with respect to the effectiveness of corporate programs on actual abatement. Though some studies have shown a possible propensity for stakeholders to put more stock in corporate environmental programs and initiatives than overall performance through analysis of reputations (Cho et al., 2012) and financial outcomes (Delmas et al., 2013a), there is less consensus in the literature with respect to the degree to which stakeholders hold firms accountable for the environmental commitments. I believe there is a research opportunity to explore this question.

⁸Firm reputation is a reflection of public attitudes towards the firm (Walker, 2010) and is consistently associated with corporate financial performance (Fombrun and Shanley, 1990; Roberts and Dowling, 2002)

⁹See Yale Climate Opinion Maps for current U.S. polling results by state on a variety of climate change questions (Howe et al., 2015).

¹⁰For examples, see Environmental Defense Fund, Ceres, and Rocky Mountain Institute

¹¹A caveat: surely, stakeholders that demand improvements in firm GHG emissions performance will prefer to see those firms with higher performance be rewarded with superior profitability than firms with lower performance, to establish the legitimacy of GHG emissions abatement as a successful and progressive business strategy.

Carbon-sensitive investors and effects on firm incentives

With respect to the question of stakeholder interest in corporate returns to investment in GHG emissions abatement, the key stakeholder group of interest are firm shareholders. Direct shareholders of a firm are interested in maximizing the value of their investment, and will not invest in a firm that they believe is not making appropriately profitable investments of capital and resources¹². The degree to which shareholders must be patient in terms of their expectations of firm returns to GHG emissions abatement strategy depends on their beliefs regarding the overall carbon risk of the firm's operations as well as the expected reputational returns to abatement efforts (or lack thereof). Different investors tend to have different preferences for firm GHG emissions abatement strategy, depending primarily on their perceptions of the future. The empirical literature has shown the curious result that prospects of new GHG emissions regulation have damaged firm value (Meng, 2017), while firm efforts to reduce emissions have generally resulted in increased in firm value (Ziegler et al., 2011; Lyon and Shimshack, 2015a) for both regulated and unregulated firms. The logic of this suggests that while the impacts of GHG regulations may hurt firms in the near-term, those firms that take a proactive approach to managing emissions in advance of any regulation will be better positioned to take advantage of those regulations. In fact, this concept has been demonstrated with firm response to previous global environmental regulatory agreements such as the Montreal Protocol restriction on ozone-depleting substances (Maxwell and Briscoe, 1997).

A key development in the evolution of investor perceptions of carbon risk has been the formation of NGOs with institutional investor signatories that highlight the demand for firms to take proactive approaches to managing carbon risk¹³. The implication of these changes is the increasing attention of firms to developing and articulating a carbon management strategy,

¹²Note: "impact investing" is a contemporary concept that may challenge this view.

¹³See Carbon Disclosure Project, which claims 822 institutional investor signatories representing \$95 trillion in assets under management, and Climate Bonds Initiative, an investor-driven sustainable corporate debt certification program that represents \$34 trillion in assets under management.

and a heterogeneous population of firms is likely to develop a vastly varied set of responses to these pressures and opportunities. However, there is yet limited evidence in the literature of the degree to which firm carbon strategies pay off and what types of firms are able to take advantage of what types of strategies to build market value, both operationally and reputationally. Seeking an answer to this question is a key motive in my dissertation research.

2.1.5 Conclusion

The preceding discussion and literature review addressed four separate questions regarding the incentives for and propensity of firms (and to a lesser extent, governments) to take action to reduce emissions of greenhouse gas emissions to combat climate change. The first section drew on literature in the fields of property rights and transaction costs economics to outline the problem of collective action in addressing global greenhouse gas emissions. The second section reviewed relevant threads of the strategic management literature to explain when firms may or may not take costly voluntary action to reduce emissions. The third section drew on the environmental economics literature covering program evaluation for greenhouse gas emissions regulation to explain various incentives for firms and mechanisms employed to improve regulatory effectiveness. Finally, the fourth section used stakeholder theory to analyze when firms are responsive to stakeholder demand for emissions abatement. I thank Professor Gary Libecap for his thoughtful guidance and motivation for this review.

2.2 Corporate Environmental Performance and Reporting Standards

2.2.1 Review of standards and protocols for corporate environmental performance measurement and reporting

Corporate reporting serves to inform investors and other stakeholders of specific details material to the activities and performance of a firm. Corporate financial reporting standards evolved primarily out of demand for government regulation of securities markets to protect investors. The United States Securities and Exchange Commission (SEC) formed in 1934, in the wake of the 1929 stock market crash and subsequent economic depression, with the general intent of improving the efficiency of capital markets and protecting against fraud by formalizing requirements for measurement and reporting of corporate financial performance and other details deemed material to future performance. While the pros and cons of various SEC rules and regulations have been and will continue to be debated, most would agree that the reporting requirements set forth by the SEC (and similar regulatory bodies worldwide) have improved the efficiency of capital markets through establishment and enforcement of standardized information disclosure that investors can rely on to make investment decisions.

Corporate environmental reporting is currently growing out of similar motivations; stakeholders are increasingly seeking to hold corporations accountable for the externalities imposed on society by their actions. While many firms are subject to some degree of mandatory environmental reporting as imposed by government regulations, the dominant mode of corporate environmental reporting today may be classified as voluntary; firms are not required by any formal regulatory body to measure and report their environmental impacts, yet an increasing proportion of firms are choosing to do so, with commensurate costs. Voluntary reporting standards are created by all sorts of institutions and consortia, and reflect the varying objectives of

those institutions, and by association, of society at large.

Voluntary standards refer to the voluntary *participation* of a firm in the sense that there is no legal obligation to comply with these standards. However, voluntary standards may still be *binding*, in the sense that a firm that voluntarily agrees to comply with a standard is therein obligated to meet the letter of the standard in order to claim compliance. Most of the voluntary standards reviewed in this article include the critical construct of third party verification and assurance. While the means and quality of verification and assurance varies from standard to standard, the general intent is that any claim of compliance by a firm must be verified by an independent third party that has been certified (often by the standards-setting body) to perform such verification. While not all third party verification systems are immune to fraud (e.g. see (Oliva, 2015)), they serve as a generally effective deterrent to manipulation.

Interest in corporate sustainability surged in the wake of the Brundtland Report to the United Nations World Commission on Environment and Development in 1987 (Brundtland et al., 1987). A more recent outcome of mobilized demand from the environmental movement has been the establishment of specific corporate measurement and reporting standards for non-financial performance metrics, mainly covering social and environmental impacts. Corporate financial reporting standards govern issues material to the financial performance of a firm. In the presence of externalities (aggregate costs imposed by the activities of firms and borne by society at large), firms are not obligated to report on those activities that impose social cost because there are no property rights over the externality that would assign legal liability for the costs. Corporate social and environmental reporting (or sustainability reporting) has evolved to provide structure by which stakeholders establish general expectations of firm disclosure on social and environmental impacts. Because these standards are not required by any centralized government (outside of various regulatory requirements, such as the disclosure of toxic chemical emissions mandated by the United States Environmental Protection Agency's Toxics Release Inventory (TRI) program), standards-makers have relied on other factors to encourage

firms to adhere to the reporting guidelines on a voluntary basis. Some reporting standards are understood to help improve information exchange between transacting firms, thus decreasing costs of independent verification of material information. Other standards provide information of relevance to investors in capital markets that go beyond the basic financial reporting requirements set forth by government regulators, thus motivating firms to report in order to improve access to capital. Some standards are also recognized as providing information deemed valuable to the public at large, and thus seen as a tool for firms to establish legitimacy in the eyes of a broader group of stakeholders. Any organization seeking traction and institutionalization of a relevant reporting standard must generally appeal to the interests of firms in making voluntary disclosures in line with its standards.

Given the demand by multiple stakeholder groups for voluntary corporate reporting standards on various metrics, recent history has seen a proliferation of these standards, with substantial variability in the uptake by firms. Some standards were developed by established voluntary standards-making bodies in other disciplines (e.g. ISO, the International Organization for Standardization), while other standards came about through the establishment of *ad hoc* non-governmental organizations (NGOs) and industry consortia (e.g. the Global Reporting Initiative, and World Business Council for Sustainable Development). Voluntary environmental standards have been established for a variety of purposes, including reporting of greenhouse gas (GHG) emissions, scientifically evaluating overall environmental impact of products and organizations, as well as augmenting standard financial disclosures with environmental information deemed material to investors. The following discussion highlights some of the more widely adopted standards for measurement and reporting of corporate environmental performance.

ISO 14040

ISO 14040 is a series of standards¹⁴ developed by the International Organization for Standardization (ISO)¹⁵ for the measurement and reporting of life-cycle impacts. It serves as a standardized methodology for life cycle assessment (LCA), a scientific means to calculate the total environmental impacts of a product or process from “cradle to grave”, accounting for the impact associated with all resource inputs, production processes, usage, and disposal. It also serves as a standard for reporting the results of a specific LCA project along a vector of different environmental impact categories, such as ecotoxicity, human health toxicity, climate change, depletion of natural resources, and others.

GHG protocol (WRI/WBCSD)

The Greenhouse Gas Protocol (GHG Protocol) was jointly developed by the World Resources Institute (WRI) and the World Business Council for Sustainable Development (WBCSD). WRI is an international NGO organized around the goal of promoting sustainable use of global natural resources, with independent staff and advised by leaders from governments and the private sector. WBCSD is a consortium of global corporate executives organized with the intention to promote sustainable development and corporate social responsibility (CSR).

The GHG Protocol is an international standard for accounting and reporting of GHG emissions at the firm or organization level¹⁶. It has become the most widely used standard for corporate GHG emissions accounting and reporting, and has served as the basis for other following GHG accounting and disclosure standards such as ISO 14064-1:2006 and the Carbon Disclosure Project (CDP).

¹⁴ISO 14040:2006 defines principles and framework of LCA, ISO 14044:2006 defines the formal requirements and guidelines

¹⁵ISO is an international NGO made up of representatives from the national standards-making bodies of its 162 member countries.

¹⁶The Intergovernmental Panel on Climate Change (IPCC) provides guidelines for nation-level GHG inventories

Product Category Rules

Product Category Rules (PCRs) define the rules and requirements associated with making Environmental Product Declarations (EPDs) in line with ISO 14025:2006 (ISO standard governing environmental information labels and declarations) for various categories of products. PCRs and EPDs are designed specifically for communication of standardized, verified information regarding certain environmental attributes of products between firms; the use of ISO 14025 standards for derivation of PCRs and EPDs allows for unbiased transmission of product information free of unsubstantiated claims. Though not specifically intended for communication from firms to end consumers, such usage is not precluded.

EPDs allow for a standard basis by which to compare the environmental impacts of related products. Since various types of products have inherently different aspects of environmental impact and performance, separate PCRs are published to establish the product category-specific rules around use of LCA methodology (see ISO 14040 series) to derive the EPDs.

GRI Protocols

The Global Reporting Initiative (GRI) is a network-based international NGO with constituents representing corporations, government agencies, NGOs, and other institutions. It was formed to develop a series of guidelines for the reporting of organizational sustainability, namely economic, social, and environmental impacts and performance. It has become the most widely used standard for corporate sustainability reporting, though many firms continue to issue corporate sustainability reports not certified to any particular standard. GRI standards on GHG emissions reporting have recently been linked with CDP, effectively reducing firms' transaction costs in complying with either standard.

A general concept prevalent in corporate reporting, both voluntary and regulated, is that of information materiality - the degree to which various types of information should be deemed as

important for the stakeholder audience and thus disclosed according to verifiable metrics. GRI standards are designed around a general stakeholder audience and take a broad view of information materiality, and thus tend to offer more flexibility to the firm in determining appropriate disclosures.

Other corporate sustainability reporting standards, such as the Sustainability Accounting Standards Board (SASB) in the United States, are more limited and specific in terms of information materiality. SASB, for example, is intended to govern a smaller set of issues and metrics relevant to investors, and thus seeks to become part of a broader set of financial disclosures mandated by the SEC. The International Integrated Reporting Committee (IIRC) is a recent offshoot of GRI and is organized with implementing similar reporting goals as SASB at an international level.

Natural Capital Protocol

The Natural Capital Protocol (NCP) is a newer standard (announced in 2014) designed as a standard framework for measuring and reporting the impacts and dependencies of a firm on global natural capital¹⁷. The NCP was developed by the Natural Capital Coalition, a consortium of corporations, government organizations, academics, and consulting and accounting firms, to provide businesses with a standard framework to measure impacts and risks of their relationship with natural resources. It is not a reporting standard but rather a means for firms to identify and manage risks associated with environmental impacts of operations.

Carbon Disclosure Project

The Carbon Disclosure Project (CDP) is an annual survey of corporations worldwide to systematically obtain corporate self-disclosure data on greenhouse gas emissions and strategies

¹⁷Natural capital is defined as the global stock of natural resources and ecosystems that enables a long-term supply of goods and services. It is an important concept of sustainable development that seeks to quantify the long-term financial impact of natural resource usage.

for addressing firms' impact on climate change. CDP is backed by 822 institutional investor signatories representing more than \$95 trillion in assets; the main objective of the project is to obtain standardized firm responses on management of climate change risk for the purpose of investment management. The CDP questionnaire is based partly on the GHG protocol.

Government voluntary programs

Government agencies have sought not only to regulate environmental performance (through regulations limiting releases of toxic chemicals and other pollutants), but also to encourage firms to reduce pollutant emissions beyond regulatory requirements. Government voluntary programs are fairly common in the European Union (EU), and less so in the United States, where most programs are created and administered through the Environmental Protection Agency (Delmas and Terlaak, 2001). Programs typically prescribe some aspirational goal for firms and may define incentives to reward firms for achievement of those goals, though sanctioning for failure to achieve is not typically used (though implied threat of future regulation may be a credible tool for regulators; Segerson and Miceli 1998).

One notable EPA program is the 33/50, under which firms were encouraged to reduce their emissions of 17 key pollutants by various percentages by certain deadlines (the 33 and 50). The program was generally successful partly because it was used in conjunction with the Toxics Release Inventory (TRI) regulation, which required public disclosure of all chemical pollutant emissions, and that a number of the program pollutants were to later become regulated by the EU under the Restriction of Hazardous Substances (RoHS) program.

Industry self-regulatory agreements

Industry self-regulatory programs are performance standards developed specifically by groups of firms or industry associations, often operating in the same industry, designed to govern firm performance along specified environmental metrics. These programs vary widely

in terms of their provisions and requirements, and have received substantial attention from scholars analyzing the effectiveness of various provisions. Prominent examples of industry self-regulatory programs include Responsible Care (governing the chemical manufacturing industry) and the Sustainable Forestry Initiative (governing the timber industry). For the purposes of this article, industry self-regulatory programs apply exclusively to those programs designed by the firms ultimately subject to the rules of the program. Many scholars have identified voluntary programs such as ISO 14001 as “self-regulatory” programs, when technically such programs are developed by third party standard-setting bodies and adopted on a voluntary basis; the distinction is critical when discussing the motivations and behavior of firms in developing standards in sections 2.2.2 and 2.2.3 below.

Ecolabels

Ecolabels, for the purpose of this discussion, may be defined as third party certifications of individual products that are verified to meet some objective environmental performance standard. The key factor that differentiates an ecolabel from a voluntary standard is that ecolabels apply to specific products, whereas the voluntary standards discussed above often apply to the entire operating impact of a firm. There is a diverse array of ecolabels in use today¹⁸ governing all types of consumer products. Ecolabels have been developed by government agencies, NGOs, and private enterprises.

Ecolabels also vary greatly in terms of the rigor of standards development and enforcement of claims¹⁹. Some labels are based on formal environmental standards (e.g. Green Seal requires an ISO 14044 LCA approach to calculating impact) while others have little scientific rigor and lax enforcement standards.

¹⁸The website ecolabelindex.com currently lists 459 ecolabels registered for use in 197 countries.

¹⁹The ISEAL Alliance provides a useful consumer guideline to judge the credibility of ecolabel sustainability claims.

2.2.2 Firm motivations for standards development

In terms of the following discussion, it is helpful to distinguish between three types of standards bodies associated with development of voluntary environmental performance reporting: formal standards-setting organizations, *ad hoc* environmental standards organizations, and industry self-regulatory bodies. The first type, formal standards-setting organizations, are generally outside the purview of firms to effectively influence. While representative of firms often take part in the technical proceedings of drafting standards, they may be considered separate from corporate influence. In the context of environmental performance and reporting standards, ISO is a primary example of this type.

The second type of standards bodies are comprised of consortia of corporations and other institutions (e.g. government agencies, NGOs, academic institutions) formed with the specific purpose of developing a single standard or set of related standards. While consortia including corporate representation may be considered to be influenced by corporate interests, the breadth and diversity of membership of these organizations opens them to wide stakeholder scrutiny that is often sufficient to ensure a balanced approach to standards making. The third type of body, industry self-regulatory institutions, are generally formed by groups of firms, often operating in the same or closely related industries, to provide a standard or system of guidelines that serves to define some threshold level of firm performance along environmental metrics of interest to stakeholders. In such an arrangement, firms typically have more (if not full) control over the direction and content of the standards, though inter-firm rivalry tends to induce a structure that benefits the industry as a whole, with some potential for disproportionate influence from larger or more visible firms (Prakash and Potoski, 2006). While corporate influence is endemic to these standards, such standards have varying degrees of effectiveness as measured in terms of their capacity to deliver the performance verification demanded by stakeholders. The following discussion will center on these latter two types.

Firm motivations to conform to a standard

Before addressing the motivations of firms to engage in the development of standards and protocols, it is instructive to consider the motivations of firms to conform to such a standard when in force. There are many reasons why firms might stand to benefit from compliance to a voluntary environmental standard; here I will focus on three general firm objectives that may be supported by such compliance: reducing transaction costs between firms, improving access to capital, and appealing to demands of critical stakeholder groups. Note that the enhancement of firm reputation in the eyes of various stakeholders is considered a component of addressing stakeholder demand.

Reduce transaction costs (Coase, 1937) suggested that firms arise whenever the cost of contracting between parties exceeds the cost of internalizing the contract under a hierarchical organization. This internalization of contracts is thus intended to reduce the cost of transacting in normal business operations (Williamson, 1973). Meanwhile, transaction costs between firms can also be reduced by improving information exchange between parties (Alchian and Demsetz, 1972); a buyer is more likely to engage in a transaction when information asymmetry is reduced, thus providing a less uncertain view of product quality (Akerlof, 1970). Furthermore, the presence of an agreed upon and verifiable information standard reduces the costs to the buyer of independently verifying quality (or to the seller in taking steps to provide verification of quality). In such instances it is in the interest of both buyer and seller to reduce transaction costs by agreeing on standards of information exchange. Voluntary environmental standards often meet this objective of reducing the cost of overcoming asymmetric information in business transactions.

Improve access to capital Firms rely on access to capital markets in order to fund their operations. A substantial goal of government regulation of financial reporting of firms is to

reduce information asymmetry between firms and potential investors; just as a buyer is more willing to transact with a seller of verifiable quality, so to is an investor more willing to commit capital to a firm of verifiable quality. Whereas mandatory financial reporting requirements have traditionally met this requirement, there is a growing class of investors demanding information on environmental performance not addressed by traditional financial regulation²⁰. This class of investors correlates environmental performance with overall corporate risk management; in the face of potential future events (e.g. increasing environmental regulation, exposure to potentially stranded assets, exposure to volatile fuel prices), these investors seek independently verified information regarding how firms are engaging in environmental risk management. By reducing the information costs to investors, firms complying with these voluntary reporting standards may in turn reduce their cost of raising capital (Dhaliwal et al., 2011).

Meet stakeholder demands and enhance reputation Finally, firms may increasingly face demand from various stakeholder groups for improved environmental performance. Firms engage in strategic management of stakeholders both to mitigate risk of activism (Freeman, 1984) and to increase reputation (Fombrun and Shanley, 1990). Activist stakeholders present a threat to firm profitability in proportion to their ability to mobilize action against a firm (e.g. through product boycotts or similar) (Baron, 2001), and a firm's corporate social or environmental performance is often targeted by activists. Furthermore, public stakeholders (as well as other stakeholder groups) often reward companies for environmental performance (Brammer and Pavelin, 2006; Deephouse, 2000; Hong and Liskovich, 2015). Conformance to formal standards may also play a strategic role. When firms use environmental performance and disclosure to respond to (or proactively address) stakeholder demand for environmental performance, rather than simply providing environmental goods for generic goals, those firms

²⁰See Carbon Disclosure Project, which claims 822 institutional investor signatories representing \$95 trillion in assets under management, and Climate Bonds Initiative, an investor-driven sustainable corporate debt certification program that represents \$34 trillion in assets under management.

may create competitive advantage and increase firm value (Hillman and Keim, 2001; Husted and de Jesus Salazar, 2006).

Importantly, firms may choose to engage in stakeholder management over demand for environmental performance by means other than compliance with formal voluntary reporting standards. Firms may exploit information asymmetry through selective disclosure of positive environmental performance and selective withholding of negative environmental performance. In general, the environmental reporting standards (particularly of the multi-institutional consortia type) discussed herein are designed to protect against this selective disclosure; however, firms have multiple avenues of information dissemination at their disposal to communicate to various stakeholder groups. Firms using greenwash²¹ to manage their environmental reputation may be deterred from selective disclosure by the threat of audit from activist stakeholders (Lyon and Maxwell, 2011; Delmas and Burbano, 2011). While studies have shown that firms tend to benefit in the reputation marketplace from increased disclosure of environmental performance (Clarkson et al., 2011; Lyon and Shimshack, 2015a), those voluntary disclosure programs have tended to not improve overall performance through some measurements (Matisoff, 2013; Cho et al., 2012). Following these results, the literature suggests that firms seeking to influence stakeholder perceptions of environmental performance may find means to use selective disclosure to improve their reputation, without making substantive changes in performance²².

Firm motivations to participate in standards development

Per the context set forth by Professor Suh, here I examine the motivations of firms to engage in the development of standards *outside* of the ISO protocols discussed above; that is, I examine firm motivations with respect to the two latter types of standards bodies: multi-institutional consortia (e.g. GRI, GHG Protocol) and industry self-regulatory bodies (e.g. Responsible

²¹Scholars increasingly define greenwash as the selective disclosure of positive environmental information to hide or distract from the presence of negative environmental information (Lyon and Montgomery, 2015).

²²Disclosure: parts of this paragraph were adapted from my response to Professor Libecap's exam question.

Care, Sustainable Forestry Initiative). Ultimately, firms engage in standards development in order to exercise some control over the process and outcomes of the standards development. For example, in development of technology standards, firms that take part in standards setting deliberations may move the resultant standard toward a structure that has synergy with their existing resources and capabilities. Alternatively, the practice of participating in a collaborative standards making body allows firms an advance view of coming requirements; while this opportunity is conceivably available to all, firms that ignore the opportunity may be at risk of falling behind the compliance curve. Naturally, there is less at stake for firms when engaging in the development of voluntary standards, relative to mandatory government regulation. By seeking to control (or minimally to be aware of) the process and outcomes of voluntary standards development, firms hope to create some competitive advantage in the marketplace. Since voluntary environmental standards are more related to the subsidiary social impacts of a firm's operations (i.e. its externalities), and less so its products²³, the resource-based view of the firm (Wernerfelt, 1984) offers a useful framework to examine firm incentives.

The resource-based view of the firm analyzes firm competitiveness in light of its unique, internal resources and capabilities (Barney, 1991) as an alternative to analyzing its products and external competitive environment (Porter, 1979a). A firm resource is defined as any asset, capability, information, and knowledge controlled by a firm that enables the firm to develop some strategy to improve its competitive advantage; in order for a resource to have the potential to provide sustained competitive advantage, the resource must be valuable, rare, imperfectly imitable, and not substitutable (Barney, 1991). In the context of voluntary standards development by consortia, the participation of firms in the development process may enable the development of new strategic resources; those resources may be generally described as knowledge from exposure to a large group of diverse stakeholders - for example, knowledge

²³Government regulation tends to target externalities from product-specific outputs such as emissions of pollutants, leaving opportunity for voluntary standards to address unregulated firm-level performance and impacts.

of the detailed preferences of powerful stakeholders, knowledge of best practices for reducing environmental impacts at comparatively lower cost, knowledge of interests and initiatives of competitors, and knowledge of the potential directions of future regulation. The value of such knowledge-based resources may be encumbered, however, by various effects: while the resource is potentially valuable, it may not be rare (participation on these consortia is effectively open to all), it may be imitable (consortia-based standards are trackable in draft form and are not held as private information), and it may be substitutable (firms are not required to comply with voluntary standards and may find alternate means of addressing stakeholder demands). Furthermore, the acquisition of this knowledge, and the ability to exploit it for competitive advantage, may come at substantial cost. A cursory review of corporate stakeholders to prominent environmental standards bodies (such as GRI and GHG Protocol) suggest that participation is more prevalent among larger firms with greater organizational slack²⁴. Firms that participate in the development of standards are willing to bear the additional cost of such participation in order to reap the benefits perceived to stem from the opportunity to influence the standard. Furthermore, firms may find that participating in the development of the voluntary standard up front may help them reduce the costs of compliance relative to implementing the standard *post hoc* (Christmann and Taylor, 2002).

In addition to seeking to develop new resources through participation, firms may also participate in development of voluntary standards in order to steer development of the standard toward existing firm resources and capabilities to further exploit those resources for future competitive advantage. Firms can exploit voluntary standards Competitive advantage may follow from various distinct corporate strategies: reduced cost of compliance, product differentiation (promoting a product with claims of superior environmental performance to achieve

²⁴While firm size is often cited as a significant covariate in empirical analyses of corporate environmental performance (e.g. see Orlitzky et al., 2003; Margolis et al., 2009) for reviews), the observation in this context is circumstantial and not substantiated by rigorous data analysis, and so may present an interesting research question addressable by empirical methods.

either market price premiums or increased market share), operating cost reduction (Porter and Van der Linde, 1995), management of competitors (e.g. developing standards of compliance that increase competitors' costs) (Reinhardt, 2000), or management of risk and uncertainty regarding impacts of future regulation. Other, less commendable strategies to steer development of voluntary standards include the omission of clear enforcement and sanctioning of the standards to reduce transparency, and the related adverse selection problem of designing standards to benefit lower performing firms. Finally, firms may also justify the cost of producing multiple standards by seeking to create confusion among stakeholders over different competing standards, particularly when all such standards are voluntary in nature. For example, a timber industry association developed the Sustainable Forestry Initiative in part counteract stakeholder expectations of sustainable forestry management set forth by a competing certification from the Forestry Stewardship Council²⁵.

Management of competitors is one of the more sophisticated strategies to benefit from steering of voluntary standards (Salop and Scheffman, 1983). In so doing, firms seek to manipulate their competitive environment in order to capture economic rents (Shapiro, 1989). Firms that effectively move voluntary standards towards existing resources and capabilities (and are successful in motivating large-scale adoption of those standards) are able to raise the costs of compliance of firms that seek to follow the standards (Reinhardt, 2000) in order to share in the collective reputation bestowed upon complying firms, or "members of the green club" (Potoski and Prakash, 2005). A prominent example of this strategy, though related to a international regulatory agreement between nations, involves the development and implementation of the Montreal Protocol to ban trade in ozone depleting substances such as chlorofluorocarbons (CFCs). E.I. DuPont de Nemours and Company (DuPont) had developed a viable market substitute for CFCs (a company resource) and was instrumental in steering development of the

²⁵Various articles in the popular news press document perceptions of these two competing standards, though comparisons have rarely been offered in the literature (see (Moore et al., 2012) for one analysis).

regulation to both ban CFCs (for which DuPont was an original innovator and market share leader) and allow its substitute product for which it had developed a substantial first mover advantage (Reinhardt, 2000). In so doing, DuPont helped redefine the market for industrial coolants by significantly raising the costs of other firms to continue competing. While voluntary regulations explicitly allow for firms to decline to comply, an effective voluntary standard induces firms to opt in to take advantage of the benefits described above (reducing transaction costs, improving access to capital, addressing stakeholder demands, and enhancing reputation).

Management of risk and uncertainty is another important strategy employed by firms seeking to influence development of voluntary standards. Firms face growing uncertainty regarding the potential for future regulation, particularly along concerns of environmental impact. One avenue available to firms to mitigate risk of future regulation is to proactively develop voluntary standards that may be perceived by regulators to effectively address environmental concerns, thus preempting future government regulation (Maxwell et al., 2000) and reducing uncertainty. This strategy may be more likely to lead to the development of industry self-regulatory agreements (generally organized among the relevant firms themselves) as opposed to broad-based consortia (which have motivations beyond reducing risk to firms). The formation of industry self-regulatory agreements may also create a problem of adverse selection. Beyond the preemption of government regulation, firms with lower environmental performance may be motivated to reduce risk by forming voluntary standards to raise the overall reputation of the industry peer group (Lenox and Nash, 2003). As in the classic adverse selection problem faced by insurance providers²⁶, regulators and other stakeholders may not be able to distinguish between low-performing and high-performing firms under the cloak of a well-crafted industry self-regulatory program, thus encouraging lower-performing firms to join and receive the benefits of perceived self-regulation while incurring lower costs. In such a case, the voluntary

²⁶Provision of insurance policies may induce those most in need of insurance to subscribe while those less likely to benefit from insurance are less likely to subscribe. Under asymmetric information, the insurance provider cannot distinguish between the two types, and is thus exposed to potential for higher claims.

standard may thus serve as a vehicle for firms to enhance reputation among stakeholders while avoiding costs associated with improving environmental performance, as discussed in section 2.2.2 above. The behavior of firms in this manner is also discussed further in section 2.2.3 below.

2.2.3 Firm behavior in standards development

As with section 2.2.2 above, it is instructive to first consider firm behavior with respect to compliance with voluntary standards before moving on to firm behavior with respect to participation in developing standards and protocols. The academic literature has probed extensively into behavior of firms that choose to comply with voluntary environmental performance and reporting standards (see (King and Toffel, 2009) for a review). A substantial proportion of the attention given to voluntary environmental standards by academics is focused on firm implementation of ISO 14001 (see (Delmas, 2001; Potoski and Prakash, 2005; King et al., 2005; Prakash and Potoski, 2006) for examples). While firms are generally not party to significant influence on the development of ISO standards, ISO 14001 does present an ideal case for analyzing firm behavior in choosing to comply; it is widely adopted worldwide²⁷ and it is not a performance standard (allowing for many different observable motivating factors for firms both to both adopt and to alter behavior). However, in line with the intent of Professor Suh's question, below I will primarily address voluntary standards developed by consortia and industry self-regulatory agreements. I will also briefly touch on government voluntary programs.

Firm behavior in complying with voluntary standards

Firm behavior with respect to compliance with voluntary environmental standards is highly visible, and thus provides a compelling scope of data for academic researchers to analyze.

²⁷According to ISO website, ISO 14001 has been adopted by more than 250,000 facilities in 160 countries.

Firms are increasingly reporting results in line with voluntary standards²⁸. In line with the motivations of firms to comply discussed with above (lowering transaction costs, improving access to capital, and addressing stakeholder demands), the literature contains numerous examples of firm behavior in the face of these voluntary standards. I will discuss each category of voluntary environmental standards in turn below.

Consortia-based standards Some of the more prominent consortia-based voluntary environmental standards include GRI sustainability reporting, the GHG protocol, and its survey-based counterpart CDP. A primary driver of firm behavior in complying with these consortia-based standards is responding to stakeholder pressure. Firms may respond to both threat of stakeholder activism and the threat of future government regulation by proactively disclosing climate change impacts via CDP (Reid and Toffel, 2009). However, other studies have shown that disclosure via CDP does not substantially contribute to improvements in environmental performance (Matisoff, 2013; Kolk et al., 2008). In fact, there is evidence that firms tend to participate in voluntary disclosure commensurate with GRI sustainability reporting guidelines in order to enhance reputation, even when the disclosed performance is poor relative to competing firms (Cho et al., 2012). My own analysis suggests, however, that such results may not be fully indicative of performance when considering the empirical methodology; for example, (Cho et al., 2012) restricts their sample to only firms operating in pollution-intensive industries, does not consider the path-dependent nature of firm reputation, and dismisses the potential bias introduced by financial halo effect (Brown and Perry, 1994).

Customers are also a stakeholder with sufficient influence on the compliance behavior of firms (Christmann and Taylor, 2006), and that influence can be thought of in terms of the objective of reducing information costs in verifying environmental performance of transaction

²⁸For example, CDP claims that the number of public responses to CDP survey questionnaires has grown from 140 in 2003 to 1826 in 2013, for a compound annual growth rate (CAGR) of 29.2%. Also, the Governance & Accountability Institute reports that the percentage of S&P500 firms voluntarily issuing a corporate sustainability report (e.g. in line with GRI guidelines) increased from 19% in 2011 to 72% in 2014, a 57.3% CAGR.

partners. However, much of the literature on customer demand for environmental performance is focused on ISO 14001 certifications. There is also increasing evidence that participation in standards such as CDP does improve access to investor capital (Kim and Lyon, 2011a), though the argument is potentially endogenous considering that this particular initiative is highly supported by institutional investors. Finally, the establishment of voluntary environmental performance standards such as GRI guidelines has led to the creation of various third party performance ranking systems, such as KLD social ratings. Scholars have found that firms are aware of and directly responsive to the availability of widely-used ratings based partly on their voluntary information disclosures (Chatterji and Toffel, 2010).

Government voluntary programs Though not discussed in detail to this point, government voluntary programs present an interesting group of case studies in observing firm behavior with respect to environmental performance. Developed by government regulatory agencies in consultation with regulated firms, these programs offer firms incentives to go beyond the requirements of existing regulation, and can be achieved by either offering performance subsidies or introducing threat of stakeholder sanction through disclosure of performance. Such programs tend to attract larger and more polluting firms, which may be already subject to greater scrutiny by stakeholders (Arora and Cason, 1995). Whether these programs are effective or not at influencing firm behavior depends on the credibility of the regulator's threat (or cost-sharing subsidy) (Segerson and Miceli, 1998).

Recent literature has suggested that such programs are generally not effective at improving performance beyond regulatory requirements (Darnall and Sides, 2008), but empirical methods of these studies have been challenged (Lyon and Maxwell, 2007). For example, disaggregating emissions from firm level to facility level has shown that participation is effective at reducing emissions (Bi and Khanna, 2012). As with many questions in corporate environmental performance, this one will continue to be debated on methodological grounds and in various

competitive contexts.

Industry self-regulatory agreements The substantial literature on industry self-regulatory agreements has found that, overall, self-regulatory agreements tend to be ineffective at improving the environmental performance of firms (King and Toffel, 2009). In light of the various motivating factors discussed in section 2.2.2 above, it is instructive to cast these voluntary agreements in the light of the “rules” for effective self-governance institutions arising from small-scale natural resource collective action problems studied by (Ostrom, 1990). In particular, scholars have found that industry self-regulatory programs typically fail to produce results (those desired by external stakeholders, not necessarily by the firms in question) when there is no credible oversight and lack of sanctions for poor firm performance (King and Lenox, 2000; Rivera and De Leon, 2004; Prakash and Potoski, 2006).

Firm behavior in participating in development of voluntary standards

Conversely, the literature has less to say regarding behavior of firms that participate in the *development* of voluntary standards. As discussed in section 2.2.2 above, firms generally have less ability to influence voluntary standards developed by *ad hoc* consortia comprised of numerous government agencies and NGOs with distinct governing objectives. Those firms that do participate tend to be large and have substantial corporate programs related to sustainability²⁹.

(Christmann and Taylor, 2002) provide a framework of firm behavior in development of and compliance with international voluntary standards, and present case-specific observations that firms may proactively choose to participate in the development of a standard, despite increased costs of participation, when those costs are seen to generate returns by steering the direction of the regulation toward existing firm resources and capabilities. The ongoing development of the Natural Capital Protocol may provide an opportunity to observe the behavior

²⁹see footnote 24

of firms in development of new voluntary standards. Though the sample of business firms currently involved in this standard is relatively small, it may yet serve as an instructive case study. In general, the business firms involved in the Natural Capital Coalition³⁰ are primarily large consulting companies with an arguable financial stake in the success of the protocol - more voluntary environmental standards for clients to comply with leads to greater business opportunity for these firms, particularly along metrics as difficult to quantify as natural capital. Other firms involved tend to be large, multinational corporations as noted above.

Finally, scholars have argued that institutionalization of environmental performance standards necessarily constrains strategic behavior (King and Toffel, 2009). As discussed herein, firms tend to resort to such partially binding options when the potential costs associated with stakeholder pressures (customers, regulators, general public) (Baron, 2001) are exceeded by the benefits (reduced transaction costs, improved access to capital, enhanced reputation among stakeholders).

2.2.4 Conclusion

In this article, I have reviewed various prominent voluntary environmental measurement and reporting standards, the motivations of firms to both comply with and to participate in the development of such standards, and the observed behavior of firms that both choose to comply with and to participate in development of the standards.

In conclusion, firms tend to comply with voluntary environmental standards when it can help the firm achieve some strategic goal. That goal may be just to keep pace with stakeholder demands, or may be to differentiate itself in its competitive environment. Firms also may use voluntary environmental performance and reporting standards to promote strong performance in one area while distracting stakeholder attention away from poor performance in other areas.

³⁰See the Natural Capital Coalition website.

The strategic value of participating in development of standards may be more subtle and sophisticated, and accessible only to certain types of firms. My understanding of the literature in this regard suggests that answering such questions may be of academic importance.

2.3 Creating and Capturing Value Through Providing Public Goods

The following review addresses more rigorously the questions and observations set forth in the introduction chapter of this dissertation. The first section discusses the concept of value, the role of firms in creating value, and the “types” of shareholder value that are available to firms through creation of social value. The second section discusses the processes of value creation and capture by firms through strategic activities. The third section outlines both necessary conditions for capturing value and obstacles that can prevent capture, and ways that firms can overcome those obstacles. A final section offers concluding thoughts.

2.3.1 Shareholder value and social value

The matter of value can be considered in multiple contexts. For the purposes of this review, I will differentiate value created as either *shareholder value* or *social value*. Shareholder value is directly received by shareholders of the firm in accordance with their direct ownership share. In practice (i.e. academic research), shareholder value is measured by a variety of metrics, generally representing either the market value of company shares (i.e. the share price, or market capitalization in aggregate), the market value of total firm assets (typically represented by Tobin’s q), or some accounting metric such as return on assets (ROA). Social value may be defined as the value of positive externalities (or reduction of negative externalities) imposed on society by a firm. Externalities typically come about through some failure of markets, and the

resulting social cost or value is thus not quantifiable through traditional price mechanisms. Due to the non-market nature of social value, in this article I will not seek to associate quantitative measures (such as the social cost of carbon or value of a statistical life) when discussing social value (other than to highlight relevant academic research), but rather refer to it in a qualitative fashion. An aspect of social value that I will generally not discuss is that of consumer surplus³¹.

In the following subsection, I will summarize the concept of corporate social responsibility and offer a very brief summary of the literature seeking to measure whether firms generate shareholder value (corporate financial performance) through increased levels of corporate social or environmental performance. The next subsection outlines the various types of social value (and costs) explored in the literature, and scholars attempts to express that value in quantifiable terms. In the final subsection of this section, I will discuss the various types of shareholder value that a firm can create through improved environmental performance.

The social responsibility of the firm

(Friedman, 1970) famously decried the concept of corporate social responsibility (CSR), stating that the sole social responsibility of a firm is to generate returns to its shareholders, and any provision of costly goods to any party other than the owners of the firm is akin to levying a tax on shareholders. Scholars have also theorized that according to the laws of mathematics, it is logically impossible to optimize in more than one dimension (Jensen, 2002), suggesting that a firm that was fulfilling its primary obligation to maximize returns for its shareholders could not possibly find room in a strategic plan for CSR. Furthermore, in Friedman's (Friedman, 1970) view, firms that make public claims about providing goods to benefit social welfare, but plotting an internal strategy to profit from that provision, are effectively committing fraud.

³¹In competitive markets, consumers purchase a firm's goods at some market price. If a consumer is not willing to pay the market price of a good, the consumer will not purchase the good. However, if a consumer is willing to pay more than the market price for a good, the consumer will purchase the good at the market price, and the difference between their willingness to pay and the market price is consumer surplus — the additional utility obtained by the consumer through the purchase.

Much has changed in the ensuing decades regarding the legitimacy of firms practicing CSR. A voluminous literature has developed outlining many facets of private and social benefits of the practice of CSR, with healthy dialogue continuing to espouse the competing views. If anything, the longevity of this debate has shown that CSR is a valid corporate objective and is generally seen as such by firms' shareholders. If CSR was strictly value-destroying, it would no longer be an accepted component of corporate activities.

Firms can be forced by law or regulation to provide costly public goods. The concept of corporate social responsibility (CSR) that a firm will voluntarily engage in the private provision of public goods to a greater degree than its legal and regulatory obligations demand suggests that firms do act in ways that promote the social or environmental good. However, for a firm to decide to voluntarily provide some public good at net private cost, outside its calculus of maximizing net private benefit, may suggest a failure of the firm to act in the interests of its shareholders.

Scholars have long debated the motivations (and the financial outcomes) of firms engaging in CSR. Some define CSR as only those activities that are explicitly intended to promote social welfare with direct net cost to the firm, some suggest that all CSR has a profit motive, and others distinguish between altruistic CSR (the former) and strategic CSR (the latter). We take the view that all actions of a firm, CSR and otherwise, must be informed by a profit motive, or shareholders would divest from the firm to pursue more profitable investments.³² Profit expectations are influenced by a great deal more than simple projections of revenue and costs; the value of intangible assets and the threats of stakeholder pressure also drive a firm's strategy. The degree to which one firm's competitive strategy outperforms another's forms the basis of a vast literature on strategic management.

A firm will engage in CSR when its corporate strategy informs ways in which it can obtain additional private benefit from the provision of public goods. If the firm is able to capture

³²Note: "impact investing" is a more contemporary concept that may challenge this view.

enough value by providing the public good to turn a net private cost into a net private benefit, or to make one project or investment more profitable than another, the practice of CSR will increase net private benefits to the firm as well as generate public goods. It follows then that CSR, when properly implemented, can result in a win-win-win: good for the environment, good for the public, and good for the firm.

Does it pay to be green? A prominent field of the CSR literature is focused on identifying and characterizing the link between corporate social or environmental performance (CSP or CEP) and corporate financial performance (CFP); in other words, “does it pay to be green?” The literature relies on three basic empirical tools to attempt to answer this question: correlative studies of financial performance, portfolio studies of market returns, and event studies of market returns for individual firms (Berchicci and King, 2007).

Correlative studies typically define one or more measures of CSP or CEP and perform statistical analyses to assess the correlation of those measures with one or more accounting measures of corporate financial performance. Accounting measures of CFP are commonly based on measures used in the accounting and finance literature as viable measures of corporate performance. CSP measures frequently used include third party composite ratings of company performance along multiple dimensions of social and environmental conduct (e.g. KLD, Trucost); corporate disclosure, both voluntary (e.g. CDP) and regulated (e.g. TRI); reputation indices (e.g. Fortune Magazine’s most admired companies, Newsweek Green Rankings); survey measures of corporate executives’ self-perceived values, attitudes and behaviors; and other observable corporate behaviors (e.g. philanthropy, organization membership).

For the most part, these measures are aggregate in nature and fail to capture the firm-specific context that may motivate a firm’s preference for investing in one dimension of CSP over another. Researchers tend to examine whether environmental strategy or initiatives are profitable for the firm in a general sense. The question of the firm-level determinants of envi-

ronmental strategy are generally not examined, and when they are they are typically resigned to secondary covariate analyses. Furthermore, very little attention has been paid in the literature to voluntary corporate actions. One substantial branch of the corporate environmental strategy literature (somewhat separate and distinct from “pays to be green”) that does pay heed to voluntary behaviors explores collaborative industry environmental standards (King and Lenox, 2000) and other voluntary environmental standards (Potoski and Prakash, 2005) and the relationship with environmental performance with respect to firms’ polluting behavior. However, this literature likewise focuses on polluting behaviors of otherwise regulated firms as well as the potential for collective benefits at an industry-wide level; here, there is little attention paid to voluntary *proactive* corporate actions.

Corporate altruism vs strategy The classical economic view holds that a primary responsibility of government is to provide public goods that would be otherwise under-provisioned if left to markets, absent government regulation or the design of sophisticated mechanisms to align private incentives with provision. As such, the private provision of public goods has traditionally been modeled as an altruistic act - one that individuals engage in for the “warm glow” feeling of helping others (Andreoni, 1990; Fehr and Fischbacher, 2003). Research also suggests that individuals have motivations other than pure altruism in undertaking charitable acts (Andreoni, 1988). Mirroring this, strategy research has often sought to distinguish between altruistic CSR and strategic CSR, suggesting that some firms engage in CSR for reasons other than profit-maximization, including managerial altruism and stakeholder coercion (Baron, 2001). An argument could be made that shareholders may even prefer that firms engage in certain types of altruistic CSR both to satisfy their own preferences for altruistic acts and take advantage of the benefits of scale offered by corporate resources. However, research suggests that both shareholder value and social value are maximized when firms specifically engage in CSR for strategic purposes (Hillman and Keim, 2001; Husted and de Jesus Salazar,

2006).

The notion of CSR as strategic initiative has paralleled the CSP-CFP literature, but perhaps came to the forefront with the seminal paper from (Porter and Van der Linde, 1995), highlighting the opportunity for substantial realization of benefits by firms under environmental regulation. The “Porter hypothesis”, as it has come to be known, suggests that firms subject to strict environmental regulations are induced to innovate in order to manage the potential costs imposed through regulation, and this innovation subsequently positions firms to establish competitive advantage in light of early regulatory response and improvements in operational efficiency. Porter and van der Linde also argued that firms are systematically missing investment opportunities in profitable projects through improvements in efficiency, leading them to challenge the neo-classical economic notion of the mythical \$10 bills on the ground. Though the Porter hypothesis remains controversial (Palmer et al., 1995), it has informed much of the recent literature on competitive environmental strategy as well as the energy efficiency gap.

Another notion driving the recognition of strategic CSR is the idea that firms may profit through the costly voluntary provision of public goods. (Reinhardt, 2000) lays out several means by which firms can leverage environmental goods into competitive advantage. In addition to reducing costs through overall efficiency improvement, firms can realize greater sales as well as command price premiums in the market through embedding public goods with private goods for sale. In a defensive sense, firms can also mitigate risk of future detrimental impacts to profitability by proactively managing their environmental impacts. For example, the provision of public goods enhances the accumulation of intangible assets, while environmental accidents can likewise quickly destroy accumulated assets (Konar and Cohen, 2001).

Social value

As discussed above, firms may find strategic rationale for providing costly public goods. Before discussing the types of shareholder value that firms can create and capture, it is in-

structive to explore the types of social value created through such provision, and offer a brief summary of the efforts of academic researchers to quantify social value. The following discussion is organized around types of social value related to environmental goods.

Human health and mortality One primary driver for environmental regulations is the reduction of human health problems (morbidity) and fatalities (mortality) related to the improvement of environmental conditions. Morbidity estimates are often made using (avoided) costs of healthcare and economic costs of reduced labor productivity, as well as quality of life factors (Arrow et al., 1996). The subject of mortality has proven controversial over the years, given the potential for moral and ethical qualms over placing a dollar value on an individual human life. Various approaches have been taken to provide such estimates (Viscusi and Aldy, 2003; Sunstein, 2004), often based on various contingent valuation or revealed preference methods, which are described in more detail below.

Amenity and existence value In addition to health considerations, humans tend to value environmental goods for their aesthetic aspects as well. When individuals obtain utility from directly experiencing certain environmental goods, such as natural viewscapes, fresh air and water, and recreational opportunities, the environmental goods are providing amenity value. Distinct from, but related to, amenity value is the utility individuals obtain from the mere knowledge that such places exist, whether or not they actually visit them. This is often referred to as existence value. Herein I will refer to both concepts simply as amenity values. Both amenity and existence values are inherent public goods, that is, they exist without being specifically provided by government or other entities. However, public goods are often provided that specifically serve to protect and preserve such amenities for human enjoyment. Two general methods are used to quantify these values: contingent valuation method (CVM) and revealed preference methods.

Contingent valuation, also referred to as stated preference, relies on survey methods to measure individual willingness to pay (WTP) for preservation of environmental amenities or willingness to accept (WTA) payment for the elimination of those amenities. The main advantage of CVM is the relative ease of collecting data; a sample of individuals is surveyed to gauge preferences. CVM has featured prominently in the academic literature (Carson, 2012), and has been used for determination of legal damages in prominent cases of environmental devastation, such as the Exxon Valdez oil spill (Carson et al., 2003). CVM has endured much criticism, however, for a number of potential shortcomings that expose estimates to substantial bias. Individuals are typically asked to value amenities based on hypothetical scenarios, potentially leading to response bias; research has also shown a tendency for individuals to state widely different values when questions are framed in terms of WTP or WTA (Hausman, 2012; Kahneman and Tversky, 1979). Scholars have also demonstrated that individual stated preferences are often arbitrary and prone to distortion by framing (Kahneman and Knetsch, 1992). There remains a substantial literature utilizing CVM, however, and the method has been defended through development of best practices (Haab et al., 2013). One way to avoid the potential pitfalls of CVM is to estimate a breakeven WTA or WTP based on quantitative estimate of economic benefits of a policy (Kotchen and Burger, 2007), rather than to directly measure WTA or WTP through CVM.

Revealed preference methods are perhaps superior to CVM, as they rely on implicit demonstration of actual WTP or WTA based on market transactions for goods that arguably include consideration of the amenity. Their usage is generally restricted to the availability of relevant market data, making them more challenging methods with which to derive empirical estimates of value. Hedonic methods use observed market prices (typically real estate transactions or labor wage differentials) to estimate the value of embedded amenities. For example, the social value of air quality has been measured by differences in real estate prices or wages in otherwise similar areas with different levels of air pollution (Chay and Greenstone, 2005), and the value

of avoiding perceived cancer risk has been measured by time series trends in real estate prices (Davis, 2004). Other revealed preference methods include travel cost estimates, wherein the cost incurred by individuals to transport themselves to a particular environmental amenity is calculated (Schmidt and Courant, 2006), and avoidance behavior, in which changes in aggregate behavior (such as attendance at outdoor events) are correlated with changes in amenities (such as smog levels) (Neidell, 2009).

Ecosystem services Ecosystem services are economic benefits provided to society by existing natural systems. Rainforests provide services in terms of biodiversity, a supply of medicinal compounds, and carbon sink. Wetlands provide natural barriers to flooding as well as filtering of groundwater supplies. Glaciers and seasonal snowpack maintain fresh water supply to agricultural regions throughout dry weather seasons. A variety of methodologies and frameworks have been developed to place economic social values on these various services (De Groot et al., 2002; Turner and Daily, 2008), and quantitative impacts of firms on this natural capital is beginning to be explored (Agarwala et al., 2014).

Climate change and the social cost of carbon Climate change is perhaps the most salient global environmental issue, considering its global origins and impact. Generally recognized as being caused by anthropogenic greenhouse gas (GHG) emissions (IPCC, 2014), and having potentially devastating long-term impacts, thus seen as potentially solvable through policy (Stern et al., 2006). The value of such policy (whether it be government regulation, NGO initiatives, firm activities, or individual behaviors) is typically measured in terms of damages avoided. Myriad potential impacts of climate change have been explored in the literature, such as human health and mortality (Deschênes and Greenstone, 2011), agricultural output (Deschênes and Greenstone, 2007; Fisher et al., 2012), and civil conflict (Hsiang et al., 2011).

Efforts made to aggregate these damages into a single figure representing the economic

impact of marginal GHG emissions have led to the popularization of the “social cost of carbon” (Pearce, 2003). In addition to the social cost of carbon, various carbon pricing schemes around the world offer the ability to observe market prices for GHG emissions, though in practice the market price has been found to depend greatly on design features of the regulations (Ellerman and Buchner, 2008).

Other issues Other issues have proven germane to the calculation of non-market social value, that may enter in a firm’s calculus for providing public goods. Discounting is the technique of adjusting the present value of future economic returns to account for the capacity of current returns to earn interest in the future. The concept has proven contraversial in the realm of calculating future social costs of environmental problems, notably with respect to climate change (Stern et al., 2006; Nordhaus, 2007).

While efforts to quantify the costs associated with environmental impacts are effective from a general standpoint, distributional issues have often been ignored. The social value of environmental goods are generally non-uniformly distributed; certain groups of individuals are likely to receive disproportionate share of the non-market benefits, as other groups are more likely to bear a disproportionate share of the non-market costs. A pareto-improving outcome is often not preferable to policy makers if it involves effective transfers between socio-economic groups due to non-uniform distribution of costs and benefits (Fullerton, 2011).

Shareholder value available through creation of social value

Shareholder value is distinct from the concept of social value discussed above. It is directly measurable and simple to understand; a shareholder of a firm captures value when the market price of shares increases, which generally results from positive perceptions among investors of the firm’s capacity to generate future returns. The components of what fuels those perceptions are more subtle and complex, however. When considering potential shareholder value to be

created as an outcome of corporate provision of environmental goods, there are a number of potential sources of this value, as described below.

Reputation Reputation is perhaps the most significant value that firms create through provision of environmental goods. Corporate reputation consists of the individual and aggregate beliefs and opinions of society about the firm, or as put succinctly by (Weigelt and Camerer, 1988), “a set of attributes ascribed to a firm, inferred from the firm’s past actions”. A firm can have a good reputation or a bad reputation, and that reputation varies among individual stakeholders and over time. A firm’s reputation influences how individuals act toward the firm, and individuals form and update their perceptions of firm reputation through the actions of the firm. A firm’s reputation is a potentially valuable intangible asset that can be difficult to measure. Firms with greater reputation enjoy distinct competitive advantages across multiple stakeholder groups; customers may perceive their products as higher quality and pay premium prices, they may have lower employee recruiting costs and higher employee retention, be subject to less scrutiny from activist non-governmental organizations, and enjoy more favorable access to capital markets.

Firms compete in a market for reputation by sending strategic signals to influence stakeholder perceptions (Fombrun and Shanley, 1990). The inimitable nature of reputation (Barney, 1991) enables firms to achieve sustained competitive advantage through reputation management (Roberts and Dowling, 2002). A firm’s corporate environmental performance has also been shown to be a strong predictor of corporate reputation, and the ability of firms to develop and foster a reputational advantage in their unique competitive environment depends on the strategic fit between a firm’s investment in corporate environmental performance and relevant stakeholder concerns (Brammer and Pavelin, 2006).

Reputation is both a shareholder construct (firms with greater reputation enjoy greater market valuations) and a stakeholder construct (firms with greater reputation enjoy higher brand

awareness and higher perceptions of quality). Firms enjoy multiple reputations in that different stakeholder groups may form different perceptions of the firm and its performance along multiple dimensions. A firm's financial reputation is critical to its value in capital markets, but it can also be an important asset that signals stability and success to consumers, while also making it a more prominent target for activist intervention. Strong reputation for product quality or customer service among consumers can be a positive signal to capital markets. Or, a firm with a poor environmental reputation among consumers and NGOs may have a negative draw on valuation of its equity shares by the capital markets.

Research has consistently shown the value to a firm of achieving and maintaining a strong reputation (Walker, 2010). A firm's social and environmental activities have also been consistently demonstrated to be highly related to its reputation (Sen and Bhattacharya, 2001; Pelozo, 2006; Cho et al., 2012). Firm reputation can influence (and be influenced by) the actions of consumers, shareholders, regulators, media, and other stakeholders, as discussed below.

Increase revenue Consumers tend to prefer purchasing goods from firms with reputation for corporate environmental performance (Bagnoli and Watts, 2003; Besley and Ghatak, 2007). By embedding public goods into its products, a firm can increase revenue (Kotchen, 2006). Through such product differentiation, firms may convince consumers to pay more for a particular embedded good (price premium), or to convince more consumers to pay for that good (increase market share). The consumer's willingness to pay for such goods may be driven in part by the simple knowledge that they are contributing to the provision (Andreoni, 1990), and it may also be driven by a positive reputation of the firm in the eyes of the consumer.

Improve access to capital Another way reputation influences the actions of stakeholders is through improved access to capital. Reputation can influence investors in multiple modes. Investors put value on firm reputation because they know it is associated with improved financial

performance (Lyon and Shimshack, 2015a), as described above. But investors are also subject to direct influence by reputation. Generally, firms with higher reputation for financial performance have been found to have higher reputation in other domains (Brown and Perry, 1994). At the same time, perceptions of non-financial reputation have been found to have relevance to investors than previous financial performance (Raithel and Schwaiger, 2015). Investors may reward high-reputation firms with a lower cost of capital (Fombrun and Shanley, 1990).

Improve productivity Firms with strong reputation are generally recognized as “great places to work” (Romero, 2004). Employees are another stakeholder group subject to influence by firm reputation; the actions of a firm to improve its reputation among employees can improve productivity. Employee engagement, and thus productivity (Harter et al., 2002), may be influenced by other means than mere reputation. Employees form attitudes about their role in the workplace through work design (Grant, 2012), and in turn may help enhance firm reputation with other stakeholders (Chong, 2007).

Reduced regulatory oversight Firms can also create shareholder value by reducing the degree to which regulators seek to restrict their activities, or impose sanctions for corporate misdeeds. Establishing a positive reputation for corporate social and environmental performance has been shown to reduce fines paid by firms for other infractions (Hong and Liskovich, 2015).

Media exposure Firms often seek to improve reputation through disclosure of positive performance (this concept is discussed in detail in section 2.3.2 below). Generally, corporate communications come at some cost to the firm, and are also subject to stakeholder filtering on credibility of self-reported claims. Favorable exposure in the media has been found to positively affect firm reputation (Deephouse, 2000), and often comes at low incremental cost to the firm.

Reduce costs The above subsections discussed the various components of value that are related to corporate reputation. This and the following sections are generally not related to reputation.

A commonly cited benefit of environmental regulations is that of “induced innovation”: strict regulatory requirements force firms to pay closer attention to pollution generating processes, enabling them to identify and eliminate cost inefficiencies in their operations (Porter and Van der Linde, 1995). Whereas the classical economic view would preclude the existence of these \$10 bills lying on the ground and waiting to be picked up, contemporary theories of firm behavior suggest they are always present, due to the bounded rationality of firm managers and other effects (Simon, 1955; Cyert and March, 1963). As these benefits of regulation have become more mainstream, firms have likewise found it in their interests to engage in a number of activities that provide social value (reduced pollution or GHG emissions) while also generating firm value (reduced costs). Specific activities that lead to these cost reductions are explored in section 2.3.2 below.

Increase competitors’ costs Conversely, when providing environmental goods comes at a cost to firms, firms may still create shareholder value through provision by indirectly increasing the costs of rival firms who seek to replicate actions for competitive purposes. The activities by which firms can increase competitors’ costs (e.g. creating new voluntary standards of conduct or environmental performance) will also be discussed in section 2.3.2 below.

Identify new markets By seeking to provide environmental goods, firms may develop new products and services or identify new customers for existing products and services (Reinhardt, 2000). Improving environmental performance helps firms expand their universe of important stakeholders.

Risk management A final, but important, type of shareholder value that firms create through provision of environmental goods is the effective management of future risks to profitability. All firms face uncertain prospects regarding future states of the world, and must develop and deploy strategies to mitigate those risks. For example, the prospect of future regulation over GHG emissions may threaten to strand recoverable assets of firms in the oil & gas exploration sector; diversification to new energy sources is a relevant risk management strategy. The value to shareholders of effective risk management is directly measured in a firm's share price, as investors constantly update their perceptions of the firm's future profitability.

2.3.2 Value creation and capture

The concept discussed here is that firms can create and capture shareholder value through voluntary activities. While creation and capture of value are similar concepts by neoclassical economic theory, the effective capture of economic value is not automatically captured by the firms that create it (Reinhardt, 2000). Here I briefly introduce the concept of value creation and capture through provision of environmental goods, then I discuss the types of activities that can create value and how firms capture that value.

In order for firms to generate private benefits through voluntary provision of public goods, two main conditions must first be met. First, the public must inherently value those goods; there must be some relevant stakeholder group that incurs a net social benefit from the provision. Second, the public must be able to properly attribute those public goods as being provided by the firm; receiving goods of value tends to invoke some measure of gratitude or obligation from the recipient to the provider (Cialdini, 2006). When a firm provides public goods that are not valued by its stakeholders, no goodwill is generated by stakeholders on the firm's behalf; the firm has failed to create conditions for the creation and appropriation of new private benefits associated with those public goods. For example, a firm may provide public goods by planting

forests in a remote region, which may not be valued by the local community living downwind from the firm's air-polluting factory. Those stakeholders may interpret the forest planting as a misuse of the firm's resources, for which other public goods—such as reduced particulate emissions from its factory contributing to lower health risks in the community—may be valuable.

The firm's act of provisioning public goods must also be attributed to the firm by its stakeholders. A stakeholder that recognizes a public good has been provided by the firm will be more willing to view the firm in a more favorable light, all other factors being equal. A stakeholder that enjoys some public good, but is unaware that the firm provided that public good for the stakeholder's consumption, will not attribute any of the social surplus to the firm and is less likely to direct private benefits, in the form of enhanced reputation, to the firm. When a firm provides public goods that its stakeholders both value and attribute to the firm, it is positioned to generate incremental private benefit.

Value creation by the provision of public goods

The types of social value and shareholder value created by providing environmental goods was summarized in section 2.3.1 above. In the following subsections, I detail the specific activities firms participate in to create that value.

Improve efficiency By improving the efficiency of its processes, a firm generates shareholder value by reducing the inputs required for those processes to produce the same level of output, and by making more efficient use of those inputs to reduce waste. Shareholders benefit from efficiency improvements through reduced cost of operations. Social value is created by the reduced impact of resource extraction for process inputs, and the reduced emissions of pollutants as industrial waste.

A firm may also act to improve the energy efficiency of its overall operations. By investing in energy efficiency projects and technology, such as energy efficient buildings and controls,

firms create shareholder value again by reducing costs. Social value is created by the reduction of GHG emissions associated with energy use.

Reduce emissions In addition to indirect emissions reductions through energy efficiency, firms may also directly reduce emissions by purchasing renewable energy, either through negotiated long-term power purchase agreements (PPAs) or on-site generation. Given the relatively high visibility of such projects (and the propensity of firms to publicize them) firms can create shareholder value by improving environmental reputation. Firms also create shareholder value through risk management: reducing exposure to fluctuations in future energy prices and mitigating risk of regulation of carbon emissions. Social value is created by reducing GHG emissions associated with traditional energy usage.

Firms can also indirectly reduce emissions through purchase of voluntary carbon offsets (VCOs) or renewable energy certificates (RECs). Though such mechanisms do not directly reduce a firm's emissions, firms have tended to promote the social benefits of VCOs for reputational benefit. Whereas there is arguably social value in the market for such voluntary offset mechanisms, firms may take caution in changing public opinion of VCOs (Murray and Dey, 2009) and recent research suggesting that RECs do not provide sufficient incentive by themselves to move energy producers to invest in more renewable energy capacity (Gillenwater et al., 2014).

Corporate philanthropy Firms engage in corporate philanthropy for strategic motives. Whereas philanthropy has traditionally been seen as an altruistic endeavor, a growing literature cites the positive effects on shareholder value of such activities (Godfrey, 2005). In the environmental domain, firms may engage in strategic philanthropy by investing in charitable foundations or non-governmental organizations (NGOs) committed to environmental causes, or directly preserving amenities valued by society (Porter and Kramer, 2002).

Voluntary program participation Firms may participate in a number of types of voluntary programs to improve environmental performance. There are many types of institutions providing such programs, such as certified environmental management systems, voluntary environmental performance standards and protocols, and industry self-regulatory organizations. A firm may enter into such programs in order to improve its reputation in the eyes of key stakeholders, and it may also employ such a strategy to implicitly add new costs to its competitors who may seek to participate in the voluntary standard as well. By increasing competitors' costs (relative to its own cost increases imposed by voluntary or self-regulatory activities), firms gain advantage in product and capital markets. Social value is created through a variety of environmental goods enabled by these programs³³.

Organizational goals Firms may create organizational goals as an indirect means of achieving some of the activities noted above. By creating management incentives for sustainable performance³⁴, firms can institutionalize efforts to improve efficiency and reduce emissions, when such efforts may otherwise not be a primary focus of management attention.

A growing trend is for firms to establish corporate environmental departments to promote internal programs to improve efficiency and reduce emissions. Firms have established various behavioral programs to boost environmental employee engagement (Potoski and Callery, 2018) with corresponding returns to shareholder value.

Value capture by the disclosure of provision

Many of the types of value discussed in section 2.3.1 are duly captured as a direct consequence of the activities that create them. For example, improved operational efficiency is directly captured by reducing a firm's operating costs. However, for those activities relying

³³This idea was discussed at length in section 2.2.2, and so (for brevity) I will not repeat the analysis here.

³⁴The Newsweek Green Rankings rewards firms for the creation of management incentives to meet certain sustainability metrics.

on effective influence of the perceptions of stakeholders, the firm must take costly measures to communicate the value provided in order to improve its probability of capturing that value. The following discussion highlights activities firms engage in to ensure the capture of value created by improved environmental performance.

Voluntary disclosure As discussed above, not only must firms adopt measures to provide public goods that are valued by specific stakeholder groups, they must also communicate that provision to those stakeholders. Effective stakeholder management requires congruency between the public goods provided, the stakeholder groups themselves, and the message content and channel (Brammer and Pavelin, 2006). A firm investing in a particular project will choose appropriate messages to address the public good demands of target stakeholder groups, and implement communication channels that more effectively reach those target groups. Firms may even use multiple messages and channels for a single case of public goods provision, if there are multiple target stakeholder groups with different characteristics demanding those public goods. For example, a firm that invests in on-site renewable energy with the dual objectives of reducing the greenhouse gas footprint of its energy use and reducing exposure to uncertain future energy price fluctuations may choose to issue a press release directed to the institutional investor community outlining the financial security provided by the hedge, while also promoting the environmental credentials of the investment on corporate blogs or mass media news outlets directed towards consumers or employees with environmental values and concerns.

Firms have multiple means of voluntary disclosure available. Various corporate channels of disclosure include corporate communications, press releases, website content and blogs, and corporate sustainability reports. Firms may also seek media attention through other means, in an attempt to engender third party endorsement of positive environmental performance. Finally, firms may participate in voluntary disclosure programs created by NGOs and other consortia; the increasing prevalence of voluntary disclosure vehicles such as the Carbon Disclosure

Project (CDP) offers new opportunities for firms to differentiate in the market for reputation.

Ecolabels The use of ecolabels is an important activity to distinguish from voluntary disclosure. An ecolabel is a product-specific certification, typically verified by a third party, that communicates the provision of some set of environmental attributes that certain classes of consumers value. The proliferation of ecolabels in the marketplace risks confusion and discontent among consumers; firms are wise to carefully select ecolabels based on the value proposition and credibility they wish to communicate (Delmas et al., 2013c).

2.3.3 Conditions for value creation and capture

Based on the discussion sections 2.3.1 and 2.3.2 above, a simple empirical model can demonstrate the relationship between the activities a firm pursues to both create and capture shareholder value from the provision of environmental goods and the actual value captured. If this were the end of the story, there wouldn't be much more for academic research to say on the subject. However, various conditions may present obstacles for the efficient capture of value, and firms should seek to foster a set of ideal conditions, specific to their unique operating context, in order to avoid or surmount those obstacles. Therefore, these conditions moderate the relationship between activities and value.

Much of the literature on the link between CEP and CFP (discussed in section 2.3.1) fails to capture the subtleties of firm-specific context that create conditions for the capture of shareholder value from improved environmental performance. Conversely, a prominent theme in the literature on disclosure is the risk of firms appropriating shareholder value where no (or disproportionately little) social value has been created (Kotchen and Moon, 2012). While such an instance may appear valuable for shareholders, firms engage in such activity at risk of stakeholder sanctioning when information is revealed (Lyon and Maxwell, 2011). It is in these subtleties that opportunities for further academic research lie. A brief discussion of some of

these conditions follows.

Competition for reputation

Firms compete in markets for reputation (Fombrun and Shanley, 1990). While reputation is a unique and inimitable resource of a firm (Barney, 1991), firms in competitive markets may undertake similar strategies for improving reputation through the provision of environmental goods. A potentially interesting question that is underexplored in the literature is the degree to which firms extract a “share” of available reputation in the market. Individual firms each command some share of the “pie” in product markets, and can increase their market share either by taking share from other firms, or by increasing the total size of the pie. How do firms appropriate - and more importantly, how do stakeholders assign - “market share” in terms of corporate reputation? If the actions of an individual consumer are binary (buy product from firm X or not), but the relative reputation of competing firms in the eyes of the consumer are continuous, firms must engage in strategic investment in reputation building in an interactive, repeated game among competing firms and consumers. I feel there is strong potential for development of theory and potential empirical applications on this question.

Information asymmetry

This section briefly discusses the perverse incentives available to firms in order to unduly influence stakeholder perceptions of environmental performance. These incentives can cut both ways, as threat of sanction may prevent firms from communicating what would generally be construed as positive behavior by a variety of stakeholders (Lyon and Maxwell, 2011).

Research has shown that the presence and persistence of asymmetric information has a deleterious effect on the efficient functioning of markets (Akerlof, 1970). In the sense that firms rely on imperfect information in markets to execute profitable strategy, a firm’s ability to proactively manage information asymmetry between it and its stakeholders also leads to a

firm's competitive advantage. Firms manage information asymmetry through the process of corporate disclosure; economic theory has predicted that firms will always choose to disclose good news and selectively disclose bad news (Milgrom, 1981). The transaction costs of providing voluntary disclosure further determine the degree to which a firm will disclose or withhold information (Verrecchia, 1983), which presents a noisy signal to investors regarding the presence of good or bad news. Firms using greenwash³⁵ to manage their environmental reputation may be deterred from selective disclosure by the threat of audit from activist stakeholders deters greenwash, but also induces firms to underdisclose positive environmental performance (Lyon and Maxwell, 2011; Delmas and Burbano, 2011).

In the context of GHG emissions performance, participation in formalized voluntary disclosure programs is increasing. While studies have shown that firms tend to benefit in the reputation marketplace from increased disclosure of GHG emissions (Clarkson et al., 2011; Lyon and Shimshack, 2015a), those voluntary disclosure programs have tended to not improve overall emissions performance (Matisoff, 2013; Cho et al., 2012). Following these results, the literature suggests that firms seeking to demonstrate leadership on addressing climate change concerns may find means to use selective disclosure to improve their reputation, without making substantive changes in performance. In this sense, one may surmise that the incentives for firms to proactively improve environmental performance are not complete, and that firms seeking to demonstrate "leadership" may currently do so at lower cost by investing in strategic disclosure and corporate communications than by substantively improving environmental performance.

³⁵Scholars increasingly define greenwash as the selective disclosure of positive environmental information to hide or distract from the presence of negative environmental information (Lyon and Montgomery, 2015).

Uncertainty

Firms take costly action to reduce uncertainty, or to extend the time period in which they need to make a larger decision. These actions are referred to as real options, and the ability to pursue real options has intrinsic value for firms operating under uncertainty (Dixit and Pindyck, 1994). Firms may under-invest in environmental performance when the benefits of improved performance are not quantifiable. Generally, environmental reputation is a function of many factors, and firms need to carefully manage initiatives and disclosure in a competitive environment.

Agency

The principal-agent problem is often prevalent in the failure of firms to capture shareholder value. Misaligned incentives for the agent (corporate managers) and the objectives of the principal (shareholder value maximization) lead to undesirable performance (Jensen and Meckling, 1976). For example, if management incentives are created to reward managers for short-term performance metrics such as quarterly stock price, certain activities with long-term value - both to shareholders and to society - may be bypassed. In the context of management rewards for environmental performance measures, those incentives must be carefully designed to ensure value is captured, and not simply created; it is often not enough for firms to improve environmental performance, but that improved performance must translate into captured value.

Another problem related to agency theory is that of licensing: managers may act to improve environmental performance along certain dimensions, particularly when those dimensions serve some utility to the managers, either in terms of compensation or in egocentric terms (Ormiston and Wong, 2013). Conversely, when firms are subject to more intense stakeholder scrutiny, poor environmental performance in some domains may be addressed by improved performance in different domains, thus seeking to distract attention rather than addressing the

original area of poor performance (Kotchen and Moon, 2012).

Bounded rationality

Economic agents - such as managers of firms - are rational, but only to the extent that they have perfect access to information and unlimited cognitive abilities (Simon, 1955). This inability to access and process all information in the name of strategic decision making is referred to as bounded rationality. Whereas firms are expected to exhibit economically rational behavior, bounded rationality suggests that managers of firms make decisions that affect corporate outcomes, and those decisions are often not optimal. A related concept is that of satisficing; when managers lack the cognitive capacity (or sufficient time and resources) to perfectly optimize, they will settle for actions that are “good enough” (Cyert and March, 1963). While such actions may result in incremental firm value, it is reasonable to expect that higher potential profits are left unexploited.

The tendency for corporate managers to exhibit bounded rationality can manifest in the environmental performance domain through underinvestment in activities with long payback periods (risk aversion), or overinvestment in activities that preserve status quo.

Behavioral obstacles

Obstacles to the creation and capture of value may also exist outside the firm, among consumers or other stakeholders groups that influence firm performance. Individual consumers have unique preferences that, when taken at aggregate, affect the ability of firms to capture value associated with providing environmental goods.

Systematic departures from economic rationality Beyond the problem of bounded rationality described above, individuals tend to exhibit a number of innate biases in cognitive processes associated with decision making; (Kahneman, 2011) refers to the systems of cognitive

processing as “System 1” and “System 2”, where individuals reach different conclusions depending on which system is activated in a particular situation. Firms must consider these potential roadblocks to influencing stakeholder perceptions, or may take advantage of them in communication strategies.

Individuals tend to employ a number of characteristic heuristics and biases to minimize cognitive strain when confronted with decision making tasks; they are often efficient but can lead to systematic errors of judgment (Tversky and Kahneman, 1974). Firms may exploit these heuristics by targeting communication of performance to certain stakeholders. Individuals are also often prone to predictable tendencies regarding basic expected utility maximization when confronted with decisions (Kahneman and Tversky, 1979); individuals tend to be more risk averse in gain frames and risk seeking in loss frames, while experiencing disutility from losses in greater magnitude than the utility from gains. Firms may exploit these tendencies through orienting of corporate communications in the appropriate frame to guide individual behaviors and perceptions of firm performance.

Individuals also tend to exhibit higher discount rates when weighing tradeoffs than would be considered financially rational (Frederick et al., 2002). Firms considering communication of benefits of environmental actions may consider individual preferences over financial and health domains in addition to environmental domains, particularly in relation to gain and loss frames as noted above (Hardisty and Weber, 2009).

Social identity Individuals tend to exhibit social identity with various peer groups, and the desire to exhibit behaviors that conform to a certain social identity can overcome other preferences, particularly when those behaviors are publicly visible. Studies have shown that individuals may be less likely to engage in visible environmental behaviors if being observed reveals preferences at odds with the target social group (Brick et al., 2015); likewise, individuals may engage in more consumption of green products if it visibly signals relevant and appropriate

preferences to peer groups (Griskevicius et al., 2010). Such tendencies have been closely linked to imperfectly observable characteristics such as political ideology (Gromet et al., 2013; Costa and Kahn, 2013), suggesting firms may have success capturing value to the extent their communications can be targeted, and resulting actions are visible or not.

Furthermore, individual consumers tend to exhibit moral licensing in a similar sense to that ascribed to corporate managers above. Consumption of “green” products may send signals about individual preferences that help to create a certain social identity that individuals may seek to foster in future opportunities to display similar behaviors (Mazar and Zhong, 2010; Merritt et al., 2010). This is a potentially very powerful tendency for firms to exploit for firm value; the establishment of reputation associated with a firm’s products can lead to repeat customers as well as rapid diffusion of positive reputational aspects (Gladwell, 2006).

Self-efficacy Perceived personal costs of action, or perceived inability to influence an outcome are also associated with resulting behaviors; this dependency of action on perceived behavioral control is referred to as self-efficacy (Bandura, 1977; Ajzen, 1991). Individuals who perceive a high cost of action, psychological or otherwise, are less likely to believe that action will have any beneficial effect and thus less likely to take action (Tobler et al., 2012). However, further to the matter of social identity, engaging in more costly behavior sends signals about the individual’s behavioral preferences and social identity, making subsequent action of the same behavior more likely (Gneezy et al., 2012).

Solutions

Scholars in psychology, economics, and public policy have separately addressed these various behavioral theories and proposed practical solutions for addressing them; techniques of influence can variably be applied for the social good or for private gain, though (as discussed throughout this article) the two values are not necessarily mutually exclusive. I briefly discuss

prominent frameworks originating from each discipline here, and their implications for firms seeking to create and capture firm value from provision of environmental goods.

Influence (Cialdini, 2006) proposed a set of six principles of interpersonal influence, each targeting a different aspect of personal relations prevalent in many modern cultures: reciprocity, commitment and consistency, social proof, liking, authority, and scarcity. Below I discuss a subset of these principles particularly relevant to firms seeking to capture value from consumers by providing environmental goods.

The principle of reciprocity suggests that individuals who have been treated fairly or provided some good tend to feel an obligation to return the act in kind. Firms rely on feelings of reciprocity among stakeholders in order to create shareholder value from provision of environmental goods. Importantly for firms engaging in environmental performance, scholars have found that the technique of reciprocity-by-proxy is effective in eliciting reciprocity from a target by providing benefits to a third party (Goldstein et al., 2011); the concept may be logically extended to the ability of firms to elicit reciprocity (say, brand loyalty) from consumers by contributing environmental public goods that consumers value.

Social proof is the knowledge that one's actions are in line with social norms. Advertisers have relied on the principle of social proof for decades to assure customers that, yes, the fact that others are consuming a product is evidence that they should as well. Social proof is often demonstrated through the communication of social norms, targeted towards influencing some desired behavior. Providing consumers with a descriptive norm, or example of behavior perceived to be what others are actually doing, has been found to move others toward that behavior (Cialdini, 2003); the technique has been used by firms at large scale to influence electric utility customers to reduce their energy consumption (Allcott, 2011). Injunctive norms, or examples of behavior perceived to be what others feel is appropriate, has been proven to counteract the effect of convergence to the norm, when the norm is not necessarily the optimal target behavior

(Schultz et al., 2007). Other normative concepts, such as provincial norms, have proven effective at influencing customer behavior where one's specific location is salient (Goldstein et al., 2008).

Nudges A nudge, as defined by (Thaler and Sunstein, 2008), is the use of choice architecture to utilize behavioral tendencies to silently push individuals towards a desired action; in principle, the desired action should be a beneficial choice to the individual as well as the nudging agent. A critical feature of a nudge is that it preserves an individual's freedom to choose, but guides that choice towards individual and societal preferences. While nudges are typically prescribed in social policy, firms can take advantage of nudges to steer customers towards more environmentally friendly product choices, or encourage increased employee engagement with respect to a firm's environmental activities.

An effective nudge should result in a cognitively easy choice (Kahneman, 2011). For example, despite the influential power of social norms, individuals tend to be remarkably ignorant of the effect norms have on their behavior; typical motivating factors individuals use to explain pro-environmental behaviors include "protecting the environment, benefitting society, saving money". But when individuals are exposed to different information stimuli, they overwhelmingly respond more to social norms (Nolan et al., 2008).

Framing Framing is a process that guides individuals to develop a particular conceptualization of an issue or reorient their thinking about an issue (Chong and Druckman, 2007); the power of framing is that small changes in the presentation of an issue or an event sometimes produce large changes of opinion. Framing can thus be particularly effective in influencing perceptions of (and reputation for) positive environmental performance by firms. Frames work by targeting the availability, accessibility, and applicability of beliefs stored in individual memory (Chong and Druckman, 2007). Individuals tend to recall facts or values based on information

readily at hand (Tversky and Kahneman, 1974; Zaller, 1992). Firms can exploit this tendency by introducing information that consumers may find relevant.

2.3.4 Conclusion

This article has explored the types of value that firms can create and capture through beyond-compliance (voluntary) environmental performance. The first section drew on business strategy and environmental economics literature to discuss the various types of value, both social and private (shareholder), that firms can create through the provision of environmental goods. The second section summarized the types of activities firms engage in to create and capture that value. Finally, the third section drew on strategy and social psychology literature to explore various obstacles that may prevent firms from effectively capturing value, and solutions to overcome those obstacles.

Chapter 3

Norm Proximity and Optimal Social Comparisons

with Chris Goodwin and Daniel Moncayo

Abstract

Bottom-up solutions targeting individual energy conservation behaviors can play an important role in mitigating the threat of climate change. Information interventions using social comparisons have proven generally effective at increasing pro-environmental behaviors, yet sometimes fail when not adequately designed for their specific context. Policy makers and practitioners need guidance on design of behavioral interventions to maximize effectiveness. This article reports the results of a randomized control trial field experiment that used social comparisons to increase electricity conservation in a unique experimental setting with homogeneous residential units and no economic incentive for subjects to conserve. Two treatment groups receiving information feedback with different social comparison reference points exhibited an average treatment effect of 6% relative to a control group that did not receive feedback. Moreover, treated subjects whose baseline behavior was “closer” to their relevant comparison group norm exhibited stronger response to the treatment than treated subjects whose baseline behavior was “further” from the relevant norm. These results demonstrate that individuals may be more responsive to social norms when their behavior is more proximate to the norm and complying with the norm is perceived to be more achievable. This paper contributes to our understanding of social comparison effects by introducing the concept and demonstrating the effect of norm proximity on individual behaviors, and by isolating pure information effects from other confounds such as economic incentives and heterogeneity in baseline household energy efficiency.

3.1 Introduction

Climate change caused by anthropogenic greenhouse gas (GHG) emissions is one of the most pressing and challenging global collective action problems of our time (Stern et al., 2006). A general consensus has formed that suggests hazards may be best mitigated by rapid and substantial reduction of GHG emissions worldwide (IPCC, 2014; Weitzman, 2009). Whereas top-down regulations and international agreements on restricting emissions have proven difficult to implement for a variety of structural reasons (Libecap, 2014), scholars suggest turning to bottom-up policy endorsements to more rapidly effect change (Keohane and Victor, 2011). Such polycentric approaches emphasize the power of local information to influence norms and rules at a small scale, with potentially significant aggregate effects (Ostrom, 2010). Policy makers are increasingly searching for more effective tools at influencing individual behaviors towards pareto-improving social outcomes¹ and applying evidence-based methodologies for program evaluation².

Individual behaviors tend to be culturally ingrained, and cultural shifts can take a long time to effect (Lehman et al., 2004). Behavioral change may be induced via many types of interventions, and often the more successful interventions are those that indirectly appeal to a desired behavior without explicitly noting the target behavior (Cialdini, 2006; Thaler and Sunstein, 2008). The provision of relevant social norms - perceptions of how others tend to behave - is one such effective tool, despite (or perhaps owing to) the knowledge that individuals are generally unaware of the degree to which they are influenced by those norms (Nolan et al., 2008). Social norms have been widely implemented in experimental and practical settings, with varying effectiveness (Delmas et al., 2013b). A number of problems may limit the effectiveness of social norms on individual behaviors. The provision of a social norm tends to attract individual behavior toward that norm, whether the norm itself represents a desirable social outcome or

¹See UK Behavioural Insights Team.

²See White House Memorandum M-13-17.

not (Cialdini, 2003). The tendency of individuals with “good” behavior to move towards a less desirable descriptive norm (often referred to as the “boomerang” effect) can often be mitigated by an additional injunctive³ norm (Schultz et al., 2007). Individuals are also less likely to adopt a certain behavior when they feel they are unable to influence an outcome (Bandura, 1977) or if that behavior is beyond their ability to control (Ajzen, 1991). Moreover, individuals are more likely to adopt a certain behavior when there is some perceived benefit to social reputation (or conversely, threat of social sanction) associated with performance of the behavior (Griskevicius et al., 2010; Brick et al., 2015).

This article describes a series of studies designed to address these various pitfalls through information campaigns based on household-level electricity consumption behaviors. We use high-frequency smart meter⁴ data to provide periodic information feedback with social norm comparisons to a group of university students living in campus housing facilities. Our innovation is the use of a unique information feedback mechanism - targeted norms - to overcome these problems associated with social norms information campaigns. A targeted norm is the provision of individualized information feedback with social comparisons that is expected to be more relevant and motivational to the subject. Through targeting of social norms based on individual characteristics, we are able to reduce both the boomerang effect and problems associated with low self-efficacy. Our information treatments using targeted social norms generated substantially greater treatment effects (approximately 6% reduction in energy consumption relative to a control group) than similar trials using generic norms.

There are several ways in which we improve upon prior research studying the effect of social norms on energy conservation behavior. Our experimental setting allows us access to a greater number of experimental units (240 student apartments and more than 1000 individ-

³Descriptive norms refer to how people actually behave; they are individual perceptions of relevant group behaviors. Injunctive norms refer to how people ought to behave; they are individual perceptions of the values and expectations of a relevant group.

⁴A smart meter is an electronic instrument that records periodic electricity consumption for a given household and includes internet connectivity for real-time monitoring.

ual subjects) which enables greater variation in treatment while retaining sufficient statistical power. Our access to billing-grade smart meter data provides a reliable, uninterrupted data stream from which we are able to estimate time of day and day of week effects, and deliver more actionable information feedback to subjects⁵. The external validity of our subject pool is enhanced relative to prior work - we observe full-service apartments, as opposed to basic dormitory rooms with no kitchen, bathroom, or common areas. Our ability to randomize subjects into treatments reduces upward selection bias in the estimated treatment effects, as well as reduces the possibility of Hawthorne effect.

The remainder of the article is structured as follows: the next section reviews relevant theories of individual behavior and drivers of behavioral change from social psychology and behavioral economics literature. The second section applies these theories to the context of pro-environmental behaviors and energy conservation specifically, and derives the testable hypotheses that motivate our studies. The third section reviews the experimental setting and empirical approach, and the fourth section summarizes the empirical results. A fifth section offers a discussion of the relevance and implications of the studies' results, and a final section concludes.

3.2 Theories of individual behavior

It is often desirable to influence behavior toward prosocial goals (Thaler and Sunstein, 2008). Numerous literatures across multiple domains concern the drivers and consequences of targeted interventions on individual behaviors, notably with respect to the environmental consequences of those behaviors (Steg and Vlek, 2009; Bamberg and Möser, 2007). Individual behavior is susceptible to certain, relatively reliable sources of external influence (Cialdini,

⁵For example, an electricity user that can observe what time of day her consumption is substantially greater than that of her peers has better information by which to plan and implement effective conservation behaviors.

2006). A substantial vein of research concerns the behavioral response of individuals to cues from social norms. Social norms - individual perceptions of how others behave - are often found to be reliable drivers of behavior change (Cialdini, 2003; Schultz et al., 2007; Goldstein et al., 2008) despite the apparent proclivity for individuals to believe they are not responsive to such cues (Nolan et al., 2008). A concept underexplored in the social norms literature is that of norm proximity - the degree to which individuals are influenced by a norm based on the perceived distance (psychological or otherwise) from their existing behavior; this article evaluates this concept empirically. This section briefly summarizes prominent theories of individual behavior and how they inform the concept of norm proximity.

3.2.1 Individual behavior and social comparisons

Many competing and complementary theories have been forwarded by social psychologists to describe the factors that determine how individuals are likely to behave in certain situations. One prominent theory of human behavior is the theory of reasoned action (TRA). TRA suggests that behavioral intention is generally under volitional control and primarily influenced by attitude and subjective norms (Fishbein and Ajzen, 1975); when individuals have a positive emotional evaluation of a behavior and its expected consequences (attitude) and perceive the behavior to be of value to important others (subjective norms), they are likely to exhibit intention to perform the behavior. A widely accepted extension to TRA - the theory of planned behavior (TPB) - introduces a third factor, perceived behavioral control (PBC) (Ajzen, 1985, 1991). PBC suggests that behavioral intention is influenced by the degree to which an individual perceives they have the capacity and the resources to perform the behavior; a lack of PBC leads to reduced behavioral intention.

TRA and TPB thus predict that individual behavioral intention (and subsequent behavior) is jointly determined by an individual's pre-existing attitudes toward a specific issue, the degree

to which norms exist and provide information on the perceived attitudes of an individual's peers toward the issue, and the degree to which an individual feels their capacity to affect the issue is significant. Whereas additional concepts have been proposed and studied as extensions to TPB (see Conner and Armitage 1998 for a review), we consider the basic TPB model to be sufficiently informative for this research. A notable omission from these theories in general, and in much of the associated empirical research, is the translation of intention into actual behavior. Meta-analytic studies have suggested that TPB (intention) accounts for 38% or less of observed behavior (Conner and Armitage, 1998). Again, we concern ourselves with behavioral intention as predicted by the theory, and measure actual behaviors over the course of the study.

Humans tend to seek to evaluate their performance against some standard of comparison (Festinger, 1954). A social norm is often, when available, that standard. Social norms are particularly relevant to individuals when conditions are uncertain (e.g. subjects don't know the correct level of consumption), the comparison group is similar (e.g. a relevant peer group), or when social status is important (Cialdini and Trost, 1998). Many types of norms may be available or referenced by individuals in various contexts, with potentially different effects on behavior. For example, descriptive norms (perceptions of how others behave) and injunctive norms (perceptions of how others think one *should* behave) have been found to influence behavior in opposite directions (Cialdini et al., 1990; Cialdini, 2003) in the same context; the pairing of an injunctive norm alongside a descriptive norm provides guidance on the expected (and socially approved) mode of behavior. In situations where one's own performance may not be readily evident (e.g. household electricity consumption), the addition of an explicit social comparison of individual behavior to the presentation of norms has been found to be effective in moving behavior toward socially desirable outcomes (Schultz et al., 2007).

But sometimes social comparisons do not work as intended (Beshears et al., 2015; Midden and Ritsema, 1983; Viscusi et al., 2011). A number of explanations have been offered, generally specific to the contexts in which the studies were performed, without backing from

theory and untested. An alternative explanation - rooted in a number of behavioral theories, but underexplored in the literature - is that of norm proximity. When an individual behavior is far from the available comparison norm, a lack of PBC over one's ability to rectify behavior with the norm may reduce motivation to comply, as predicted by TPB (Ajzen, 1985). While PBC is potentially affected by many factors other than this perceived distance, several other theories of behavior (discussed below) provide further insight to the concept of norm proximity.

3.2.2 The concept of norm proximity in behavioral theory

Several theories of individual behavior make indirect reference to the concept of norm proximity. Festinger (1954) lays out a number of hypotheses and corollaries related to the relevance of available social comparisons, notably that the tendency to compare oneself with a reference standard decreases as difference in one's ability or opinions with the standard increases. Festinger (1954) also suggests that individuals are less attracted to situations where others' performance is more divergent from one's own, and thus more likely to disengage from the comparison. Individual aspiration is also influenced by norm proximity. Chapman and Volkman (1939) study the effects of varying social comparisons on individual aspiration in basic tasks and find that individuals tend to regress to their perceptions of performance expectations; if a low standard is set, subjects may exhibit lower aspiration and subsequent performance, whereas the converse is noted for higher standards of comparison.

In the field of decision sciences, various studies evaluate factors that influence individual assessments of information and subsequent actions. The concept of anchoring - the use of a (frequently irrelevant) number to influence individual perceptions of appropriate quantitative measures - is related to that of norm proximity. When facing uncertainty, individuals tend to gravitate toward available information as a heuristic to aid decision-making (Tversky and Kahneman, 1974). However, research has found that the degree to which such an anchor ef-

fectively influences subsequent behavior is restricted to the degree subjects believe that anchor to contain plausible information (Wegener et al., 2001). In the context of social comparisons, a perceived implausible comparison (less proximate) is more likely to be disregarded.

The theory of self-efficacy (Bandura, 1977) holds that an individual's willingness to alter their behavior is often dictated by the degree to which they have confidence in their capacity to perform in compliance with some criteria. Individuals with higher self-efficacy are more likely to initiate effort to change behavior, exert higher levels of effort, and sustain effort over longer periods of time. While self-efficacy may be enhanced through experiential learning processes, a lack of self-efficacy around a certain behavioral expectation may inhibit initiation of action. Though similar to the concept of PBC, scholars have distinguished self-efficacy along internal factors such as intrinsic motivation, with PBC related to external factors such as availability (Armitage and Conner, 1999). Such internal motivation and subsequent performance has been linked with perceived difficulty of tasks (Schunk, 1991) and the relative proximity of performance targets (Bandura and Schunk, 1981). More recent work has demonstrated the propensity for subjects to capitulate in the face of high achievement by their peers (Rogers and Feller, 2016). A social comparison norm, which implicitly conveys such targets of behavioral performance, may increase self-efficacy for individuals whose initial behavior is more proximate to the norm.

3.3 Social norms and electricity conservation

In this study, we use provision of social comparison information against multiple reference points to estimate the effects of norm proximity on individual behaviors. As with a number of previous studies, we use changes in household electricity consumption as the dependent variable. Household energy consumption is a useful behavioral construct as it is typically private information, socially relevant, environmentally impactful, and difficult for the subject

to independently measure or evaluate their own behavior.

3.3.1 Relevant literature

The concept of using informational interventions to influence energy consumption behaviors is not novel. Electricity consumption data is well instrumented and easily available in developed nations, as it represents an ubiquitous yet vital commodity with substantial state regulatory oversight. There exists a substantial literature spanning several decades exploring myriad types of information interventions. Among the interventions used in this experimental literature include antecedant treatments such as commitment, goal-setting, information; and consequence treatments such as feedback and rewards.

Scholars have been designing and conducting field experiments to analyze optimal means of reducing energy consumption (increasing electricity conservation) since the energy crisis of the 1970s. With the publishing of a landmark study in 2007 (Schultz et al., 2007), the power of descriptive and injunctive social norms on influencing individual energy consumption behavior was brought to the forefront of this literature. The provision of energy consumption feedback with social comparisons has since been recognized as a widely successful and cost-effective approach to achieving improved conservation results (as partly evidenced by the market success of firms such as Opower⁶).

Considering the extent of experimental and quasi-experimental studies published measuring the effect of various information interventions on household-level energy consumption, several review papers have been published to document the scope and effectiveness of those interventions. Abrahamse et al. (2005) presents a notable qualitative review of various informa-

⁶Opower (NYSE: OPWR) is a publicly traded corporation founded on the premise (as informed by Schultz et al. 2007) that energy usage feedback information with social comparisons provided to electric utility customers could save money for both utilities and their customers. The company issued an initial public offering in April 2014 with a subsequent market capitalization of approximately \$1.2 billion. See Ayres et al. (2013); Allcott (2011); Allcott and Rogers (2014); Costa and Kahn (2013) for peer-reviewed studies based on Opower data.

tion interventions studied over two distinct temporal trends (in response to the global energy crisis of the 1970s and the increasing salience of climate change in the 1990s and 2000s), while Delmas et al. (2013b) provides perhaps the most comprehensive and rigorous quantitative review of experimental results. Among this body of literature, we believe the concept of norm proximity has received insufficient consideration by scholars and practitioners alike. We define norm proximity as the distance (measured or perceived) between an individual's own performance and the performance level communicated by the social comparison information provided.

In social norm studies where a quantitative descriptive norm is provided (e.g. your typical neighbor's electricity consumption), the location or level of that norm is generally fixed. Depending on an individual's prior performance relative to that norm, studies have shown heterogeneous response to the social comparison information treatment (Allcott, 2011), often producing effects generally seen as undesirable by interested policy makers (e.g. the "boomerang effect"; see Schultz et al. 2007). While additional interventions such as the application of injunctive norms have been shown to help neutralize the boomerang effect (Schultz et al., 2007; Allcott, 2011), the actual effect of the location of the descriptive norm has been overlooked. A recent experiment conducted in this same university student apartment setting (Goodwin and Moncayo, 2015) showed that the social comparison with similar neighbors is more effective at influencing consumption behavior than personal information feedback alone. This experiment provided subjects with a personalized energy usage report by email with a comparison to an "efficient" norm comprised of a lower percentile composite of similar, neighboring users. To our knowledge, there are no experimental studies measuring the effects of providing different norms on behavioral response.

3.3.2 Targeted norms

This study examines the effect of norm proximity on behavior change. Prior studies have clearly documented the tendency for individuals to converge to a descriptive norm, whether their prior behaviors were on either side of the norm (Cialdini, 2003; Schultz et al., 2007), and the effectiveness of an additional injunctive norm to correct this “boomerang” effect (Schultz et al., 2007). Allcott (2011) used regression discontinuity analysis to argue that provision of injunctive norms had negligible effect on electricity conservation, though there was no evidence of a boomerang either. In the Allcott (2011) study, subjects may be aware of the proximity of their own behavior to the descriptive norm, but because there is no variation in treatment design, the provision of injunctive norms may cloud any proximity effect.

There may furthermore be situations where providing an injunctive norm may be problematic or objectionable to subjects. For example, Costa and Kahn 2013 find that households in Republican-leaning political districts increase their consumption when provided information feedback with social comparisons. In another study documenting a negative response to social norms, Beshears et al. 2015 suggest that a substantial gap between subject’s prior performance and the norm provided may provide a demotivating effect for employees to enroll in a retirement savings program. Providing a single, “efficient” norm (10th percentile consumption level) was found to be effective at eliminating the boomerang in the absence of injunctive norms (Goodwin and Moncayo, 2015), though high consumption households (top quartile) reduced consumption by less than other quartiles and not significantly different from zero.

Descriptive norms provide a target reference point for individuals to seek to emulate. When that target point is perceived as being relatively proximate, individuals may be more likely to engage with the information and change their behavior to more closely align with the norm. When that target point is perceived as being difficult to achieve or implausibly distant, subjects may experience a lower level of self-efficacy or perceived behavioral control over the situa-

tion. This study seeks to determine whether an individual's proximity to the norm will affect subsequent behavior.

Hypothesis 1: Households presented with electricity usage information including social comparisons will reduce their subsequent consumption by more than households that do not receive information.

Hypothesis 2: Households with baseline consumption "closer" to and higher than the norm will reduce their subsequent consumption by more than those households "further" from the norm.

3.4 Methodology

To evaluate the pure information effect of social comparisons on individual behavior, we take advantage of a unique experimental setting. In this setting, subjects do not directly pay for their electricity consumption and thus do not have any economic incentive to conserve. Subjects are furthermore temporary residents of the community with no ownership interest, reducing any incentive to make investments in energy efficient technologies. The community has uniform dwellings and furnishings, normalizing any baseline differences in technical capacity for conservation between subjects. The community also contains a relatively homogeneous social structure among residents, leading to greater community identification as well as reduced uncertainty about perceived validity of relevant peer comparison groups. Moreover, individual subjects do not have prior access to information about their electricity consumption, reducing the potential for bias in the pre-experiment baseline consumption data. This section describes the experimental setting, treatment design for both studies, covariates available for experimental control, and the empirical models used to analyze the experimental data.

3.4.1 Experimental setting

The experiments were conducted within campus student apartment facilities at the University of California, Santa Barbara (UCSB). UCSB owns and operates several student apartment complexes in which groups of students reside in full-service apartments. The experiments were conducted in two different apartment complexes, each equipped with unit-level electricity smart meters. The smart meters collect high frequency electricity usage data - kilowatt-hours of electricity consumed - for each hour of the day for each individual apartment. In order to obtain access to this smart meter data, we entered into agreements with both UCSB Housing & Residential Services (the landlord) and Southern California Edison (the electricity utility that owns and maintains the smart meters and collects the raw data) to conduct these experiments. Typical electricity loads from these apartments are primarily from refrigerators, room lighting, and home electronics (computers, television, appliances, mobile device chargers, etc); there are no air conditioning units on premises.

The subject pool was selected based on existing metering hardware constraints. The UCSB campus facilities currently instrumented as required for purposes of these experiments (individual apartment-level electricity consumption information) include three distinct apartment complexes: Santa Ynez (190 apartments), El Dorado (50 apartments), and Storke 2 (42 apartments). Other campus apartment facilities are not individually metered and so individualized information treatments cannot be provided. Santa Ynez and El Dorado were selected for both experiments due to their comparable resident demographics (undergraduate students). Santa Ynez is a village-style complex, with groups of apartments scattered over a large, open space (see appendix for complex layout). Santa Ynez apartments are of uniform construction, with identical two-bedroom floor plans and furnishings. Individual Santa Ynez apartments are characterized as one of three types: upstairs unit (with vaulted ceilings), downstairs unit, and cottage-style unit (standalone single-story). Santa Ynez apartments typically house 4-5 under-

graduate students per apartment. El Dorado is an urban block-style apartment complex, with apartments arrayed in a single two-story building with central courtyard. El Dorado consists of both 2-student units (one bedroom) and 4-student units (two bedroom). Storke 2 was not considered for the experiment due to substantially different resident demographics (students with families) and utility obligations (Storke 2 residents generally pay separately for electric utility services and are direct account holders with Southern California Edison).

Student housing residents at UCSB pay a fixed rent to the university each month. Students do not pay a separate amount for their utility service, nor do they typically have access to information about their utility service. As such, there is no direct financial incentive to students to conserve electricity. This absence of pecuniary incentives allows us to directly manipulate other incentives to conserve electricity, such as awareness of social norms within the apartment community. To observe the effects of social norms on energy conservation behavior, we designed interventions that provide periodic feedback to individual residents on their own apartment's electricity consumption with comparisons to the consumption of similar, neighboring apartments. The interventions were administered over the course of the 11-week Spring 2014 academic quarter, roughly April through mid-June. This treatment timeframe allowed us to establish baseline electricity usage for each apartment prior to the intervention (during Fall and Winter academic quarters).

3.4.2 Experimental treatment

A randomly selected group of apartments in each complex received a private information treatment during the experiment. A control group, consisting of apartments not selected into the treatment group, received no information on their electricity consumption during the experiment. The private information treatment consisted of a weekly, personalized email message to each individual resident containing a social identity appeal ("*Be a Green Gaucho!!*") and

information detailing the subject apartment's electricity consumption (and corresponding carbon dioxide equivalent emissions) from the previous week with a comparison to a consumption norm calculated from the concurrent consumption of neighboring apartments. The treatment group was further divided into two subgroups based on their baseline consumption from the Winter quarter. One subgroup, comprised of apartments with a lower aggregate baseline consumption than the treatment group median, was assigned weekly comparisons to an "efficient" norm. The efficient norm was calculated as the 10th percentile consumption level (i.e. lower consumption) of all apartments in the relevant comparison group. The other subgroup, comprised of apartments with higher aggregate baseline consumption than the treatment group median, was assigned weekly comparisons to an "average" norm. The average norm was calculated as the 50th percentile consumption level of all apartments in the relevant comparison group.

This non-random assignment to each subgroup was chosen for practical reasons. Prior research at this experimental setting (Goodwin and Moncayo, 2015) identified a potential relationship between the subject's proximity to the norm and their behavioral response. The current study was designed to attempt to parameterize this relationship, with the hypothesis that individuals who are closer to the norm are more likely to attempt to comply with the norm, whereas individuals who are further from the norm are less likely to alter their behavior. Random assignment of apartments to the two subgroups will result in a substantial proportion of subjects (roughly one quarter) with baseline consumption already lower than the norm, which prior research (Schultz et al., 2007) suggests will result in a boomerang effect of reversion to the norm. We reason that practitioners - with access to information on subject's prior usage - will seek to optimize energy conservation by selectively targeting specific groups with specific norms. In a similar study on household water consumption behaviors, Ferraro and Miranda 2013 find heterogeneous behavioral response to treatment based on certain demographic variables, and recommend policy-makers use demographic targeting for optimal response.

Aside from the subject's comparison norm, the email messages delivered to the two subgroups were identical. In addition to the text comparison, each email message included two graphs: the first showing the subject apartment's hourly consumption levels over the course of the week, and the second superimposing the consumption of the relevant norm against the subject apartment's consumption. On this second graph, the difference in each hour's consumption level between the subject apartment and the norm was shaded red (when the subject apartment's consumption exceeded the norm) or green (when subject apartment's consumption was less than the norm). This graphical comparison allowed individuals to determine their apartment's level of consumption over the course of each day, in both absolute terms and relative to the norm. A hyperlink was also included to a project web page that included detailed information on interpreting the graphs, as well as tips and pointers for saving electricity. An example of the email content is included in the appendix.

3.4.3 Covariates

A large number of apartment, demographic, and temporal covariates are available to serve as experimental controls. At Santa Ynez, apartments are identical in construction and furnishings, but may be differentiated on location by upstairs, downstairs, and cottage-style. El Dorado apartments are substantially different from Santa Ynez, and have the distinguishing variable of size (one bedroom versus two bedroom), and may also be further differentiated as upstairs and downstairs. Available demographic information includes gender, age, ethnicity, enrollment data (number of units enrolled, major field of study, and cumulative grade point average), and registered vehicles. We use data on vehicle make and model to construct a crude proxies for wealth and environmental preferences.

Self-reported behaviors and attitudes (composites of environmental behaviors, environmental attitudes) as well as political party identification were obtained by survey. We also obtained

survey measures of roommate interactions as a proxy measure of household heterogeneity. We acknowledge that due to generally low survey response rates (12-25%), the survey-based covariates may not be sufficiently robust to be used in our statistical analyses.

3.4.4 Empirical approach

The cluster randomized assignment of treatment and control is well suited for a difference in differences estimator; under simplifying assumptions, the average treatment effect for each treatment will be calculated as the difference in outcome (energy consumption measured in kilowatt-hours per week) for the treatment group from before to after the treatment intervention less the difference in energy consumption over the same timeframe for the control group. The average treatment effect is determined through ordinary least squares (OLS) linear regression on the treatment variables and available covariates, including time and apartment-level fixed effects. The relevant OLS estimator for the average treatment effect is β_3 in equation 3.1 below, where $\ln kwh_{it}$ is the log of daily energy consumption for each unit⁷, $Priv_i$ is an indicator variable for units receiving the private information treatment, and $Treat_t$ is a time indicator variable representing the period during which both treatments were in effect. Covariate controls are included: \mathbf{X}_{it} is a matrix of apartment-level characteristics and demographics⁸, \mathbf{Z}_t is a matrix of time fixed effects (e.g. holidays, finals week, hour of day, day of week, etc), and ε_{it} is a random error term.

$$\ln kwh_{it} = \beta_0 + \beta_1 Priv_i + \beta_2 Treat_t + \beta_3 Priv_i Treat_t + \gamma \mathbf{X}_{it} + \delta \mathbf{Z}_t + \varepsilon_{it} \quad (3.1)$$

⁷Hourly consumption data is aggregated by day to avoid a small number of dropped observations where observed consumption for a given hour was zero. Hour of day regression analysis described later in this paper used the raw, non-aggregated hourly data.

⁸While apartment-level characteristics are generally constant over time, some units have variable demographic composition between quarters due to occupant changes. Analysis of occupant changes is a work in progress and will be updated.

The private information treatment actually consisted of two separate treatment groups. Treatment subjects with baseline consumption below the community median were non-randomly assigned to receive social comparisons to an “efficient” norm, which we calculated as the 10th percentile consumption level, throughout the treatment period. Treatment subjects with baseline consumption above the community median were assigned to receive an “average” norm, calculated as the community median consumption level.

According to hypothesis 3.3.2, individuals with baseline behavior less proximate to these norms are less likely to reduce their consumption subsequent to receiving the treatment. We operationalize the concept of norm proximity as a simple assignment of subjects into quartiles⁹. The 1st quartile, or 25% of apartments with lowest baseline consumption, is then expected to reduce their consumption in the treatment period more than those apartments in the 2nd quartile, made up of the 25% of apartments with next to lowest baseline consumption, since the 2nd quartile subjects are further from the “efficient” norm than the 1st quartile subjects. Likewise, hypothesis 3.3.2 also predicts that subjects in the 3rd quartile will reduce their consumption in the treatment period more than those in the 4th quartile, since the 4th quartile subjects are further from the “average” norm. Table 3.1 summarizes these predictions.

In order to determine the heterogeneous treatment effects for each quartile, additional dummy variables were assigned to subjects corresponding to their presence in one of four quartiles of

⁹It is more desirable to use a smaller bin width for the quantiles used in this analysis (see Allcott 2011); however, our experimental sample is constrained by the number of households with smart meter data available. The available sample represents insufficient statistical power to reduce the quantile bin widths lower than 25%.

Table 3.1: Hypothesized Quartile Treatment Effects

Group	0-25 pct	25-50 pct	50-75 pct	75-100 pct
Baseline energy use	Lowest	Lower	Higher	Highest
Assigned norm	efficient	efficient	average	average
Proximity to norm	near	far	near	far
Prediction	↓ energy	no change	↓ energy	no change

baseline consumption as noted above. Using the regression model described above (equation 3.1), the variable $Priv_i$ is replaced with these four quartile dummies and their corresponding treatment interaction terms.

Given the non-random assignment to the two treatment sub-groups, and the nature of the social comparison treatment, an alternate approach is to consider the two treatment sub-groups as each receiving a unique treatment. Therefore, an alternate OLS regression specification may include these two treatments as separate independent variables, according to equation 3.2 below, where Eff_i corresponds to the private information treatment group with below median baseline consumption and exposure to the “efficient” norm, and Avg_i corresponds to above median baseline consumption and exposure to the “average” norm. In this specification, there are two coefficients of interest. β_4 represents the average treatment effect of the efficient norm treatment, and β_5 represents the average treatment effect of the average norm treatment.

$$\ln kwh_{it} = \beta_0 + \beta_1 Eff_i + \beta_2 Avg_i + \beta_3 Treat_t + \beta_4 Eff_i Treat_t + \beta_5 Avg_i Treat_t + \gamma \mathbf{X}_{it} + \delta \mathbf{Z}_t + \varepsilon_{it} \quad (3.2)$$

The non-random assignment of treatment also lends itself well to regression discontinuity (RD) analysis. *Ceteris paribus*, subjects very close to, and on either side of, the median baseline performance are expected to exhibit similar energy consumption behavior during the treatment period. However, if hypothesis 3.3.2 holds (i.e. subjects close to the norm are more likely to reduce consumption than subjects far from the norm), then those subjects near to and below the median (assigned to the efficient treatment) are expected to decrease their energy consumption less than those subjects near to and above the median (assigned to the average treatment), because their current behavior is less proximate to the comparison norm. We therefore also apply a RD analysis of the form expressed below in equation 3.3, where $Below_i$ is an indicator variable for units with baseline consumption below the median level. The degree to

which hypothesis 3.3.2 holds will be revealed in the value of the coefficient β_2 . Note that in computing the RD, only the treatment group (those receiving the private information, whether compared to efficient or average norms) are considered. The ability to compare the behavior of the two treatment subgroups with that of a control group, wherein subjects have a similar distribution of baseline consumption but receive no information feedback during the treatment period, provides a valid counterfactual to further validate the RD results.

$$\ln kwh_{it} = \beta_0 + \beta_1 Treat_t + \beta_2 Below_t + \gamma \mathbf{X}_{it} + \delta \mathbf{Z}_t + \varepsilon_{it} \quad (3.3)$$

In conjunction with each study, a pre-experiment (entry) and post-experiment (exit) survey was conducted. Online surveys were administered via email to the entire experimental sample (all residents of Santa Ynez and El Dorado, regardless of assignment into the private information treatment group). While the response rate of the surveys was generally low, sufficient information was collected to draw some statistical inference on the behaviors and attitudes of the subject pool, as well as their reactions to the experiment (exit survey only). Where relevant, survey data was incorporated into the apartment-level covariate matrix.

3.5 Results

A short summary of descriptive statistics is noted first, followed by a detailed summary of experimental results.

3.5.1 Descriptive statistics

The results of the random assignment into private information treatment and control groups were analyzed using demographic information provided by UCSB Housing & Residential Services. The degree to which random assignment produced two independent samples with similar

characteristics was evaluated using two sample t-test on those key observable characteristics. Housing characteristics include upstairs versus downstairs (or standalone cottage) unit and number of tenants per individual unit. Demographic variables of interest include age, male or female apartment¹⁰, ethnicity, academic units enrolled, academic achievement as measured by cumulative grade point average (GPA), and vehicle ownership. In addition to these demographic variables, the baseline average electricity consumption¹¹ of each group expressed in kilowatts (i.e. average kilowatt-hours per hour). There were no statistically significant differences ($p < 0.10$) in the composition of treatment and control groups along these characteristics. Table 3.2 summarizes these results.

Table 3.2: Summary statistics (treatment vs control)

Variable	Control	Treatment	Difference	t	p
Baseline kW	0.32	0.32	0.00	0.15	0.878
Upstairs unit	0.49	0.41	0.08	1.16	0.246
Number of tenants	4.32	4.37	-0.05	-0.38	0.701
Male apartment	0.47	0.43	0.04	0.59	0.555
Mean age	21.50	21.50	0.00	-0.01	0.991
Mean units enrolled	13.79	13.45	0.34	1.14	0.254
Mean GPA	3.08	3.03	0.05	1.31	0.192
Number of observations	119	118			

Note: Unit of observation is one apartment.

The entry survey captured various attitudes and behaviors of subjects prior to administration of the experimental treatments. The survey responses may also be used to construct comparative statistics between treatment and control groups with respect to their pre-experiment behaviors and attitudes toward environmental issues. The survey response rate was 38%, so while the attitudes and behaviors of a large portion of the subject pool were not collected, the data provides a useful statistical sampling of the two treatment groups. Two-sample t-tests were used to compare means between treatment and control groups, where the survey responses were coded by integer values along their respective Likert-scales, as described in

¹⁰UCSB Housing policy prohibits mixed-gender residential units.

¹¹Throughout the discussion of this study, we assign the baseline period as the entirety of the Winter 2014 academic quarter.

Table 3.3 below. Note that several self-reported environmental behaviors scored higher among survey responders in the treatment group than in the control group.

Table 3.3: Entry survey responses (treatment vs control)

Question	Control	Treatment	Difference	t	p
Behavior: reusable shopping bags	2.61	2.89	-0.28	-2.53	0.012
Behavior: purchase green products	2.52	2.64	-0.12	-1.15	0.250
Behavior: recycle electronics	2.12	2.29	-0.16	-1.35	0.177
Behavior: unplug appliances and chargers	3.06	3.20	-0.14	-1.40	0.162
Behavior: turn off lights	3.70	3.82	-0.12	-1.91	0.056
Behavior: shorter showers	2.66	2.66	0.00	-0.02	0.986
Attitude: willing to pay more	3.49	3.53	-0.04	-0.37	0.711
Attitude: small actions important	4.11	4.28	-0.16	-1.50	0.134
Political ideology	3.56	3.52	0.04	0.43	0.665
Number of responses	187	188			

Note: unit of observation is an individual response (one student).

Behavior questions were coded as 1 = *never*, 2 = *rarely*, 3 = *sometimes*, 4 = *regularly*

Attitude questions were coded from 1 = *strongly disagree* to 5 = *strongly agree*

Ideology was coded from 1 = *very conservative* to 5 = *very liberal*

Daily electricity usage of individual apartments throughout the baseline and experimental periods exhibited a skewed distribution. For purposes of analysis, daily consumption levels were transformed by natural logarithm, resulting in an approximate normal distribution, as shown in Figure 3.1.

3.5.2 Treatment effects

The results from OLS regression on the basic difference in difference model from Equation 3.1 are summarized in Table 3.4 below. Five basic models were used, each with different combinations of covariates. All regression models used robust standard errors clustered at the apartment level. The average treatment effect (β_3 from Equation 3.1) is the coefficient of the interaction term between private information treatment group (*Private*) and the time period when treatment was in effect (*Treatment*). In all five models, the coefficient is significant at the 95% confidence level, and relatively robust to alternative specification. In the more descriptive models (i.e. models 2, 4, and 5) the coefficient indicates an average treatment effect of -

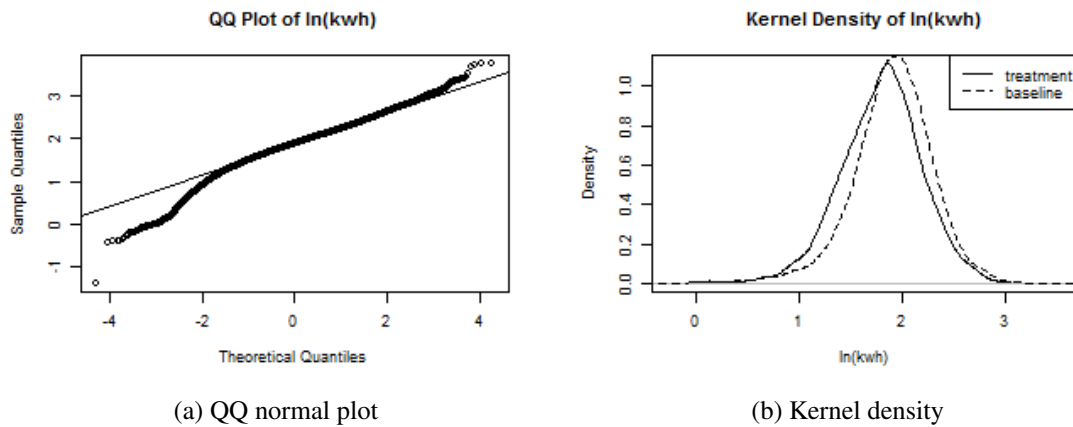


Figure 3.1: Distribution of \ln transformed energy usage

5.9%, suggesting that during the treatment period apartments receiving the private information treatment reduced their electricity consumption by 5.9% more than apartments that did not receive the treatment, relative to their pre-treatment baseline usage.

The alternate specification noted by Equation 3.2 above was also analyzed to determine the differential effect, if any, of the efficient and average norms on their respective treatment subgroups. We replicated each of the five models from Table 3.4 using this alternative specification. Table 3.5 below summarizes the results (while some covariates have been removed from the tables for brevity, the same covariate groups were used in each model). The results indicate that the efficient norm group on average reduced electricity consumption by approximately 6.2% relative to control (using the more descriptive models) while the average norm group on average reduced consumption by approximately 5.2% relative to control. Though not shown in Table 3.5, other covariate coefficients were generally unchanged in the alternative specification.

Table 3.4: Primary regression results

Variable	Model				
	1	2	3	4	5
Private info	-0.010 (0.04)	-0.005 (0.02)	0.012 (0.03)	-0.001 (0.02)	-0.001 (0.02)
Treatment	-0.082 *** (0.01)	-0.066 *** (0.01)	-0.072 *** (0.02)	-0.062 *** (0.02)	-0.007 (0.01)
Private * Treatment	-0.056 *** (0.02)	-0.059 *** (0.02)	-0.051 ** (0.02)	-0.059 *** (0.02)	-0.059 *** (0.02)
Baseline below median		-0.403 *** (0.03)		-0.370 *** (0.03)	-0.371 *** (0.03)
Upstairs unit		-0.038 (0.05)		-0.050 (0.04)	-0.052 (0.04)
Santa Ynez		-0.024 (0.05)		-0.021 (0.05)	-0.022 (0.05)
Number of occupants		0.080 *** (0.02)		0.079 *** (0.02)	0.077 *** (0.02)
Number of SUVs			0.381 ** (0.19)	0.075 (0.14)	0.083 (0.14)
Male apartment			0.228 *** (0.04)	0.103 *** (0.03)	0.103 *** (0.02)
Mean age			-0.029 (0.02)	-0.015 (0.01)	-0.017 (0.01)
Mean units			0.000 (0.01)	0.002 (0.01)	0.000 (0.01)
Mean GPA			-0.002 (0.07)	0.027 (0.05)	0.029 (0.05)
(Intercept)	1.90 *** (0.03)	1.75 *** (0.11)	2.45 *** (0.47)	1.85 *** (0.35)	1.87 *** (0.35)
Apartment characteristics	No	Yes	No	Yes	Yes
Occupant characteristics	No	No	Yes	Yes	Yes
Time fixed effects	No	No	No	No	Yes
Degrees of freedom	54980	54974	54969	54963	54936
F-statistic	305	3033	616.2	1454	722.5
Adjusted R ²	0.016	0.332	0.135	0.346	0.371

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Table 3.5: Alternate specification results

	1	2	3	4	5
Efficient norm	-0.218 *** (0.036)	-0.205 *** (0.032)	-0.167 *** (0.038)	-0.167 *** (0.031)	-0.009 (0.031)
Average norm	0.206 *** (0.037)	0.193 *** (0.035)	0.180 *** (0.035)	0.180 *** (0.033)	0.007 (0.033)
Treatment	-0.081 *** (0.014)	-0.061 *** (0.013)	-0.067 *** (0.017)	-0.067 *** (0.015)	-0.036 *** (0.012)
Efficient * Treat	-0.066 *** (0.025)	-0.064 *** (0.023)	-0.062 ** (0.025)	-0.062 *** (0.023)	-0.065 *** (0.024)
Average * Treat	-0.048 ** (0.024)	-0.057 ** (0.022)	-0.045 * (0.025)	-0.045 ** (0.023)	-0.054 ** (0.024)
Apartment characteristics	No	Yes	No	Yes	Yes
Occupant characteristics	No	No	Yes	Yes	Yes
Time fixed effects	No	No	No	No	Yes
Degrees of freedom	54978	54972	54967	54961	54936
F-statistic	1956	2483	923	1323	692.2
Adjusted R ²	0.151	0.332	0.212	0.346	0.371

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

3.5.3 Norm proximity

According to hypothesis 3.3.2 and as noted in Table 3.1 above, we hypothesize a relationship between a subject's proximity to the comparison norm provided and the subsequent response to treatment. In order to test this hypothesis we performed a quartile regression to estimate an average treatment effect for each baseline consumption quartile, using the same difference in difference approach. The results of this regression support this hypothesis and are shown graphically in Figure 3.2 below. As shown, subjects in the first quartile (lowest baseline consumption) receiving the private information treatment (comparing their usage to an "efficient" norm) decreased their electricity usage significantly more than those subjects in the first quartile that did not receive the treatment. However, subjects in the second quartile receiving the treatment did not significantly reduce their consumption more than subjects in the second quartile that did not receive the treatment. Those subjects with baseline behavior "closer" to the norm thus exhibited a stronger response to the treatment than those "further" from the norm. This phenomenon is repeated for subjects with baseline consumption above

the median (those in the third and fourth quartiles) that received private information treatment with comparison to the “average” norm.

Regression discontinuity

Given the significant finding related to norm proximity described above, we may consider the behavior of individuals with baseline consumption close to the median. Individuals very close to and on either side of the median may be expected to exhibit similar behavior. To illustrate this, Figure 3.3 below plots the treatment period consumption (average kWh per day) versus the baseline period consumption for the control group. However, individuals very close to and on either side of the median that were in the treatment group received substantially different social comparison information; those with baseline consumption below the median received a comparison to the efficient norm, and those above the median received a comparison to the average norm. Those individuals close to the median that received the efficient norm comparison were, by our definition, far from the norm, while those close to the median that received the average norm comparison were near to the norm. The hypothesis that individuals are more likely to alter their behavior if they perceive the norm to be more proximate found support using the quartile analysis above. Using a regression discontinuity approach, we also find that individuals close to but above the median on average reduced their consumption by significantly more than those close to but below the median, providing further support for the hypothesis.

Other analyses

Additional analyses are in progress and will be updated as results are available. First, a social comparison function as set forth by Goodwin and Moncayo (2015) seeks to define the functional form of the observed norm proximity effects. Second, data on subject compliance with treatment is available through detailed tracking of treatment email opens; in general, a

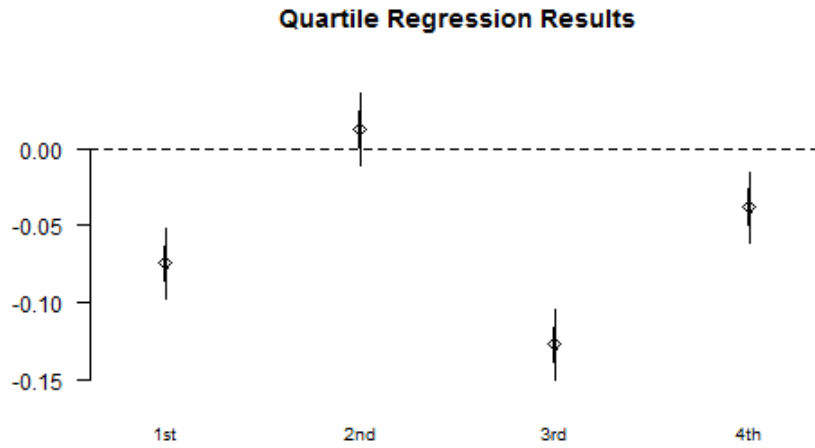


Figure 3.2: Individuals closer to norms exhibit greater treatment effects

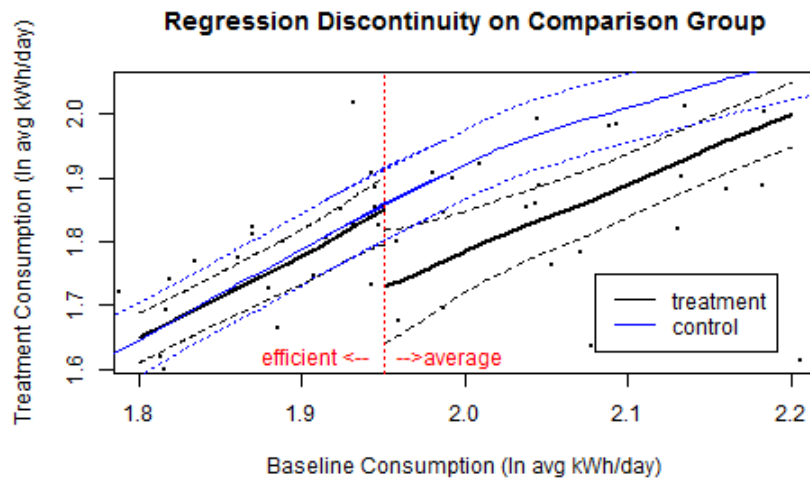


Figure 3.3: Regression Discontinuity

lower compliance rate may be expected to lead to higher estimates of complier average causal effects.

3.5.4 Covariate analyses

The results also yield interesting observations regarding the covariates analyzed. Including apartment-level characteristics (model 2), notably above/below the median baseline consumption and the number of occupants, substantially improves the amount of variance explained by the model. Incremental explanatory improvements are obtained by including occupant characteristics such as gender and demographic information (model 4) and time fixed effects (model 5).

Apartments that had baseline consumption below the sample median consumed, on average, roughly 40% less electricity than apartments with baseline consumption above the sample median; this coefficient is effectively a relative comparison between units at the 25th and 75th percentiles. Also, for each additional occupant in an apartment, electricity consumption increased by approximately 8% on average, all else equal. Using data on student vehicle ownership, we surmised the ownership of a sport utility vehicle (SUV) may be a relevant proxy for lower regard for energy conservation. While each additional SUV registered to an apartment corresponded to a 38% higher electricity consumption level on average according to model 3, this result was not found to be robust to alternative specifications. Finally, we found that male residents consumed significantly more electricity than female residents, approximately 10% higher consumption according to the more descriptive models.

Analysis of time variables also yielded interesting results. We performed an additional regression on the interaction between week of the quarter (during the treatment period) and the treatment group to estimate weekly treatment effects. The average treatment effect varied over the course of the ten weeks during which the private information treatment was provided,

as shown in Figure 3.4. It appears the initial treatment encouraged some reaction (significant decrease of 5% by treatment units relative to control), while subsequent treatments tapered off somewhat. The weekly treatment effect gradually increased to a peak around week 7, after which the treatment effect abated slightly. It is possible that information fatigue set in for some subjects, an assertion partly supported by subject compliance analysis discussed below. A significant variation was also found in the treatment effects during each week, as shown in Figure 3.4. Over the course of the experiment, treated subjects tended to reduce their consumption relative to control more over the weekends than during the week.

3.6 Discussion

3.6.1 Main results

This study was designed to evaluate the effect of providing social comparisons with private energy usage information feedback to subjects, and to determine the effect of providing aspirational norms (i.e. the consumption level of the social norm generally below the consumption level of the subject) on the boomerang effect. We found that providing electricity usage information with social norms produced an average treatment effect of roughly 6% reduction

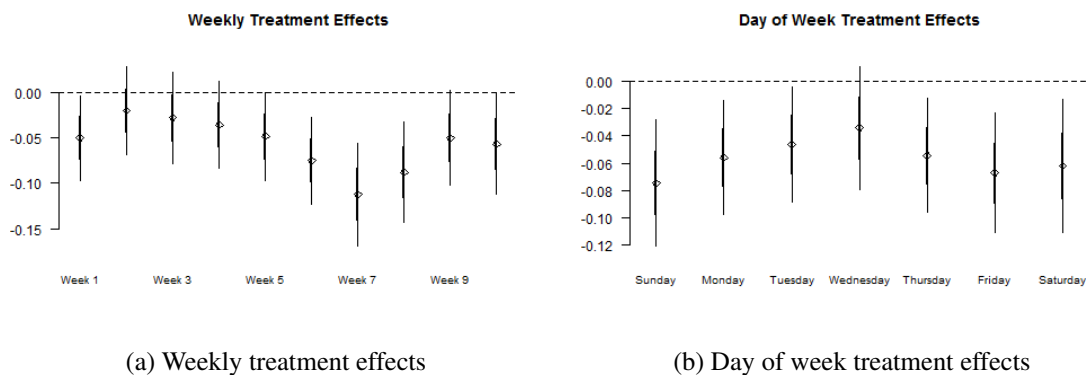


Figure 3.4: Time-dependent treatment effects

in electricity consumption. This result is robust to alternative specifications, and is a substantially greater effect than found in other large-scale studies¹². It is also a substantially greater private information treatment effect than comparable studies using university student resident populations (Delmas and Lessem, 2014).

A prominent result of this study is the demonstration of a norm-proximity effect. We found proximity (as defined by the relative distance between a subject's behavior and the relevant descriptive social norm) to be a significant predictor of response to the provision of social norms information. We purposefully assigned each half of the treatment group (as divided by the median baseline period consumption) to one of two social comparison groups: an "efficient" norm was provided to below median baseline consumers, and an "average" norm was provided to above median baseline consumers. The resulting proximity effect was measured and confirmed by multiple statistical methods. First, by separating the subject pool into quartiles corresponding to their baseline period electricity consumption, we found that subjects with baseline behavior "near" to the assigned norm (i.e. the lowest baseline consumption quartile for the efficient norm, and the third lowest baseline consumption quartile for the average norm) exhibited significant reductions in energy usage relative to a control group that did not receive information feedback. Meanwhile, subjects with baseline behavior "far" from the assigned norm (i.e. the second lowest baseline consumption quartile for the efficient norm, and the highest baseline consumption quartile for the average norm) did not exhibit reductions in energy usage relative to the control group. Importantly for policy makers and practitioners, this result yields promising methods for the counteraction of the boomerang effect associated with behavioral interventions using social norms. Whereas previous studies have shown the use of injunctive norms may moderate the boomerang effect (Schultz et al., 2007), injunctive norms have the potential to dissuade skeptical individuals from performing desired behaviors if not

¹²For example, the 2% average treatment effect of Opower Home Energy Reports (see Allcott 2011; Ayres et al. 2013; Costa and Kahn 2013).

properly targeted (Costa and Kahn, 2013). By providing individuals with targeted, aspirational (but not *too* aspirational) norms based on those individuals' baseline behavior, we demonstrate greater overall treatment effects.

Psychological theory suggests numerous potential explanations for this result. Individuals may tend to diverge from normative behavior when they perceive the norm to be less relevant (Festinger, 1954). Subjects who perceive the norm to be unrealistically low may deny the plausibility of the comparison and refuse to seek conformity (Wegener et al., 2001; Cialdini and Trost, 1998). Also, the setting of an over-ambitious goal (i.e. narrowing a large discrepancy between current behavior and the norm) may reduce individual self-efficacy (Bandura and Schunk, 1981) and capitulation on the task. Also, considering household heterogeneity, individuals who seek to conform with the norm may perceive a lack of behavioral control over their roommates' behaviors, and thus refuse to alter their behavior. Future studies may seek to unravel these complex effects, and work toward a more defined theory of norm proximity.

Using high-frequency (i.e. hourly) usage data obtained from on-site smart meters, we are able to identify individual and aggregate usage patterns that also yield valuable insight into opportunities for energy conservation. Treatment effects were more pronounced later in the treatment period, suggesting behavior change may increase with continued exposure to treatment. Treatment effects also varied with time of day, suggesting that subjects are able to identify periods of excess energy usage, perhaps owing to the hourly information feedback provided in treatment emails.

3.6.2 Limitations

The study is not without practical limitations. A brief discussion of various limitations and opportunities to address them in future studies follows.

Heterogenous composition of apartments

Our unit of observation is an individual student apartment, which generally consist of two to five roommates. Roommates are known to exhibit heterogeneous preferences, perhaps more so than the traditional households examined in other experiments. Whereas one or more residents in a given apartment may strongly desire to conform with the social norms provided, other roommates may counteract or otherwise obstruct those effects. In this sense, we may infer that the household-level average treatment effects measured in these studies are closer to a lower bound (closer to zero) and households with more homogeneous preferences may exhibit greater treatment effects. It is possible to obtain data to corroborate this idea, though a higher response rate to exit surveys is required to deduce any effect of household heterogeneity with confidence.

Non-random assignment

Subjects were randomly assigned to either a private information treatment group that received private information (via personalized email messages) on their apartment's energy usage with social comparisons or a control group that did not receive information. This random assignment of treatment allows us to estimate a (nearly¹³) unbiased effect of the private information with social comparisons. We further relied on non-random assignment of treated subjects into one of two subgroups: below-median baseline users were compared to an "efficient" peer and above-median baseline users were assigned to an "average" peer. While random assignment to these treatment subgroups may have provided a more reliable estimate of the norm proximity effect, experimental power of such a randomization was a concern, and prior research has already demonstrated the tendency for subjects with lower consumption than the

¹³Some sources of potential bias, such as heterogeneous household preferences, could not be avoided due to constraints of the experimental setting, but generally are expected to have biased estimated treatment effects toward zero.

norm to revert back to the norm (Cialdini, 2003; Schultz et al., 2007), and the targeted nature of our assignment is more likely to be of use to practitioners seeking to optimize conservation effects of treatments.

Non-compliance

There is a substantial likelihood that individuals assigned to information treatments may not have received the treatments. We addressed this risk through specific measurement of subject non-compliance; the email client used to privately distribute treatment messages to individuals contains a tracking device that indicates whether the email was opened or not. We assume that by opening the email, the individual will read the email and thereby receive the treatment; therefore, non-compliance with the intent to treat is easily measured. Data show that the compliance rate exhibits a declining week-over-week trend over the course of the experiment, and that some students may switch from compliance to non-compliance and back to compliance over the course of the experiment.

A general rule of thumb is that a compliance rate of 50% or greater may allow for analysis of the local average treatment effect (Gerber and Green, 2012). However, given the practical objectives of the experiment (to reduce energy consumption among residents of campus apartments), we may be more interested in the average treatment effect independent of whether individuals assigned to treatment receive the treatment or not (intent to treat). Future work may consider other means of treatment delivery to improve (and better estimate) subject non-compliance. A potential solution is to prepare encouragement options for individuals who don't receive treatment (don't open email). Additional signage (e.g. paper flyers posted around the complex grounds) may bring increased attention to the information campaign.

Another form of non-compliance involves some students that formally opt out of the experiment, and no longer receive the treatment (we offer the option of unsubscribing from the treatment distribution). In prior studies, we have found this opt-out rate to be quite low (~1%).

In any case, however, the outcome data is always observable: we will obtain electricity meter data for all subjects, whether assigned to treatment or control, and whether received treatment or not.

Subject interference / contamination

An assumption of non-interference indicates that potential outcomes of each individual are unaffected by the assignment or treatment of any other individual. As discussed above, this assumption could be violated by individuals discussing the treatment among their untreated friends within the complex. University students are generally a social population, and it is not plausible to assume perfect information control in this configuration; however, one may also surmise that students may tend to be sufficiently absorbed in their own activities to the degree that any spread of information may not have a significant effect on an average control subject's behavior. If students in the control group are aware of the treatment, we might then expect conservation behaviors relevant to the treatment group to contaminate the control group behavior, resulting in a downward bias to our estimated treatment effect.

Future experiments may consider two options for mitigating this contamination risk. One option is to increase the availability and persistence of information regarding which subjects are participating in the treatment. Frequent notices might be posted on treatment subject apartment doors to remind them of the availability of the information feedback, while control subjects may receive notices regarding their lack of participation in the trial.

Other controls

A recent review article has highlighted the importance of including appropriate experimental controls to improve validity of results (Delmas et al., 2013b); one such control often lacking in experimental studies is weather. Hotter temperatures generally indicate higher electricity usage due to increased air conditioning, while colder temperatures also indicate higher energy

use for home heating. We chose not to include covariates for weather conditions because the experimental units (a) do not have air conditioning available (Santa Barbara is blessed with a stable and temperate climate), and (b) use natural gas heating, thus heating demand is not reflected in the electricity data. The analysis of gas usage data (both for heating and for gas-fired cooking appliances) may provide interesting insights into spillover of treatment effects; however, the gas usage data available for the experimental units was not sufficiently granular for our needs.

External validity

The presence of multiple subjects in each apartment unit adds unknown (and unmeasurable) heterogeneity within the subject pool. Effectively, the conservation efforts of highly motivated subjects may be completely offset by countervailing behaviors of oppositely inclined roommates. Anecdotal survey results from these studies as well as other prior experiments (Goodwin and Moncayo, 2015) have shown this to be the case among multiple subjects.

Our subject pool may be lacking external validity: a population of college students will not necessarily exhibit similar behavior to the population at large, and may have significantly different perceptions of and reactions to social norms (Levitt and List, 2007). However, a substantial volume of scientific, experimental studies have been published using undergraduate student subject pools for laboratory experiments, demonstrating the general acceptance of these types of pools for experimental purposes (Falk and Heckman, 2009). Our study takes a similar pool and extends observations out of the laboratory and into individual every-day behaviors. While certain aspects of our subject pool limit generalizability of results (e.g. more heterogeneous apartment preferences than typical U.S. households, higher and more explicit attention to social comparisons among peer group, no economic incentives to conserve) these same aspects also lend keener insight into the response of human behaviors to social stimuli. The heterogeneity of household preferences, though not measured directly, is suggested by exit

survey data¹⁴, and in turn suggests that estimated treatment effects in this study may be biased downward (toward zero). The lack of any confounding economic incentives associated with energy conservation also allows us to measure a true social comparisons effect, unlike Opower experiments (Allcott, 2011; Ayres et al., 2013; Costa and Kahn, 2013).

3.7 Conclusions



This article summarizes the results of a randomized control trial field experiment that examined the effects of social norms on electricity conservation behavior. The study found that private information feedback with social comparisons leads to significant changes in behavior, and that the proximity of baseline electricity consumption to the norm provided is positively associated with the subsequent reduction in consumption. These findings have significant implications for practitioners and policy makers. We believe this is the first study to document a norm proximity effect in the context of pro-environmental behavior; the ability to target information treatments to individuals based on their baseline behaviors offers an opportunity to significantly improve the effectiveness of interventions to increase conservation behavior. The results are also significant in that it opens a new door of academic inquiry into the determinants of pro-environmental behavior related to norm proximity.

Future work on norm proximity should consider random assignment of the norm to individual subjects, in order to better assess the behavior of individuals with performance “better than” the norm provided. Similar experiments may be conducted in other contexts to assess the robustness of the concept to other settings and subject pools. There is opportunity to develop a behavioral theory of norm proximity, and establish its credibility in other empirical settings.

¹⁴Nearly 70% of respondents indicated their apartments would have used less electricity if it were up to them, and more than 25% of respondents indicated they were rarely or never in agreement with their roommates about energy usage.

3.8 Appendix

View this email in your browser

Be a Green Gauchito!!

Hi PATRICK,

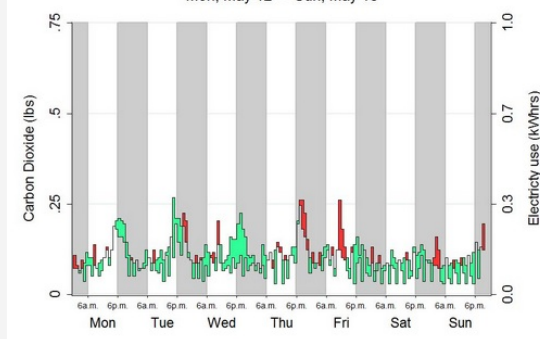
Last week, your apartment consumed **88 kWh** of electricity, and emitted **60 lbs** of CO₂.

Your average peers at Storke 2 consumed **24.90 kWh** of electricity, and emitted **18.10 lbs** of CO₂ during the same week.

[How do I interpret and analyze these numbers? Please look at the graphs below](#)

Carbon emissions from your energy consumption

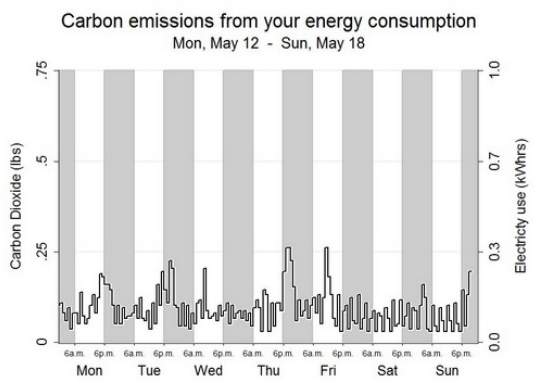
Mon, May 12 - Sun, May 18



This graph presents your hourly electricity consumption and carbon emissions from last week (same line as in the first graph), now directly compared to your average neighbors in Storke 2. This average level is calculated using your neighbors' energy consumption patterns from the past week as well. The green areas represent times where your apartment's energy consumption and carbon emissions are below your average peers, meaning you are using less energy than the average level. The red areas represent times where your electric consumption and CO₂ emissions are above your average peers. [How do I read this graph? For more details CLICK HERE](#)

Carbon emissions from your energy consumption


Mon, May 12 - Sun, May 18



This graph shows your apartment's hourly electric power consumption and CO₂ emissions for past week. The horizontal axis represents the days of the week, with nighttime hours (8p.m.-6a.m.) shaded. On the left vertical axis you will find your carbon emissions for each hour during the week, and on the right the scale is kWh consumed each hour during the week. [How do I read this graph? For more details CLICK HERE](#)

Tips to save energy

[Click HERE](#)




Facebook

If you would like to know more information about our program, more ways to save energy, gauchito news and miscellaneous, like us on Facebook.

Copyright © 2014 Housing and Residential Services. All rights reserved.

Our mailing address is:
Housing and Residential Services
6750 El Colegio Rd
Goleta, CA 93117



[Add us to your address book](#)

Figure 3.6: Example of private information email content.

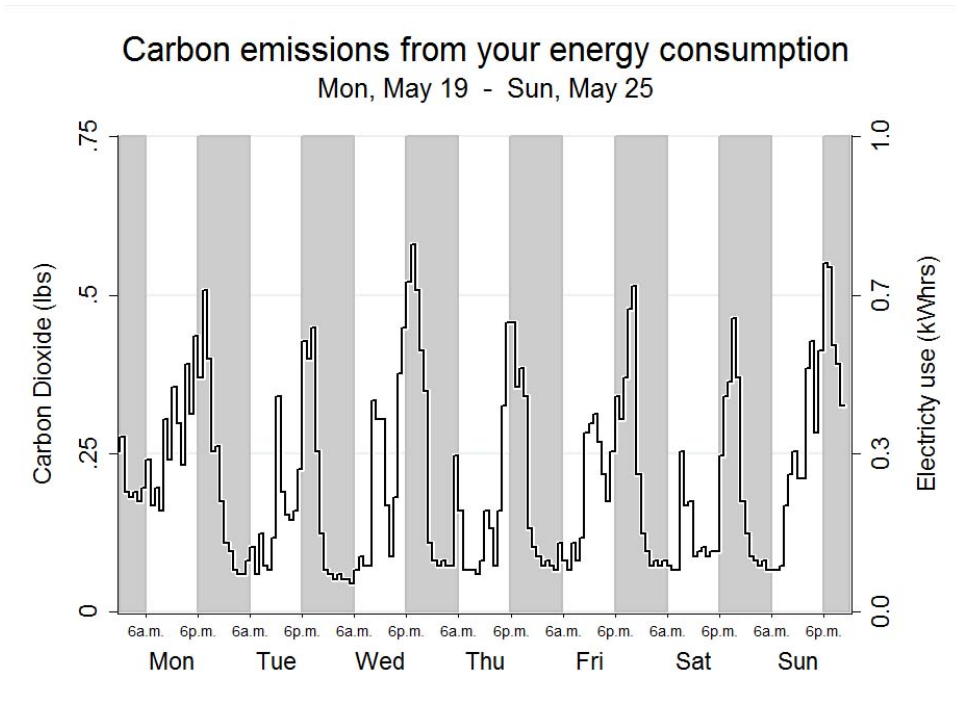


(a) UC Santa Barbara campus (inset: undergraduate apartments)

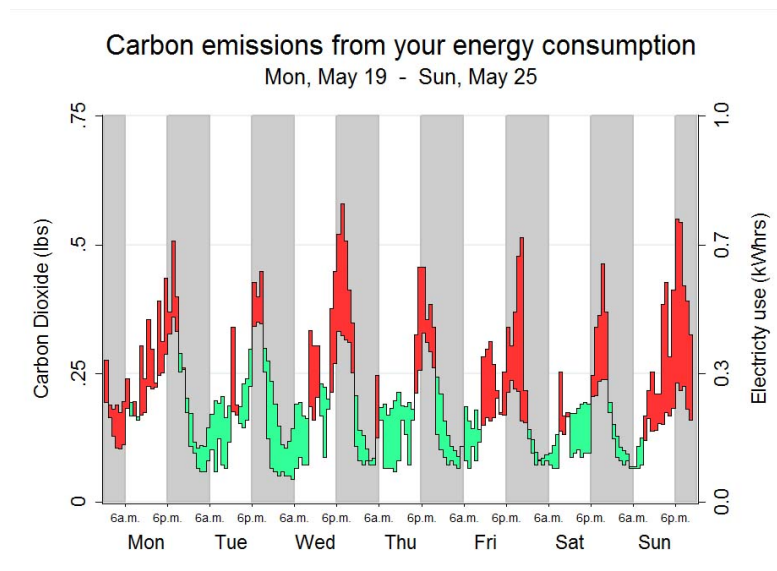


(b) Inset: undergraduate student apartments

Figure 3.5: Experimental setting: satellite view (Google Maps) of UC Santa Barbara campus and apartment complexes.



(a) Own hourly consumption



(b) Own hourly consumption versus comparison norm

Figure 3.7: Example of time-of-day granularity of information feedback with social comparisons provided to treatment subjects.

Chapter 4

Peer Communication Improves Environmental Employee Engagement

Evidence from a Quasi-Experimental Field Study

with Matthew Potoski

Abstract

Environmental employee engagement programs promise to raise employee morale, improve social and environmental conditions and strengthen companies' financial performance. Such programs, however, sometimes fail to improve employee engagement, often because employees do not believe in the program's authenticity. This study evaluates peer communication as a mechanism for improving the credibility of employee engagement programs. We use a quasi-experimental research design in which employees from different regional offices of a single company were placed in either a treatment group that experienced a peer communication program or a control group that did not. Pre- and post-test surveys measured employees' affective, cognitive and behavioral engagement with their work. Treatment group employees showed increases in pride in the company's environmental initiatives and accomplishments, confidence in discussing its environmental record with external stakeholders, and awareness of and participation in its employee environmental programs. These changes were significantly greater than what occurred in the control groups, suggesting that the peer communication program was generally effective at improving employee engagement. These results demonstrate new modes of internal communication that can strengthen companies' environmental performance and improve employee-related outcomes.

4.1 Introduction

More and more companies around the world are looking for ways to increase their employees' workplace engagement (Lacy et al., 2009). One popular approach to improving engagement is the creation of environmental programs in which company employees participate in organized activities that target their employer's environmental priorities (Bhattacharya et al., 2008; Collier and Esteban, 2007; Kim et al., 2010). Such programs can improve engagement when employees believe their activities contribute to issues they care about (Glavas, 2016). Increasing employee engagement can boost workers' morale and productivity and reduce turnover (Delmas and Pekovic, 2017; Flammer and Luo, 2017; Harter et al., 2002). Engaged employees may also be more effective ambassadors for communicating their organization's environmental accomplishments to external stakeholders (Chong, 2007), which can be particularly useful in an era where stakeholders want companies to go beyond mere regulatory compliance (Delmas and Toffel, 2004; Marcus and Fremeth, 2009).

Company programs to improve employee engagement often end up ineffective because employees do not believe the programs reflect a genuine company effort to create social value (Aragón-Correa et al., 2013; Westermann-Behaylo et al., 2014). The cause may be that the traditional channels through which companies communicate to employees do not credibly convey the emotional and ethical values underlying the company's program (Glavas, 2016; Thomas et al., 2009; White et al., 2010). The academic literature does not provide much practical insight on how companies can achieve the credibility among their employees that successful environmental employee engagement programs require.

This paper shows how companies can improve the effectiveness of employee engagement programs by harnessing the credibility of communication through employees' peers. In a peer communication program, companies disseminate information about their programs and practices through a network of selected line employees, so that rank and file employees hear

company messages from co-workers who are closer to them both geographically and in the company's hierarchy. The shared bonds of common social group membership means that employees may be more amenable to persuasion from their peers on value dimensions (Ashforth and Mael, 1989), suggesting that peer communication may be more effective for employee engagement programs than traditional company communication practices.

4.2 Theoretical Background

The concept and practice of employee engagement has received considerable scrutiny in academic and practitioner writing, as inquiry seeks to understand the causes and consequences of employees' emotional states at work. Unfortunately, the literature has not settled on clear definitions of employee engagement as a core concept (Saks and Gruman, 2014; Schaufeli and Bakker, 2010). Practitioner definitions focus on emotional states and extra-role behaviors with clear connections to improving the bottom line (Inc., 2013; Lockwood, 2007). Definitions among academics tend to be narrower and more precise, though without an overarching consensus among them (Saks and Gruman, 2014). Most definitions focus on employees' emotional and cognitive attachment towards their company (Macey and Schneider, 2008; Saks, 2006), with employee engagement sometimes serving as the opposite of work burnout (Maslach et al., 2001). Some academic definitions extend beyond emotional and cognitive states to include how employees approach their workplace tasks and behavior (Kahn, 1990; Rothbard, 2001), such as their level of "vigor" at work (Schaufeli and Bakker, 2010).

In the absence of a canonical definition, a prudent approach is to specify definitions and assumptions clearly and to fit the research questions and circumstances at hand. For this study, we adopt a broader definition of employee engagement because our goal is to assess the effects of peer communication across broader range of potentially relevant dimensions, all of which represent tangible value to companies. Stemming from the definitions noted above, we

define employee engagement as three potential traits employees can have towards their workplace role and/or employer: positive affect or emotional engagement, cognitive engagement or identification, and the vigor of workplace behavior.

Employee engagement has attracted so much attention because there is considerable evidence that companies with more engaged employees enjoy benefits across several human resource dimensions. Engaged employees are more productive (Harter et al., 2002; Rich et al., 2010), more willing to volunteer their extra-role time to important stakeholder-oriented corporate initiatives (Grant, 2012; Rodell, 2013; Temminck et al., 2015) and more likely to serve as effective company ambassadors to customers and other stakeholder groups (Chong, 2007; Korschun et al., 2014). Engaged employees also lower human resource costs, through lower turnover rates (Bode et al., 2015; Harter et al., 2002) and more effective recruitment (Bhattacharya et al., 2008; Jones et al., 2014). Some research suggests that increasing employee engagement directly improves companies' profits (Tang et al., 2012) and stock market values (Edmans, 2012).

Unfortunately, employee engagement turns up low in survey after survey (Inc., 2013). In response, many companies seek to enhance employee engagement by providing environmental employee engagement programs that offer employees opportunities to participate in extra-role (Rodell, 2013) or on-the-job (Bode and Singh, 2018) activities that contribute to some dimension of the company's environmental objectives. For example, companies may encourage employees to volunteer for activities that improve both local environmental conditions and perceptions of the company within their local communities, such as planting trees in a nearby park. Or, programs may promote energy efficiency and recycling to reduce the company's environmental footprint (Clancy, 2013).

Environmental employee engagement programs can increase employee engagement when employees perceive that their work efforts contribute to environmental issues they care about (Aguilera et al., 2007; Delmas and Pekovic, 2013; Glavas, 2016). A primary obstacle for ef-

ffective environmental employee engagement programs is authenticity: in order to improve employees' affective disposition, cognitive engagement, and workplace behaviors as targeted by programs, companies must convince employees of the sincerity and authenticity of the program objectives. Companies often struggle to convince employees that their environmental programs are genuine (Aragón-Correa et al., 2013; Westermann-Behaylo et al., 2014), particularly in an era where so many believe companies place profits above people and the planet (Pfeffer, 2010). Failure to achieve authenticity may explain why so many employee engagement programs fail to deliver their promised benefits.

Effective communication is one way companies can overcome the challenge of ensuring employees believe their environmental programs are authentic. Every company has some sort of formalized communication system for distributing information to employees. In a typical system, company messages are distributed to employees from centralized sources through established channels that mirror management structures (Welch and Jackson, 2007), so that mid- and line-level employees receive information via the institutional hierarchy (e.g. from their direct supervisor, human resources representative, or formal communications department). The strengths of a traditional communication system are that it provides an authoritative voice and message consistency across the organization. A weakness is that it may be less effective at conveying credibility and authenticity when delivering emotional and ethical value messages (Thomas et al., 2009; White et al., 2010), which can be particularly important when employees may question the messenger's motivations.

Of course, employees in every company also informally share information through face to face conversations, email, phone calls, and chats around the proverbial water cooler. While informal communication networks can be prone to factual infidelity (Sias, 2005), employees may find their peers more credible when it comes to communicating about issues of emotional valence and identity. With the higher trust of intra-group relationships, individuals are less likely to question or view with skepticism the messenger's motives (Cialdini and Goldstein,

2004). Workgroup peers are thus a distinct psychological group with the potential for social influence, particularly along emotional and value dimensions (Ashforth and Mael, 1989).

Peer communication more may be more effective for employee engagement programs than communication through centralized hierarchy. Information about these programs' value authenticity and credibility tends to be more important than factual details, which plays to the strengths of peer communication relative to centralized communication. A peer communication program is a formal but unpublicized channel of communication from corporate managers to employees via a network of appointed line-level or middle management employee agents. A peer communication program may improve the effectiveness of employee engagement programs by more credibly disseminating values-based information regarding environmental initiatives (Blok et al., 2015; Slack et al., 2015). By taking advantage of informal social networks in the workplace, a peer communication program may thus overcome the authenticity challenge inherent in environmental employee engagement programs.

The above discussion suggests hypotheses about the efficacy of employee engagement programs when employees receive information via a peer communication program compared to when they do not. We seek to assess engagement in a broader sense and in terms of relevant metrics targeted by corporate managers, using the company's employee survey data to measure dimensions of employee engagement. Our first hypotheses evaluate the effect of peer communication on employee's affective state, the emotional dimension of employee engagement. If peer communication more credibly conveys the authenticity of the company's value commitments, employees may feel more workplace pride (Jones et al., 2014) and organizational commitment (Grant et al., 2008).

H1: Peer communication about the organization's environmental programs increases employee pride in the organization.

H2: Peer communication about the organization's environmental programs increases employee commitment to the organization.

Our next hypotheses evaluate the effect of peer communication on two types of cognitive work engagement. Employees may be more likely to pay attention and retain information when it comes from their peers (Carrico and Riemer, 2011), thereby increasing the amount of factual information employees retain about their company's programs (Perron et al., 2006). Armed with more credible information, employees may be more comfortable discussing the company's environmental activities with its external stakeholders (Korschun et al., 2014).

H3: Peer communication about the organization's environmental programs increases employee awareness of organizational environmental initiatives.

H4: Peer communication about the organization's environmental programs increases employee confidence in discussing organizational environmental activities with external stakeholders.

Our final hypothesis investigates the impact of peer communication on the behavioral dimension of employee engagement. Stimulating changes in behavior such as increased employee participation in environmental programs can lead directly to a number of positive outcomes for companies (Remmen and Lorentzen, 2000). Exemplary behavior demonstrated by respected peers can have significant effect on the behavioral leanings of employees (Blok et al., 2015). As such, receiving communication from peers may increase the likelihood that employees will increase participation in the company's extra-role environmental programs.

H5: Peer communication about the organization's environmental programs increases participation in employee environmental programs.

4.3 Research Methods

4.3.1 Research setting

The field setting used for evaluating the effects of peer communication programs on environmental employee engagement was the retail banking operation of TD Bank, the United States subsidiary of TD Bank Group. By October 2013, TD Bank was one of the ten largest retail banks in the United States with about 26,000 total employees, including over 16,000 retail employees working at 1,300 stores located along the U.S. eastern seaboard.

TD Environment is the company department responsible for managing its environmental programs. Over the period of our study, TD Environment focused on employee environmental programs. For example, TD Bank's Green Network was an engagement program that used the company's internal social media platform and website to help mobilize their colleagues around the company's environmental programs. TD Environment used Green Network members to recruit employees to take the company's "Green Pledge," which targeted six voluntary environmental behaviors that align with TD Bank's environmental priorities. Participants in TD Tree Days, the company's flagship volunteer program, planted trees in local communities.

Over the study period, TD Environment used two primary channels for communication to employees about its environmental programs. First, throughout the entire study period, all TD Bank employees received information through a standard centralized communication approach in which most communication comes from TD Environment through mass company email, with an occasional story in company newsletters. In addition, programs like TD Green Network also communicated to participants through monthly newsletters and a "Green Network Handbook" detailing paper and energy reduction strategies for home and work.

Second, partway through the study period, the bank introduced a peer communication program called TD Green Leaders in several regional markets. Green Leader participants were selected by the company's Senior Vice President for each region within the treatment markets.

Green Leaders ranged in position from Assistant Store Managers to Regional Market Managers, and were chosen based on their ability to influence other employees. The Green Leaders then recruited “Store Ambassadors” typically recognized as “up-and-comers” at TD Bank for each retail branch location.

The Green Leaders and Store Ambassadors were change agents charged with communicating to their peers about the company’s environmental programs through formal and informal channels. The Green Leaders sent weekly (or more frequent) emails to and solicited sustainability ideas from fellow employees. TD Environment encouraged Green Leaders to customize the messages to make them relevant to their local audience. Green Leaders had little formal authority or input into personnel evaluations. Green Leaders could give token rewards for employee’s environmental performance (\$5 gift cards and small prize drawings) and could publicize high performing employees through corporate communications channels. Finally, the Green Leaders and Store Ambassadors were also encouraged to engage customers on the company’s sustainability initiatives, such as finding opportunities to discuss LEED building features, TD Forests, and paperless banking statements.

TD Environment offered a number of resources to support the Green Leaders. TD Environment facilitated communication among Green Leaders to report on progress and share tips and success stories. The “Green Leaders Playbook” was a manual of general program guidelines detailing participants’ responsibilities and offering suggestions for implementation strategies. TD Environment also supplied suggested narratives for Green Leaders’ own weekly email communications, including information regarding TD Bank’s corporate sustainability goals and practices, “Did You Know?” facts about the company’s environmental performance, “Green Tips” for saving energy and paper, customer conversation starters, and weekly challenges and recognition intended to incentivize employees’ social and environmental behavior.

To evaluate its employee engagement programs, TD Environment measured employee attitudes toward environmental issues, awareness of and participation in TD Bank environmental

programs and initiatives such as the Green Network, pride and commitment for working at TD Bank, and confidence in discussing the company's environmental accomplishments with key company stakeholders. The assumption underlying the program was that improvements along these dimensions would contribute value in two ways. First, employees would be more willing and effective in discussing the company's environmental accomplishments with environmentally interested potential customers. Second, the employees would feel more satisfaction and commitment to their work, leading them to be more productive and stay longer in the jobs, a particularly important source of value in a service industry with high turnover rates.

4.3.2 Quasi-experimental design

The research design exploits the manner in which TD Bank designed and implemented the Green Leaders program. The Green Leaders program was implemented in some markets and not others, with employee surveys providing before and after outcome measures in both sets of markets. This controlled program rollout enables a quasi-experimental field research design that compares changes in pre- and post-rollout survey responses in the treatment group (those markets receiving the Green Leaders program) to the change in pre- and post-rollout survey responses in the control group (those markets not receiving the program), often referred to as a "difference in difference" research design. The analyses examine how the treatment markets changed after introduction of the Green Leaders program compared to how the control markets changed over the same time period; any differences in response between the treatment and control markets should be unrelated to the initial conditions.

TD Bank was running its environmental employee engagement programs (TD Forests, TD Green Nation, etc.) in all markets throughout the study period. TD Bank first administered the environmental employee engagement survey during the first quarter (January to March) of 2013 in ten markets. The Green Leaders program was then implemented in three treatment

group markets starting March 1, 2013 with the other seven markets serving as the control group. Figure 4.1 summarizes the research design.

After two months of TD Green Leaders implementation in the treatment markets, the same environmental employee engagement survey was then re-administered across all ten markets starting on May 1, 2013. Application of the same employee survey in all markets provides comparable pre-treatment and post-treatment measures in both treatment and control groups. The surveys provided about 2,540 useable responses, with 1,175 in the treatment group and 1,365 in the control group.

4.3.3 Survey instrument and variables

To evaluate the effectiveness of the Green Leaders peer communication program at improving employee engagement, the survey instrument contained multiple measures that covered employee engagement outcomes important to TD Bank: pride and commitment in the company, which we see as a measure of employees' affective or emotional engagement; awareness of company environmental initiatives and confidence in discussing company accomplishments with external stakeholders, which we see as measures of employees' cognitive engagement; and participation in employee environmental programs, which we see as measures of employees' behavioral engagement. Table 4.1 lists the dependent variables, which are discussed below.

To measure affective employee engagement, survey questions measured employee pride in and commitment to working at TD Bank (Hypotheses 1 and 2). First, the surveys asked employees "How proud are you of TD Bank's environmental efforts?" The variable Pride measures responses as "not proud at all" (scored -1), "somewhat proud" (scored 0), "very proud" (scored 1) and "I don't know" (excluded from analysis). Second, the surveys asked employees to indicate "yes" or "no" to the question "Does being able to contribute to the environment while you're at work strengthen your commitment to the company?" The variable Commit-

Table 4.1: Dependent variable measures of environmental employee engagement

Engagement Traits	Construct	Survey Questions	Response Scale	
Affective Engagement	Pride	How proud are you of TD Bank's environmental efforts?	1	very proud
			0	somewhat proud
			-1	not proud at all
	Commitment	Does being able to contribute to the environment while you're at work strengthen your commitment to the company?	1	yes
			0	no
Cognitive Engagement	Awareness	Are you aware of the following TD Bank initiatives and awards? - TD Forests - Paper Reduction - Energy Efficiency - LEED certified / Net Zero - Carbon Neutral	1	yes
			0	no
	Confidence	How confident are you with discussing TD Bank's commitments/achievements with the following groups of people? - Colleagues - Customers - Family & Friends - Community	2	very confident
			1	confident
			0	neutral
			-1	somewhat confident
			-2	not confident
Behavioral Engagement	Participation	Please indicate your level of participation in the following: - TD Green Nation - Green Network - TD Community on Connections - TD on TeamWOW!	3	I am a promoter
			2	I am an active participant
			1	I am a member
			0	I am aware

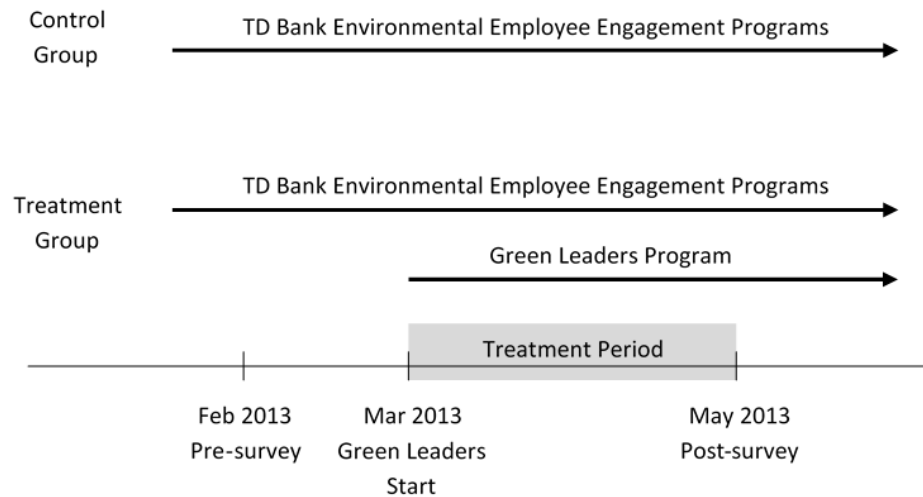


Figure 4.1: Timeline and Research Design. TD Bank Environmental Employee Engagement Programs were present in both treatment and control groups throughout the study. The Treatment group received the Green Leaders program beginning in March 2013.

ment is scored 1 if respondents indicate yes to this question, else zero. More cognitively engaged employees may be more aware of company environmental initiatives (Hypothesis 3) and more confident in discussing the company’s environmental activities with external stakeholders (Hypothesis 4). First, to assess the effects of Green Leaders on employees’ awareness of the company’s environmental initiatives and accomplishments, we examine employees’ responses (scored 1 if “yes”, 0 if “no”) to the question asking “Are you aware of the following TD Bank initiatives and awards?” The survey listed the following company initiatives and awards: “TD Forests”, “Paper Reduction”, “Energy Efficiency”, “LEED certified / Net Zero stores and offices”, and “Carbon Neutral”. Second, engaged employees may be more willing to discuss TD Bank’s environmental accomplishments with external stakeholders. To assess this, we examine employees’ responses to the question “How confident are you with discussing TD Bank’s commitments/achievements with the following groups of people?” Response categories for each group were “not confident” (scored -2), “somewhat confident” (scored -1), “neutral” (scored 0), “confident” (scored 1) and “very confident” (scored 2). The groups were “colleagues”, “customers”, “family and friends” and “your community”; we report changes in

employee confidence across each of these measures.

Finally, to assess the effects of peer communication on employees' behavioral engagement, we examine participation in TD Bank's environmental employee engagement programs (Hypothesis 5) using the question asking "Please indicate your level of participation in the following." The survey listed the following TD Bank employee programs "TD Green Nation", "Green Network", "TD Community on Connections", and "TD on TeamWOW!". Respondents were asked to indicate "I am aware" (scored 0), "I am a member" (scored 1), "I am an active participant" (scored 2), and "I am a promoter" (scored 3) in each of these programs.

To evaluate the hypotheses, we present results from two separate analyses, with the first analyzing the individual survey items and the second analyzing indexes constructed from factor analysis of the survey items. While single-item constructs have some drawbacks (Bergkvist, 2016; Sarstedt et al., 2016), they can have value when additional measures are unavailable (Bergkvist and Rossiter, 2007; Bowling, 2005). Importantly, single-item measures have been used in previous employee engagement studies (Humborstad et al., 2007; Wanous et al., 1997). For the latter approach, indexes were constructed via principal components factor analysis. Resultant factors were validated using the Kaiser-Meyer-Olkin (KMO) sampling adequacy measure ($KMO > 0.70$) and orthogonally (varimax) rotated.

Table 4.2 displays results of the factor analysis. Survey measures of awareness of company initiatives, confidence in discussing company achievements with stakeholders, and participation in company programs clearly load on the respective constructs of Awareness, Confidence, and Participation, providing valid measures for testing Hypotheses 3 through 5, respectively. Given the strong correlations and distinct loading of individual items onto factors consistent with the hypothesized constructs, factors were calculated by unit-loading (Grice and Harris, 1998). Unit-loading also carries the advantage of preserving individual responses where one or more questionnaire items were not completed. Finally, unit-loading also allows for validation of internal consistency of the factor constructs; Cronbach's alpha is reported for each of the

four factors in Table 4.3 of the results section.

The factor analysis also suggested that the two survey measures of affective engagement pride in and commitment to the company together load onto a single construct, which we refer to as Affect. The Affect index computed from Pride and Commitment displays questionable construct validity (Cronbach's alpha < 0.5), suggesting that the effect of the Green Leaders peer communication treatment on Pride and Commitment may preferably be analyzed using single-item scale constructs.

Table 4.2: Varimax rotated factor loadings (principal component factors method)

Variable	Factor1	Factor2	Factor3	Factor4	KMO ^a
Awareness of TD Forests			0.609		0.928
Awareness of Paper Reduction			0.680		0.773
Awareness of Energy Efficiency			0.743		0.794
Awareness of LEED / Net Zero			0.756		0.813
Awareness of Carbon Neutral			0.777		0.825
Participation in TD Green Nation		0.865			0.848
Participation in TD Green Network		0.925			0.831
Participation in Community Connections		0.913			0.820
Participation in TeamWOW!		0.907			0.832
Confidence Discussing with Colleagues	0.935				0.893
Confidence Discussing with Customers	0.946				0.870
Confidence Discussing with Family & Friends	0.940				0.897
Confidence Discussing with Community	0.932				0.885
Commitment to TD Bank				0.817	0.825
Pride in TD Bank				0.718	0.889
Scale Cronbach's Alpha	0.972	0.937	0.813	0.472	–

Note: Blank cells represent absolute value of factor loading < 0.3

^a Kaiser-Meyer-Olkin measure of sampling adequacy; KMO > 0.7 considered adequate

4.3.4 Research Design

The quasi-experimental research design allows comparisons of the change in outcomes between employees in the treatment and control conditions. Although the treatment and control markets were non-randomly assigned by company management, difference in differences estimation controls for differences in unobserved time-invariant characteristics between treatment

and control markets as well as differences in baseline response levels. Our approach estimates a model of the following form for each dependent variable:

$$Y_i = \alpha + \beta_1 Treatment_i + \beta_2 Period_i + \beta_3 (Treatment_i Period_i) + Market_i + \varepsilon_i \quad (4.1)$$

In Equation 4.1, the subscript i indicates individual employee survey responses. Y_i is the dependent variable survey response or index corresponding to the outcome measures. Market contains unique intercepts to control for differences across each of the markets in the study, and ε_i is the error term, clustered on market and time period. The variable *Treatment* is a dummy variable indicating whether respondents were members of a market group that ultimately received the Green Leaders peer communication treatment (assigned a value of 1) or not (assigned 0). *Period* is a dummy variable indicating whether the survey was administered prior to the Green Leaders rollout (assigned 0) or two months after rollout (assigned 1), regardless of treatment group membership. The interaction term $Treatment \times Period$ thus captures the difference in difference; in other words, the interaction term coefficient (β_3) measures the average treatment effect of the Green Leaders program on the respective dependent variable measures. Importantly, this research design controls for two potential confounds: time-invariant differences across the treatment and control groups and unobserved secular trends affecting respondents equally in both groups.

We estimate Equation 4.1 using two different analytical approaches: logit and ordered logit regression, respectively, for the binary and ordinal individual item dependent variables, and ordinary least squares regression (OLS) for the factored index dependent variables. Both analyses include individual market group dummies (fixed effects) and robust standard errors clustered on market group. Direct interpretation of logit analyses is complicated by the models' nonlinear form. To ease interpretation, we estimate the predicted probabilities of selecting each

choice on the response scale for each survey rollout group (King et al., 2000). Full logit model results with coefficients and diagnostic statistics are presented in Appendix Tables A1 through A4. Appendix Table A5 presents all predicted probabilities: the treatment and control groups and the pre- and post-treatment periods.

For simplicity, the main results section focuses on the difference in difference calculations, summarized in Tables 4.3 through 4.7 and Figures 4.2 through 4.5. Tables 4.3 through 4.7 present the changes in predicted probabilities (from pre-treatment to post-treatment) of the respondents' answers to the survey questions for the treatment and control groups along with the difference in this change between the treatment and control groups, the "difference in difference". Figures 4.2 through 4.5 display the difference in difference graphically. The index regression results are reported in Table 4.8, with marginal effects displayed in Figure 4.6.

4.4 Results

4.4.1 Logit analyses of individual survey items

Table 4.3 presents the ordered logit predicted probabilities of the effects of the Green Leaders program on employees' pride in working for TD Bank, providing support for Hypothesis 1. Figure 4.2 presents results of both tables graphically. The Green Leaders program showed statistically significant effect on employee pride. Focusing on the "very proud" response category for simplicity, Table 4.3 shows that employees in regions with the peer communication program reported greater increases in their pride in TD Bank's environmental efforts than employees in the control groups. The probability that an employee in the treatment group reported being "very proud" of TD Bank's environmental efforts increased from pre-treatment to post-treatment by 0.12, while the corresponding increase in the control group was 0.07. The difference between the treatment group and control group increase in being "very proud" was

0.05, a statistically significant difference ($\chi^2 = 5.4, p < 0.05$).

Table 4.3: Pride in TD Bank: Change in predicted probability of a respondent selecting each of the scaled response items after the treatment period; data displayed for treatment group, control group, and the difference in difference. χ^2 test statistics indicate significance.

Question: How proud are you of TD Bank's environmental efforts?	Treatment		Control		Difference	
	Diff.	χ^2	Diff.	χ^2	Diff.	χ^2
Response: Very proud	0.12		0.07		0.05	
Somewhat proud	-0.11		-0.06		-0.05	
Not proud	-0.01	239***	-0.01	1.4	0	5.4**

Note: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Data indicates the difference in probability that an individual in the sample selects the relevant degree of pride on 3-point scale from the pre-period survey to the post-period survey for treatment group, control group, and the difference in difference, respectively.

The results reported in Table 4.4 do not provide evidence that peer communication produced greater employee commitment, thus failing to support Hypothesis 2. Both the treatment and control groups reported modest increases in the probability that an employee responded “yes” to the question “does being able to contribute to the environment while you’re at work strengthen your commitment to the company?” However, the difference between the treatment and control group increases were not statistically significant, perhaps because in the pre-treatment period both the treatment and control groups measured very high (0.83 and 0.75, respectively) on this measure, leaving little room for additional improvement.

The results reported in Table 4.5 and Figure 4.3 indicate that the Green Leaders program had a significant impact on employees’ awareness of the company’s environmental programs, providing support for Hypothesis 3. The probability that a treatment group employee reported being aware of TD Forests, paper reduction, LEED buildings, and carbon neutral initiatives increased respectively by 0.29, 0.25, 0.16, 0.18 from pre-treatment to post-treatment. In contrast, the probability that a control group employee reported being aware of TD Forests, paper reduction, LEED buildings, and carbon neutral initiatives increased respectively by 0.10, 0.20, 0.08, 0.11 from pretest to posttest. The χ^2 terms indicate that control group increases were

Table 4.4: Commitment to TD Bank: Change in predicted probability of a respondent selecting yes after the treatment period; data displayed for treatment group, control group, and the difference in difference. χ^2 test statistics indicate significance.

Question: Does being able to contribute to the environment while you're at work strengthen your commitment to the company?	Treatment		Control		Difference	
	Diff.	χ^2	Diff.	χ^2	Diff.	χ^2
Response: Yes	0.04	4.5**	0.03	0.3	0.01	0.23

Note: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Data indicates the difference in probability that an individual in the sample responds Yes from the pre-period survey to the post-period survey for treatment group, control group, and the difference in difference, respectively.

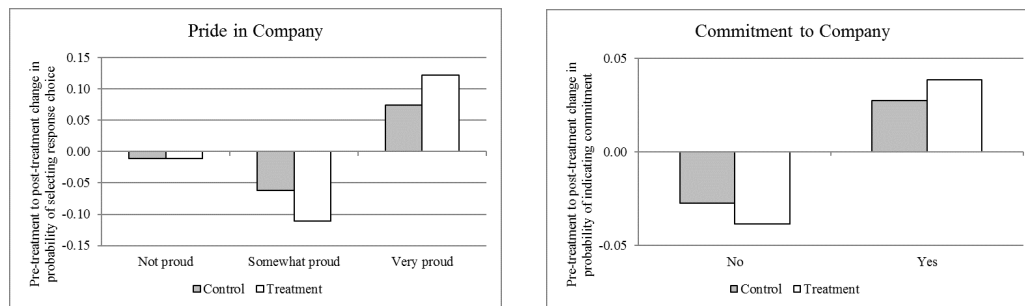


Figure 4.2: Changes in predicted probability of employees indicating pride (a) and commitment (b) from pre-treatment to post-treatment, for both treatment and control groups. Pride model is significant at $p < 0.05$; commitment model is not significant with $p > 0.10$

significantly smaller than the treatment group increases. Contrary to expectations, employee awareness of the company's energy efficiency initiatives increased by a smaller amount in the treatment group (0.16) than in the control group (0.26), which may be due to the fact that the treatment group already had very high awareness in the pre-test treatment condition compared to the control group (0.80, compared to 0.46 for control group).

The results reported in Table 4.6 and Figure 4.4 report the effects of the Green Leaders program on employee confidence in discussing TD Bank's environmental accomplishments with various stakeholder groups. Employees in the treatment group showed a significant increase in their confidence in discussing the company's environmental initiatives and accomplishments

Table 4.5: Awareness of TD Bank Environmental Initiatives, Difference in Difference Predicted Probabilities

Question: Are you aware of the following TD Bank environmental initiatives?	Treatment		Control		Difference	
	Diff.	χ^2	Diff.	χ^2	Diff.	χ^2
TD Forests	0.00	178***	0.00	3.0*	0.00	7.9***
Paper reduction	0.00	92***	0.00	17***	0.00	10***
Energy efficiency	0.00	146***	0.00	9.4***	0.00	4.4**
LEED buildings	0.00	140***	0.00	1.2	0.00	4.4**
Carbon neutral	0.00	275***	0.00	2.40	0.00	2.8*

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Data indicates the difference in probability that an individual in the sample responds Yes from the pre-period survey to the post-period survey for treatment group, control group, and the difference in difference, respectively.

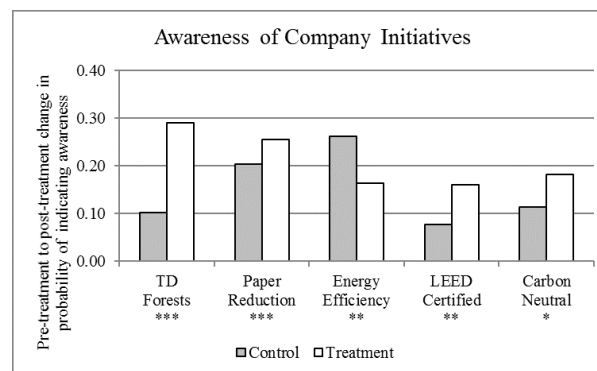


Figure 4.3: Changes in predicted probability of employees indicating awareness of company initiatives from pre-treatment to post-treatment, for both treatment and control groups. Individual model significance noted by: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

with colleagues, customers, their family, and their community, compared to employees in markets without the Green Leaders program, providing support for Hypothesis 4. This result is clearest in the predicted probability of “very confident” responses, though the results are similar for other response categories. The probability that a treatment group employee reported being “very confident” in discussing the company’s environmental programs with colleagues, customers, family, and community members increased by 0.16, 0.14, 0.17, and 0.15 from pre-treatment to post-treatment. In contrast, the probability that a control group employee reported being “very confident” in discussing the company’s environmental accomplishments with these

stakeholder groups respectively increased by 0.02, 0.02, 0.04, and 0.01 from pre-treatment to post-treatment. Again, the χ^2 terms indicate that control group increases were significantly smaller than the treatment group increases.

Table 4.6: Confidence in Discussing TD Bank Environmental Commitments/Achievements, Difference in Difference Predicted Probabilities

Question: How confident are you in discussing TD Bank's environmental achievements with the following groups of people?		Treatment		Control		Difference	
		Diff.	χ^2	Diff.	χ^2	Diff.	χ^2
Discussing with colleagues	Very confident	0.16		0.02		0.13	
	Confident	0.02		0.02		0	
	Neutral	-0.08		-0.01		-0.07	
	Somewhat confident	-0.05		-0.02		-0.03	
	Not confident	-0.04	200***	-0.02	1.2	-0.02	10***
Discussing with customers	Very confident	0.14		0.02		0.12	
	Confident	0.03		0.02		0.01	
	Neutral	-0.07		0		-0.07	
	Somewhat confident	-0.04		-0.01		-0.03	
	Not confident	-0.05	102***	-0.02	0.7	-0.02	6.8***
Discussing with family	Very confident	0.17		0.04		0.14	
	Confident	0		0.03		-0.03	
	Neutral	-0.08		-0.01		-0.07	
	Somewhat confident	-0.05		-0.02		-0.03	
	Not confident	-0.04	120***	-0.03	2	-0.01	7.5***
Discussing with community	Very confident	0.15		0.01		0.14	
	Confident	0.04		0.02		0.02	
	Neutral	-0.09		0		-0.08	
	Somewhat confident	-0.05		-0.01		-0.04	
	Not confident	-0.06	146***	-0.02	0.5	-0.04	11***

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: Data indicates the difference in probability that an individual in the sample selects the relevant degree of confidence on 5-point scale from the pre-period survey to the post-period survey for treatment group, control group, and the difference in difference, respectively.

Table 4.7 and Figure 4.5 show the effects of peer communication on predicted probabilities of employees' participation TD Bank's extra-role workplace programs. Increases in participation across all four programs were significantly greater among employees in the treatment group compared to employees in the control group, providing support for Hypothesis 5. This

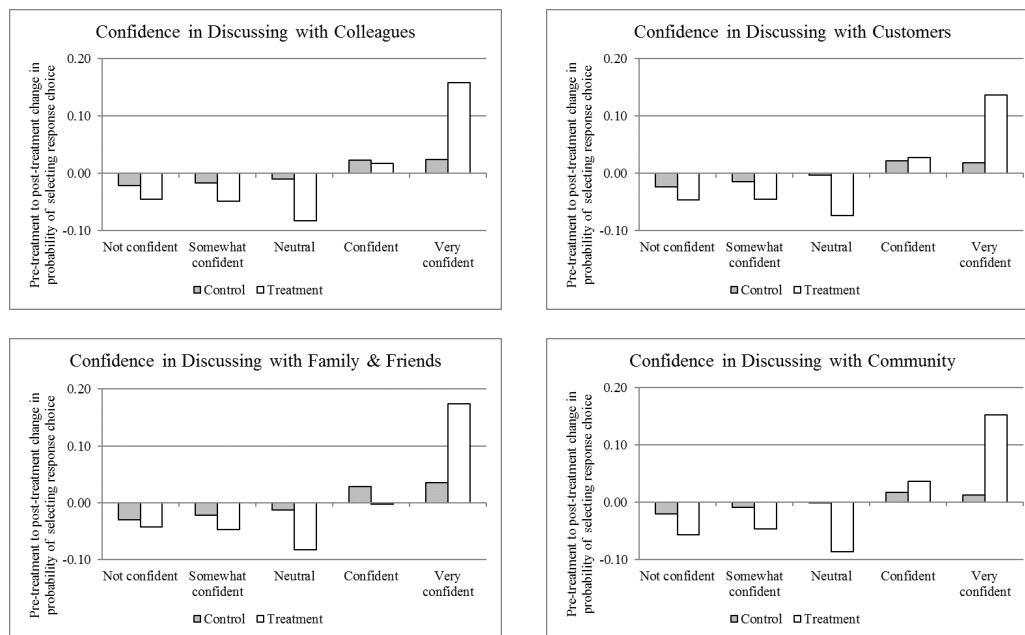


Figure 4.4: Changes in predicted probability of employees indicating confidence in discussing company achievements with stakeholder groups from pre-treatment to post-treatment, for both treatment and control groups. All models are significant at $p < 0.01$

result is evident in the predicted probability of “active participant” responses, and the results are similar for other response categories. The probability that a treatment group employee reported being an “active participant” in TD Green Nation, TD Green Network, Community Connections, and TeamWOW increased by (respectively) 0.13, 0.11, 0.08, and 0.09 from pre-treatment to post-treatment. In contrast, the probability that a control group employee reported being an “active participant” in these programs respectively increased by 0.06, 0.03, 0.01, and 0.01 from pre-treatment to post-treatment. Again, the χ^2 terms indicate that control group increases were significantly smaller than the treatment group increases. Taken together, these results indicate that the Green Leaders program increased employee participation in TD Bank’s environmental engagement programs, a key measure of behavioral engagement.

Table 4.7: Participation in TD Bank Environmental Employee Programs, Difference in Difference Predicted Probabilities

Question: Please indicate your level of participation in the following:		Treatment		Control		Difference	
		Diff.	χ^2	Diff.	χ^2	Diff.	χ^2
TD Green Nation	Promoter	0.08		0.03		0.05	
	Active participant	0.13		0.06		0.07	
	Member	0.19		0.1		0.09	
	Aware of	-0.4	840***	-0.19	18***	-0.21	21***
TD Green Network	Promoter	0.09		0.02		0.07	
	Active participant	0.11		0.03		0.08	
	Member	0.15		0.05		0.1	
	Aware of	-0.34	913***	-0.1	8.8***	-0.24	37***
Community Connections	Promoter	0.07		0.01		0.06	
	Active participant	0.08		0.01		0.07	
	Member	0.1		0.02		0.09	
	Aware of	-0.25	151***	-0.03	2.3	-0.22	28***
TeamWOW!	Promoter	0.07		0.01		0.06	
	Active participant	0.09		0.01		0.07	
	Member	0.08		0.02		0.06	
	Aware of	-0.24	328***	-0.04	4.1**	-0.2	26***

Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Data indicates the difference in probability that an individual in the sample selects the relevant level of participation on 4-point scale from the pre-period survey to the post-period survey for treatment group, control group, and the difference in difference, respectively.

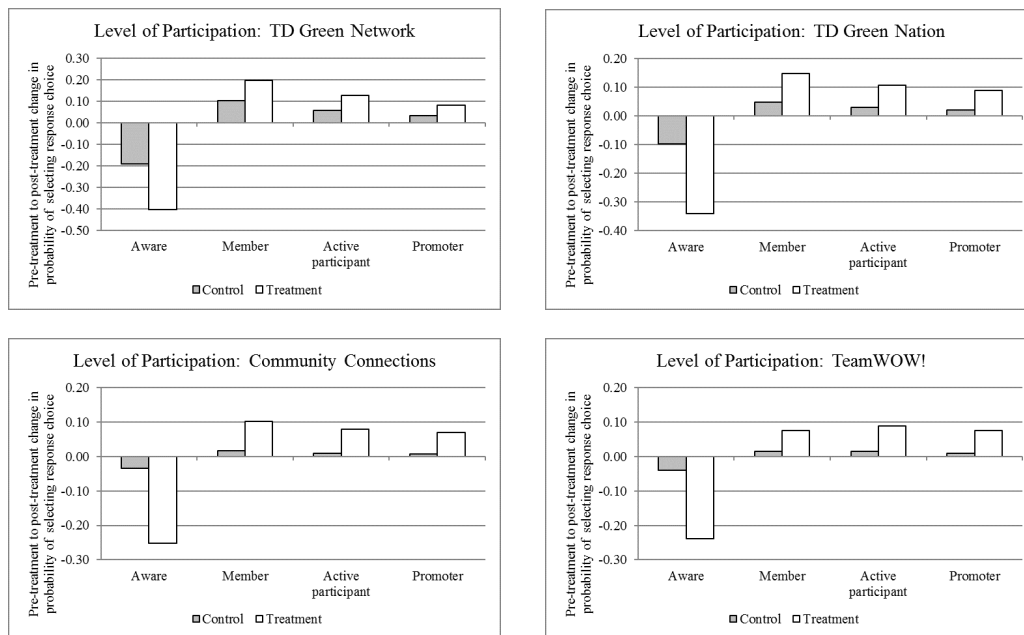


Figure 4.5: Changes in predicted probability of employees indicating levels of participation in employee programs from pre-treatment to post-treatment, for both treatment and control groups. All models are significant at $p < 0.01$

4.4.2 OLS regression of factored constructs

Table 4.8 reports OLS regression results of the difference in difference estimation for each of the four dependent variable factors: *Affect*, *Awareness*, *Confidence*, and *Participation*. As noted above, the primary coefficient of interest is the *Treatment* \times *Period* interaction term; the difference in difference average treatment effect. To assess the magnitude and significance of the coefficients, Figure 4.6 presents these results graphically. In each panel of Figure 4.6, the slope of each line indicates the change in the dependent variable for the treatment and control groups from before to after the treatment period. Note that in all four panels, the treatment and control groups have initial values of the dependent variable that are not statistically different, as indicated by 95% confidence intervals that overlap the means.

The results in Table 4.8 provide support for Hypotheses 4 and 5 but do not provide evidence for Hypotheses 1, 2 and 3. For Hypotheses 1 and 2, the Green Leaders program did not have a

statistically significant effect on employee's affective disposition, as measured by the factored index of employee pride and commitment in working at TD Bank. The *Treatment* \times *Period* coefficient for the *Affect* analysis (0.017) was not statistically significant ($p > 0.10$). Likewise, the Table 4.8 results do not support Hypothesis 3. The Green Leaders program did not have a statistically significant effect on the factored index of employee awareness of environmental initiatives, contrary to Hypothesis 3. The *Treatment* \times *Period* coefficient for the *Awareness* analysis (0.080) was not statistically significant ($p > 0.10$). As shown in Figure 4.6(b), the treatment and control groups show very similar increases in *Awareness* from before to after the treatment period.

The Table 4.8 results do provide evidence strongly in support of Hypotheses 4 and 5. The Green Leaders program showed statistically significant effect on employee confidence in discussing TD Bank's environmental achievements, as measured by the *Confidence* index. The *Treatment* \times *Period* coefficient for the *Confidence* analysis suggests that *Confidence* increased by about 0.343 standard deviations more among the treatment group employees than among the control group employees over the course of the treatment period. As shown in Figure 4.6(c), treatment group respondents show a significant increase in *Confidence* over the treatment period while the control group respondents were essentially flat. Finally, the Green Leaders program showed statistically significant effect on employee participation in the company's environmental programs, as measured by the *Participation* index. The *Treatment* \times *Period* coefficient for the *Participation* analysis suggests that *Participation* increased by about 0.40 standard deviations more among the treatment group employees than among the control group employees over the course of the treatment period. As shown in Figure 4.6(d), treatment group respondents show a significant increase in *Participation* over the treatment period while the control group respondents were essentially flat.

Table 4.8: Treatment effect of peer communication program on employee engagement – difference-in-difference regression results on unit-loaded factor variables

	(1) Affect	(2) Awareness	(3) Confidence	(4) Participation
Treatment	0.166*** -0.051	-0.044 -0.038	-0.318*** -0.073	-0.212 -0.13
Period	0.093* -0.044	0.172** -0.065	0.170* -0.09	0.138* -0.077
Treatment * Period	0.017 -0.048	0.08 -0.068	0.343*** -0.098	0.400*** -0.091
Constant	0.643*** -0.05	0.510*** -0.036	0.304*** -0.067	0.357** -0.128
Observations	1,726	1,718	1,715	1,542
R-squared	0.036	0.101	0.066	0.095
Scale Cronbachs Alpha	0.472	0.813	0.972	0.937

Note: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Robust standard errors in parentheses. All models contain market-level fixed effects. Average treatment effect of difference-in-difference analysis is the coefficient on the *Treatment* \times *Period* interaction term.

4.5 Discussion

In this section we discuss implications of our findings for the theory and practice of employee engagement. The results build upon prior research showing that employee workplace behaviors may be positively influenced by factors beyond mere intention (Blok et al., 2015) such as information disseminated by workplace peers (Carrico and Riemer, 2011). The company's core program objectives increased engagement towards the company, greater employee awareness of its environmental initiatives and participation in its environmental employee programs, and improved employee attitudes and behaviors are typical of environmental employee engagement programs (Mirvis, 2012; Pearl et al., 2011), lending confidence to the generalizability of this study's findings.

The effects of peer communication may stem from recipients either simply acquiring new information or from placing greater credibility in the information they are receiving. Looking

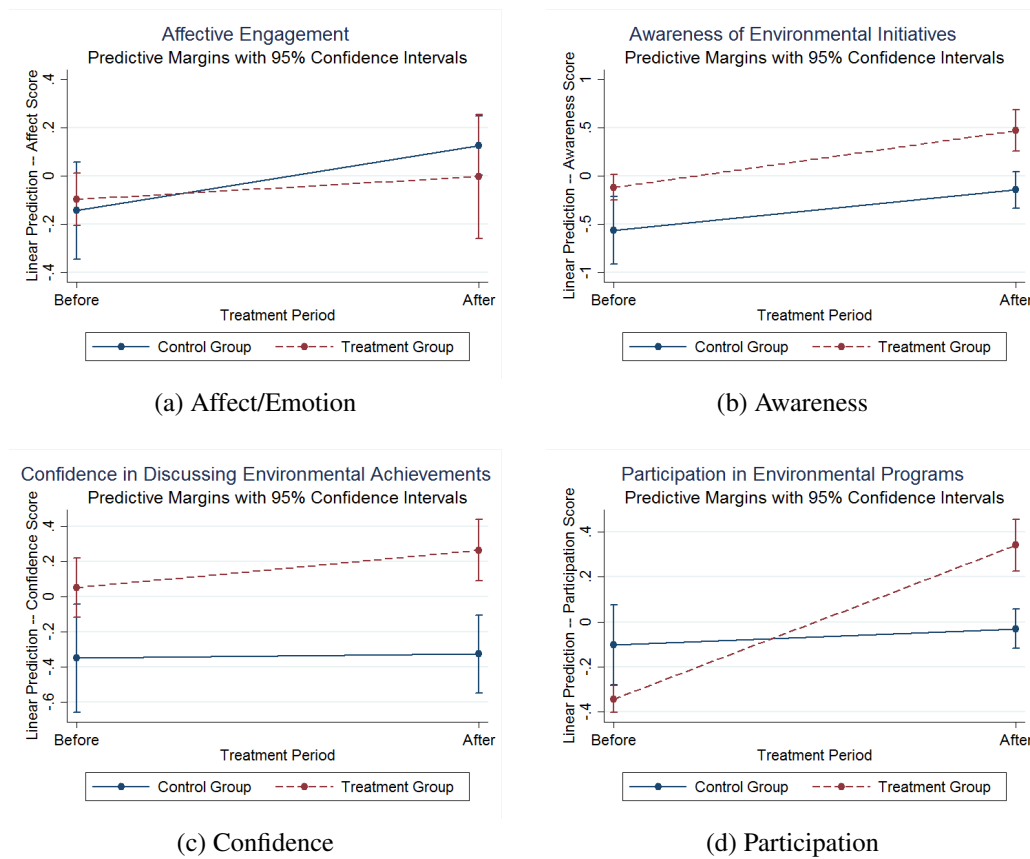


Figure 4.6: Marginal effects of treatment and control on employee engagement traits. Note the difference in difference treatment effect is the difference in slopes between the two lines.

across the range of outcomes and measures, the results suggest the importance of peer communication in enhancing the credibility of the company's environmental activities. The Green Leaders program exhibited consistent and strong effects on increasing employee confidence in discussing the company's environmental achievements with stakeholders. Employees need to be personally engaged with the company's environmental achievements in order to be willing to discuss them with family and members of their community (Chong, 2007).

Likewise, the Green Leaders program also increased employees' participation in the company's environmental programs. This increase does not seem to be due to employees' acquiring new information about the program that they did not already possess. The pre-treatment surveys show that employees already had relatively high levels of awareness about the company's

environmental programs, and our analyses provide mixed evidence that the Green Leaders program increased employee awareness. It may be that employees largely develop awareness of company initiatives and programs through traditional communication channels. It is also possible that awareness is a more basic mode of cognition, whereas confidence in serving as a spokesperson for the company's achievements represents a higher level of cognitive engagement.

In this context, it seems more likely that the increase in participation be attributed to the credibility employees place in the information they are receiving about the programs from their peers. Peer communication may simply convey additional information about employee programs, but its more salient effect may be increasing the credibility employees place in the information they are receiving, an outcome that companies often struggle to achieve (Aragón-Correa et al., 2013; Westermann-Behaylo et al., 2014). Increasing credibility is particularly important because employees may be skeptical of their employer's environmental claims, and thus may resist engaging with the company (Tosti-Kharas et al., 2017).

Our results also suggest that companies should be cautious about the amount of emotional engagement peer communication programs can achieve among employees. The Green Leaders program did not have a significant influence on the affective engagement index, and when in the individual items analysis, the program's effect was insignificant in the commitment analysis. The Green Leaders program did significantly increase employee pride, although the substantive effects were still somewhat small. Pride in one's organization is perhaps more closely associated with the sense of community and shared values fostered by a richly interactive workplace environment (Jones et al., 2014), which the Green Leaders peer communication program reinforced. On the other hand, commitment to one's organization is perhaps more strongly related to the individual employee's own direct relationship with the company (Grant et al., 2008), and may be less activated by peer communication.

The lessons from this study offer important implications for improving environmental and

broader corporate social responsibility (CSR) strategies. While proactive social and environmental activities can benefit companies, such as by improving stakeholder relations or expanding capabilities (Sharma and Vredenburg, 1998), the returns on these activities can sometimes depend on the credibility of companies' communication messages. For environmental activities aimed at improving stakeholder relations, achieving message credibility is an important factor for success. Stakeholders must believe the company's social and environmental activities are genuine before bestowing their good will and other benefits.

4.6 Conclusions

All in all, the analyses reported in this paper show that peer communication can increase the effectiveness of employee engagement programs. Employees exposed to the Green Leaders peer communication program showed higher levels of engagement across affective, cognitive and behavioral dimensions. While not direct measures of financial gain, the company believed that improvements along these lines positively contributed financial value by enhancing employee recruitment, retention, and productivity. Peer communication improves engagement because employees find more credible the emotional and values information they are receiving. Even taking into account TD Bank's stronger environmental reputation, the need for such credibility may have been particularly strong in our research setting a large geographically distributed company with high turnover among frontline employees.

The analyses in this study are based on a quasi-experimental field research design with pre- and post-treatment measurements of a treatment group of employees working in regions that received the peer communication program and a control group that did not. Though somewhat unusual in applied management research, this approach provides more precise causal inference relative to more commonly used cross-sectional research designs (Delmas and Aragon-Correa, 2016). Our research design and our analytic approach are sufficiently general that both can

be applied in a wide variety of organizational settings, particularly in large companies that regularly survey their employees.

This study also suggests directions for future research. Employee engagement may have important consequences for other organizational outcomes, such as employee retention and productivity, and other workplace environmental behaviors, such as energy conservation and production efficiency. Future study could also investigate the broader financial consequence of the peer communication program. The effectiveness of peer communication programs is likely to depend on their fit with the specific circumstances in which they are implemented. In this study, the company had already put in place a broad range of environmental initiatives and employee programs and had arguably established a strong reputation of environmental performance (Clancy, 2013). The efficacy of peer communication may depend on a variety of factors, such as senior management's credibility with line employees, company culture, and the nature of existing engagement and communication programs. TD Bank's Green Leaders peer communication program shows that social identity and social values can be harnessed to improve the credibility of environmental communications to employees; small interventions can have outsized effects when designed and implemented to fit their organizational context (Griffin and Prakash, 2014).

4.7 Appendix

Discussion of ordered logit predicted probability analysis

The logit and ordered logit approach to analysis of individual survey questionnaire items estimates a model of the following form for each survey question. This model is a minor variant that is equivalent to Equation 4.1 presented in the text and enables the predicted probability

simulation analyses represented in Tables 4.3 to 4.7 in the manuscript.

$$Y_i = \alpha + \beta PreControl_i + \gamma PostControl_i + \delta PreTreat_i + Market_i + \varepsilon_i \quad (4.2)$$

In this model, the subscript i indicates individual employee survey responses. Y_i is the latent variable corresponding to ordinal response choices (i.e. Likert scale) to individual survey questions designed to measure employee engagement, described below. $Market$ contains unique intercepts to control for differences across each of the markets in the study, and ε_i is the error term, clustered on market and time period. The variables $PreControl$, $PostControl$, and $PreTreat$ are dummy variables indicating respectively whether respondents were in the pre-treatment control, post-treatment control, or pre-treatment rollout groups, with β , γ , and δ their respective coefficients. The post-treatment treatment group response is captured by the constant, α . We estimate the model using ordered logit regression and derive predicted probabilities comparing effects sizes among the pre-control, post-control, pre-treatment and post-treatment groups.

The key test of the effect of the Green Leaders peer communication program is whether the change in treatment group outcomes from before the program to after is greater than corresponding change in the control group outcomes. More formally, testing $H_0 : \delta < \beta - \gamma$ indicates whether the changes in the treatment group responses were significantly more positive than the changes in the control group responses, conditional on controls in the analysis.

Tables A1 through A4 in this appendix contain the raw coefficients from logit regressions (for binary response survey items) and ordered logit regressions (for ordinal response survey items) for each dependent variable. The coefficients represent the average value of the latent variable estimated for each survey rollout group: pre-treatment control, post-treatment control, and pre-treatment treatment (the post-treatment treatment group coefficients represent zero for each regression). The constant (logit) and cut point (ordered logit) coefficients represent la-

latent variable threshold values between individual response choices. Chi-squared test statistics report the statistical significance of the individual regression models.

Table A5 in this appendix presents the predicted probabilities of each potential survey response choice for all questions and each group (pre-control, post-control, pre-treatment, and post-treatment) along with the pre-treatment to post-treatment differences for treatment and control groups, and the difference in difference. The *p*-value indicating significance of each model result is also reported. The group-level differences and difference in differences are also reported in Table 4.3 through Table 4.7 in the main text.

Table A1

Affective engagement towards company
Logit (commitment) and ordered logit (pride) regression results

	TD Bank Commitment	TD Bank Pride
Pre-Control	-0.81*** (0.31)	-1.76*** (0.29)
Post Control	-0.66*** (0.14)	-1.43*** (0.10)
Pre-Treatment	-0.31** (0.15)	-1.00*** (0.06)
Constant	2.14*** (0.12)	
Cut point 1		-5.14*** (0.21)
Cut point 2		-2.45*** (0.08)
Market fixed effects	Yes	Yes
Model χ^2	400***	1,476***
Number of observations	2,204	1,962

Note: Each column corresponds to separate model based on an individual survey question. Data are log-odds (commitment) and ordered log-odds (pride) regression coefficients with robust standard errors in parentheses. Cut points correspond to threshold between levels of the latent dependent variable.

Table A2

Awareness of company environmental initiatives

Logit regression results

	TD Forests	Paper Reduction	Energy Efficiency	LEED/ Net Zero	Carbon Neutral
Pre-Control	-2.02*** (0.31)	-2.37*** (0.30)	-3.49*** (0.39)	-2.13*** (0.29)	-1.89*** (0.29)
Post Control	-1.56*** (0.12)	-1.39*** (0.20)	-2.37*** (0.18)	-1.81*** (0.08)	-1.42*** (0.06)
Pre-Treatment	-1.26*** (0.09)	-1.97*** (0.21)	-1.95*** (0.16)	-0.96*** (0.08)	-0.98*** (0.06)
Constant	1.26*** (0.09)	3.17*** (0.19)	3.56*** (0.17)	2.22*** (0.07)	1.88*** (0.05)
Market fixed effects	Yes	Yes	Yes	Yes	Yes
Model χ^2	706***	4,111***	883***	3,802***	5,995***
Number of observations	2,232	2,229	2,225	2,221	2,218

* p<0.10, ** p<0.05, *** p<0.01

Note: Each column corresponds to separate model based on an individual survey question. Data are log-odds regression coefficients with robust standard errors in parentheses.

Table A3

Confidence in discussing company environmental achievements
Ordered logit regression results

	Colleagues	Customers	Family & Friends	Community
Pre-Control	-1.21*** (0.20)	-1.32*** (0.21)	-1.42*** (0.20)	-1.38*** (0.22)
Post Control	-1.05*** (0.08)	-1.16*** (0.08)	-1.16*** (0.09)	-1.24*** (0.09)
Pre-Treatment	-0.78*** (0.05)	-0.70*** (0.07)	-0.79*** (0.07)	-0.80*** (0.07)
Cut point 1	-3.50 (0.08)	-3.35 (0.08)	-3.52 (0.10)	-3.29 (0.08)
Cut point 2	-2.57 (0.07)	-2.46 (0.08)	-2.60 (0.10)	-2.51 (0.08)
Cut point 3	-1.35 (0.06)	-1.22 (0.06)	-1.42 (0.08)	-1.21 (0.07)
Cut point 4	0.16 (0.05)	0.28 (0.06)	0.00 (0.07)	0.27 (0.06)
Market fixed effects	Yes	Yes	Yes	Yes
Model χ^2	2,862***	6,010***	774***	3,250***
Number of observations	2,236	2,236	2,232	2,226

* p<0.10, ** p<0.05, *** p<0.01

Note: Each column corresponds to separate model based on an individual survey question. Data are ordered log-odds regression coefficients with robust standard errors in parentheses. Cut points correspond to threshold between levels of the latent dependent variable.

Table A4

Level of Participation in Company Environmental Employee Programs
Ordered Logit Analyses

	TD Green Nation	TD Green Network	Community Connections	TeamWOW!
Pre-Control	-1.91*** (0.31)	-1.73*** (0.27)	-1.49*** (0.22)	-1.60*** (0.24)
Post Control	-0.65*** (0.09)	-0.94*** (0.04)	-1.17*** (0.08)	-1.18*** (0.11)
Pre-Treatment	-2.68*** (0.09)	-2.46*** (0.08)	-1.65*** (0.13)	-1.56*** (0.09)
Cut point 1	-0.33 (0.11)	-0.05 (0.06)	0.36 (0.08)	0.44 (0.10)
Cut point 2	0.72 (0.12)	0.80 (0.07)	1.14 (0.09)	1.02 (0.11)
Cut point 3	1.85 (0.19)	1.77 (0.16)	2.06 (0.15)	1.99 (0.12)
Market fixed effects	Yes	Yes	Yes	Yes
Model χ^2	5,338***	1,802***	1,204***	1,202***
Number of observations	1,982	1,944	1,975	2,001

* p<0.10, ** p<0.05, *** p<0.01

Note: Each column corresponds to separate model based on an individual survey question. Data are ordered log-odds regression coefficients with robust standard errors in parentheses. Cut points correspond to threshold between levels of the latent dependent variable.

Table A5

Predicted probability levels (before and after treatment period) for treatment and control groups, the change (difference) in predicted probability levels for treatment and control groups, and the difference in difference, for each survey questionnaire item and categorical response choice. Model p -values are reported for the χ^2 test of significance of the difference-in-difference predicted probabilities of each survey questionnaire item (model).

		Treatment Group		Control Group		Difference (Before to After)			
		Before	After	Before	After	Treatment	Control	Difference	Model p
Awareness of company initiatives									
TD Forests		0.46	0.75	0.29	0.39	0.29	0.10	0.19	0.01
Paper reduction		0.68	0.94	0.59	0.80	0.25	0.20	0.05	0.00
Energy efficiency		0.80	0.97	0.46	0.72	0.16	0.26	-0.10	0.04
LEED buildings		0.70	0.86	0.42	0.50	0.16	0.08	0.08	0.04
Carbon neutral		0.65	0.83	0.43	0.54	0.18	0.11	0.07	0.10
Level of confidence discussing company achievements with stakeholder groups:									
Discussing with colleagues	Very confident	0.22	0.37	0.15	0.17	0.16	0.02	0.13	0.00
	Confident	0.34	0.35	0.29	0.31	0.02	0.02	0.00	
	Neutral	0.26	0.17	0.29	0.28	-0.08	-0.01	-0.07	
	Somewhat confident	0.11	0.06	0.14	0.13	-0.05	-0.02	-0.03	
	Not confident	0.09	0.04	0.13	0.11	-0.04	-0.02	-0.02	
Discussing with customers	Very confident	0.20	0.34	0.12	0.14	0.14	0.02	0.12	0.01
	Confident	0.33	0.36	0.26	0.28	0.03	0.02	0.01	
	Neutral	0.27	0.19	0.30	0.29	-0.07	0.00	-0.07	
	Somewhat confident	0.11	0.06	0.16	0.14	-0.04	-0.01	-0.03	
	Not confident	0.10	0.05	0.17	0.14	-0.05	-0.02	-0.02	
Discussing with family	Very confident	0.25	0.43	0.15	0.19	0.17	0.04	0.14	0.01
	Confident	0.33	0.33	0.27	0.30	0.00	0.03	-0.03	
	Neutral	0.24	0.15	0.28	0.27	-0.08	-0.01	-0.07	
	Somewhat confident	0.10	0.05	0.15	0.13	-0.05	-0.02	-0.03	
	Not confident	0.08	0.04	0.14	0.11	-0.04	-0.03	-0.01	
Discussing with community	Very confident	0.19	0.34	0.12	0.13	0.15	0.01	0.14	0.00
	Confident	0.32	0.35	0.25	0.27	0.04	0.02	0.02	
	Neutral	0.28	0.20	0.31	0.31	-0.09	0.00	-0.08	
	Somewhat confident	0.10	0.05	0.14	0.13	-0.05	-0.01	-0.04	
	Not confident	0.11	0.05	0.18	0.16	-0.06	-0.02	-0.04	
Commitment to company									
	Yes	0.83	0.87	0.75	0.78	0.04	0.03	0.01	0.63
Level of pride in company:									
	Not proud	0.02	0.01	0.04	0.03	-0.01	-0.01	0.00	0.02
	Somewhat proud	0.19	0.08	0.33	0.27	-0.11	-0.06	-0.05	
	Not proud	0.02	0.01	0.04	0.03	-0.01	-0.01	0.00	0.02
	Somewhat proud	0.19	0.08	0.33	0.27	-0.11	-0.06	-0.05	
	Very proud	0.79	0.91	0.63	0.71	0.12	0.07	0.05	
Employee program:									
TD Green Nation	Promoter	0.01	0.09	0.01	0.05	0.08	0.03	0.05	0.00
	Active participant	0.01	0.14	0.03	0.09	0.13	0.06	0.07	
	Member	0.03	0.23	0.07	0.17	0.19	0.10	0.09	
	Aware of	0.95	0.54	0.89	0.70	-0.40	-0.19	-0.21	
TD Green Network	Promoter	0.01	0.10	0.02	0.04	0.09	0.02	0.07	0.00
	Active participant	0.01	0.12	0.03	0.06	0.11	0.03	0.08	
	Member	0.03	0.18	0.06	0.10	0.15	0.05	0.10	
	Aware of	0.95	0.61	0.90	0.80	-0.34	-0.10	-0.24	
Community Connections	Promoter	0.02	0.09	0.02	0.03	0.07	0.01	0.06	0.00
	Active participant	0.03	0.11	0.03	0.04	0.08	0.01	0.07	
	Member	0.05	0.15	0.05	0.07	0.10	0.02	0.09	
	Aware of	0.91	0.66	0.89	0.86	-0.25	-0.03	-0.22	
TeamWOW!	Promoter	0.02	0.10	0.02	0.03	0.07	0.01	0.06	0.00
	Active participant	0.03	0.12	0.03	0.05	0.09	0.01	0.07	
	Member	0.04	0.11	0.04	0.05	0.08	0.02	0.06	
	Aware of	0.91	0.67	0.91	0.87	-0.24	-0.04	-0.20	

Chapter 5

Competing Motivations for Corporate Social Responsibility

Identification Through Peer Group Selection

Abstract

This study examines firm strategic motivations to engage in corporate social responsibility (CSR) through the lens of peer effects. The concept of CSR has long intrigued management scholars; the literature is replete empirical analyses of corporate social performance (CSP) and has established a rich set of theories to explain why profit-oriented firms seek to voluntarily provide public goods beyond the requirements of law. Two prominent lines of research suggest that firms engage in CSR for profit motives and for ensuring legitimacy with stakeholders. However, many disagreements exist between studies in terms of the degree to which these motivations are conflicting or complementary, and the contextual drivers in which firms seek to improve performance. To address these concerns, in this study I develop a theoretical framework of firm strategic motivations based on performance feedback relative to a purposefully selected group of relevant peer firms. This framework yields a number of predictions regarding firm behavior that I test using an empirical model of peer effects based on tenets of the behavioral theory of the firm. The model uses instrumental variables estimation, based on unique properties of an innovative approach to industry peer group definition, to resolve endogeneity concerns not fully addressed by extant literature on performance feedback and aspirations. Results indicate that purposeful selection of peer groups based on relevant strategic context may uncover important aspects of firm behavior that are otherwise masked by generic definition of industry peers. The study also finds that the usage of conventional aggregate measures of CSP may likewise mask subtleties of firm strategic behavior that are evident along more narrowly defined dimensions of CSP.

5.1 Introduction

Firms face pressure from stakeholders to engage in corporate social responsibility (CSR) — the voluntary corporate provision of public goods. Certain stakeholder groups may hold significant power over firms in the form of coercive pressure (Dimaggio and Powell, 1983) and threats to legitimacy (Wood, 1991). Increasingly, similar pressure also originates from shareholders; this shareholder pressure also comes with the expectation that firms demonstrate a profit from their CSR activities, leading to the so-called triple bottom line of environmental, social, and financial performance. But firms face strategic uncertainty in their efforts to improve financial performance through CSR; it is difficult for managers to credibly attribute financial results to improvements in corporate social performance (CSP) (Peloza, 2009), let alone accurately predict outcomes of strategic CSR initiatives *ex ante*. Yet firms continue to invest in CSP, suggesting that firms perceive some form and degree of appropriable value in providing public goods through CSR.

There is a general lack of consensus among management scholars as well. Myriad studies have sought to disentangle the relationship between corporate financial performance (CFP) and CSP. Though a majority of studies suggests a positive relationship, there is a notable lack of contextual arguments for when CSP is more or less likely to be profitable, and ongoing disagreement over the direction of causality (i.e. does CSP lead to CFP, or vice versa?) (Margolis et al., 2009). Meanwhile, the stakeholder view suggests legitimacy is of primary concern to firms in many aspects of CSR, leading to a subtle tension in the literature over which view is more prevalent in various contexts. This tension suggests a number of fundamental questions: do firms tend to seek profit through CSR, ensure legitimacy, or both? What organizational contexts lead firms to prioritize one or the other? Do specific aspects of firm behavior lend insight into the nature of strategic motivations?

The nature of CSP in the context of academic research is a contentious concept as well.

Scholars tend to disagree on various subtleties embedded in the meaning of the term (Carroll, 1999; Dahlsrud, 2008), leading to a diversity of views on the competitive and institutional drivers. Empirical researchers employ a number of measures to represent the construct (Orlitzky et al., 2003), leading to easy disagreement over the interpretation of results (Margolis et al., 2009). Furthermore, in practice CSP is a complex and multidimensional construct composed of a broad range of corporate initiatives and policies. The monolithic representation of CSP as a unidimensional metric in empirical studies masks subtle variation in strategic behavior of firms (Rowley and Berman, 2000).

Peer effects provides a lens through which we can uncover the strategic motivations of firms. Peer effects are present in the tendency of firms to formulate strategy based on the perceived strategic success or failure as observed in comparable behavior of relevant peer firms. A peer firm in this context is any firm with sufficiently similar operating context or desirable characteristics or performance that renders its experience relevant to a focal firm seeking information on which to formulate strategy. By examining peer effects in firm behavior, we can begin to infer the nature of firm motivations in particular strategic contexts. CSR is an ideal context to examine peer effects from the standpoint that firms face competing demands for improved CSP (e.g. legitimacy threat versus profitability requirement) and face substantial uncertainty in the degree to which a certain level or aspect of performance will meet those demands.

This study seeks to understand firm strategic motivations to improve CSP through observation and analysis of firm behavior relative to the performance of relevant peer firms. The study proposes a novel theoretical framework of firm motivations based on performance feedback and peer group selection. The framework suggests that strategic motivations may be inferred based on firm behavior relative to the observable performance of a group of purposefully selected peer firms relevant to a particular strategic context. In order to test hypotheses generated from this framework, an empirical model is developed based on a rich peer effects literature in eco-

nomics and education (see Manski, 1993; Brock and Durlauf, 2001; Epple and Romano, 2011; Sacerdote, 2011), edited and framed in the context of the behavioral theory of the firm (Cyert and March, 1963) and performance feedback theory (Greve, 2003b). The model is analyzed using widely accessible data on corporate social performance, dynamic and non-transitive industry peer group associations based on product market rivalry (Hoberg and Phillips, 2016), and robust dynamic panel estimation using instrumental variables to control for endogeneity endemic to peer effects models (Bramoullé et al., 2009; De Giorgi et al., 2010).

The results of the empirical analysis yield unexpected observations about firm strategic motivations for CSP. By selecting subsets of broadly defined peer groups based on characteristics relevant to a particular strategic context, and by disaggregating CSP into multiple dimensions with different operational and stakeholder contexts, substantial differences in firm behavior emerge that were not observable through aggregate analysis. These results indicate that firms exhibit profit-maximizing behavior along environmental and social dimensions of CSP when legitimacy motivations tend to drive firms to *satisfice* — do no more than the minimum required to satisfy perceived stakeholder expectations. The results also provide evidence for the importance of differentiating among specific areas of CSP or even individual initiatives; adopting CSP as a general, aggregate construct in empirical analyses may mask important subtleties in CSR activities at a finer scale.

The contributions of this study are fourfold: first, the study proposes and empirically demonstrates a new theoretical framework for the analysis of firm strategic motivations using the concept of peer effects as a lens through which to observe strategic behavior. Applied here to the context of strategic motivations for CSP, the framework may be generalized to other areas of strategic management. Second, the study demonstrates the importance of thoughtful selection of peer groups relevant to the strategic context under study. Third, the study highlights the importance of more thoughtful characterization of CSP along individual dimensions or initiatives. Finally, the study employs advanced econometric techniques to address and over-

come the problem of endogeneity bias present in any model that includes explanatory variables based on averages of a peer group or social network.

This article proceeds as follows: the next section summarizes relevant extant theory from management literature, introduces a new theoretical framework of peer effects, and suggests testable hypotheses regarding strategic motivations derived from the framework. A third section develops an empirical model to evaluate these hypotheses, outlines the source data, and details the empirical identification strategy. A fourth section summarizes the empirical results, a fifth section discusses the nature and implications of those results, and a final section concludes.

5.2 Theory

5.2.1 Motivations for corporate social responsibility

A study on the strategic motivations of CSR and CSP demands clear and consistent definitions of the terms. Many definitions have been employed in academic literature (Carroll, 1999; Dahlsrud, 2008), though the fundamental concept is relatively durable. CSR is defined herein as the voluntary and costly corporate provision of measurable social benefit to the general public or specific non-shareholder groups. Following Wood (1991), CSP is defined as the operationalization of CSR strategies and resulting performance along observable outcomes of the firm's actions, programs, and policies (see also Ioannou and Serafeim, 2012). Under this definition, CSP may be interpreted as the manifestation of a firm's CSR strategy. Unlike strategies to improve financial performance where firms face substantial uncertainty in their ability to transform strategic intent into profitable results, firms arguably have reasonable control over their ability to transform CSR initiatives into measurable CSP.

Many views exist on the nature of firm motivations to engage in CSR; Bansal and Roth

(2000) identified three clear motivations among firm managers to improve CSP: competitiveness (i.e. profitability), legitimacy, and social responsibility (e.g. sense of obligation or moral concerns). The latter of these explanations is rooted in the concept of “altruistic CSR” (Baron, 2001; McWilliams et al., 2006) while the former two are often direct antecedents of strategic CSR. The concept of strategic CSR has naturally intrigued scholars for some time (McWilliams and Siegel, 2001): firms increasingly engage in CSR for expected benefits to the firm, whether directly measurable or intangible, and whether motivated by profit opportunities or risk management, such as prevention of potential losses (Baron, 2001) or threats to legitimacy (Wood, 1991). Strategic CSR suggests that a firm will engage in CSR when its corporate strategy informs ways in which it can obtain additional private benefit from the provision of public goods (McWilliams and Siegel, 2011). If the firm is able to capture enough value by providing the public good to turn a net private cost into a net private benefit, or to make one project or investment more profitable than another, the practice of CSR will increase net private benefits to the firm as well as generate public goods. Strategic CSR may include both proactive profit strategies, as well as reactive risk management strategies under the threat of various stakeholder pressures.

One of the most prevalent themes in the CSR literature is the question of the profitability of CSR activities, i.e. the direction and magnitude of the effect of corporate social performance (CSP) on corporate financial performance (CFP). While a multitude of studies has offered empirical evidence of both positive and negative effects of CSP on CFP (as well as null results), a general consensus has emerged that CSR is generally profitable but only subject to certain conditions or contexts; furthermore, research has revealed the direction of causality in the CSP-CFP link to be highly uncertain (Orlitzky et al., 2003; Margolis et al., 2009). The high degree of interest and research on the topic has led to continual improvements in the analytical rigor of empirical approaches over time (see Ullmann, 1985; Wood and Jones, 1995; McWilliams and Siegel, 2000; Garcia-Castro et al., 2010; Clarkson et al., 2011; Shahzad and Sharfman,

2017). Research has also highlighted an increased recognition that it may be more important to study the “how and why” of profitability of CSR than the “whether” (King and Lenox, 2001; Margolis et al., 2009), suggesting that much work remains to be done to improve our understanding of the strategic motivations of firms engaging in CSR.

Stakeholder pressure is commonly cited as a driver of (primarily reactive) CSR (e.g. Sharma, 2000; Delmas and Toffel, 2004; Chiu and Sharfman, 2011). Not only does the threat of shareholder activism over CSR issues drive strategic changes in CSP (Baron, 2001), firms may increase their own CSP in response to perceived threats focused at peer firms (Cao et al., 2018). Local institutions are also relevant in perceptions of stakeholder demands for CSP (Marquis et al., 2007). In the realm of stakeholder management, CSR activities are used proactively for reputation building (Brammer and Pavelin, 2004), reputation offsetting for poor CSP (Kotchen and Moon, 2012), as well as reputation risk management (Godfrey et al., 2009); reputation management via increased CSR is also performed reactively to address prior low ratings of CSP (Chatterji and Toffel, 2010). Inherent in stakeholder management is the concern over legitimacy (Deephouse, 1996; Bansal and Roth, 2000): the power possessed by stakeholders to influence the degree to which a firm maintains control over its “license to operate” (Wood, 1991; Chiu and Sharfman, 2011).

The extensive degree of academic research into the business case for CSR has resulted in substantial ambiguity over strategic motivations of firms to improve CSP (Barnett, 2016). The dual dimensions of profit seeking and stakeholder management are at times complementary and contradictory, resulting in a tension in the literature over the nature of motivations in different strategic contexts. Compounding this issue is the understanding that firms face substantial uncertainty in the effectiveness of their own CSR strategies. Such ambiguity begs for new approaches to evaluate the strategic motivations of firms to engage in CSR in different contexts.

Business managers face uncertainty when making decisions in virtually any strategic context, whether investing in research and development, evaluating a potential corporate merger

or acquisition, or developing a civic stakeholder engagement program. Such uncertainty is perhaps greatest in determining the appropriate type or scope of CSR initiatives. While some types of initiatives are based on direct monetization of company products or services containing embedded public goods (Kotchen, 2006) or improved operating efficiencies (Porter and Van der Linde, 1995), many CSR initiatives deal in non-market activities with ties to operating performance that are tangential, at best. Not only are firms challenged to assess the range of potential outcomes of a CSR initiative, they also face difficulty in estimating probability distributions around achieving those outcomes. Perhaps even more vexing is the challenge to credibly attribute *ex post* outcomes with various aspects of a specific CSR initiative or policy (Peloza, 2009). The connection between a firm's own CSP and the returns to both firm profits and social welfare are often highly intangible and nearly impossible to quantify directly with a high degree of confidence. A manager may measure corporate returns to CSP in terms of such metrics as higher customer satisfaction, lower employee turnover, better reputation, reduced regulatory oversight, or fewer activist shareholder resolutions filed. Skilled managers may further have reasonably accurate, quantitative measures of the value to the firm owing to improvements in these metrics. However, the corporate manager is challenged to credibly attribute such performance measures to success of its CSR programs versus other strategic corporate initiatives.

In this context, managers seeking to increase firm value or competitiveness through CSR initiatives often have little specific guidance in determining the optimal level or direction of activities to undertake. Firms may engage in proactive strategies to enhance competitive advantage (Aragón-Correa and Sharma, 2003) or effectively manage stakeholders (Buysse and Verbeke, 2003) through CSR initiatives, though without product market feedback or specific stakeholder grievances, firms are challenged to determine whether they've invested enough to achieve objectives or have passed into the zone of diminishing marginal returns. Reactive strategies — engaging in CSR initiatives to fend off competitive threats or stakeholder

sanctions — have been found to be a net drain on firm financial performance (Husted and de Jesus Salazar, 2006) or otherwise allow external stakeholders (without a vested interest in the firm's success) too much sway over a firm's strategic direction (Baron, 2001). Outside of direct appeals, there are arguably no objective standards readily available for managers to determine appropriate levels of CSP for their specific strategic context.

5.2.2 Peer effects

In the presence of incomplete information, corporate managers engage in search to acquire information regarding the potential success or failure of certain modes of strategic conduct (Levinthal and March, 1981). One important source of public information for setting of strategic goals is the performance of peer firms. In this sense, firms may be expected to behave in ways not unlike individuals seeking information or subject to environmental influences regarding social expectations; peer effects then describe the tendency for a firm to exhibit behaviors in line with some reference group to which the firm belongs (Manski, 1993). As such, relevant peer firms are more likely to be those with common external stakeholders, regulatory requirements, product markets, and other institutional structures (Porter, 1979b; Fiegenbaum and Thomas, 1995).

Firms often employ mimetic processes - modeling behavior on the observed behaviors of related firms - as a means to cognitively manage this uncertainty (Meyer and Rowan, 1977; DiMaggio and Powell, 1983). By adopting strategies and practices already prevalent among industry peers, follower firms may access information on existing knowledge and experience at a substantially lower cost than firms that have invested over time in developing that superior performance (Chatterji and Toffel, 2010). Lower cost approaches to organizational learning and adoption are particularly attractive for firms with greater financial constraints, which is typical for firms with less developed internal resources and capabilities (Flammer, 2015). Firms that

are under-informed about the potential profitability of strategies seek to enhance organizational learning from the observation of relevant peer firms' performance (Foucault and Fresard, 2014). Firms with less prior experience in implementation of CSR strategies are thus more likely to benefit from adoption of strategies observed from relevant peers.

A firm's choice of CSR is often a public and notably visible strategy; in order to extract value from their provision of public goods, firms typically make public disclosures of their CSR goals and activities. Social and environmental ratings of firms and inclusion on market sustainability indices are understood to benefit those firms with good performance (Lyon and Shimshack, 2015b) — or perhaps just good information disclosures (Lyon and Maxwell, 2011; Delmas and Burbano, 2011; Cho et al., 2012) — and are generally publicly accessible. Under such low information costs, firms have added incentive to pursue and adopt similar strategies to those observed among their industry peers when such strategies are perceived as effective in creating value or managing risks.

The concept of peer effects is prominent in strategic management research and can be recognized under many different terms. Institutional theory has studied peer effects for decades, building from the prominent concept of institutional isomorphism (DiMaggio and Powell, 1983; Meyer and Rowan, 1977). Corporate adoption of administrative and operational technologies is frequently credited to modes of isomorphism (Liang et al., 2007; Teo et al., 2003). Adoption bandwagons explain the rapid uptake of innovations in product market strategies (Abrahamson and Rosenkopf, 1993; Terlaak and King, 2007); vicarious learning describes the propensity for firms to learn about effectiveness of strategies from related firms (Terlaak and Gong, 2008). The corporate finance literature has begun to evaluate peer effects in the context of corporate financial policy and governance (Leary and Roberts, 2014; Foucault and Fresard, 2014; Servaes and Tamayo, 2013; Fracassi, 2016). A common theme across these literatures is the concept that firms face significant uncertainty in many aspects of strategic management, and commonly turn to the observable experiences of relevant peer firms for information on the

potential success or failure of a particular strategy. It is the behavior of a group of relevant peer firms that often provides the best information on potential strategic outcomes at the lowest information cost, and thus forms powerful incentives for strategic mimicry.

Firms with performance below that of most profitable peers are more likely to subsequently increase performance than firms above profitable peers.

Hypothesis 1: Firms increase (decrease) CSP in response to an increase (decrease) in the average CSP of its industry peers.

5.2.3 Performance targets

The behavioral theory of the firm and performance feedback theory suggest that firms establish certain performance targets (i.e. “aspiration levels”¹) that effectively serve as a minimum desired level of performance on a given strategic metric. While few studies have used actual performance targets explicitly defined and publicly disclosed by firms (e.g. Lant, 1992; Mezas et al., 2002; Keum and Eggers, 2015), various strategic reasons may compel managers to establish private, undisclosed targets different from the public target (Keum and Eggers, 2015). As such, most studies in the aspirations literature assume some performance target based on various sources of reference information available to the firm and subsequently judge the accuracy of those assumptions based on degree to which they explain patterns in the data (Greve, 2003a,b). In general, those performance targets assumed by researchers are generally based on some linear combination of a focal firm’s own past performance and the average performance of its relevant peer group (Washburn and Bromiley, 2012).

The significance of a performance target in this context is that it provides some plausible

¹This literature (see Lounsbury and Beckman 2015 and Shinkle 2012 for reviews) tends to follow the original terminology of “aspiration level” used by Cyert and March (1963); I will use the term “performance target” as this offers an arguably more appropriate description of the phenomenon described herein; firms do not necessarily “aspire” to any particular level of performance, but may establish targets based on perceptions of an appropriate level of performance as observed through the behavior of relevant peer firms.

benchmark for a firm to judge its own performance. The concept is that a firm compares its current performance relative to this target and takes action based on whether the target has been met or not. In general, the body of research in this field suggests that when firm performance trails this target, the firm is disposed toward engaging in problemistic search (Levinthal and March, 1981), changing strategic behavior or assuming more risk in an effort to meet the target; moreover, when firm performance exceeds the target, firms are less likely to change strategy or take risks. In this study, I postulate an analogous explanation wherein firms establish such targets as predicted levels of satisfactory performance corresponding to the firm's ultimate strategic motivation. Whether or not firm strategic behavior depends on its performance relative to that target level then depends on whether the target level contains relevant information regarding the value of continued performance improvement.

When a firm changes its behavior at the performance target threshold, behavioral theory of the firm offers a number of plausible explanations. For example, bounded rationality suggests that managers may lack sufficient information and cognitive capacity to consistently optimize, with the result that strategy is developed and implemented to meet performance targets and switch attention or resources to other areas once those performance targets are met (Cyert and March, 1963). Performance targets have the cognitively beneficial effect of focusing managerial attentions on areas of strategic performance most in need of resources. When firm performance achieves or exceeds a target, managers are able to switch attention and resources to other priorities, decreasing the impetus for continued change or improvement along the same dimension of performance, or reducing the propensity of managers to undertake high risk strategies to improve performance. In the context of CSP, particularly at the corporate level (i.e. aggregate performance across all corporate CSR initiatives), firms are likely to reduce effort when a performance target has been met in due course of CSR strategy. For example, firms may anticipate decreasing marginal returns to profitability of CSR (e.g. Flammer, 2013; Barnett and Salomon, 2012) at levels of CSP in excess of targets, or achievement of some minimum level

expected in order to ensure legitimacy or avoid sanction from stakeholder groups (Deephouse, 1996).

Hypothesis 2: Firms with performance below the average of its industry peer group are more likely to subsequently increase performance than firms with performance above its peer group average.

When a firm does not exhibit change in behavior when crossing a performance target threshold, the firm behaves independently of that threshold level. When evidence also indicates peer performance influences a firm's own strategy, firm performance relative to the threshold is irrelevant; the peer performance provides a useful and actionable signal no matter what a firm's own performance is. In the context of CSP, such a result suggests that firms consistently respond to performance improvements by peer firms with their own subsequent performance improvements, even if they are already established as a leader within their respective peer groups. Such a result may indicate firms seek attainment of competitive advantage, or strive for profit maximization, in their strategic determination of CSP; alternatively, it may indicate firms seek to dissipate rents associated with perceived competitive advantage generated by peer firms through prior CSP.

In general, the aspirations literature uses various financial performance metrics for these performance targets (Shinkle, 2012). Recent work has extended the model to areas of non-market strategy (Rudy and Johnson, 2016). In this study, I apply the general aspirations model to an area of performance that is increasingly considered important to shareholders of the firm and stakeholders alike - corporate social performance. Arguably, CSP represents a performance metric more directly under the control of managers than corporate profits, and thus provides a more relevant setting for the observation of firm behavior relative to peer performance. Furthermore, CSR is an ambiguous concept and firms face substantial uncertainty in the setting of appropriate performance targets, lending even greater relevance to peer effects in explaining variation in CSP over time. The performance of relevant peer firms provides a clear signal as

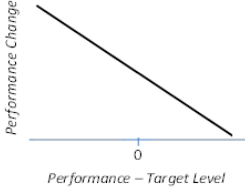
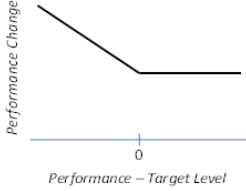
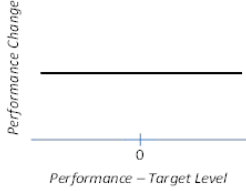
to the appropriateness of a given level of CSP. Given that firms may select relevant peers for performance comparison, then, the selection of peer groups may provide a useful window to infer the strategic motivation behind firms efforts to increase CSP.

Theoretical framework

The main theoretical contribution of this study is the synthesis and application of these two related theories from economics and management literatures to the phenomenon of corporate peer effects and subsequent explication of the combined theory to predict and explain associated patterns in strategic corporate behavior. As discussed above, firms tend to (1) establish performance targets and compare own performance to those targets to determine the need for subsequent strategic action, and (2) select strategic reference groups based on characteristics relevant to firm motivations. These two characterizations of firm behavior provide two dimensions on which to evaluate observations of firm performance. With respect to performance targets, firms either purposefully set peer-based targets and evaluate the need for strategic action based on own performance relative to the target (consistent with the behavioral theory of the firm and performance feedback theory), or do not consider own performance relative to the peer-based target in setting strategic action. With respect to peer group selection, firms may consider selecting relevant peers based on observed profitability or on institutional similarity². Table 5.1 suggests a simple framework based on these two dimensions.

²Firms may select peer groups on other relevant characteristics; such characteristics are not studied here but may provide opportunities for future research.

Table 5.1: Framework of potential firm responses to peer group performance

Motivation	Linear response 	Nonlinear response 	Null response 
Profitability	Profit maximization	Diminishing returns	No peer effect
Legitimacy	Ratchet expectations	Satisficing	No peer effect

Note: in the figures, *x*-axes represent firm performance minus target level, *y*-axes represent subsequent change in performance. Individual cells theorize firm motivations for increasing CSP in response to peer CSP.

In Table 5.1, three proposed response characteristics to a peer-based performance target are displayed left to right. Accompanying each response type is a graphical representation of the effect in the style of Greve (1998). In these figures, the *x*-axis indicates firm own performance relative to the performance target; left of zero indicates firm trails its target and right of zero indicates firm exceeds its target. The *y*-axis is the change in performance, a proxy for strategic change. A downward-sloping line indicates presence of peer effects in that the more a firm trails its target, the more it increases subsequent performance, whereas a flat line indicates no response to a peer-based target. A linear response indicates the presence of peer effects (firms adjust own performance relative to that of a relevant peer group), but with no dependency on whether own performance leads or trails the peer group average performance. This is an example of the basic peer effect commonly referred to in studies of corporate peer effects (e.g. see Leary and Roberts, 2014). Nonlinear response indicates a peer effect when firm performance trails the peer-based target, and no peer effect when firm performance exceeds the target. This is an example of satisficing behavior set forth in the behavioral theory of the

firm and demonstrated in multiple studies of performance feedback theory³. Finally, a null response generally indicates no peer effect; firms do not take peer group performance into consideration in setting strategy. Peer group selection is indicated by rows in the table, and the various cells each describe a predicted behavior associated with the corresponding description of firm motivations.

5.2.4 Relevant peers and strategic context

According to the DiMaggio and Powell (1983) canonical article, “Organizations tend to model themselves after similar organizations in their field that they perceive to be more legitimate or successful.” In order to measure peer effects, a group of relevant peers must be determined. In the strategic management literature, peer groups are typically associated with industry group. Industry is relevant because firms in a common industry tend to share multiple common stakeholder groups, encounter a similar regulatory context, and tend to engage in common product markets and supply chains. However, simple industry association has been called into question as a precise identifier of relevant peer groups due to the static nature of formal industrial classification codes (such as SIC and NAICS) and their dependence on production processes over products for primary classification (Hoberg and Phillips, 2010). Recent work highlights the importance of product market similarity as an indicator of close rivalry and common institutional context (Hoberg and Phillips, 2016).

The combination of factors that constitute a relevant peer group are worthy of closer examination. Strategic context significantly influences both the mode of imitation (i.e. the relevant traits or characteristics that drive imitation) and thus the types of peers that are selected as referent standards to imitate (Haunschild and Miner, 1997). Furthermore, the behavioral theory

³Note that while the nonlinear response shown here differs from the shapes suggested by Greve (1998), the strategic behavior is equivalent. Note the y-axis represents magnitude of subsequent change, not probability of future change.

of the firm would suggest it is beyond the cognitive capacity or search constraints of a manager to process and aggregate the performance of several dozen firms belonging to the same 2-digit SIC code. Furthermore, firms are likely to view different peer firms as more or less relevant depending on the strategic context (Terlaak and Gong, 2008). Therefore, a more precise determination of relevant peers that influence a focal firm's strategic actions must involve selecting on characteristics that the firm deems relevant in a specific strategic context. As has been discussed above, firms may engage in CSP for a number of strategic motivations that may generally be classified in two primary dimensions: profit seeking and legitimacy. Those motivations, respectively, can be represented by selecting relevant peer groups on characteristics relevant to profitability and legitimacy.

Profit motivation

If firms benchmark their own performance on that of relevant peers in the interest of improving strategic outcomes, there is motivation to further identify other peer characteristics that may signal a higher probability of success. Firms select relevant peer firms on which to emulate strategies based on characteristics most likely to be indicative of success (Terlaak and Gong, 2008). The characteristics that firms find relevant are generally specific to the context of its strategic goals and the perception of success of individual peer firms along those characteristics (Terlaak and King, 2007). Firms face a tension between competitive differentiation and strategic conformity or legitimation (Deephouse, 1999), thus firms may seek to emulate CSP of profitable firms to diminish competitive advantage of rival firms.

Profitability signals managerial competence. Whereas individual strategic successes and failures of a firm may not be externally observable in aggregate, consistently superior profitability represents a record of successful strategic decision making. And so while firms have difficulty measuring or attributing their own financial outcomes directly to CSR strategies (Peloza, 2009), the overall financial success of a peer firm may lead to perceptions that, on average, the

peer firm's strategic initiatives are sound. Moreover, when considering ways to reduce strategic uncertainty, firms may perceive that (in expectation) any strategic initiative implemented by a profitable peer is more likely to have contributed to that record of financial success. As disentangling profitability of specific CSR measures is difficult for a firm's own strategies, it may be nearly impossible for firms to directly infer those strategies that have been most successful at peer firms. As such, the best information available to a firm from observing peers may be based in the "good management" theory of profitable CSP - that the successful implementation of CSR is reflective of good management practices, and firms with good management practices are more profitable (Orlitzky et al., 2003). When firms seek to emulate the CSR strategies of peers, they are more likely to select peer firms with higher net profitability as the target sample of firms to emulate.

Modeling potential modes of behavior on the framework described in Table 5.1, if firm response to a peer group selected on profitability is linear, then CSP is perceived as inherently valuable to firm profitability. This type of response is evidence of the classic model of peer effects (Sacerdote, 2011). In the context of peer group selection, it would suggest that firms seek to maximize profit on investments in CSP and continually update performance in response to performance changes observed in the behavior of their more profitable peer firms. If firm response to a peer group selected on profitability is nonlinear, as represented in the stylized graph at center of Table 5.1, CSP is perceived as having diminishing marginal value to firm profitability. Finally, if firm response is null, peer performance CSP is perceived as having limited value to firm profitability. Alternatively, a null response may suggest that firms are simply not influenced by peer performance in the determination of appropriate levels of CSP. Note that these three response types are mutually exclusive; when selecting a relevant peer group based on peer firm profitability, exactly one of these three response behaviors will be observed⁴.

⁴A fourth mathematic possibility is that firms will exhibit a peer effect when leading the peer-based target, and

Consistent with recent empirical evidence of diminishing marginal returns to higher levels of CSP (Flammer, 2013), when selecting relevant peer firms based on profitability, higher performing firms are less likely to find strategic motivation to substantially increase CSP. Furthermore, if the profitability of CSP is difficult to ascertain, and if there are indeed expected decreasing marginal returns to increased CSP, then managers may be reluctant to significantly increase investment in improving CSP once the performance target has been met.

Hypothesis 3: Firms with performance below that of most profitable peers are more likely to subsequently increase performance than firms above profitable peers.

Legitimacy motivation

Whereas profitability sends a powerful signal of management skill and strategic success, legitimacy is often seen as a stronger driver of investment in CSR initiatives. As CSR activities are often external to a company's product markets and tangential to main lines of corporate and business strategy, achieving legitimacy in the eyes of stakeholders is generally the first order objective of many CSR programs. Prior research has found that firms disclose CSP information primarily to build legitimacy and not for profits (Patten, 1991). However, to consider that motivations are monolithically defined within any given firm is a restrictive and fairly naive assumption. While many firms do indeed encounter mixed motivations for engaging in CSR initiatives, the legitimacy motivation frequently dominates (Bansal and Roth, 2000).

Legitimacy motivation may drive strategic mimicry on multiple peer characteristics. Firms that face similar institutional pressures or share common groups of external stakeholders may compare performance among themselves to determine plausibly appropriate levels of performance. Institutional similarity is thus a relevant factor for peer group selection. Institutional similarity may be defined on multiple dimensions, each of which may or may not have primary

no effect when trailing the target. The theory described herein does not consider such behavior to be plausibly observable.

relevance in a given strategic context. For example, firms operating in a certain geographic region may be subject to similar regulatory obligations or accountable to common local activist stakeholder groups (Reid and Toffel, 2009), and shared local media coverage, labor unions, or other regional institutions (Husted et al., 2016); in such case firms with similar geographic base of operations may be more relevant. Alternatively, larger and more geographically disperse firms operating in common product markets may face similar customers or consumer demographics that influence brand awareness or reputation and face risk of stakeholder activism due to collective reputations (Tirole, 1996; Grant and Potoski, 2015). The literature has only recently begun to address the issue of different peer groups (Hu et al., 2017). Firms may also select “institutional equivalents”: peers that span multiple relevant institutional contexts, such as industry affiliation and local geographic communities (Marquis and Tilcsik, 2016). Selection of relevant peers on institutional context is thus highly dependent on the nature of strategic motivation.

Firms may also seek to benchmark the performance of those firms that have similar institutional environments. Firms that compete in similar product markets engage with a common customer base as well as other stakeholder interest groups. Such groups of firms also tend to develop similar sets of internal resources and capabilities that may lend well to similar non-market strategies. When searching for relevant peer performance to establish performance targets, firms may therefore tend to select relevant peers that are closer product market rivals. When selecting on such firms with common institutional environment, firms seek to validate their CSP based on the perceived norms present within the peer group. As with selection on profitability, there is reduced strategic impetus for firms to substantially increase CSP beyond some minimum threshold level perceived to be relevant for ensuring legitimacy among stakeholder groups.

Similar to the discussion above, CSP is perceived as inherently important for stakeholder management and legitimacy when firm response to a peer group selected on institutional simi-

larity is linear. Such a phenomenon suggests a competitive market for CSP and associated reputation, wherein firms strive to not be left behind by the continued public efforts of their rivals. This phenomenon is sometimes referred to as a “Red Queen” effect, wherein firms continue to invest in higher levels of CSP just to keep pace with peer firms in addressing the ratcheting expectations of stakeholder groups (Tetraault Sirsly and Lvina, 2016; Bertels and Pelozo, 2008). A nonlinear response when selecting relevant peers on institutional similarity suggests that CSP is perceived as having diminishing marginal value for stakeholder management. Finally, a null response suggests that CSP is perceived as having no value to the firm for stakeholder management or that institutionally similar peers have no relevance to firm CSR strategy. Again, note that these three response modes are again mutually exclusive. However, a given response mode on peer groups selected on profitability is not necessarily mutually exclusive with any of the possible response modes with peer groups selected on institutional similarity. Evidence across response modes with different peer groups would suggest both groups of peers are relevant (since we do not, in practice, observe actual selection of peer groups) but in different contexts and firm motivations.

By its very definition, legitimacy suggests a satisficing motivation (Bansal and Roth, 2000) — firms simply seek to meet some perceived minimum acceptable level of performance in the eyes of stakeholders. When firms turn to relevant peer groups for observable guidance on an appropriate minimum level, they will tend to select a target level commensurate with the average performance of those institutionally similar peers (Greve, 2003b). As such, firms seeking legitimacy will seek to achieve a level of performance as high as the average performance of the relevant peer group, and tend to disengage from strategic mimicry when performance exceeds that level.

Hypothesis 4: Firms with performance below that of most institutionally similar peers are more likely to subsequently increase performance than firms with performance above similar peers.

As noted above, legitimacy motivations may trigger strategic mimicry on many other relevant characteristics. Whereas institutional similarity addresses a large portion of plausible characteristics for peer group selection, other characteristics (as with profitability motivation noted further above) may drive firms to select peer firms that are not necessarily a closest match. Organizational visibility is one such characteristic. Larger firms are more visible and have more ties to external stakeholders (Deephouse, 1996). Organizational size also draws more problems of legitimacy and thus greater awareness of stakeholder demands (Dowling and Pfeffer, 1975), suggesting that large firms face greater stakeholder scrutiny (Terlaak and Gong, 2008) — and thus are more likely to have implemented strategies to meet stakeholder demands — for increased CSP. Large firms tend to serve as role models for other firms (Have-
man, 1993; Haunschild and Miner, 1997) as they present the most relevant model of perceived appropriate levels of CSR (Chiu and Sharfman, 2011).

Hypothesis 5: Firms with performance below that of the largest peers are more likely to subsequently increase performance than firms with performance above similar peers.

5.3 Empirical Approach

The following section first describes the empirical model in the context of extant literatures both on peer effects in economic research and on social aspirations in management research. Execution of an appropriate empirical test of this model and hypotheses set forth above requires an identification strategy sufficient to clearly identify the hypothesized effects separate from numerous potential confounds, data describing the social performance of a large sample of firms, and a methodology for defining the relevant peer groups. Following explication of the empirical model directly below, these three components are discussed in turn.

5.3.1 Empirical model

A simple approach to modeling the relationship between peer firm performance and individual firm behavior is the linear-in-means (LIM) model of peer effects. The LIM model, so named by virtue of the linear relationship between peer average performance or behavior and the dependent variable, is commonly applied in peer effects studies throughout the social sciences (Moffitt et al., 2001; Epple and Romano, 2011) and has more recently gained traction in corporate finance and strategic management research (e.g. Leary and Roberts, 2014; Patnam, 2013). Similarly, the LIM model is an appropriate baseline to simulate the strategic motivations of a firm in selecting its level of CSP. Consider a firm i which in period t observes its internal resources and capabilities, external competitive environment, relevant peer firm performance, institutional and stakeholder context, and its own level of performance in a given period. The firm processes this information in order to determine what level of CSP to implement in the following period. The firm's CSP is therefore path dependent; its current period CSP is based on the previous period CSP, adjusted for observed changes in its situation during that period. The outcome of the firm's decision is its realized current period CSP, which may be imperfectly measured. The researcher does not observe the firm's detailed CSR strategy or its industry peers' strategies, but does observe the resulting measurement of CSP for all firms. This process then repeats itself in the subsequent period. Let the variable y represent some CSP metric, indexed by i for individual firms and by t for time periods. The following simple LIM, dynamic panel data model⁵ describes this process:

$$y_{it} = \alpha y_{it-1} + \beta \bar{y}_{-it-1} \quad (5.1)$$

The explanatory variables are lagged by one year (i.e. index $t - 1$), to account for the lag in observation of peer performance and subsequent update in chosen level of CSP. The

⁵Control variables and other terms are omitted for clarity and are included in the final model presented below.

scalar outcome variable y_{it} is the current year CSP, and the lagged dependent variable y_{it-1} is included as an autoregressive covariate to capture the path dependence of CSP. As is standard in empirical models of peer effects (Manski, 1993; Moffitt et al., 2001), \bar{y}_{-it-1} represents the mean outcome for firm i 's reference peer group in the previous period, where $-i$ index indicates the firm's own outcome is excluded from the peer group mean calculation⁶. The $-i$ peer average calculation is shown in Equation 5.2 below, where G_{it} represents the group of firm i 's relevant peers in year t as defined by the TNIC data set, and n_{it} is the size of G_{it} . The coefficient of interest in Equation 5.1 is β , or the effect of peer firms' performance on a firm's choice of CSP.

$$\bar{y}_{-it} = \frac{1}{n_{it}} \sum_{j \in G_{it}} y_{jt} \quad (5.2)$$

To model strategic *change*, the dependent variable measure employed in this study is the change in performance relative to the previous period, or $\Delta y_{it} = y_{it} - y_{it-1}$. CSP (and associated third party CSP ratings) is a fundamentally strategic construct, in that firms are able to exercise substantial control over the level of performance achieved⁷, as opposed to financial performance metrics that are subject to considerable uncertainty over short time frames. As such, the dependent variable Δy_{it} is an appropriate measure of strategic organizational change with respect to CSR policy. Subtracting y_{it-1} from each side of equation 5.1 leads to:

$$\Delta y_{it} = (\alpha - 1)y_{it-1} + \beta \bar{y}_{-it-1} \quad (5.3)$$

According to equation 5.3, in each period the firm faces a decision whether to increase CSP. The firm forms a strategic performance target for its own CSP based on observations

⁶Heterogeneity among firms may suggest a more complex functional form than linear-in-means for the CSP peer effect and presents an opportunity for further study. See Sacerdote (2011) and Smith et al. (2015) for recent examples in social science research.

⁷As with other strategic initiatives such as investment in research and development (e.g Greve, 2003a) or corporate mergers and acquisitions (e.g Iyer and Miller, 2008).

of the performance of its relevant peers as well as its own past performance. Such performance targets, more commonly referred to as “aspiration levels” in large, empirical literatures based on the Behavioral Theory of the Firm (Cyert and March, 1963) and Performance Feedback Theory (Greve, 2003b), form the reference point by which firms evaluate their current performance. In these literatures, aspiration levels are often assumed by researchers to take one of several alternate functional forms based on peer performance (the “social” component) and on realizations of aspiration levels from prior periods (the “historical” component) (see Washburn and Bromiley, 2012, for a review). One common approach prescribes a single aspiration level calculated as the weighted average of social and historical levels, with the relative weights either predetermined by the researcher or estimated using grid search methods to find the best model fit (Greve, 2003a; Audia and Greve, 2006). In these studies, the historical component is based on a recursive function that effectively incorporates all past realizations of own performance into the current level. Furthermore, this grid search approach often indicates that the social component tends to dominate historical in terms of explanatory power (Greve, 2003a). Other models (Mezias et al., 2002) have included these two components separately in the same regression model to account for potentially additive aspirations on different performance comparisons. Finally, other researchers have tested “switching models” where firms are hypothesized to change behavior upon performance surpassing various thresholds (or aspiration levels). Different thresholds may apply in different strategic contexts, whether applied at the peer group average (Bromiley, 1991) or at multiple levels representing different regimes of financial stability (Chen and Miller, 2007). Furthermore, aspiration levels (performance targets) addressed in this literature are largely based on corporate financial performance (arguably the main motivator for strategic change in firms), where such performance is the complex outcome of innumerable variables.

This study is concerned with corporate social performance, which is arguably under the direct control of firms through their decisions to engage in multiple, specific initiatives or poli-

cies that are commonly recognized by third-party CSP ratings schemes. In this context, we augment the Bromiley (1991) switching model where the social aspiration drives firm behavior when firm performance trails this peer-based target, and social aspiration loses relevance when firm performance exceeds the target. To account for the possibility that historical performance influences behavior on either side of this peer-based target, we include a lagged dependent variable as the historical component. Note that the lagged dependent variable, by construction, includes effects of all past firm performance levels through recursion. Hypotheses 5.2.3 through 5.2.4 all suggest that firm behavior will switch from peer influence to historical influence at the threshold set by the peer group average performance. Returning to the analytical model, and according to Hypothesis 5.2.2, the firm sets its current period CSP strategy based on the level of CSP realized in the prior period relative to its peer performance-based strategic target. Adding and subtracting own lagged performance to the right hand side of equation 5.3 and rearranging terms yields the following equation:

$$\Delta y_{it} = (\alpha + \beta - 1)y_{it-1} - \beta (y_{it-1} - \bar{y}_{-it-1}) \quad (5.4)$$

Equation 5.4 represents the basic descriptive model of this study in terms comparable to the aspiration levels literature; it describes the influence on firm strategy by the firm's prior performance relative to a performance target based on the observed prior performance of relevant peers⁸. For notational simplicity, let $P_{it} \equiv y_{it}$ signify a firm's own performance, and $S_{it} \equiv \bar{y}_{-it}$ signify the "social" performance target based on average performance of relevant peer firms. Also, let $\gamma \equiv \alpha + \beta - 1$ and $\delta \equiv -\beta$, such that:

$$\Delta P_{it} = \gamma P_{it-1} + \delta (P_{it-1} - S_{it-1}) \quad (5.5)$$

Thus, the empirical models described by equations 5.1 and 5.5 are mathematically equiv-

⁸The aspirations literature refers to this relative performance measure as "attainment discrepancy".

alent, and either model may be used to represent peer effects and path dependency in CSP. The base LIM parameters are thus easily derived from the empirical results, i.e. $\beta = -\delta$ and $\alpha = 1 + \gamma + \delta$, where α represents the autoregressive coefficient on firm performance and β represents the direct peer effect. While equation 5.5 is perhaps more recognizable and relevant to management scholars versed in the behavioral theory of the firm and aspiration levels, equation 5.1 will be used in this study given the simpler interpretation of the main regression coefficients of interest, the prevalence of this functional form in the large literature of peer effects, and for compatibility with available instrumental variables.

Both α and β (the main coefficient of interest) will be estimated empirically. Hypothesis 5.2.2 predicts that β will be positive and significantly different from zero. A series of controls and other parameters are added to this base model for empirical estimation. Let \mathbf{X}_{it} represent a vector of exogenous firm characteristics (e.g. size and profitability), and likewise let $\bar{\mathbf{X}}_{-it}$ represent a vector of peer firm averages (firm i excluded) of those same firm-level characteristics. Let s_t represent a set of year dummies to control for time-varying shocks affecting all firms, and c_i are firm fixed effects to control for unobserved, time-invariant firm characteristics. ε_{it} represents unobserved, mean zero, serially uncorrelated random shocks. The following model describes a firm's strategic change as a function of its attainment discrepancy, or the degree to which its prior period performance exceeded or trailed its target. Note that all explanatory variables (minus the fixed effects and random error) are lagged one period to account for the iterative nature of performance observation and strategy update.

$$\Delta P_{it} = \alpha P_{it-1} + \beta S_{it-1} + \zeta \mathbf{X}_{it-1} + \eta \bar{\mathbf{X}}_{-it-1} + s_t + c_i + \varepsilon_{it} \quad (5.6)$$

The model may be further refined in order to test the remaining hypotheses. Equation 5.6 assumes a linear response to the peer performance. According to Hypothesis 5.2.3, a firm may take different strategic action in the current period depending on whether its prior period CSP

exceeded or trailed the performance target. In order to test this hypothesis, an indicator variable is assigned to differentiate between firms that have exceeded or not exceeded their peer-based performance target in the prior period. Define this indicator variable D_{it} as below:

$$D_{it} = \begin{cases} 1, & \text{if } P_{it} > S_{it} \quad (\text{i.e. performance exceeds target}) \\ 0, & \text{if } P_{it} \leq S_{it} \quad (\text{i.e. performance trails target}) \end{cases} \quad (5.7)$$

The following equation then describes the updated model, such that β_0 signifies the peer effect when firm performance trails its target and β_1 signifies the peer effect when firm performance exceeds its target.

$$\begin{aligned} \Delta P_{it} = & \alpha_1 P_{it-1} D_{it-1} + \alpha_0 P_{it-1} (1 - D_{it-1}) + \beta_1 S_{it-1} D_{it-1} \\ & + \beta_0 S_{it-1} (1 - D_{it-1}) + \zeta \mathbf{X}_{it-1} + \eta \bar{\mathbf{X}}_{-it-1} + s_t + c_i + \varepsilon_{it} \end{aligned} \quad (5.8)$$

Hypothesis 5.2.3 predicts that β_0 will be positive and significantly different from zero, indicating that as firm performance approaches the target (from below), impetus for strategic change decreases. Intuitively, firms whose performance substantially trails the peer-based target level have greater motivation to increase performance than firms whose performance is only slightly lower than target. On the other hand, hypothesis 5.2.3 predicts that β_1 will not be significantly different from zero. Such a result would indicate that a firm whose performance exceeds that of its relevant peer group average is likely to set strategy independent of considerations of peer performance.

The remaining hypotheses 5.2.4 through 5.2.4 are tested in the manner set forth by the equation 5.8 model, using selection on peer firm characteristics to narrow the set of relevant peers. Hypothesis 5.2.4 predicts that, when a firm selects its more profitable peers to comprise

its reference group, the β coefficients will take values of similar or greater magnitude to those estimated in testing hypothesis 5.2.3. Such a result would suggest that firms view CSP as a potentially profitable strategy, and use observations of CSP achieved by more profitable peer firms as a source of information to reduce uncertainty over the potential profitability of their own CSP efforts. Similarly, hypothesis 5.2.4 predicts that when a firm selects its more similar peers (closer product market rivals) to comprise its reference group, the β coefficients will likewise take values of similar or greater magnitude to those estimated in testing hypothesis 5.2.3. Such a result would suggest that firms may face substantial institutional pressures to deliver CSP on par with its product market peers, and thus respond to trailing performance levels by increasing CSP in order to maintain legitimacy or license to operate. Hypothesis 5.2.4 entails a similar prediction as hypothesis 5.2.4, though argues the legitimacy motivation may alternatively manifest through modeling firm behavior on its largest and most visible peers. Taken together, hypotheses 5.2.4 through 5.2.4 may provide evidence of the basis of perceived profitability and reduced threats to legitimacy, respectively, as strategic motivation to deliver higher levels of CSP.

5.3.2 Identification strategy

Historically speaking, strategic management research has consistently faced problems of endogeneity in empirical analyses, considering the notion that management decisions are endogenous to expected corporate performance (Hamilton and Nickerson, 2003). This study is not immune to this concern; in fact, any empirical analysis that includes explanatory variables based on aggregate characteristics or behaviors of a peer group or network must confront and address this specific endogeneity problem. A substantial literature has developed around the problem of empirical identification of peer effects in studies of social interactions; these problems are statistical in nature and apply across research domains. In a seminal paper on the

topic, Manski (1993) highlights three main effects of interest that have been subsequently cited throughout the social interactions literature, and the associated challenges to empirical identification of those effects. In the context this study, the three effects include: (1) endogenous effects, where one firm's behavior is influenced by the behavior of its peer firms (represented by the coefficient β in equation 5.6), (2) contextual effects, where the firm's behavior is influenced by exogenous characteristics of peer firms (represented by the coefficient η in equation 5.6), and (3) correlated effects, where firms within the same peer group behave similarly due to common factors such as similar institutional environments or contemporaneous market shocks (represented by the fixed effects and error terms).

In order to identify empirical models of peer effects, the researcher then faces three main identification challenges (Moffitt et al., 2001): (a) to separately identify endogenous effects from contextual effects (simultaneity, or the "reflection problem" per Manski 1993), (b) to separately identify these two peer effects (endogenous and contextual) from correlated effects (which are often unobserved), and (c) to properly account for endogenous peer group membership (or mobility of firms between peer groups). The models specified above are defined with the objective of addressing these key identification challenges, to which each will be described in detail below.

Simultaneity

Simultaneity, or the reflection problem, arises when an individual is influenced by the average behavior of the group, and in turn the group behavior is thus affected by the behavior of each individual. Manski (1993) argues that for the linear-in-means empirical model, when social interactions are homogeneous within a group (i.e. the peer effect is the same for all individuals) and all groups are of the same size, it is empirically impossible to identify the en-

ogenous peer effect due to perfect collinearity with the exogenous group characteristics⁹. In Equation 5.6), β represents the endogenous peer effect, while η represents the contextual peer effects. The problem of disentangling these two effects is perhaps even more noteworthy in the context of corporate strategy than with individual behaviors, as firms are likely more acutely aware of the behaviors of their relevant peers, magnifying the potentially spurious effects of simultaneity.

A simplistic potential solution to the simultaneity problem might involve lagging all the independent variables. This approach makes intuitive sense, since firm management's current period decisions are based on previous period outcomes, and firms do not contemporaneously observe the results of their peers' strategies until the following period. However, while lagged independent variables are appropriately used in the models described above given the nature of strategic updating, they are not sufficient to achieve identification under the simultaneity problem (Reed, 2015; Bellemare et al., 2017). Because CSP is strongly serially correlated, prior year peer effects are likely correlated with those in the following year. So while the lagged independent variables are appropriately used in the main empirical model of this study, it is not a viable identification strategy for simultaneity bias.

Instrumental variables offer a potential solution to the reflection problem. However, there are not many available instruments that meet the requirements for validity: such instruments must be strongly correlated with the endogenous variable of interest, and must not be correlated with the error term (i.e. the instrument may only affect the dependent variable through its relationship with the endogenous variable). For equation 5.6, where the lagged dependent variable is a primary explanatory covariate, perhaps the only available instrument is deeper lags of the same variable. The two-year lag instrument is correlated with the one-year lag endogenous variable by construction. Whereas a two-year lag of own CSP is likely correlated

⁹Extending their binary choice model to a linear-in-means approach, Brock and Durlauf (2001) show that for non-linear functions of the peer mean with continuous 2nd order derivatives, local identification will hold in the face of simultaneity.

with current year CSP, it is reasonable to assume that it acts only through its relationship with the one-year lag and is therefore uncorrelated with the error term, particularly if no serial correlation of the error term is present (see below for explanation of fixed effects). A test for serial correlation in equation 5.6 may confirm this assumption. The two-year lag of peer CSP may likewise serve as an instrument for the one-year lag peer CSP explanatory variable.

Whereas deeper lags of the endogenous variables are appropriate instruments for equation 5.6, these may not be sufficient instruments for equation 5.8. The construction of these models relates firm performance relative to target to the outcome of strategic change (the change in CSP in the subsequent period). Because this performance target is assumed by the researcher, it is conceivable that dynamic peer relationships between years could result in correlation between those deeper lags and the error term of the current year model. Another factor related to properties of the TNIC peer groups provides a solution to this dilemma; the ability to identify “excluded peer” relationships given the partially overlapping nature of peer groups. An excluded peer is defined as a peer of a peer of the focal firm that is not also a direct peer of the focal firm itself. By definition, excluded peer performance is correlated with the peer performance, since the two firms are peers themselves. If firms indeed take into account the performance of relevant peers, but not other less relevant firms, in determination of strategic goals, then the excluded peer relationship is uncorrelated with the firm’s decision, except through its direct relationship with the peer firm. The concept of excluded peers as an effective identification strategy is clearly outlined by Bramoullé et al. (2009) and applied empirically by De Giorgi et al. (2010). Given the unique structure of peer relationships established by Hoberg and Phillips (2016), the TNIC peer groups provide a compelling opportunity to identify peer effects in performance relative to strategic goals.

Correlated unobservables

Another potential identification problem facing the empirical model is the presence of correlated unobservables leading to endogeneity bias. Such bias may arise when firms within a given industry peer group are exposed to similar regulatory environments, common stakeholders, or industry-wide demand shocks. Endogeneity is present on the individual firm basis as well, in that a firm's strategic decision to change its CSP may be related with any number of unobserved firm-specific variables which may or may not be time-invariant, such as corporate culture, proclivities of executive management, and others. Studies have suggested that the endogeneity problem has resulted in numerous Type I errors (incorrect rejection of a true null hypothesis) in empirical studies attempting to link CSP with CFP (Garcia-Castro et al., 2010).

Equations 5.6 and 5.8 both include firm fixed effects to difference out all time-invariant observational unit-specific unobserved factors. However, fixed effects do not resolve potential bias stemming from time-varying unobservables, among which important factors such as corporate culture and stakeholder pressure should be considered. Nor do fixed effects properly control for unobserved heterogeneity within a peer group (Gormley and Matsa, 2014). Inclusion of firm-year fixed effects (i.e. s_{it}) may provide a sufficiently rich set of fixed effects to control for such time-varying unobservables, but extract an excessive price in terms of reduced degrees of freedom in the analysis. An instrumental variables approach again is relevant, this time to address the correlation between time-varying firm-level unobservables and both individual and peer lagged measures of CSP. The same approach described in the section above is sufficient to identify effects in light of the correlated unobservables problem as well.

To be clear, excluded peers are not correlated with the error term, because those peers are not relevant to firm calculus in updating CSR strategy. However, it is possible that those excluded peers may be "just below" the threshold set by Hoberg and Phillips (2016), which was designed to coincide with peer group size provided by three-digit SIC codes. So, in case

the excluded peers are indeed relevant to firm performance, it is advisable to test such models for instrument validity, i.e. to confirm whether the instrumental variables are uncorrelated with the error term (the exclusion restriction). Instrument validity tests are performed and reported with all model results below.

Endogenous group selection

The third challenge - endogenous peer group membership, owing to individual mobility between groups - is perhaps the most studied of the three Moffitt et al. (2001), particularly in sociology and education research. However, unlike other studies of corporate peer effects (Patnam, 2013; Fracassi, 2016), in this study I take a firm's industry classification as a reasonable proxy of peer group membership that influences a firm's CSR strategy. Whereas firms do not self-select into industry peer groups, hypotheses 5.2.4 through 5.2.4 rest on the notion that firms *do* select their most relevant peers based on characteristics that serve to reduce uncertainty in line with a firm's specific strategic motivations. As such, the degree to which a firm's peer group is self-selected for the establishment of performance targets creates an endogenous relationship between explanatory variables. Fortunately, the matter of endogenous group selection may also be resolved through the specification of instrumental variables as outlined above.

Finally, a basic analysis on the dynamic composition of peer groups as defined in this data set was conducted to assess the relative mobility of firms between TNIC-defined peer groups over time. Namely, observers may be concerned that significant peer group changes may be realized when large numbers of firms are added to the sample in certain years (by way of initial inclusion in the ASSET4 coverage universe) even if those companies have had consistent peer groups before inclusion into the study sample. After removing the handful of outliers with either comparatively few peers (< 3) or major changes in peer groups from one year to the next (e.g. change in primary lines of business), the mean ratio of percentage change in number of

peers to the percentage change in number of overall firms in the data set quickly converges to less than one. This suggests that most firms see less change in peer group composition from year to year than changes in the firm constituents of the overall data set, which supports the theoretical validity of the excluded peer instrumental variables approach.

5.3.3 Data

The sample of firms analyzed in this study is comprised of the intersection of two large data sets used for corporate performance data and peer group definition, each described in detail below.

Corporate social performance

We use ASSET4 ratings of corporate environmental, social, and governance (ESG) performance as the measure of CSP. ASSET4 is a social investment advisory product managed by Thomson-Reuters that seeks to establish objective and consistent criteria by which institutional investors may evaluate corporate performance on ESG issues. Ratings are designed to reflect the capacity of firms to generate sustainable, long-term value to shareholders through rigorous evaluation of corporate policies and management practices along traditional CSP metrics, yielding a measure distinctly in line with strategic intentions. Furthermore, the ratings are based on corporate reports, disclosures, media, and other third-party reports, effectively representing public information available to peer firms at low cost.

The ASSET4 ratings are structured around four pillars of sustainability associated with CSP: environmental, social, corporate governance, and economic performance. A team of dedicated analysts (120 Thomson-Reuters employees as of 2012) tracks more than 700 individual data points and 250 key performance indicators (KPIs) that were developed to describe and assess the content of corporate policies and management practices, and the resulting perfor-

mance. Environmental scores track corporate impacts on natural systems and reflect corporate management of environmental risks and opportunities. For example, areas of environmental performance that are most heavily weighted in the ASSET4 methodology include reduction of pollutant emissions and resource use, and avoidance of environmental controversies. Social scores assess capacity for building reputation and ensuring continued license to operate from key stakeholder groups and society at large. Corporate governance scores measure the capacity for corporate systems and processes to ensure management acts in the best interest of stakeholders. Economic scores track ability to generate sustainable, long-term return to shareholders through efficient use of resources and commitment to maintaining loyalty among shareholders and other key stakeholder groups (including customers, employees, and suppliers).

ASSET4 lends several advantages over other, more commonly used measures of CSP that are of particular value to this study. The ratings have employed a fairly consistent methodology over time, and use standardization to maintain a relative performance score among the universe of rated firms on a set scale of 0 to 100. The comprehensive ASSET4 score gives roughly equal weight to each of the four pillars described above, which are based on 18 categories grouped around the aforementioned KPIs and individual data points. Individual data point scores and indicators are based on objective criteria designed to minimize analyst inference. Thomson-Reuters provides transparent access to all data points and the calculation methodology, and employs multiple quality screening steps on data updates. Time series data is available on all individual indicators tracked by ASSET4, and so analyses may be replicated on any particular subset of the aggregate rating. For this study, in addition to the aggregate ASSET4 rating, we employ the overall pillar scores for environmental, social, governance, and economic performance as dependent variables in the empirical analysis. Since all four pillars are scored on the same 0–100 scale as the aggregate ASSET4 rating, the results of such analyses support direct comparisons of firm behavior between different dimensions of CSP.

The data used in the study consists generally of constituents of the Russell 1000 index of

the largest publicly traded companies on United States exchanges from 2002 to 2015. The universe of ASSET4 covered firms has grown over time, and so fewer firms are available from the earlier years, as noted by Table 5.2. Panel size is also reduced by corporate financial data available as well as the data set used to derive corporate peer groups.

Table 5.2: ASSET4 panel and individual CSP dimension means

Year	n firms	ASSET4	Environ.	Social	Govern	Economic
2002	365	44.1	34.7	38.3	67.5	45.2
2003	361	43.7	33.4	37.4	69.5	45.0
2004	494	51.6	35.8	42.7	74.4	53.9
2005	571	53.5	38.0	44.4	74.7	55.9
2006	582	53.7	38.2	44.8	75.0	56.0
2007	607	55.0	41.9	48.5	74.3	54.9
2008	763	51.8	39.9	44.9	74.4	50.8
2009	900	52.0	41.8	45.2	71.9	51.9
2010	939	54.6	43.9	46.7	74.2	53.8
2011	927	54.9	45.0	46.9	72.6	55.3
2012	918	52.8	45.5	46.2	71.4	50.3
2013	893	54.8	46.2	46.9	73.5	52.8
2014	888	56.0	45.9	47.7	73.6	55.1
2015	636	55.9	44.5	48.1	73.0	55.3
Total	9844	53.2	42.1	45.6	73.1	53.0

Corporate financial performance

Because CFP is clearly correlated with CSP both contemporaneously and moving forward (Margolis et al., 2009; Orlitzky et al., 2003), it is included in the model to control for financial determinants of CSP. Prior literature has established the relevance of both accounting returns and market returns on subsequent CSP Margolis et al. (2009); Orlitzky et al. (2003); Clarkson et al. (2011); Bird et al. (2007). This study uses return on assets (ROA) as an accounting measure of returns to capital investment (interest expense is not added back)¹⁰. Data was obtained

¹⁰Tobin's q was also analyzed as measures of CFP and found to be not qualitatively different from ROA in all models.

for each firm-year in the ASSET4 panel from Thomson-Reuters Datastream. To account for the rationale that a firm considers its financial position when determining whether and to what extent to invest in CSR activities in the coming year, ROA is lagged one year in the model. Outliers were Winsorized at +/- 100%.

Firm size and visibility

Firm size is commonly noted as being strongly correlated with CSP (Orlitzky, 2001; Margolis et al., 2009). The rationale is that larger firms often have more discretion to invest in non-market strategies such as CSR. Larger firms also tend to be more visible and thus potentially more subject to stakeholder demands. Total net revenue (sales) is used as the measure of firm size for this study¹¹. These measures were all obtained from Thomson-Reuters Datastream, and all measures were transformed by their natural logs to more closely approximate a normal distribution.

It may be argued that firms with higher “visibility” are more likely to be subject to stakeholder scrutiny and demands for CSP. This study uses firm size as a proxy for visibility, which is captured by the net revenue variable discussed above. Finally, given the objective of identifying and the effects of industry peer performance on firms’ choice of CSP, all covariates included as firm characteristics are also used to derive industry peer group averages. As noted previously, this is standard practice among empirical models of social interactions measuring peer effects.

¹¹Total assets, stock market capitalization (year-end stock price multiplied by number of shares outstanding), and number of employees were also evaluated as measures of firm size and found to be not qualitatively different in all models.

Table 5.3: Key variable summary statistics and correlations

Variables	Mean	Std Dev	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) ASSET4	53.2	28.2	1.000						
(2) Environmental	42.1	31.1	0.863	1.000					
(3) Social	45.6	28.2	0.898	0.761	1.000				
(4) Governance	73.1	16.7	0.658	0.505	0.509	1.000			
(5) Economic	53.0	28.0	0.766	0.474	0.591	0.376	1.000		
(6) % ROA	6.17	9.44	0.143	0.052	0.102	0.053	0.266	1.000	
(7) ln Sales	16.3	.514	0.067	0.023	0.086	0.042	0.068	0.071	1.000

5.3.4 Peer groups

The definition of relevant peer groups is instrumental to this analysis. Firms are likely to seek information from those peer firms that are most relevant to their institutional and competitive contexts (Liang et al., 2007; Teo et al., 2003). Product market competition is further related to reactive changes in CSP (Flammer, 2015; Cao et al., 2018).

Peer groups are defined using dynamic, text-based product market networks developed by Hoberg and Phillips (2016) using word similarity scores derived from product description sections of corporate forms 10-K filed with the SEC. The scheme is based on the concept that pairs of firms that score high on commonality measures of such descriptions are more likely to operate in similar product markets, and thus represents a more accurate assessment of industry constituents. This text-based network industry classification (TNIC) more closely estimates product market competition than traditional industry classifications (e.g. SIC, NAICS, GICS) and also allows for dynamic classification (changing year-to-year) of individual firms based on evolving corporate strategies. The data set used for this study sets the similarity threshold at a level to most closely approximate the same industry group size as set forth by the three-digit SIC code series. TNIC has been recently used to define corporate peer groups in other research modeling peer effects among product market competitors (Hoberg and Phillips, 2010; Foucault and Fresard, 2014; Cao et al., 2018). Importantly, TNIC also allows for the formation of asymmetric or non-transitive industry peer groups, which enables a unique identification strategy discussed below. Alternate algorithms following this approach may be developed to

optimize the peer group definition for common stakeholders and regulatory context, which may be reserved for future work on this project.

The TNIC data from Hoberg and Phillips (2016) is available from 1996-2015, allowing an overlap with the ASSET4 panel from 2002-2015. The merged data set thus includes only observations for those firms that appear both in the TNIC database (U.S. publicly traded firms) and the ASSET4 coverage universe — generally indicating firms listed on the Russell 1000 index. Observations were also dropped from the dataset if no financial data available through Thomson Datastream.

Peer group selection on characteristics

Calculation of peer group average characteristics (e.g. CSP, ROA, sales) is based on equation 5.2 above. In order to test hypotheses 5.2.4 through 5.2.4, subsets of the baseline TNIC peer groups are assembled from selection on peer firm characteristics. For selection on profitability, all firms within a focal firm's baseline peer group with ROA above the peer group median level in a given year are selected, while firms with ROA below that median level are discarded. The rationale for this selection is that when seeking information regarding the profitability of CSR strategies, firms look within their group of relevant peer firms and observe those firms that have demonstrated superior financial performance, an important signal of managerial competence.

Similarly, for selection on institutional similarity, all firms within a focal firm's baseline peer group with TNIC similarity score above the peer group median level are selected. Other measures of institutional similarity, such as geographical proximity of corporate headquarters (e.g. see Husted et al., 2016; Marquis and Tilcsik, 2016), were considered as well. However, the product market rivalry defined by the TNIC algorithm (Hoberg and Phillips, 2016) is considered the most relevant for institutional concerns. Among those identified in the TNIC universe as close rivals, firms are likely to recognize a subset of those firms with closest product

market rivalry as most relevant for institutional drivers of CSP. Closer rivals are more likely to share a common customer base, brand association, and have similar regulatory, supply chain, and operational contexts through which stakeholder attention to CSP is focused.

Table 5.4 lists the total number of peer firm observations in the dataset and the classification of each observation within the two peer group selection criteria outlined here. As shown, all peer firm observations are evenly distributed; roughly half of the high profit peer types also belong to the high rivalry peer group, and vice-versa. This even distribution reduces the risk of collinearity between the two different peer group selections.

Table 5.4: Aggregation of peer types

Peer group	Observations	Per cent
High profit	33,679	25
High rivalry	35,867	26
Both	34,827	25
Neither	32,645	24
Total	137,018	100

To address hypothesis 5.2.4, peer groups were also constructed on size. Organizational size draws more problems of legitimacy and thus greater awareness of stakeholder demands (Dowling and Pfeffer, 1975). Larger firms are more visible and have more ties to external stakeholders (Deephouse, 1996). Large firms tend to serve as role models for other large firms (Haveman, 1993; Haunschild and Miner, 1997) as they present the most relevant model of perceived appropriate levels of CSR (Chiu and Sharfman, 2011). More visible firms are also likely more subject to stakeholder scrutiny and thus more likely to have established a socially appropriate level of performance (Terlaak and Gong, 2008). We use total sales as a proxy for visibility; total assets was also used and results not qualitatively different.

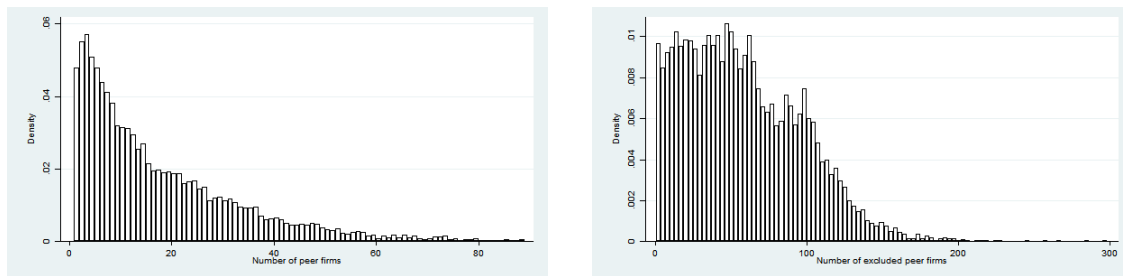


Figure 5.1: Size of (a) industry peer groups and (b) excluded peer groups

Excluded peer instrument construction

To develop a set of excluded peer instruments in line with the identification strategy discussed above, we assembled a large three-dimensional matrix of peer firms described by the TNIC3 dataset (1160 firms * 1160 peer firms * 14 years) and constructed matrix-manipulation code to systematically detect and store a list of “excluded peers”: any firm that is a peer of a peer of the focal firm, but is not a direct peer of that focal firm, is considered an excluded peer. Then, in the same manner that peer group averages are calculated for each focal firm in the dataset, excluded peer group averages are also calculated to serve as instrumental variables. Figure 5.1 shows histograms of the size of industry peer groups (a) as well as the number of excluded peer relationships (b) for all observations in the sample.

5.4 Results

5.4.1 Peer effects

Results shown in Table 5.5 provide mixed support for hypothesis 5.2.2: firm CSP follows the average CSP of peer firms. In Table 5.5, individual models correspond to different dimensions of CSP represented in the ASSET4 data. Model 1 shows results of this estimation using the aggregate ASSET4 equal-weighted rating as the dependent and explanatory variables.

The coefficient β (variable: *Peer CSP*) represents the peer effect in equation 5.6: a one unit increase in peer group average CSP score in one year corresponds to an average 0.116 unit increase ($p = 0.17$) in the focal firm's CSP score in the subsequent year, all other factors held constant. Whereas the aggregate CSP score is not statistically significant at generally accepted confidence levels, results on the individual dimensions of CSP are revealing. Model 2 results for the ASSET4 environmental score indicate that a one unit increase in peer group average environmental performance in one year corresponds to an average 0.213 unit increase ($p < 0.01$) in the focal firm's environmental CSP score in the subsequent year. Similarly, model 3 shows a peer effect of 0.179 ($p = 0.02$) for social performance, and model 4 shows a peer effect of 0.227 ($p = 0.06$) for governance performance. These results show that in all three ESG performance dimensions, the average firm responds to an average movement of five units (on the ASSET4 scale of 0 to 100) by its relevant peer firms with a single unit movement in the same direction.

A number of tests were performed on the instrumental variables model to check for under-identification and instrument validity¹². The Kleibergen-Paap rank test (Kleibergen and Paap, 2006) is a Lagrange Multiplier (LM) test of the coefficient matrix rank that indicates whether the excluded instruments are correlated (as intended) with the endogenous covariates. The null hypothesis of this test is that the instruments are not relevant and the model is underidentified; rejection of the null indicates that the model is identified. The large statistic reported in Table 5.5 supports validity of the instrumental variables. The regression models use cluster-robust standard errors so the Kleibergen-Paap rank Wald F test (Kleibergen and Paap, 2006) is used as a test for weak instruments. The null hypothesis of this test is that the instruments are weakly correlated with the endogenous regressors. In order to reject the null, the F statistic must exceed the relevant critical values specified by the Stock-Yogo weak identification test

¹²The instrumental variable identification and endogeneity tests were carried out using the Stata `xtivreg2` command (see Schaffer, 2005).

Table 5.5: Peer effects regression results

VARIABLES	(1) ASSET4	(2) Environ.	(3) Social	(4) Govern.	(5) Economic
Peer CSP	0.116 (0.084)	0.213*** (0.074)	0.179** (0.079)	0.227* (0.121)	0.149 (0.159)
Own CSP	0.532*** (0.025)	0.591*** (0.021)	0.572*** (0.024)	0.420*** (0.052)	0.402*** (0.052)
ln Sales	1.501** (0.653)	3.420*** (0.710)	1.228** (0.601)	1.672*** (0.526)	-1.536 (1.081)
% ROA	-0.061*** (0.021)	-0.017 (0.020)	0.027 (0.023)	0.010 (0.019)	-0.105* (0.057)
Peer ln Sales	-1.054 (0.693)	-1.818*** (0.619)	-1.201* (0.691)	-0.516 (0.362)	-1.273 (0.923)
Peer % ROA	-0.090* (0.053)	-0.059 (0.050)	-0.004 (0.045)	-0.071* (0.041)	-0.133 (0.170)
Observations	7,224	7,224	7,224	7,224	7,224
Number of firms	1,002	1,002	1,002	1,002	1,002
Model <i>F</i> statistic	110.84	130.62	100.56	27.59	21.23
Kleibergen-Paap rank LM stat	83.41	77.94	86.26	47.10	60.65
Kleibergen-Paap rank Wald <i>F</i> stat	42.78	42.99	42.92	26.68	26.26
Endogeneity test <i>C</i> statistic	19.65	24.28	40.26	12.05	12.20
Hansen <i>J</i> test <i>p</i> -value	0.07	0.17	0.81	0.11	0.93

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Robust standard errors clustered on firm in parentheses. Two-sided p -values as described in text.
Notes: Each model's dependent variable is a dimension of current period CSP noted in the heading.
Peer CSP is the unweighted mean of all relevant peers' CSP defined from the TNIC data set.
Instruments are two-year lags of CSP and Peer CSP and CSP of excluded peers. All explanatory variables are one-year lags.

(Stock and Yogo, 2005); the critical value for a 20% maximal IV size with two endogenous variables and three instruments is 6.40, well below the F statistic reported in Table 5.5. Finally, as a check of whether the endogenous regressors (lagged own CSP and peer average CSP) are truly endogenous, a C statistic is generated using a difference-in-Hansen test. Here, the null hypothesis is that the endogenous regressors are actually exogenous. Rejection of the null, as indicated by the C statistic in Table 5.5 confirms that the regressors are indeed endogenous, and the IV model is required for identification. Finally, including lags of the endogenous explanatory variables as instruments results in an overidentified model (number of instruments is greater than the number of endogenous regressors), which carries the advantage of allowing for standard tests of instrument validity (whether the instruments are uncorrelated with the dependent variable except through their correlation with the instrumented endogenous variables). In this case, a Hansen J -test is performed to check for instrument validity, i.e. whether the instruments are orthogonal to the error term. The null hypothesis is that the instruments are valid; but rather than rejecting the null for $p < 0.05$, p -values as high as 0.25 should be viewed with concern (Roodman, 2009).

5.4.2 Performance targets

Results shown in Table 5.6 provide partial support for hypothesis 5.2.3: for certain dimensions of CSP, firms with CSP below their peer group average are more likely to subsequently increase CSP than firms with CSP above their peer group average. As in Table 5.5, Model 1 shows results using the aggregate ASSET4 equal-weighted rating as the dependent and explanatory variables. The coefficient β_0 indicates that for firms whose CSP trails its peer group average, a one unit increase in peer group average CSP in one year corresponds to an average of approximately 0.162 unit increase ($p = 0.13$) in the focal firm's CSP in the subsequent year. However, firms whose CSP exceeds the peer group average demonstrate no significant

peer effect (coefficient β_1); that is, those firms' CSP does not exhibit a significant change in response to the average CSP of its peer group. The difference in coefficients represents *prima facie* evidence of the satisficing behavior set forth in the Behavioral Theory of the Firm and Performance Feedback Theory: when firm CSP exceeds its peer-based performance target, the impetus for strategic change is reduced and management priorities shift elsewhere. A Wald χ^2 test of equal coefficients ($\beta_1 = \beta_0$) is reported in the lower panel of Table 5.6; for model 1, a two-sided *p*-value of 0.092 indicates that the two coefficients are significantly different at a relatively high confidence level.

Looking at the individual ESG dimensions of CSP as well as economic performance (models 2–5), the results again suggest satisficing behavior by firms in CSP relative to a peer group average performance target; all four models report significant peer effects for firms with CSP below the peer average and no significant peer effects for firms with CSP above the peer average. In these cases, the Wald χ^2 tests of equal coefficients indicate somewhat higher confidence in the difference in peer effects between the two subsets of observations. The coefficients on environmental performance (model 2) and corporate governance (model 4) are significantly different at 90% and 99% confidence levels, respectively. Meanwhile, whereas the model 3 (social performance) *p*-value of 0.217 is outside the traditional bounds of statistical significance, it does yield a non-trivial suggestion of behavior consistent with aspirations theory. Finally, as in Table 5.5, the suite of instrument relevance and validity tests provides support for the appropriate specification of instrumental variables.

In summary, the results provide strong evidence for changes in strategic behavior when a firm performs on either side of a peer-based performance target. Whereas peer effects are not evident for the corporate governance dimension in a linear model of firm behavior (see Table 5.5), Table 5.6 provides evidence for non-linear response (akin to satisficing behavior) in corporate governance. Note that Table 5.5 provides “average” response across all levels of target attainment discrepancy, while Table 5.6 demonstrates the degree of heterogeneous response for

firms on either side of their respective targets. Meanwhile, whereas the evidence for nonlinear response for social performance dimensions is not significant at restrictive confidence levels (i.e. $p < 0.10$), the overall magnitude of peer effects is indeed significant, as noted in Table 5.5.

5.4.3 Peer selection on characteristics

Results shown in Tables 5.7, 5.8, and 5.9 provide evidence for the relevance of peer group selection on key characteristics that motivate strategic engagement in CSR. Table 5.7 results offer mixed support for hypothesis 5.2.4: while firms are more likely to follow the CSP of their more profitable peers when trailing average peer performance, there is also evidence along some ESG dimensions (environmental and social) that firms exceeding peer performance continue to engage in more CSP when peer firms do so, indicating the salience of profit motivations in CSR strategy. Meanwhile, Tables 5.8 and 5.9 results largely support hypotheses 5.2.4 and 5.2.4, respectively: firms tend to exhibit satisficing behavior with respect to performance levels of their closest industry rivals and largest peers (respectively). Taken together and contrasted with Table 5.6 results discussed above, these results indicate certain conditions that motivate maximizing behavior by firms in areas where satisficing predominates.

Profit motivation

Table 5.7 summarizes results when the referent peer group consists of peer firms with above median accounting profits (ROA). In models 1–3 (ASSET4 aggregate, environmental, and social performance), positive β coefficients indicate that firm CSP tends to follow peer CSP, regardless of whether the firm trails or exceeds the peer group average CSP. Firms trailing the profitable peer group average in aggregate CSP will increase CSP by 0.171 points ($p = 0.10$) for every one point increase in the prior year peer average. Firms exceeding the peer

Table 5.6: Performance target regression results

VARIABLES	(1) ASSET4	(2) Environ.	(3) Social	(4) Govern.	(5) Economic
β_1 : Peer CSP (exceeds)	0.019 (0.093)	0.107 (0.088)	0.098 (0.093)	0.025 (0.126)	0.105 (0.177)
β_0 : Peer CSP (trails)	0.162 (0.108)	0.244*** (0.091)	0.211** (0.099)	0.420*** (0.130)	0.489*** (0.186)
α_1 : Own CSP (exceeds)	0.643*** (0.057)	0.681*** (0.044)	0.660*** (0.060)	0.694*** (0.112)	0.571*** (0.125)
α_0 : Own CSP (trails)	0.587*** (0.064)	0.642*** (0.061)	0.658*** (0.064)	0.343*** (0.093)	0.281** (0.114)
ln Sales	1.545** (0.641)	3.319*** (0.700)	1.331** (0.604)	1.710*** (0.530)	-1.224 (1.113)
% ROA	-0.063*** (0.021)	-0.017 (0.020)	0.027 (0.023)	0.010 (0.019)	-0.056 (0.056)
Peer ln Sales	-1.275* (0.684)	-1.844*** (0.639)	-1.424** (0.689)	-0.606* (0.325)	-2.144** (0.883)
Peer % ROA	-0.102* (0.053)	-0.052 (0.050)	-0.009 (0.046)	-0.056 (0.041)	-0.341** (0.164)
Observations	7,224	7,224	7,224	7,224	7,224
Number of firms	1,002	1,002	1,002	1,002	1,002
Model F statistic	105.30	127.70	96.10	30.59	21.50
Kleibergen-Paap rank LM stat	91.30	81.04	92.44	46.07	76.26
Kleibergen-Paap rank Wald F stat	23.28	22.67	22.82	12.89	16.93
Endogeneity test C statistic	24.25	30.85	41.40	16.48	10.11
Hansen J test p -value	0.30	0.33	0.70	0.21	0.16
Wald test ($\beta_1 = \beta_0$) p -value	0.092	0.058	0.217	0.002	0.018

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Robust standard errors clustered on firm in parentheses. Two-sided p -values as described in text. Notes: Each model's dependent variable is a dimension of current period CSP noted in the heading. Peer CSP is the unweighted mean of all relevant peers' CSP defined from the TNIC data set. Instruments are two-year lags of CSP and Peer CSP and CSP of excluded peers. All explanatory variables are one-year lags.

group average increase by 0.132 points ($p = 0.26$) for every one point increase in peer group average. While the two coefficients are only weakly significant, they are not significantly different from each other ($p = 0.65$), indicating a lack of support for hypothesis 5.2.4. On the contrary, firms with performance above peer group average tend to adjust performance in response to comparable changes among their most profitable peers. This result is even more evident for environmental and social performance. For environmental performance (model 2), firms exceeding profitable peer group average performance increase CSP by 0.253 points ($p = 0.06$) for every one point peer average increase in the prior year. This effect is roughly the same response as for firms trailing profitable peer group average; the Wald chi^2 test fails to reject the null hypothesis of equal coefficients ($p = 0.89$). A similar result, with slightly lower magnitude and weaker statistical significance, is observed for social performance as well. These results suggest that firms may have a profit maximization motivation in setting strategies for improving environmental and social CSP.

For corporate governance performance (model 4), we see a similar result for peer groups selected on profitability as with the overall effect (Table 5.6), though with lesser significance. While the peer effect on firms exceeding peer performance is not significant ($p = 0.75$), firms trailing the profitable peer group average still exhibit a peer effect ($\beta_0 = 0.375$, $p = 0.13$), with the coefficients significantly different from each other ($p = 0.07$). Outside of ESG concerns, firms also exhibit satisficing behavior with respect to economic performance, with coefficients and significance roughly in line with the governance results.

Legitimacy motivation

This study uses two proxies for relevant peer groups selected on legitimacy concerns: closer product market rivalry, which corresponds to greater similarity of institutional pressures, and larger firms, which tend to be more visible to stakeholder groups. Table 5.8 summarizes results for peer groups selected on closer rivalry. Across all five dependent variables (models 1–5), the

Table 5.7: Peer selection: profitability

VARIABLES	(1) ASSET4	(2) Environ.	(3) Social	(4) Govern.	(5) Economic
β_1 : Peer CSP (exceeds)	0.132 (0.118)	0.253* (0.135)	0.241* (0.124)	-0.152 (0.474)	-0.066 (0.225)
β_0 : Peer CSP (trails)	0.171 (0.104)	0.243** (0.102)	0.158 (0.115)	0.375 (0.247)	0.375** (0.184)
α_1 : Own CSP (exceeds)	0.568*** (0.062)	0.599*** (0.050)	0.544*** (0.066)	0.811*** (0.250)	0.683*** (0.139)
α_0 : Own CSP (trails)	0.569*** (0.053)	0.618*** (0.054)	0.677*** (0.067)	0.339*** (0.091)	0.363*** (0.096)
ln Sales	1.517** (0.669)	3.294*** (0.709)	1.317** (0.628)	1.648*** (0.539)	-1.456 (1.087)
% ROA	-0.062*** (0.022)	-0.015 (0.021)	0.026 (0.024)	0.012 (0.020)	-0.079 (0.056)
Peer ln Sales	-1.469** (0.681)	-2.029*** (0.765)	-1.435** (0.717)	-0.409 (0.744)	-1.755* (0.949)
Peer % ROA	-0.067 (0.050)	-0.040 (0.060)	0.027 (0.052)	-0.020 (0.047)	-0.137 (0.109)
Observations	6,975	6,975	6,975	6,975	6,975
Number of firms	983	983	983	983	983
Model F statistic	98.98	122.31	92.45	27.78	21.24
Kleibergen-Paap rank LM stat	45.02	38.87	47.63	7.83	30.74
Kleibergen-Paap rank Wald F stat	9.40	7.32	9.77	1.23	5.89
Endogeneity test C statistic	28.34	30.33	49.00	20.33	15.02
Hansen J test p -value	0.53	0.26	0.93	0.53	0.63
Wald test ($\beta_1 = \beta_0$) p -value	0.653	0.888	0.405	0.072	0.009

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Robust standard errors clustered on firm in parentheses. Two-sided p -values as described in text. Notes: Each model's dependent variable is a dimension of current period CSP noted in the heading. Peer CSP is the unweighted mean of all relevant peers' CSP defined from the TNIC data set. Instruments are two-year lags of CSP and Peer CSP and CSP of excluded peers. All explanatory variables are one-year lags.

results provide evidence of satisficing behavior. In each model, the coefficient for firms trailing closest rival peer average CSP (β_0) is statistically significant at the 95% confidence level, while the coefficient for firms exceeding that peer average CSP (β_1) is not significantly different from zero (all p -values greater than 0.80). Furthermore, in each model the two β coefficients are significantly different from each other (all p -values less than 0.10). These results collectively indicate that firms tend to act on legitimacy motivations for CSR when their overall CSP is below an institutionally similar peer group (selected on product market rivalry) average, but do not follow peer firm performance when already exceeding the peer group average.

Table 5.9 summarizes results for peer groups selected on size: total assets greater than the industry median. As with the results on closer rivalry peer groups, all five dependent variables (models 1–5) provide evidence of satisficing behavior, with slightly lesser significance. In each model, the coefficient for firms trailing closest rival peer average CSP (β_0) is statistically significant at the 90% confidence level, while the coefficient for firms exceeding that peer average CSP (β_1) is not significantly different from zero (all p -values greater than 0.20). Furthermore, in four of the five models the two β coefficients are strongly significantly different from each other (all p -values less than 0.01). The one exception is social performance, with smaller magnitude coefficients not significantly different from each other ($p = 0.38$). These results collectively indicate that firms tend to act on legitimacy motivations for CSR when their overall CSP is below a more visible peer group (selected on total assets) average, but do not follow peer firm performance when already exceeding the peer group average.

Finally, to evaluate whether the peer effect is significantly different between models with peer groups on profitability or institutional similarity, coefficients between models (using the same dependent variable) may be compared using z -tests of the corresponding coefficients (see Table 5.10). Comparing model 2 coefficients between Tables 5.7 and 5.8 shows that firms execute environmental performance strategies in a significantly different manner depending on how the assumed performance target is determined. The difference between the two models'

Table 5.8: Peer selection: rivalry

VARIABLES	(1) ASSET4	(2) Environ.	(3) Social	(4) Govern.	(5) Economic
β_1 : Peer CSP (exceeds)	0.012 (0.082)	0.015 (0.084)	-0.005 (0.091)	0.024 (0.119)	0.012 (0.166)
β_0 : Peer CSP (trails)	0.164** (0.077)	0.148** (0.074)	0.154** (0.075)	0.354*** (0.125)	0.326** (0.155)
α_1 : Own CSP (exceeds)	0.637*** (0.056)	0.675*** (0.043)	0.688*** (0.057)	0.665*** (0.115)	0.562*** (0.120)
α_0 : Own CSP (trails)	0.545*** (0.053)	0.626*** (0.053)	0.641*** (0.057)	0.375*** (0.089)	0.347*** (0.100)
ln Sales	1.363** (0.649)	3.140*** (0.678)	1.165* (0.608)	1.725*** (0.532)	-1.636 (1.081)
% ROA	-0.071*** (0.022)	-0.024 (0.020)	0.017 (0.023)	0.006 (0.019)	-0.095* (0.055)
Peer ln Sales	-0.958** (0.465)	-0.929** (0.463)	-0.698 (0.514)	-0.401 (0.266)	-1.377** (0.666)
Peer % ROA	-0.080 (0.049)	-0.052 (0.048)	0.014 (0.044)	-0.060 (0.041)	-0.202 (0.134)
Observations	7,224	7,224	7,224	7,224	7,224
Number of firms	1,002	1,002	1,002	1,002	1,002
Model F statistic	106.13	128.13	96.81	31.57	22.74
Kleibergen-Paap rank LM stat	63.79	72.32	68.01	40.93	54.61
Kleibergen-Paap rank Wald F stat	17.10	19.30	15.65	10.87	11.33
Endogeneity test C statistic	26.35	29.74	44.60	14.60	11.89
Hansen J test p -value	0.60	0.21	0.42	0.37	0.58
Wald test ($\beta_1 = \beta_0$) p -value	0.059	0.049	0.067	0.011	0.048

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Robust standard errors clustered on firm in parentheses. Two-sided p -values as described in text. Notes: Each model's dependent variable is a dimension of current period CSP noted in the heading. Peer CSP is the unweighted mean of all relevant peers' CSP defined from the TNIC data set. Instruments are two-year lags of CSP and Peer CSP and CSP of excluded peers. All explanatory variables are one-year lags.

Table 5.9: Peer selection: size/visibility

VARIABLES	(1) ASSET4	(2) Environ.	(3) Social	(4) Govern.	(5) Economic
β_1 : Peer CSP (exceeds)	-0.090 (0.094)	-0.004 (0.081)	0.048 (0.108)	-0.066 (0.119)	-0.226 (0.194)
β_0 : Peer CSP (trails)	0.158* (0.093)	0.199*** (0.066)	0.138* (0.077)	0.387*** (0.125)	0.407** (0.173)
α_1 : Own CSP (exceeds)	0.739*** (0.079)	0.736*** (0.054)	0.648*** (0.081)	0.785*** (0.144)	0.863*** (0.152)
α_0 : Own CSP (trails)	0.558*** (0.040)	0.599*** (0.039)	0.640*** (0.042)	0.368*** (0.082)	0.397*** (0.089)
ln Sales	1.298** (0.640)	3.242*** (0.703)	1.139* (0.614)	1.642*** (0.513)	-1.948* (1.055)
% ROA	-0.062*** (0.022)	-0.013 (0.020)	0.030 (0.023)	0.009 (0.020)	-0.124** (0.060)
Peer ln Sales	-1.204 (0.770)	-1.804*** (0.661)	-1.339* (0.791)	-0.686** (0.332)	-1.778* (0.984)
Peer % ROA	-0.072 (0.047)	-0.038 (0.049)	0.016 (0.045)	-0.063 (0.042)	-0.200 (0.145)
Observations	7,222	7,222	7,222	7,222	7,222
Number of firms	1,002	1,002	1,002	1,002	1,002
Model F statistic	109.46	132.40	94.18	34.04	22.99
Kleibergen-Paap rank LM stat	66.20	75.43	81.28	37.46	53.23
Kleibergen-Paap rank Wald F stat	17.96	17.70	20.74	9.57	10.90
Endogeneity test C statistic	29.44	31.22	45.64	16.41	17.85
Hansen J test p -value	0.11	0.26	0.82	0.55	0.38
Wald test ($\beta_1 = \beta_0$) p -value	0.010	0.003	0.381	0.004	0.001

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Robust standard errors clustered on firm in parentheses. Two-sided p -values as described in text. Notes: Each model's dependent variable is a dimension of current period CSP noted in the heading. Peer CSP is the unweighted mean of all relevant peers' CSP defined from the TNIC data set. Instruments are two-year lags of CSP and Peer CSP and CSP of excluded peers. All explanatory variables are one-year lags.

β_0 coefficients (firm trails peer average) is not significantly different ($p=0.23$), and β_1 coefficients (firm exceeds peer average) are significantly different ($p=0.07$). Z-tests of model 3 coefficients between Tables 5.7 and 5.8 yield similar results, suggesting a similar profit motivation toward social performance strategy depending on peer group selection. Between these models, coefficients β_0 are not significantly different ($p=0.49$), and coefficients β_1 are significantly different ($p=0.06$). These results confirm that peer firm performance is highly relevant to firm CSR strategies in environmental and social performance dimensions in the context of profit maximization, while there is little motivation for firms to do any more than satisfice with respect to measures of corporate governance performance.

Meanwhile, on the dimension of corporate governance (models 4), both sets of coefficients are not significantly different ($\beta_0, p = 0.47$ and $\beta_1, p = 0.36$) between Tables 5.7 and 5.8. The significance of this result is that firms exhibit satisficing with respect to peer group averages on corporate governance performance regardless of their strategic motivation. This is again consistent with the notion that firms perceive diminishing marginal returns to corporate governance performance, regardless of whether motivated by profit or legitimacy.

The consolidated results discussed above are presented in Table 5.11 and graphically in Figure 5.2. Table 5.11 presents each peer group specification in a separate panel; each panel indicates the statistical significance (both the p -value from a null hypothesis test and a 90% confidence interval) of each of the two peer effects coefficients (trailing or exceeding peer group average). Each panel also presents the p -value from the Wald χ^2 test of equal coefficients and a resulting assessment of the behavioral “fit” of the result with respect to the theoretical framework set forth above. A “satisficing” response indicates a positive peer effect for firms trailing the peer group average and no peer effect for firms exceeding it. A “maximizing” response indicates a positive peer effect regardless of whether firms trail or exceed the peer group average. Marginal effects from these coefficients are plotted in Figure 5.2, providing visual intuition of the response in the light of the theoretical framework discussed earlier. As

Table 5.10: Peer effect coefficient comparison between profitable and closer rival peer group regression models

Statistic	ASSET4	Environ.	Social	Govern.	Economic
Trails (β_0)					
Difference	0.007	0.095	0.004	0.021	0.049
z-score	0.054	0.754	0.029	0.076	0.204
p-value	0.478	0.225	0.488	0.470	0.419
Exceeds (β_1)					
Difference	0.120	0.238	0.246	-0.176	-0.078
z-score	0.835	1.497	1.599	-0.360	-0.279
p-value	0.202	0.067	0.055	0.359	0.390

Notes: Difference is the relevant β coefficient from the profitable peer model (Table 5.7) minus the closer rival peer model (Table 5.8). *p*-values are one-sided.

shown in panels (a)–(c), maximizing behavior is exhibited for peer groups selected on high profitability with environmental and social performance, as well as the aggregate CSP score. All other peer groups and CSP dimensions indicate satisficing behavior.

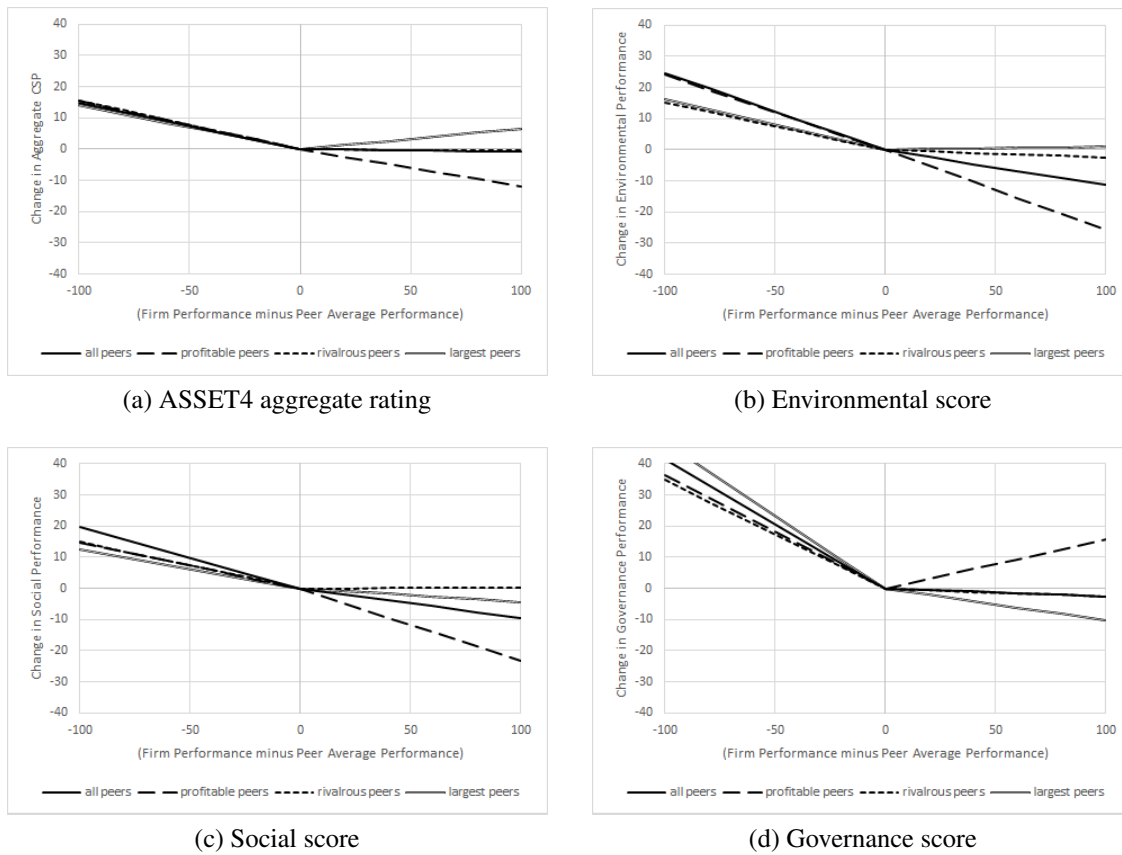


Figure 5.2: Marginal peer effects for aggregate CSP and three ESG dimensions. Each plot compares the firm response for different peer group selections as per the framework specified in Table 5.1

Table 5.11: Results summary — peer effect coefficient p -values and confidence intervals

Peer group	Target attainment	Statistic	ASSET4	Environ.	Social	Govern.	Economic
TNIC3 industry (From Table 5.6)	Exceed ($OwnCSP > PeerCSP$)	$\beta_1 = 0$ p -value 90% conf. int.	0.838 [-0.134, 0.172]	0.224 [-0.038, 0.252]	0.292 [-0.055, 0.251]	0.843 [-0.182, 0.232]	0.553 [-0.186, 0.396]
	Shortfall ($OwnCSP \leq PeerCSP$)	$\beta_0 = 0$ p -value 90% conf. int.	0.134 [-0.016, 0.34]	0.007 [0.094, 0.394]	0.033 [0.048, 0.374]	0.001 [0.206, 0.634]	0.009 [0.183, 0.795]
	Coefficient difference	$\beta_1 = \beta_0$ p -value Firm behavior	0.092 <i>Weak satisfice</i>	0.058 <i>Satisfice</i>	0.217 <i>Weak satisfice</i>	0.002 <i>Satisfice</i>	0.018 <i>Satisfice</i>
Most profitable (From Table 5.7)	Exceed ($OwnCSP > PeerCSP$)	$\beta_1 = 0$ p -value 90% conf. int.	0.263 [-0.062, 0.326]	0.061 [0.031, 0.475]	0.052 [0.037, 0.445]	0.748 [-0.932, 0.628]	0.769 [-0.436, 0.304]
	Shortfall ($OwnCSP \leq PeerCSP$)	$\beta_0 = 0$ p -value 90% conf. int.	0.100 [0, 0.342]	0.017 [0.075, 0.411]	0.169 [-0.031, 0.347]	0.129 [-0.031, 0.781]	0.042 [0.072, 0.678]
	Coefficient difference	$\beta_1 = \beta_0$ p -value Firm behavior	0.653 <i>Weak maximize</i>	0.888 <i>Maximize</i>	0.405 <i>Maximize</i>	0.072 <i>Satisfice</i>	0.009 <i>Satisfice</i>
Closest rivals (From Table 5.8)	Exceed ($OwnCSP > PeerCSP$)	$\beta_1 = 0$ p -value 90% conf. int.	0.884 [-0.123, 0.147]	0.858 [-0.123, 0.153]	0.956 [-0.155, 0.145]	0.840 [-0.172, 0.22]	0.942 [-0.261, 0.285]
	Shortfall ($OwnCSP \leq PeerCSP$)	$\beta_0 = 0$ p -value 90% conf. int.	0.033 [0.037, 0.291]	0.046 [0.026, 0.27]	0.040 [0.031, 0.277]	0.005 [0.148, 0.56]	0.035 [0.071, 0.581]
	Coefficient difference	$\beta_1 = \beta_0$ p -value Firm behavior	0.059 <i>Satisfice</i>	0.049 <i>Satisfice</i>	0.067 <i>Satisfice</i>	0.011 <i>Satisfice</i>	0.048 <i>Satisfice</i>
Largest firms (From Table 5.9)	Exceed ($OwnCSP > PeerCSP$)	$\beta_1 = 0$ p -value 90% conf. int.	0.338 [-0.245, 0.065]	0.961 [-0.137, 0.129]	0.657 [-0.13, 0.226]	0.579 [-0.262, 0.13]	0.244 [-0.545, 0.093]
	Shortfall ($OwnCSP \leq PeerCSP$)	$\beta_0 = 0$ p -value 90% conf. int.	0.089 [0.005, 0.311]	0.003 [0.09, 0.308]	0.073 [0.011, 0.265]	0.002 [0.181, 0.593]	0.019 [0.122, 0.692]
	Coefficient difference	$\beta_1 = \beta_0$ p -value Firm behavior	0.010 <i>Satisfice</i>	0.003 <i>Satisfice</i>	0.381 <i>Weak satisfice</i>	0.004 <i>Satisfice</i>	0.001 <i>Satisfice</i>

Note: Two-sided p -values are taken from coefficient results from respective tables.

Firm behavior is interpreted from coefficient significance and relative to theoretical framework set forth above.

5.5 Discussion

The analytical results summarized above reveal a number of surprising observations about the strategic motivations of firms to engage in CSR. Viewed through the lens of peer effects, the results demonstrate satisficing behavior among firms using CSR to ensure legitimacy through CSR initiatives and profit-maximizing behavior among firms using CSR to improve competitive advantage. Overall, the results indicate a stark contrast in firm behavior depending on the strategic context (i.e. seeking profit or legitimacy) and between different dimensions of CSP. The discussion below steps through three key contributions to theory informed by the result. First, following the behavioral theory of the firm (Cyert and March, 1963) and performance feedback theory (Greve, 2003b), the study finds that firms with CSP trailing a target based in part on the average performance of relevant peer firms will tend to increase performance to make up for the shortfall. This result is well aligned with the cumulative findings of aspirations literature, which suggests that firms have reduced impetus for strategic change when performance exceeds that of some target level based on own past performance and that of relevant peer firms (Lounsbury and Beckman, 2015; Shinkle, 2012; Washburn and Bromiley, 2012). Second, and more interestingly, results diverge for firms exceeding the average CSP of peer firms, particularly when the referent peer groups are selected based on a relevant motivational context. On some dimensions of CSP (environmental and social), such firms exhibit peer effects relative to a group of their most profitable peers, whereas such firms do not exhibit peer effects relative to a group of peers selected on legitimacy concerns, such as competitive rivalry (i.e. institutional similarity) or visibility (i.e. higher stakeholder scrutiny). Third, and explicit in the aforementioned findings, the results suggest that firms approach different dimensions of CSP with different strategic motivations, supporting the notion of CSP as a finely multidimensional construct warranting more careful consideration.

The first key finding and contribution to theory shows that the CSP of relevant peers pro-

vides firms with a valuable reference point for evaluating own performance, in line with BTOF and PFT, and extending the domain of strategic actions ascribed to these behavioral theories (Shinkle, 2012). CSR, as an outcome of arguably “non-market” strategy, is particularly prone to peer effects considering the uncertainty associated with both potential outcomes and *ex post* attribution of past outcomes to such strategies (Peloza, 2009). In prior empirical studies of BTOF and PFT, the explanatory variable is commonly some financial or otherwise competitive performance benchmark and estimates the effect of shortfalls to those aspirations on many other types of strategic activities. Research on aspirations has recently extended to areas of corporate political activity (Rudy and Johnson, 2016) and corporate governance practices (Rowley et al., 2017) still with respect to a firm’s financial performance aspirations. This study is unique in that it considers the level of CSR as both the relevant performance metric as well as the dependent variable representing strategic response. The results show statistically similar effects for firms with CSP shortfalls regardless of strategic motivation; this alludes to the power of aspirations theory in explaining the primary importance to firms (and by extension, managers) of being perceived as *at least* minimally competent in attaining corporate goals. It also highlights the emerging view that most firms set (and ultimately achieve) some type of performance target for important non-financial metrics such as CSP; many influential stakeholders, and increasingly institutional investors, place increasing expectations and corresponding scrutiny on ESG performance.

The second contribution — and more theoretically interesting finding — is the divergence in results for firms exceeding average peer group performance (say, “CSR leaders”); varying the relevant comparison peer group indicates significantly different firm behavior for certain dimensions of CSP. Past research has explored the idea that firms may set higher aspirations as their own performance improves (Hu et al., 2011) or change aspiration levels at extremes of performance (Blettner et al., 2015), but selection of referent peers on target characteristics has received comparatively little attention from researchers. The idea that a CSR leader may both

select a different set of referent peers depending on its strategic motivation is not necessarily a novel concept, though the careful consideration of selecting appropriate referent peer groups has been largely absent from management literature. Furthermore, the idea that firms may exhibit different strategic behavior with respect to that peer group's performance depending on the nature of the motivation has not been rigorously tested.

The finding of a linear response for environmental and social CSP to peer groups selected on profitability (see Figure 5.2) demonstrates that CSR leaders may have motivation to continue improving environmental and social performance when their most profitable peers have also improved; those firms may pursue absolute leadership instead of satisficing when profitability of CSR is presumed. However, those same leaders are less likely to improve CSP along any dimension when their closer rivals have recently improved. This suggests that when leader firms view environmental and social performance as potentially accretive to firm profitability, they will make continued investment in CSR initiatives to either protect or extend a perceived competitive advantage. This finding supports the notion of CSR as a potentially valuable tool for firms in terms of reputation benefits (Cho et al., 2012), access to capital (Cheng et al., 2014), increased competitiveness in product markets (Flammer, 2015), reduced government or regulator scrutiny (Hong and Liskovich, 2016), and risk management or other insurance-like properties (Godfrey et al., 2009).

Meanwhile, the results for profitable peers do show evidence of satisficing behavior along governance and economic dimensions. The lack of influence on CSR leader behavior by peer firms along these dimensions is consistent with the notion that firms perceive diminishing marginal returns to those programs. Indeed, this finding is in line with the study hypotheses, but does not fully support other recent research suggesting that leader firms in governance ratings are more likely to continue to adopt new governance practices (Rowley et al., 2017).¹³

¹³Note that Rowley et al. (2017) included an interaction term for firms with performance below two different aspiration levels — governance rating and profit — to show that profits below aspirations may prevent firms from taking action to improve their rating. Such heterogeneous effects in our sample and context may be

Importantly, the ASSET4 economic performance rating is not necessarily a suitable proxy for corporate financial performance, as it is heavily weighted to public information regarding the adoption of firm policies and practices perceived as supporting long-term financial health, which is not always associated with short-term measures such as ROA and relative market value (i.e. Tobin's q). As such, the finding of diminishing marginal returns to economic CSP suggests that firms do not perceive aggressive management for loyalty among employees, suppliers, customers, and shareholders as yielding differentiated competitive advantage.

Looking at the results for peer groups selected on legitimacy motivations (competitive rivalry and visibility) presents a stark contrast on environmental and social CSP dimensions. A linear response under legitimacy motivations (see Table 5.1) would have suggested behavior akin to a "Red Queen" effect for CSR, where CSR leaders perceive obligation to continue increasing efforts just to keep pace with ratcheting stakeholder expectations of firm performance (Bertels and Pelozo, 2008; Tetrault Sirsly and Lvina, 2016). However, when leader firms view CSP as a matter of ensuring or maintaining legitimacy, the results indicate there is little motivation for those firms to do any more than just turn in above-average performance.

The finding that CSR leaders are not widely influenced by the performance of their closest rival peers (i.e. those with greater institutional similarity in terms of stakeholder groups, regulatory obligations, etc.) and largest peers (i.e. visibility to media and stakeholder groups) indicates that firms exhibit satisficing behavior when CSR is employed to ensure legitimacy. This finding supports the study hypothesis, and much of the extant literature on legitimacy in general (Oliver, 1991) and with respect to CSR (Bansal and Roth, 2000). Furthermore, in comparison with the profitable peers analysis discussed above, it extends our understanding of firm behavior when performance exceeds aspirations and highlights the importance of considering relevant peer firms from which to build a social aspirations comparison group.

A third key contribution of the study highlights the importance of defining CSR efforts

evaluated in a follow-up study.

along specific dimensions or focus areas. To a large extent, prior work on CSR has employed aggregate data constructs to describe CSP of individual firms. Whereas this study was limited to the broader CSP dimensions of environmental, social, governance, and economic performance (i.e. management for long-term value creation), clear differences in firm response are observable at even coarsely delineated performance dimensions. This supports the understanding that firms do not view CSR as a unidimensional performance objective and the notion that researchers should consider more detailed measures of performance that are relevant for the research question at hand (Rowley and Berman, 2000).

Environmental and social performance were found to be more closely associated with profitability motivations than other performance dimensions. These two dimensions are arguably more visible aspects of CSR and are more prominently featured in older, more often-studied data sets (e.g. KLD). Our finding that firms employ more environmental performance strategies in pursuit of increased profits ran counter to our hypothesis — which was based on the notion that firms are more likely to perceive diminishing marginal returns to environmental performance above a peer average level — but is yet roughly consistent with many of the findings of the “pays to be green” literature (King and Lenox, 2001; Ambec and Lanoie, 2008). While exploring this question was quite outside the scope of this study, future research along this line of inquiry will explore more firm-specific moderators as well as industry contextual factors that help address “when” it pays to be green as opposed to simply the “whether”. Furthermore, finer definitions of environmental performance (e.g. emissions reductions, resource efficiency improvements, development of “green” products and innovations) tend to be more closely associated with company operations and potentially more focal to efforts to improve the bottom line. Meanwhile, the profit motivation finding on social performance is arguably more surprising; whereas both environmental and social issues have captured increasing attention from external stakeholder groups, social issues in general are arguably more associated with meeting stakeholder demands (Wood, 1991; Husted and de Jesus Salazar, 2006) and whereas

environmental factors tend to be more closely associated with improvements in operational efficiency and reduced regulatory scrutiny (Delmas and Toffel, 2008). Both environmental and social performance assessments are capable of evaluating multiple subset dimensions to the overall performance rating (e.g. with ASSET4) and these more narrow contexts are worthy of future research.

Corporate governance is a relatively newer factor of CSP under consideration, and has attracted increasing attention among researchers given the recent rise of investors focus on “ESG”. As expected, firms exhibited satisficing behavior on corporate governance in response to all types of peer groups evaluated. While matters of corporate governance do sometimes attract the attention of stakeholder groups (Cao et al., 2018; Flammer and Luo, 2017), most matters of governance tend to be points of contention between firms and investors and are thus often ignored or under-weighted in empirical research on CSP (Liang and Renneboog, 2017). Recent research has found that more “desirable” governance practices tend to be adopted in clusters and thus concentrated among higher performing firms while also less frequently adopted when firms already lag their social referents and are concurrently experiencing greater financial stress (Rowley et al., 2017). In all cases, the notion of satisficing or diminishing marginal returns tends to prevail in matters of governance since there is arguably little potential for firms to competitively differentiate on governance matters, nor demand from activist shareholders to push firms for continual adoption of new policies and practices if they are already among a group of leaders within their industries.

Finally, the diminishing marginal returns and satisficing results on the economic CSP dimension, while technically predicted by the dimension-agnostic study hypotheses, were quite surprising. To understand these results, it is important to clarify the nature of what ASSET4 measures and scores on this dimension. The ASSET4 economic pillar score assesses firms’ financial performance as well as the presence of policies and practices intended to promote long-term value to and loyalty from key internal stakeholder groups, including shareholders,

customers, employees, and suppliers. Under profit motivations firms may be expected to exhibit maximizing behavior on financial performance, though such motivations may be more driven by short-term incentives that carry less weight in the ASSET4 CSP formulation.

A final, important contribution involves the novel application and synthesis of two recent empirical innovations to the analysis of corporate peer effects. We first borrow from Hoberg and Phillips (2016) a new industrial classification system derived from text analysis of company disclosures on product market orientation, which has demonstrated superior explanatory power over traditional classifications (Hoberg and Phillips, 2010) and has the unique characteristic that firms' industry peers are only partially overlapping and may change over time as product market strategies evolve. We exploit this feature by developing an instrumental variables identification strategy using the concept of excluded peers, thanks to recent advances in econometric techniques to resolve endogeneity problems in analyses of peer effects (De Giorgi et al., 2010; Bramoullé et al., 2009).

The results are robust to alternative model specifications. We evaluated performance targets (aspiration levels) both at mean and median peer performance levels with no significant change in results. Furthermore, no significant change in results was observed when selecting referent peer groups above the median of the relevant characteristic (the reported results) or on the upper quartile of peers. Different time lags for explanatory variables also showed similar results, as did alternate specifications for calculation of the excluded peer average instrumental variables.

There are a number of limitations to this study that must be considered when attempting to generalize the results. The sample used consists of the relatively small intersection between two large and overlapping datasets (Hoberg and Phillips 2016 TNIC, and ASSET4); as such, a significant number of identified peer firms (and excluded peers) are excluded from analysis, leading to potential for selection bias. From this aspect, however, the study may also be framed from the standpoint that peer firms are assumed selected from amongst larger, more visible firms present in the ASSET4 dataset (additional comments on the problem of unobserved peer

selection follows below).

The study relies on an assumption that the ASSET4 rating scores — or the various underlying performance measures that construct the category scores — are observable and relevant to peer firm managers. In fact, the scores are based primarily on publicly available information and thus serve as proxy for firm observations about publicly disclosed performance. The highly aggregated nature of the ratings also compensates for the limited attention and cognitive capacity of firm managers to process (Cyert and March, 1963; Simon, 1979). The study further does not differentiate between substantive and symbolic CSP as represented by ASSET4. However, since corporate strategy is based on some internal expectation of information asymmetry, the concern over actual substantive performance is minimized and less relevant.

We have also taken minor liberties with the traditional model specifications used in studies evaluating aspects of behavioral theory of the firm (Cyert and March, 1963) and performance feedback theory (Greve, 2003b); however, we also note that these models are fairly fluid in the literature and are regularly tuned to meet the contextual needs of research questions (Washburn and Bromiley, 2012; Bromiley and Harris, 2014). Specifically, we focused primarily on peer effects, which taken in combination with a performance target model are often referred to as “social aspirations”. We choose the social aspirations as more relevant than “historical” because the nature of our aspirations variable — CSP — is arguably more subject to peer comparisons than financial performance metrics typically used in aspirations studies. Furthermore, studies that have attempted to empirically iterate on relative weights between social and historical aspirations tend to find social weighs substantially more (Greve, 2003a; Audia and Greve, 2006; Rowley et al., 2017). Despite this study’s focus on peer effects in setting performance targets, we are careful to control for own past performance by inclusion of the lagged dependent variable. While simultaneous inclusion of lagged dependent variables and fixed effects (dynamic panel model) can be problematic (Nickell, 1981) our instrumental variables approach reduces potential bias (Angrist and Pischke, 2008). Finally, recent research shows

that the weighted average approach to combining social and historical aspiration levels does not hold up well (Bromiley and Harris, 2014) and that using separate aspiration levels (e.g. a social level and a lagged dependent variable for historical performance) are moderately more useful than the switching model that omits one of the two separate aspiration levels on either side of a threshold.

Another potential problem rests with the fact that two key constructs utilized in the analytical approach — the performance target and peer group selection on characteristics — are unobserved and thus estimated by the researcher. In fact, the approach of assuming performance targets (aspiration levels) in the absence of any actually observable company targets and evaluating patterns of firm behavior under the constraints imposed by those assumptions is commonplace in strategic management research (Washburn and Bromiley, 2012), and have made substantial contributions to exposition and empirical demonstration of theory. The selection of relevant peer groups is also potentially problematic; in this study, the thoughtful application of an evolutionary advancement in our understanding of industry group membership (Hoberg and Phillips, 2016) and comparison of multiple contextual subsets allows an effective analysis of different hypothetical sets of relevant and influential peer firms. For legitimacy motivations, we considered other characteristics such as geographic proximity (Husted et al., 2016; Marquis and Tilcsik, 2016), but note that among firms in the sample (typically among the Russell 1000) many firms have dispersed geographical operations and thus location of company headquarters is less of a factor.

In practice, there are many more factors that influence the determination of firm performance targets and how relevant peers are selected for strategic reference. However, the results generated from these assumptions are yet informative. Whereas there are always “omitted variables” present in any empirical model of firm strategic behavior, many effective models isolate a single variable for analysis and identify the corresponding effect (Simon, 1979); the problem of identification then often rests on the selection and execution of a sufficient analytical

method. This study aims to prescribe methods appropriate for the estimation problem at hand.

Finally, we observe “average” effects based on averaging across all subject firms and their respective industry groups. Additional and perhaps more valuable insight may come from an alternate analysis exploring behavior at the margins; what types of moderator variables may explain the differences in average observed behavior? Under our empirical approach it is difficult to observe heterogeneous effects driven by other industry-level factors such as level of competitive intensity, rate of entry, or level of stakeholder scrutiny. Future research efforts may address these questions.

5.6 Conclusion

This study evaluates the strategic motivations of firms to improve CSP through the lens of peer effects. Peer effects are loosely defined as the tendency for firms to use the performance of relevant peer firms as indicators of the potential success of strategies with uncertain outcomes. The study proposes a theoretical framework of firm motivations that are discovered through observation of firm behaviors in response to performance feedback under different realizations of relevant peer group selection. Empirical analysis of this model was executed using widely accessible data on corporate social performance, dynamic and non-transitive industry peer group associations based on product market rivalry, and robust dynamic panel estimation using instrumental variables to control for endogeneity endemic to peer effects models. Viewed in the context of the theoretical framework, the empirical results provide support for the notion of peer effects in strategic corporate social responsibility, and yield unexpected observations about firm strategic motivations for corporate social performance.

The study demonstrates firm behavior consistent with profit maximization on the dimensions of environmental and social performance, shedding new light on conditions when firms may continue to invest in CSP to extend a leadership position — supporting the notion that

many firms perceive opportunities to “do well by doing good” (Margolis et al., 2009; Orlitzky et al., 2003) or “pay to be green” (King and Lenox, 2001; Ambec and Lanoie, 2008) — and highlighting the knowledge that CSP is a complex, multi-dimensional construct that warrants strategic consideration along areas of performance most relevant to a firm’s particular context.

We use a modified model of aspiration levels (adding to a healthy debate over model specifications; see Washburn and Bromiley 2012 and Bromiley and Harris 2014) that assumes peer effects (i.e. social comparisons) are more relevant than historical targets, and note that such a model is roughly consistent with peer effects models commonly used throughout economics and finance literatures. We employ a unique identification strategy to address the problem of simultaneity encountered in models with the same variable on both sides of the regression equation, taking advantage of unique characteristics of a recent innovation in industry classification and recently developed econometric techniques involving identification of “excluded peers”.

The contributions of this study are fourfold: first, the study proposes and empirically demonstrates a new theoretical framework for the analysis of firm strategic motivations using the concept of peer effects as a lens through which to observe strategic behavior. Applied here to the context of strategic motivations for CSP, the framework may be generalized to other areas of strategic management. Second, the study demonstrates the importance of thoughtful selection of peer groups relevant to the strategic context under study. While recent studies have begun to highlight the importance of more precise peer group definition (Fracassi, 2016; Husted et al., 2016; Marquis and Tilcsik, 2016; Kaustia and Rantala, 2015), the theoretical framework and results presented in this study provide compelling evidence for the practice of peer group selection on strategy-relevant characteristics. Third, the study highlights the importance of more thoughtful characterization of CSP along individual dimensions or initiatives, in the spirit of Rowley and Berman (2000). Finally, the study synthesizes and applies two recent empirical innovations from disparate literatures to address and overcome the problem of endo-

geneity bias present in any model that includes explanatory variables based on averages of a peer group or social network.

The study also opens avenues of future research; the theoretical and empirical foundations established herein may be augmented through utilization of finer dimensional constructs of CSP, more precise time series data, or an expanded sample of firms. The general framework presented here may also be applied to other concepts in strategic management where definition of relevant peer groups is fundamental to understanding firm behavior.

Chapter 6

Unmasking Symbolic Management

Evidence from Voluntary Corporate Carbon Disclosures

with Jessica Perkins

Abstract

Information intermediaries have emerged as credible institutions for voluntary corporate disclosures of non-financial performance. However, research suggests that these mechanisms do not always lead to corresponding improvements in substantive performance or transparency. This study extends new theory of voluntary disclosure intermediaries and their explicit endorsements of firm performance as “credibility shields” that can serve to deflect stakeholder scrutiny. Using forensic analysis of detailed corporate disclosures made to one such prominent intermediary, we develop measures of symbolic management and motivation to attain intermediary endorsement to empirically test the theory. Results suggest that intermediary endorsement of firm performance disclosures often fails to distinguish between symbolic or substantive management. The study contributes to our understanding of symbolic management and provides guidance for improved design of corporate voluntary disclosure institutions.

6.1 Introduction

As both investor and stakeholder demand for information on non-financial aspects of corporate policies and performance has increased, more firms engage in voluntary disclosure of information.¹ However, this increase in disclosure is often viewed with skepticism as just another channel of public relations management (Laufer, 2003). Voluntary disclosure intermediaries have emerged as institutional mechanisms to increase transparency in discretionary corporate reporting. The promise of such third party information intermediaries lies in their potential to drive substantive improvements in both transparency and performance along dimensions of public interest, both through specification of standardized information disclosure guidelines and via application of coercive and normative pressures (Delmas and Toffel, 2004). The intermediary then gains credibility through the effectiveness of its mechanism (as perceived by relevant stakeholders) and network effects of its adoption by firms.

However, extant literature suggests that such intermediaries often fail to generate improved performance among adopters along dimensions specifically targeted by the program.² If intermediaries are not effective at improving performance, one may question whether true transparency is being achieved. Third party voluntary disclosure intermediaries typically dictate a fixed format for information disclosure in the mold of financial reporting standards in an effort to reduce opportunity for exaggeration and obfuscation. Such reporting structure may serve investors and other stakeholders by setting common information disclosure standards across firms and unbiased aggregation by a neutral arbiter, but may also inadvertently create new incentives for firms to misrepresent reported data in ways that mislead investors and other stakeholders as to the true performance. Whereas evidence of symbolic disclosure (e.g.

¹For example, the proportion of firms listed in the S&P500 index to publish a corporate sustainability report increased from roughly 20% in 2011 to more than 80% in 2015 (Governance & Accountability Institute, 2016).

²Examples include the US DoE 1605(b) greenhouse gas disclosure program (Kim and Lyon, 2011b), the Dow Jones Sustainability Index (Cho et al., 2012), CDP (Matisoff, 2013), and the Global Reporting Initiative (Milne and Gray, 2013).

earnings management) abounds within both mandatory and voluntary reporting mechanisms (Healy and Wahlen, 1999; Healy and Palepu, 2001), we have relatively limited understanding of strategic behavior by firms to manipulate third-party voluntary disclosure intermediaries.³ Yet the implicit assumption that ratings are valid gives incentive to firms to exercise symbolic management (Chatterji et al., 2016), particularly when they have sufficient information and attentiveness to the methodology used to construct ratings.

An understanding of strategic motivations over content of disclosure requires multiple theoretical lenses (Hahn et al., 2015); we consider the role of stakeholder legitimacy, symbolic management / decoupling, and economic theory in constructing a theory of voluntary disclosure evaluators — those that issue subjective performance ratings — as external sources of credibility that shield firms from stakeholder scrutiny. We theorize that voluntary disclosure evaluators have emerged to satisfy demand for material disclosures to reduce information asymmetry; those firms with strong strategic motivation to enhance the credibility of disclosures among stakeholders seek the evaluator's endorsement, and stakeholders seek to reliably identify firms making substantive performance improvements on dimensions of concern. However, the credibility developed by such evaluators over time carries the possibility of perverse incentives as opportunistic firms seek to leverage endorsements to enhance stakeholder perceptions of performance without material improvement (Westphal and Zajac, 1994).

Building from this new theoretical context, we find empirical evidence that firms respond to those incentives and engage in undetected symbolic disclosure through third-party evaluators. Symbolic disclosure may be pervasive considering that intermediated voluntary disclosures face heterogeneous and often lower standards of verification and audit (Gürtürk and Hahn, 2016). We also find that a prominent means of signaling substantive performance (third-party assurance) sometimes predicts substantive disclosure (see Bagnoli and Watts, 2017), but that

³Delmas and Montes-Sancho (2010) find late joiners to voluntary agreements tend to make more symbolic gestures; Kim and Lyon (2011b) find evidence of selective disclosure in voluntary government programs; Fabrizio and Kim (2016) find that lower performing firms tend to use more obfuscatory language in their disclosures.

evaluators often fail to recognize the value-relevant information contained in those signals. Whereas prior research on symbolic voluntary disclosure has relied on limited subsets of firms with available data on actual performance (Kim and Lyon, 2011b; Delmas and Montes-Sancho, 2010), this study takes a novel approach. Using data from a well known voluntary disclosure intermediary, CDP (previously the Carbon Disclosure Project), we perform detailed analysis of microdata embedded in individual firm disclosures and identify patterns in the data that are consistent with symbolic disclosure. Our approach is unique among a substantial literature exploring CDP disclosures; rather than focus on the binary decision to disclose or not (e.g., Lewis et al., 2014; Reid and Toffel, 2009), we take a deep dive into the content of disclosures and CDP's scoring methodology, evaluate the effect of CDP performance rank scores, and consider disclosure data over a period of several years, taking advantage of small perturbations in disclosure format and scoring for identification purposes. From this detailed analysis we develop and validate measures of symbolic disclosure as well as overall motivation to obtain CDP's explicit endorsement. This study joins a small subset of literature that identifies symbolic disclosure (see Fabrizio and Kim, 2016; Kim and Lyon, 2011b) and examines the effect of sustainability rankings on firm behavior (see Chatterji and Toffel, 2010).

This study makes several contributions to knowledge of symbolic management in voluntary corporate disclosures. First, we synthesize disparate theory of voluntary disclosure and introduce new theory of intermediaries as "credibility shields" to improve stakeholder management. This theory also describes the motivation for firms to attain higher levels of endorsement beyond minimal disclosure, and to signal that motivation using different levels of assurance. Second, we apply rigorous quantitative analysis of detailed individual firm disclosures to CDP and develop empirical measures of both this motivation for endorsement and symbolic management. Our analytic results provide new empirical evidence both of symbolic management through voluntary disclosure intermediaries and of the use of different quality levels of third-party assurance by firms to either signal substantive management or provide additional external

credibility for symbolic management. The study offers practical guidance both for design of disclosure institutions and methods and for investors and other stakeholders that make use of endorsements that may help reduce the incidence of symbolic management and its resulting inefficiencies.

6.2 Theory

6.2.1 Legitimacy, credibility, and voluntary disclosure

Stakeholders⁴ increasingly demand higher levels of corporate transparency and performance along non-financial dimensions of stakeholder-specific or broader societal interest. In turn, firms seek to establish legitimacy — a general societal perception that firm actions are desirable or appropriate (Suchman, 1995) — in the eyes of stakeholders. Obtaining and managing legitimacy can serve as an operational resource that firms develop in strategic contexts (Dowling and Pfeffer, 1975; Ashforth and Gibbs, 1990) to enable competitive advantage and other private benefits. By communicating information about performance of societally desirable activities, firms continually engage in a *process* of legitimation to influence stakeholder perceptions in an effort to achieve the *property* of legitimacy (Suddaby et al., 2017). Whereas the property of legitimacy is often characterized as an intangible asset or strategic resource possessed by a firm, theory on the process of legitimation suggests that this resource is fleeting and must be cultivated and maintained through a continual interaction between firms and social actors (Suddaby et al., 2017).

Firms generally attempt to exercise control over the process of legitimation through either substantive or symbolic management (Ashforth and Gibbs, 1990). Substantive management consists of material change in corporate policies and practices that leads to direct improve-

⁴In this paper we refer to stakeholders in the broad sense of Donaldson and Preston (1995): “groups with legitimate interests in procedural and/or substantive aspects of corporate activity”.

ment in performance desired by stakeholders. Symbolic management involves creating the perception of desirable practices or performance without substantively implementing them; a symbolically managed firm effectively decouples its formal structure and public image from its internal functions and processes (Meyer and Rowan, 1977). Symbolic management is often (perhaps naively) perceived favorably by stakeholders (Westphal and Zajac, 1998) and thus offers firms an opportunity to reap the benefits of legitimacy at lower cost than under substantive management (Delmas and Montes-Sancho, 2010). However, the practice of symbolic management carries significant risk of backfire if perceived by stakeholders as misleading or illegitimate (Ashforth and Gibbs, 1990), especially when stakeholder scrutiny is high (Marquis et al., 2016). While such scrutiny often motivates firm efforts toward substantive management, some firms may instead seek external validation of symbolic structures to reduce risk associated with this “double-edge” of legitimation.

The notion of legitimacy also suggests that firms tend to satisfice, or seek to do the minimum required actions to achieve the desired outcome and no further (Bansal and Roth, 2000). However, given the dynamic interplay between firms and stakeholders over expectations, disclosures, and perceptions, firms may be motivated to go beyond the mere minimum and establish greater credibility of their activities with stakeholders, regardless of whether symbolic or substantive management predominates. Legitimacy as a source of credibility is conceptually distinct from continuity or persistence (Suchman, 1995), and firms obtaining credible external accounts of their activities are less subject to risk of stakeholder sanction (Meyer and Rowan, 1977). Furthermore, to establish and maintain credibility firms must seek active engagement in support of stakeholder demands, in contrast to the passive support required in domains with low thresholds of legitimation (Suchman, 1995). A parallel literature on “social license to operate” suggests a hierarchy of stakeholder perceptions whereby firms can move from tacit acceptance to explicit approval among stakeholders by enhancing credibility of their actions (Gehman et al., 2017). We consider credibility as a differentiating factor, akin to reputation

or status, that enables stakeholders to separate and rank the perceived performance of individual actors relative to others that share in the legitimacy bestowed by virtue of common group membership (Bitektine, 2011).

Voluntary disclosure of performance metrics important to influential stakeholders is a primary manner in which firms engage in the process of legitimation (Patten, 1991). While increased disclosure provides perceived transparency, this does not necessarily translate to improved performance (Aragón-Correa et al., 2016). Lack of formal standards and audited disclosures create incentives for symbolic management (Healy and Palepu, 2001), often realized as selective disclosure of “good news” and withholding of “bad news” (Milgrom, 1981). Stakeholders are generally aware of this information asymmetry problem (Verrecchia, 1983) and may deter symbolic management by providing a credible threat of audit and corresponding sanction. However, as an unintended consequence of this deterrent, firms employing substantive management may under-disclose positive performance to avoid unwanted scrutiny of its claims. Furthermore, middle-performing firms — often those with greatest uncertainty over their true performance — are more likely to engage in selective disclosure (Lyon and Maxwell, 2011). An outcome is that firms whose actual performance is more difficult to ascertain may stand to benefit the most from engaging in symbolic management; if the perceived risks of external audit are low, the expected value of symbolic management increases. Stakeholders (including investors) want to provide resources to firms with substantive management, and demand a source of credible disclosures to reduce proprietary costs in verifying claims of individual firms. Meanwhile, substantively managed firms seek improved disclosure credibility to receive credit for higher performance.

This unsatisfied, two-sided demand for credible disclosures creates opportunity for third-party actors to reduce information asymmetry (Nayyar, 1990). Stakeholders tend to place higher value on credibility of disclosure content than on mere conformance, particularly when quality of disclosure or performance is more tangible (i.e. when a formal evaluation of firm

disclosure is available) (Philippe and Durand, 2011). Where proprietary firm performance disclosures are insufficient to obtain or enhance credibility, positive third-party assessments of performance may add substantial credibility (Elsbach and Sutton, 1992). When stakeholders perceive the evaluative capabilities of the third-party to be high, they associate a stronger third-party endorsement with higher perceived firm quality on relevant dimensions of performance (Stuart et al., 1999). Furthermore, higher credibility of authoritative endorsements may influence stakeholders to rely on those evaluations (Tost, 2011) in place of their own proprietary analysis. By obtaining the explicit endorsement of credible third parties for voluntary disclosures, motivated firms may improve not only the stability of their legitimacy status, but also move toward credibility of disclosures that can reduce risk of future sanction and free up resources for other productive pursuits (Bitektine and Haack, 2015).

6.2.2 Voluntary Disclosure Evaluators

Increasing demand for credibility in voluntary disclosures has led to the emergence of a variety of information intermediaries. Our theory addresses a specific type of intermediary that we term voluntary disclosure evaluators (VDEs). We define a VDE as a distinct type of voluntary disclosure intermediary generally characterized by its systematic collection of issue-specific information directly from firms and subsequent analysis, aggregation, and dissemination of consolidated information in a fixed framework to the general public or subscribers.⁵ Importantly, VDEs are distinguished from other, passive voluntary disclosure intermediaries by virtue of their explicit use of consolidated ratings to enable direct comparison between firms using a single, aggregate metric.⁶ VDEs are further distinguished from other ratings schemes

⁵Examples of VDEs include CDP (the subject of this study), the Dow Jones Sustainability Indices (DJSI), and FTSE4Good Indices.

⁶Other voluntary disclosure intermediaries that do not aggregate disclosure data or assign ratings include the Global Reporting Initiative (GRI) or the Sustainability Accounting Standards Board (SASB). CDP is unique in that it was formerly a strict information intermediary and only recently did it begin to issue ratings.

by virtue of their sole reliance on direct firm disclosures instead of other publicly available information sources. By setting a fixed disclosure framework, VDE mechanisms limit the amount of discretion in reporting available to firms, which theoretically reduces firms' ability to misrepresent performance (Fishman and Hagerty, 1990) and in turn lends perceived credibility to the quality of disclosed information. By relying on firm-provided data, VDEs seek to provide opportunity for firms with substantive management to harness that institutional credibility to distinguish themselves from lower performing firms and improve reputation among stakeholder groups. A VDE's proprietary evaluation of firm disclosures — its rating — thus becomes an effective endorsement with potential to serve the demand from both firms and stakeholder groups for credible voluntary disclosure.

VDEs themselves must first achieve legitimacy (in order to survive) and then credibility (in order to thrive). A VDE may gain legitimacy by virtue of its own transparency regarding the stakeholder groups and interests it represents and how it evaluates information disclosures from firms. Unbiased and transparent assessment of firm disclosures enables a VDE to establish legitimacy as a decentralized institution (King et al., 2005). A successful VDE achieves credibility by harnessing network effects generated through its normative and coercive influence (Reid and Toffel, 2009; Delmas and Toffel, 2008); an outcome of achieving credibility is that stakeholders place implicit trust in formal VDE endorsements. The VDE endorsement becomes its key value proposition to stakeholders; by processing large amounts of information to arrive at a simple output metric that is easily digested by users (i.e., inclusion on an index or a performance rating), the VDE effectively serves as a provider of information processing services.

By bearing information processing costs and establishing credibility, VDEs allow stakeholders to gravitate towards a simple endorsement or interpretable metric rather than scrutinize the complex, underlying data through costly proprietary analysis (Lyon and Shimshack, 2015b). Accordingly, once a firm makes the decision to disclose, it faces powerful incentives

to improve its rating in order to enhance stakeholder perceptions of performance (Chatterji and Toffel, 2010; Stern and James, 2016) regardless of whether the firm employs substantive or symbolic management to do so. Achieving VDE endorsement confers credibility on a firm's disclosure, differentiating the firm from similar others that merely seek to legitimate through proprietary disclosure without VDE endorsement. A firm can thus expend less proprietary effort to convince stakeholders of substantive performance (and reduce risk of sanction) by obtaining the endorsement. Increased transparency and enhanced stakeholder engagement can lead to improved access to finance and other market benefits (Cheng et al., 2014). Different firms approach disclosure through VDEs with different strategic objectives and are thus heterogeneous in terms of motivation for endorsement. Given the transparency of VDE assessment methodologies, firms with stronger strategic motivation to gain VDE endorsement will be more attentive to the assessment methodology. Firms that are more attentive to the methodology will have a clearer view of the implications of their disclosure, are expected to achieve a higher level of endorsement (i.e. rating).

Hypothesis 1: Firms with stronger attentiveness to VDE methodology will achieve a higher level of VDE endorsement.

According to Hypothesis 1, any firm attentive to the VDE rating methodology may achieve a higher rating, regardless of whether symbolically or substantively managed. Substantively managed firms may wish to get credit for (and improve the credibility of) their efforts to meet stakeholder expectations. Symbolically managed firms have incentive to obtain a higher level of endorsement to effectively shield disclosures from stakeholder scrutiny. To maintain credibility with stakeholders, VDE schemes need to include sufficient safeguards to prevent manipulation by symbolically managed firms (Kim and Lyon, 2011b). Transparency in evaluation methodology allows symbolic firms clear instructions on how to optimize the VDE rating.⁷

⁷Anecdotally, the authors have perused several websites of small consulting firms specializing in CDP questionnaire response preparation. For example, one firm's website claimed "Our expert team of data managers, CDP analysts and project managers can complete your entire response for you."; another stated "With our experience

For example, in regulated financial reporting, firms may still have leeway within the bounds of fixed protocols to provide misleading information (Healy and Wahlen, 1999); while the rules of disclosure are clear, some discretion in reporting is allowed. To limit opportunity for firms to provide misleading information regarding true performance, VDEs may limit the discretion available to firms (Fishman and Hagerty, 1990). Research indicates that firms may use obfuscating text in efforts to improve VDE endorsement, but strict disclosure content guidelines limits the degree to which those efforts lead to higher levels of endorsement (Fabrizio and Kim, 2016).

However, a distinguishing feature of VDEs is the lack of formal audit mechanism to enforce accuracy and reliability of disclosures. Sophisticated firms, armed with a detailed methodology for maximizing level of VDE endorsement, adeptly find loopholes to manipulate disclosure requirements to improve perceptions of performance and reduce probability of detection (Healy and Wahlen, 1999). When probability of detection is low, information asymmetry provides firm incentives to disclose but insufficient incentives to disclose truthfully or completely (Bagnoli and Watts, 2017; Kim and Lyon, 2011b). The lack of formal audit or review over disclosures suggests that firms may act strategically to improve their level of VDE endorsement through symbolic management.

Hypothesis 2: Symbolic disclosures through a VDE will achieve the same level of VDE endorsement as substantive disclosures, all else equal.

6.2.3 Assurance

Successful communications strategies tend to employ multiple channels; firms motivated to achieve credibility among stakeholders for voluntary disclosures will likewise employ multiple signals. One prominent signaling strategy available to firms is to obtain third-party assurance

of text management, and knowledge of sustainability ratings, we are certain we are able to improve our clients report (sic).”

of claims. Assurance is a formal, independent assessment by a certified agent of whether sufficient appropriate evidence has been presented to assure (to an approximate level) an entity is in material compliance with a given set of guidelines or requirements. The level of assurance granted is generally classified as either “reasonable” or “limited”. Reasonable assurance expresses a relatively high level of confidence in compliance of the entity being assessed and thus dictates a more rigorous (and costly) investigation, often associated with a formal audit. Limited assurance expresses a more moderate level of confidence, is less costly, and is associated with less rigorous investigation.

Assurance is more commonly obtained by firms operating in markets with higher stakeholder orientation and the presence of strong institutional mechanisms governing sustainable corporate practices (Kolk and Perego, 2010). Assurance is generally provided by any one of myriad agents certified to assess compliance with the particular guidelines set forth by a regulatory or extra-regulatory body; great variability exists between assurance practitioners and associated practices (Perego and Kolk, 2012). Whereas obtaining assurance is generally associated with rigor and accuracy (Hummel and Schlick, 2016), assurers are often not trained in the auditing profession and conflicts of interest raise doubt regarding the overall reliability and credibility of assurance certificates for corporate sustainability claims (Boiral and Gendron, 2011; Gürtürk and Hahn, 2016).

While scholars have reason to doubt the legitimacy of a randomly drawn assurance report, their increasing prevalence is an indicator that firms and stakeholders view them in a positive light (Gürtürk and Hahn, 2016). Assurance is generally sought by firms with substantive management to send a signal of quality (Bagnoli and Watts, 2017), and thus might be expected to correspond with a higher level of endorsement by a VDE. However, assurance can be obtained through symbolic management as well; since assurance is a public signal and symbolic management is meant to be concealed, symbolic firms obtaining assurance may also achieve higher endorsement. A firm that obtains assurance is more likely to be motivated to signal credibility

of its disclosure to external stakeholders, regardless of whether they are engaged in substantive or symbolic management. Therefore, assurance is likely to have a significant moderating effect on the relationship of motivation to VDE endorsement. Different levels of assurance may be associated with different levels of rigor taken in the assurance process, though the level of assurance obtained is not likely to be associated with a firm's ability or motivation to achieve a higher level of VDE endorsement. If the level of assurance adds information about a firm's proclivity for substantive management, its effect will be overshadowed by the motivation to achieve endorsement.

Hypothesis 3a: Limited assurance of performance claims will positively moderate the relationship between attentiveness and VDE endorsement.

Hypothesis 3b: Reasonable assurance of performance claims will positively moderate the relationship between attentiveness and VDE endorsement, but not more so than limited assurance.

While the obtainment of any level of assurance may be a positive indicator of the motivation to achieve higher VDE endorsement, the specific level of assurance obtained may present a useful signal of substantive management. While assurance in general is subject to manipulation (Boiral and Gendron, 2011), a significant majority of firms obtaining assurance of voluntary disclosures choose to obtain limited assurance instead of the more costly and rigorous reasonable assurance (Gürtürk and Hahn, 2016). These findings suggest that limited assurance is more easily obtained by firms exercising symbolic management. Bagnoli and Watts (2017) present a formal economic model of the decision to obtain assurance and conclude that firms with substantive management have a stronger incentive to obtain a higher level of assurance and thus select a separating equilibrium that signals differentiation from symbolic types. Therefore, we propose that firms obtaining reasonable assurance are less likely to engage in symbolic management. Moreover, whereas Bagnoli and Watts (2017) do not predict a pooling equilibrium in which firms of both types (substantive and symbolic) obtain assurance, practical observa-

tions indicate that limited assurance has value to both types under a variety of circumstances (Boiral and Gendron, 2011); thus we expect limited assurance will not distinguish symbolic from substantive management.

Hypothesis 4a: Firms that obtain limited assurance of performance disclosures are neither more nor less likely to engage in symbolic management through a VDE.

Hypothesis 4b: Firms that obtain reasonable assurance of performance disclosures are less likely to engage in symbolic management through a VDE.

Figure 6.1 summarizes the hypothesized relationships in a path model.

6.3 Empirical Setting

To test these hypotheses, we analyze voluntary corporate disclosures made through CDP, a prominent VDE. CDP is a private, not-for-profit organization founded in 2002 (originally called the Carbon Disclosure Project) with the backing of multiple institutional investors that seeks to influence corporations to make voluntary disclosure of performance and risks related to climate change.⁸ Greenhouse gas (GHG) emissions and carbon risk management are increasingly relevant to investors, as they weigh the long term risks and opportunities faced by

⁸In recent years, CDP has added disclosure programs in other domains of environmental impact, including water (in 2010) and forests (in 2013).

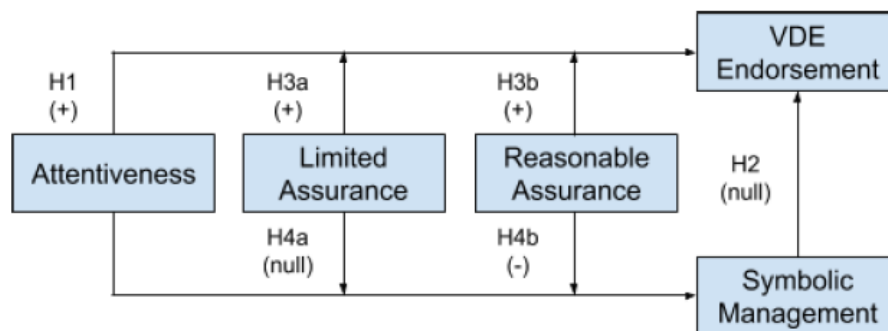


Figure 6.1: Theoretical model

firms as both natural systems and international regulatory response adjusts to climate change. CDP is perhaps the preeminent intermediary in this domain and has established substantial institutional credibility since its inception.⁹ The number of firms responding to CDP questionnaires has increased substantially over the past 12 years, as have the number of institutional investor signatories supporting the CDP mission (see Figure 6.2), which lends it substantial normative and coercive influence (Reid and Toffel, 2009).

A key factor in CDP's success is its specification of a standard disclosure format. Since 2003, CDP has annually distributed questionnaires to the largest publicly traded global firms.¹⁰ These questionnaires consist of a series of questions to which a firm responds by variably (a) selecting a discrete choice from a drop-down menu, (b) entering numerical data, (c) providing a detailed free text response to describe a policy or strategy, or (d) attaching relevant documents prepared for other purposes (e.g. corporate sustainability report, third-party assurance certificate, etc). Questions are organized into topical categories, such as Governance, Strategy, Risk Management, and Emissions Performance. While firms have the option of responding to any given question or not, each response (or set of related responses) may be directly compared to those of other firms on a standalone basis. Each year CDP collects both solicited and unsolicited responses, analyzes the data, and publishes a series of regional and sectoral reports based on the content of disclosures made by firms. While CDP makes publicly available the raw, individual questionnaire responses,¹¹ the primary vehicle for communicating the data is through these formal CDP reports.

⁹A 2013 study by GlobeScan found CDP to be the "most credible" source of sustainability rankings according to surveys of a cross-section of experts from corporate, government, NGO, academic, and consulting domains. A parallel study found CDP the second most commonly used source of sustainability rankings by institutional investors, after the Dow Jones Sustainability Indices (DJSI).

¹⁰In 2003 CDP targeted listed firms of the S&P 500 index of largest United States listed firms and Global 500 index of largest listed firms around the world. Since then, CDP has distributed questionnaires to a larger set of global firms, and also collects unsolicited disclosures from smaller firms.

¹¹Firms have the option of requesting their response not be publicly released; CDP notes those firms that have done so in its reports. With respect to public access, users have free access only to a limited number of disclosures; full access is available through a paid subscription.

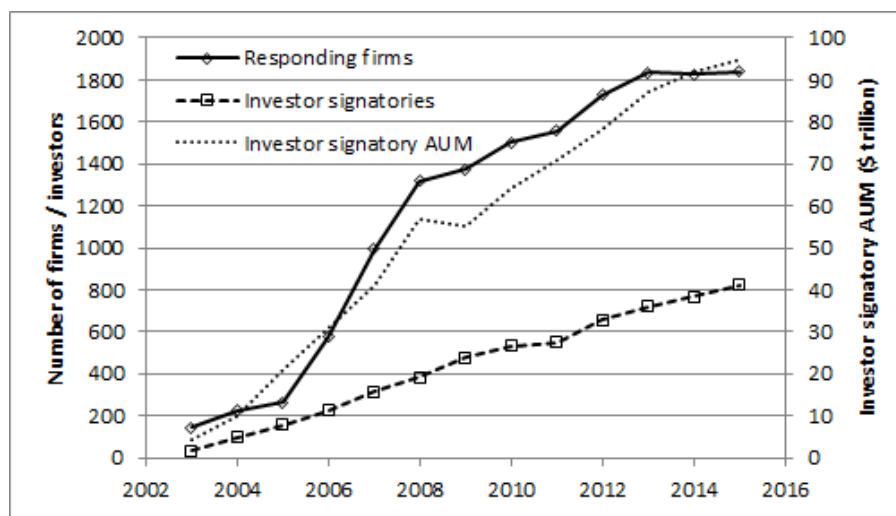


Figure 6.2: Corporate disclosures and investor signatories to CDP

In early report years, in addition to aggregate analysis of disclosure data and select case studies, CDP mainly reported the disclosed emissions levels of responding firms. Starting in 2010, as the CDP questionnaire grew more lengthy and complex, CDP developed and compiled two separate quantitative ratings for each firm based on (1) completeness of disclosure and (2) overall emissions management performance.¹² The Carbon Disclosure Leadership Index, or CDLI, is a numerical score on a 0–100 scale that ranks firms on overall transparency. The Carbon Performance Leadership Index, or CPLI, is a categorical rank score that places firms in one of six performance bands (A, A-, B, C, D, E) based on CDP’s assessment of overall emissions management. Importantly, CDP provides firms with a detailed description of its scoring methodology for both CDLI and CPLI in advance, so that attentive respondents can estimate with confidence the manner in which their individual responses will be scored.

Within the scoring methodology, various numbers of points are awarded for providing different types of information. For each questionnaire item, CDP assigns both a numerator score (the individual score for the item) and a denominator score (the maximum possible points for

¹²N.B. CDP has substantially overhauled its scoring methodology beginning in 2016. As of May 2018, CDP no longer hosts a copy of the 2015 scoring methodology document on its public website.

the item), wherein the denominator score for a given item may take different values depending on the response to a previous item (note that many items have a denominator score of zero, indicating that those items are not considered in computing the overall score). For both CDLI and CPLI, each firm's score is the sum of all numerator scores divided by the sum of all denominator scores. The CPLI performance bands are set by CDP based on the overall distribution of tabulated scores.

Based on our analysis of CDP scoring methodology, there are three general criteria by which CDP assigns points (for both CDLI and CPLI) based on individual questionnaire responses. The first criterion is by awarding a set number of points based on whether a respondent selected a specific option or series of options from discrete choice drop-down menus, or entered numerical data upon request. These provide a convenient way for a dispassionate observer to objectively analyze and compare disclosures between companies. A second criterion is by awarding points based on whether a free text response meets a number of clearly specified criteria. While difficult to analyze quantitatively, CDP employs teams of analysts who review these responses and assign scores based on how well the text response meets those criteria.¹³ Other recent research has analyzed these free text responses for evidence of obfuscatory intent, which is one potential measure of symbolic management (Fabrizio and Kim, 2016). The third criterion is by awarding points based on the content of an uploaded document and how well it meets the clearly specified criteria. Many of the questionnaire items request corporate information that is often proprietary and may not be accessible or otherwise verifiable through other public disclosures. In this way, CDP offers a compelling advantage over other types of ratings in that it is able to obtain (and make public) potentially proprietary information from a broad range of firms that may not otherwise be disclosed. A downside of this information is that it may often not be objectively verifiable from other third-party information intermediaries. Users of the data thus rely on the accuracy of self-reported information and must be wary of

¹³CDP does not provide access to its raw, itemized scores.

incentives created that may influence firms to respond in a particular way.

6.4 Data and Measures

We address the extent to which firms engage in symbolic management through detailed analysis of microdata contained within individual CDP questionnaire responses. This analysis yields several novel measures that enable a test of the degree to which symbolic disclosure is detected by CDP (hypothesis 2), as well as a test for the degree to which other disclosure signals sent by firms reliably indicate substantive management (hypotheses 3 and 4). Note that with our sample we are unable to directly estimate the effectiveness of CDP scoring methodology on emissions performance, as actual emissions figures are all self-reported and most firms in the sample are not subject to regulated emissions measurement and disclosure (see Matisoff, 2013, for an analysis of CDP's effectiveness at driving improved GHG emissions performance). We use CDP scores and detailed disclosures from years 2011-2015, which contain 8514 unique firm-year observations from 2087 individual firms.

6.4.1 VDE endorsement

Our dependent variable measure of VDE endorsement is CDP's Carbon Performance Leadership Index rating, or *CPLI*. We assign an ordinal scale to CDP's letter grade performance bands, where "A" equals 6 and "E" equals 1 (CDP includes a grade of "A-" which we score as 5). Characterization of the *CPLI* performance band score as explicit endorsement is appropriate; the CDP actively promotes the firms scoring "A" each year as members of its "A-list": those companies that are best "measuring, verifying, and managing their carbon footprints" (CDP, 2015).

6.4.2 Motivation for endorsement

To understand a firm's motivations to obtain a higher CPLI score, we require a measure of general competence and higher attentiveness to the finer details of the scoring methodology. A firm that is highly motivated to achieve a high CPLI score will be more attentive to the content and incentives set forth in the CDP scoring methodology. We therefore define *Attentiveness* as the ratio of points awarded (or otherwise enabled; see below) through simple drop-down and quantitative input questionnaire items to the maximum number of points achievable for those items. A higher *Attentiveness* score signals that a firm is not only more aware of the implications of certain questionnaire responses on its CPLI score but also more motivated to increase its score.

The CDP questionnaire and scoring methodology offers firms the opportunity to score CPLI numerator points by simply selecting a certain choice (or combination of choices) from drop-down menu discrete choice questionnaire items. By selecting the appropriate response choice as indicated by the CDP scoring methodology document, firms are either directly awarded points or gain eligibility to receive points on a corresponding text response to a subsequent question. If the appropriate choice is not selected, firms automatically receive zero points regardless of what is contained in the corresponding text response. Whereas we do not subjectively code subsequent text responses for potential points, firms signal intent to obtain these points by selecting the appropriate discrete choice response. For purposes of analysis, we assign an indicator variable with value 1 for each such response made by a given firm in a given year, and value 0 for any such response that ensures zero CPLI points awarded by CDP. We then weight those indicators by the number of eligible CPLI denominator points enabled by the appropriate drop-down menu selection. The variable *Attentiveness* is then coded as the total eligible CPLI points divided by the maximum number of points possible (i.e. if all such indicators were scored 1) in a given year; thus *Attentiveness* of 1 indicates that a firm has scored the

maximum number of points possible for these questions in a given disclosure year. A firm that demonstrates higher attentiveness is both more motivated to achieve a higher CPLI and more aware of the effects an individual questionnaire response has on its CPLI. Figure 6.3 shows the simple correlative relationship of *Attentiveness* to *CPLI*. Note that this relationship effectively describes the path from “Attentiveness” to “VDE Endorsement” in the theoretical model described by Figure 6.1 earlier.

To aid with intuition on the concept of attentiveness as a measure of both motivation and competence, consider that CDP made minor changes in its scoring methodology each year during the study period in order to add or remove emphasis from various aspects of firm disclosure and performance on aggregate scores. As the questionnaire content remained fairly consistent throughout the study period, most such changes involved updates to the number of CPLI points awarded for various responses. We consider such inter-year scoring changes as exogenous “shocks” that influence firm behavior. However, firms that change their response to a particular disclosure question when CDP changes the number of performance points awarded for a target response to the question may or may not be directly responding to the scoring incentive. In order to identify whether response changes are influenced by the scoring change or some other, unobserved factor, we can compare the propensity to change response relative to some comparable “control” question. This yields a quasi-experimental method for identifying attentiveness to changes in the scoring methodology.

As an example, Figure 6.4 shows the results of a quasi-experiment on the change in CPLI points awarded from 2014 to 2015 for having a C-level executive or board member sign off on the firm’s CDP questionnaire response. The solid line shows that the proportion of respondents claiming this governance measure more than doubled after CDP awarded CPLI points for doing so in 2015. To check for exogeneity of this effect, a control question (“*Where is the highest level of direct responsibility for climate change within your organization?*”) that had no change in scoring is shown by a dashed line; almost no change in aggregate response to this question

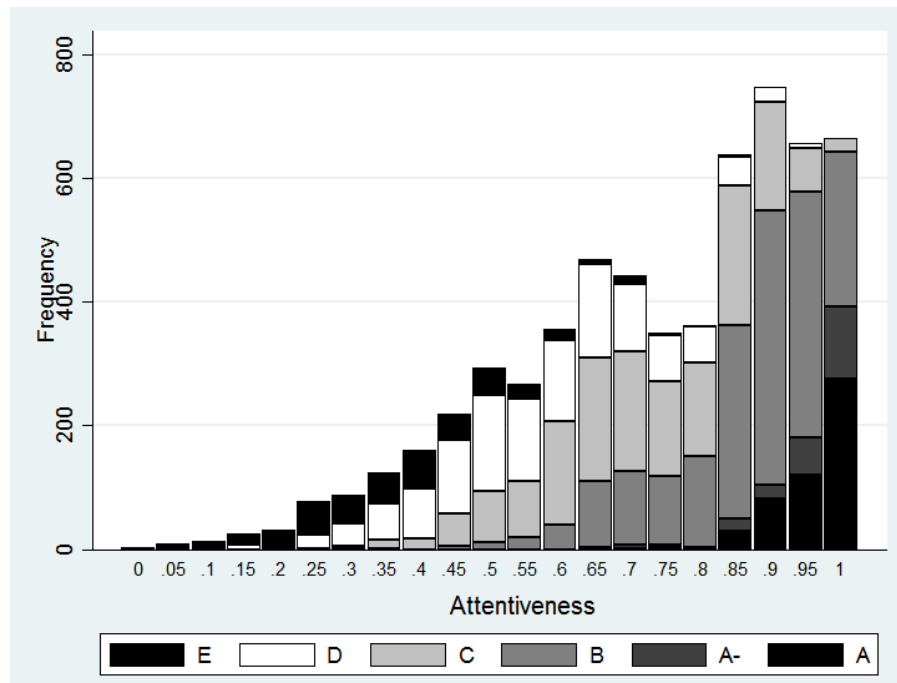


Figure 6.3: Stacked histogram of CPLI performance bands by attentiveness

was observed in the same time frame. Though not a true experiment (no random assignment, all subjects receive treatment), an equivalent “treatment effect” of roughly 140 percent presents compelling evidence of attentiveness to scoring methodology. Importantly, *Attentiveness* is neither a signal of substantive nor symbolic management; a more specific measure of symbolic management is thus required.

6.4.3 Symbolic management

The CDP questionnaire format and performance scoring methodology was fairly consistent over the years sampled (2011–2015), which motivates a novel approach to identification of symbolic management. Firms that are willing to indicate compliance with target performance along some measure of interest (as specified by CDP scoring methodology), without engaging in costly measures to actually achieve that performance, are engaging in symbolic management. We focus on firm disclosure responses to discrete choice drop-down menu questionnaire

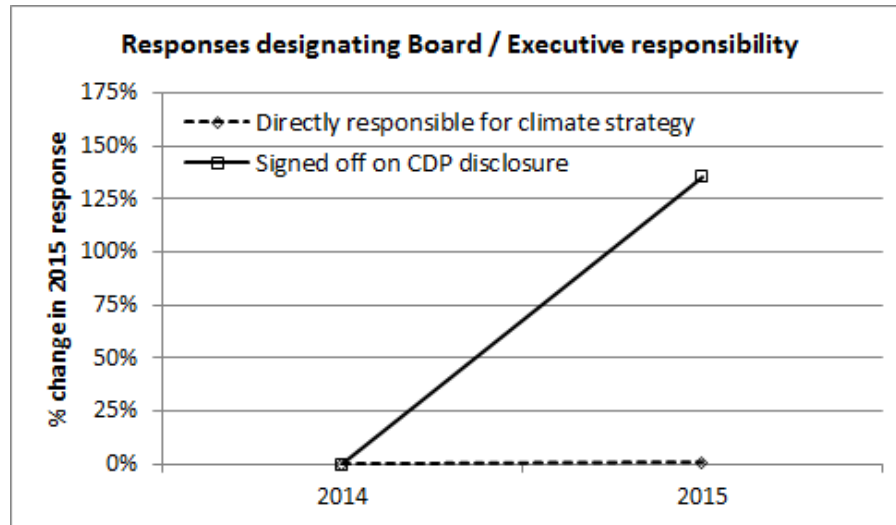


Figure 6.4: Quasi-experiment demonstrating attentiveness to changes in scoring method

items. The premise behind this approach is that such information disclosures require no special preparation and are often difficult to verify externally. Such discrete choice questionnaire items thus represent low-hanging fruit for firms seeking to improve scores and willing to tolerate the risk that symbolic disclosure might be detected by a third party. One way to establish presence of symbolic management is to identify internal inconsistencies within a firm's disclosure that directly benefit its score, either in the current year or comparing across years.

We define *Inconsistency* as some aspect of a firm's CDP disclosure in a given year that contradicts information disclosed by the same firm in the prior year. The nature of most questionnaire items allows for firms to improve their score over the previous year by implementing policies or practices that are rewarded by the CDP scoring methodology. However, each year CDP offers three specific opportunities for firms to score CPLI points in a way that may contradict previously disclosed information: reporting of absolute GHG emissions, revenue intensity of emissions (i.e. emissions per unit revenue), and employment intensity of emissions. Firms score CPLI points in a given year if they claim a decrease in emissions relative to the previous year specifically due to "emissions reduction activities", but are not requested to report their

previous year emissions. We exploit the panel data structure of firm CDP disclosures over time to effectively audit each firm's claim for emissions decreases. We assign an indicator variable for the response to each of the three emissions decrease items. Firms that claim an emissions decrease that contradicts the current and prior year levels of disclosed emissions are scored an indicator value of 1 for that year, otherwise 0. The binary variable *Inconsistency* takes the value 1 when any one or more of the three item indicators is present, otherwise 0. We also assign an alternate ordinal measure that is calculated as the total number of inconsistent disclosures a firm makes in a given disclosure year, thus ranging from 0 to 3.

There are a number of reasons why firms may need to "restate" prior year emissions, which could render our audit methodology inconclusive. However, each year CDP offers firms the opportunity to restate aspects of prior year disclosures. We compile the most recent prior year disclosure (whether original or restated) as the baseline for emissions reduction claims, reducing the possibility that firms may be legitimately reporting an emissions decrease that contradicts prior year disclosures.

More importantly, it is plausible that a firm may simply err when providing information about its emissions trends relative to the prior year; an inconsistent disclosure as coded above may arguably be the result of incompetence in completing the questionnaire correctly. A primary concern is thus whether internally inconsistent disclosures are truly an example of symbolic management or whether they are the result of fundamental errors in a responding firm's execution of the questionnaire response (i.e. incompetence). To demonstrate evidence that *Inconsistency* is associated with symbolic disclosure and not simply incompetence, we present two static analyses here pointing to the propensity of firms with temporally inconsistent emissions disclosures to be aware of their disclosed data. Across all disclosures, we find evidence that a substantial proportion of firms overstate their emissions reductions. Figure 6.5 shows the distribution of the difference between reported and actual emissions intensity for all firms that claimed an emissions reduction in a given disclosure year. Negative numbers indicate that

reported emissions reductions are greater in magnitude than actual emissions reductions. Gray bars correspond to firms whose claims are inconsistent with prior year disclosure (by definition all gray bars are left of zero), clear bars correspond to firms that reported consistently. Interestingly, most firms that reported consistently tended to understate their actual reductions. Two-sample t -tests of equal means are significant with test statistics of greater than 29; this indicates that firms are more likely to overstate emissions reductions when those claims are not consistent with actual performance.

Next, we compare the distribution of *Attentiveness* between firms that produce inconsistent emissions disclosures and those that do not. Figure 6.6 shows that firms that report inconsistent disclosures are significantly more attentive than firms that do not. A two-sample t -test of means is strongly significant, with t -statistic of greater than 17. Given our understanding of *Attentiveness* as a gage of a firm's motivation to increase CPLI, this result strongly suggests that inconsistent disclosures are a sign of symbolic management as opposed to incompetence. Note that this relationship effectively describes the path from "Attentiveness" to "Symbolic Management" in the theoretical model described by Figure 6.1 earlier.

6.4.4 Assurance

Firms that obtain costly third party assurance of GHG emissions inventories may be more likely to pursue other policies and practices that lead to higher performance. The CDP questionnaire solicits disclosure on whether firms have obtained third party assurance. Unlike other CDP questionnaire items that rely on self-reported information, firms claiming third-party assurance for GHG emissions inventories are required by CDP to provide a formal certificate of assurance as evidence. Firms that provide a certificate of reasonable assurance for GHG emissions are assigned an indicator variable *Reasonable* with value 1 and 0 otherwise; evidence of limited assurance for GHG emissions is assigned an indicator variable *Limited* with value 1, 0

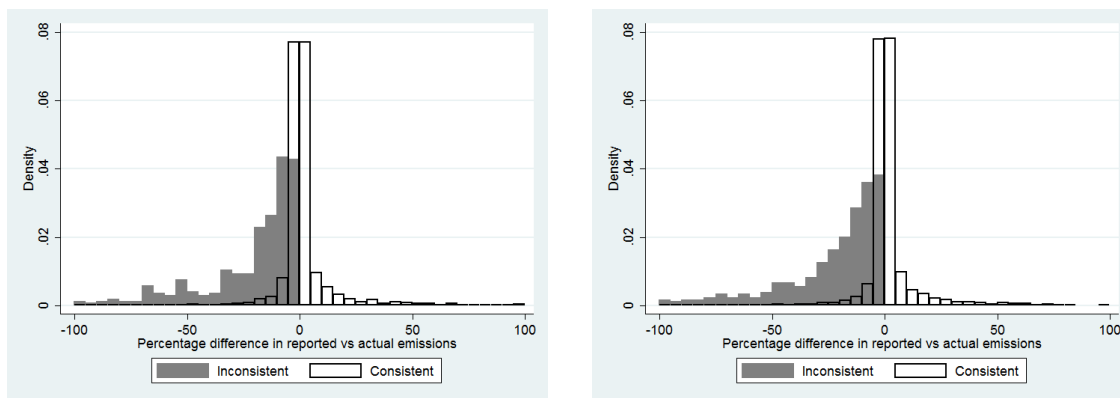


Figure 6.5: Magnitude of inconsistency in emissions reduction claims: (a) revenue intensity and (b) employment intensity

otherwise.¹⁴

6.4.5 Control variables

Risk of audit is heightened when activist stakeholders suspect symbolic management. One signal available to firms is to disclose material risks via Forms 10-K or other regulatory channels. Whereas disclosure of such risks is technically voluntary (in terms of the nature of risks disclosed) it is generally recognized as good practice to disclose all material risks in order to reduce the probability of future legal action in the event of stock price collapse or other shocks (Healy and Palepu, 2001). Given that certain stakeholders have developed sophisticated monitoring mechanisms, consistency in disclosure is important to avoid scrutiny. It follows that firms that disclose climate risks and strategies through regulated disclosure channels are less likely to engage in symbolic management. Firms that indicate such voluntary disclosure was made through Forms 10-K or other regulatory filings on their CDP questionnaire response are assigned an indicator variable *RegDisclose* with value 1, otherwise 0. Furthermore, firms that are subject to regulation via emissions trading schemes (ETS) or other carbon pricing mech-

¹⁴Firms must provide evidence of assurance for both Scope 1 (i.e. direct) and Scope 2 (i.e. indirect) emissions to be designated by these indicator variables.

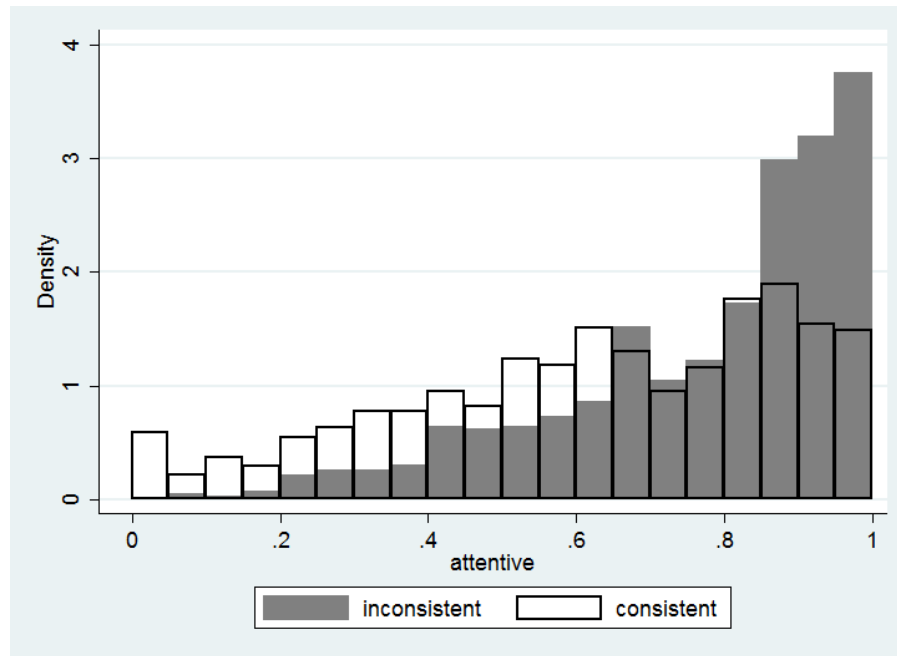


Figure 6.6: Firms that make inconsistent emission reduction claims are more attentive

anisms may be less likely to provide inconsistent disclosures of their GHG emissions. The indicator variable *ETSReg* takes the value 1 for firms subject to carbon pricing regulations, otherwise 0.

The effectiveness of management performance incentives as solution to the agency problem has been disputed (Westphal and Zajac, 1994). Long-term incentive plans are often symbolic and can deter from more substantive corporate governance controls (Westphal and Zajac, 1998). Furthermore, higher levels of performance incentives lead to greater risk taking and are associated with greater environmental harm (Minor, 2016). However, compensation incentives oriented toward environmental performance are be associated with a range of favorable outcomes (Flammer et al., 2016). The indicator variable *MgmtIncentive* takes value 1 for firms that disclose the presence of senior/executive management performance incentives for climate change related issues on their CDP questionnaire response, and 0 otherwise.

Firms that score in a lower CPLI performance band in a given year, particularly relative to

other companies within the same industry, may be more motivated to improve performance in the following year (Chatterji and Toffel, 2010). We classify firms into industries according to their 4-digit GICS (Global Industry Classification Standard) code, and calculate the variable *LagRelativeCPLI* as the previous year *CPLI* minus the average *CPLI* of all other firms in the same GICS industry group. We use the integer representations of *CPLI* as discussed above, and the industry group average may take on a real (floating point decimal) number in order to better represent perceived distance. A positive value indicates the firm has a higher than average *CPLI* score within its industry group.

Larger firms tend to have greater public visibility and are often subject to greater scrutiny regarding environmental impacts. We use total assets as a relevant measure for firm size, and take the natural logarithm to account for the skewed distribution. Firm profitability is associated with greater resources and capacity for attention to environmental performance. We use the return on assets (ROA) measure of accounting profits. All financial performance variables are lagged one year to correspond with the CDP disclosure time frame. Financial performance data is obtained from Thomson-Reuters Datastream and Worldscope.

Firms with larger environmental footprints may be less prone to symbolic disclosure, considering heightened stakeholder scrutiny of environmental impacts (Lyon and Maxwell, 2011). A direct measure of environmental impact is provided by Trucost; the variable *ImpactRatio* corresponds to Trucost's assessment of the financial value of a firm's impact on environmental natural capital across a comprehensive set of emissions and resource extraction metrics. We take the natural logarithm of the ratio of a firm's estimated impact to its revenue. Finally, the variable *GHGIntensity* is the natural logarithm of Trucost data on estimated firm-level GHG emissions per unit revenue. Whereas Trucost estimates impact based partly on firm-level disclosures (including CDP), it augments those estimates using proprietary input-output modeling based on sector-level data from multiple sources, including government census and surveys, industry reports, and other economic data.

Firms in different industries are subject to different stakeholder and institutional pressures to demonstrate conformance with normative expectations for environmental performance. Furthermore, perceived levels of stakeholder and regulatory scrutiny may also affect the degree to which firms may evaluate incentives to engage in symbolic management regarding disclosure of environmental performance. Environmentally sensitive industries are often subject to more environmental regulations (including GHG emissions caps or taxes) and subject to greater stakeholder scrutiny of their environmental impacts, and thus may have greater incentives to reduce their GHG emissions and carefully consider the consequences of a particular disclosure strategy. We identify firms operating in environmentally sensitive industries (*ESI*) as those in GICS sectors corresponding to Energy (primarily Oil & Gas), Materials (Chemicals, Metals, Mining, Forestry), and Utilities (Utilities and Power Producers). Firms operating in consumer-facing industries (*CFI*) tend to be highly visible in public discourse and may thus be subject to greater stakeholder awareness of environmental performance and disclosures. However, CFI firms, on average, are arguably subject to lesser regulatory oversight (relative to ESI firms) and may perceive a lower probability of detection of symbolic management practices. We identify firms operating in consumer-facing industries as those in GICS sectors corresponding to Consumer Discretionary (Durable Goods, Services, Media, Retail) and Consumer Staples (Food, Beverage, and Household Products).

6.5 Methods and Results

6.5.1 Descriptive statistics

Table 6.1 contains a summary of descriptive statistics and covariate correlations. *Attentiveness* is highly correlated with *CPLI*, as predicted by Hypothesis 1 and illustrated in Figure 6.3. Several variables exhibit relatively high correlations with *CPLI* and *Attentiveness*, and an ex-

amination of variance inflation factors (VIF) indicates multicollinearity is not a concern (all $VIF < 2$).

6.5.2 Empirical models

To test hypotheses 1, 2, 3a, and 3b, we evaluate the effect of symbolic disclosure on CPLI, controlling for attentiveness and other relevant factors as outlined above. The basic model is described as:

$$CPLI_{it} = \alpha Inconsistency_{it} + \beta Attentiveness_{it} + \gamma Assurance_{it} + \delta \mathbf{X}_{it} + c_i + s_t + \varepsilon_{it} \quad (6.1)$$

Subscript i denotes individual firm, and t corresponds to the year of CDP disclosure. Note that *Assurance* is a vector of assurance levels (*Reasonable* and *Limited*). \mathbf{X}_{it} is a vector of control variables, c_i represents unobserved time-invariant firm-specific factors (firm-level fixed effects), s_t a vector of year dummies, and ε_{it} are zero-mean random disturbances. The model may be estimated both as a linear model (by classifying *CPLI* as a discrete random variable) and as a nonlinear model (*CPLI* as an ordinal scale).

The model also allows for inclusion of variable interaction terms. Our theory suggests that firms with greater *Attentiveness* are more likely to engage in symbolic management, regardless of the ultimate outcome (i.e. *CPLI*). By including additional interaction terms of *Inconsistency* and both levels of assurance on *Attentiveness*, we test for the moderating effect of these variables on the overall effect of *Attentiveness* on *CPLI*.

We test hypotheses 4a and 4b by evaluating the effects of disclosures and other firm characteristics on our binary measure of symbolic management, *Inconsistency*. This model is de-

Table 6.1: Covariate summary statistics and correlations

	Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12
1 <i>CPLI</i>	3.27	1.28	1.00											
2 <i>Attentiveness</i>	0.64	0.26	0.74	1.00										
3 <i>Inconsistency</i>	0.06	0.25	0.09	0.15	1.00									
4 <i>Reasonable</i>	0.14	0.35	0.13	0.13	0.01	1.00								
5 <i>Limited</i>	0.38	0.49	0.40	0.31	0.03	-0.33	1.00							
6 <i>RegDisclose</i>	0.28	0.45	0.20	0.21	0.04	0.06	0.14	1.00						
7 <i>MgmtIncentive</i>	0.52	0.50	0.36	0.44	0.04	0.10	0.14	0.14	1.00					
8 <i>ESI</i>	0.14	0.35	-0.02	-0.03	-0.04	0.06	-0.07	0.10	0.07	1.00				
9 <i>CFI</i>	0.13	0.33	-0.00	0.02	0.00	-0.05	0.01	-0.01	-0.02	-0.29	1.00			
10 <i>In Assets</i>	15.9	1.84	0.29	0.24	0.02	0.09	0.19	0.01	0.13	-0.02	-0.14	1.00		
11 <i>ROA</i>	5.68	8.23	-0.03	-0.03	0.02	-0.02	-0.01	-0.03	-0.02	-0.07	0.13	-0.25	1.00	
12 <i>In GHGIntensity</i>	3.94	1.86	0.03	0.03	-0.03	0.04	-0.05	0.08	0.11	0.63	-0.10	-0.18	-0.02	1.00

scribed as:

$$\mathbb{P}(Inconsistency_{it}) = F(\alpha LagRelativeCPLI_{it} + \beta Attentiveness_{it} + \gamma Assurance_{it} + \delta \mathbf{X}_{it} + s_t + \varepsilon_{it}) \quad (6.2)$$

Where F represents the logistic cumulative distribution function. The model may be estimated both using a logit fixed effects within estimator, a random effects logit estimator, and a “pooled” logit estimator. Because a large subset of firms in the sample exhibit no variation in *Inconsistency* over time, the pooled and random effects estimators preserve the number of observations analyzed in the model while sacrificing the control over unobserved time-invariant firm characteristics offered by the within estimator. As with the first model, interactions between *Attentiveness* and the components of *Assurance* allow for estimation of marginal effects.

6.5.3 Empirical results

Factors influencing VDE endorsement

Results of the first analysis — identification of key factors influencing the CPLI score — are displayed in Table 6.2. All models use *CPLI* as the dependent variable and contain the same set of control variables. Models 1–4 employ a panel ordinary least squares (OLS) within estimator with firm-level fixed effects; each successive model adds additional explanatory variables. A Hausman test confirms that pooled OLS is inconsistent and indicates the use of fixed effects. Hypothesis 2 — that *CPLI* does not distinguish between substantive and symbolic disclosure — is rejected when the regression coefficient on *Inconsistency* is significantly different from zero; in other words, if the coefficient on *Inconsistency* is indistinguishable from zero, this indicates that *CPLI* does not distinguish between firms that engage in symbolic management and those that do not (holding all other factors constant).

Table 6.2: Factors influencing VDE endorsement (*CPLI*)

	(1)	(2)	(3)	(4)
<i>Inconsistency</i>	0.104*** (0.040)	-0.008 (0.036)	-0.006 (0.035)	0.009 (0.153)
<i>Attentiveness</i>		3.179*** (0.095)	3.094*** (0.093)	2.849*** (0.114)
<i>Reasonable</i>			0.168*** (0.053)	0.125 (0.172)
<i>Limited</i>			0.376*** (0.041)	-0.053 (0.119)
<i>Inconsistency * Attentiveness</i>				-0.019 (0.196)
<i>Reasonable * Attentiveness</i>				0.085 (0.222)
<i>Limited * Attentiveness</i>				0.582*** (0.159)
<i>RegDisclose</i>	0.076* (0.041)	0.074** (0.035)	0.063* (0.035)	0.059* (0.034)
<i>MgmtIncentive</i>	0.378*** (0.053)	0.134*** (0.045)	0.115*** (0.044)	0.114*** (0.044)
<i>ESI</i>	0.080 (0.352)	-0.063 (0.262)	-0.055 (0.242)	-0.036 (0.244)
<i>CFI</i>	0.069 (0.120)	-0.043 (0.117)	0.001 (0.115)	-0.007 (0.116)
<i>ln Assets</i>	0.024 (0.113)	0.030 (0.093)	0.006 (0.089)	0.016 (0.090)
<i>ROA</i>	-0.001 (0.003)	-0.000 (0.003)	-0.001 (0.003)	-0.001 (0.003)
<i>ln GHGIntensity</i>	-0.072 (0.056)	-0.009 (0.047)	-0.004 (0.047)	0.001 (0.047)
Constant	2.945 (1.918)	0.322 (1.579)	0.540 (1.503)	0.503 (1.522)
Observations	5,098	5,098	5,098	5,098
Number of firms	1,475	1,475	1,475	1,475
Within R^2	0.167	0.369	0.386	0.389

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Robust standard errors in parentheses

All models use *CPLI* as continuous dependent variable

All models use firm fixed effects and year dummies

In Table 6.2, model 1 results indicate that *Inconsistency* is positively associated with *CPLI*, which suggests that (without controlling for attentiveness) symbolic management is directly rewarded by CDP; the coefficient reported suggests that symbolic firms are roughly 10% more likely to achieve a higher CPLI performance band than substantive firms, all else held constant. However, model 2 results indicate that when controlling for *Attentiveness*, the presence of symbolic management has no discernible effect on *CPLI*. For a given level of *Attentiveness* (all other factors held constant), firms that engage in symbolic disclosure are no more likely to achieve a higher or lower CPLI performance band than firms that do not. Moreover, taking the results from models 1 and 2 into context with the correlation analysis of *Attentiveness* and *CPLI* noted earlier shows that *Attentiveness* fully mediates the relationship between *Inconsistency* and *CPLI*; any variance in *CPLI* due to symbolic management can be fully explained by *Attentiveness*. Finally, comparing the within R^2 of the two models indicates that *Attentiveness* alone explains more than 20% of the variance in *CPLI* within an average firm over time. By failing to reject the null hypothesis that CPLI does not differentiate between symbolic and substantive management, the results strongly support hypothesis 2. Figure 6.7 helps illustrate this finding: note that the effect of *Inconsistency* on *CPLI* almost perfectly overlaps the complementary effect of substantive management over all levels of *Attentiveness*. The upward sloping nature of the relationship of *Attentiveness* on *CPLI* also illustrates support for hypothesis 1 regardless of symbolic or substantive management.

Model 3 adds *Reasonable* and *Limited* assurance as explanatory variables, which show that obtaining reasonable assurance of GHG emissions inventories leads to roughly 17% greater likelihood of achieving a higher CPLI performance band, and obtaining limited assurance leads to roughly 39% greater likelihood of achieving a higher CPLI performance band, all else equal. These results provide support for hypothesis 3a and partial support for hypothesis 3b. The two coefficients on assurance are significantly different from each other with greater than 99% confidence (Wald test of equal means: $F = 14.6$), indicating that firms obtaining limited assurance

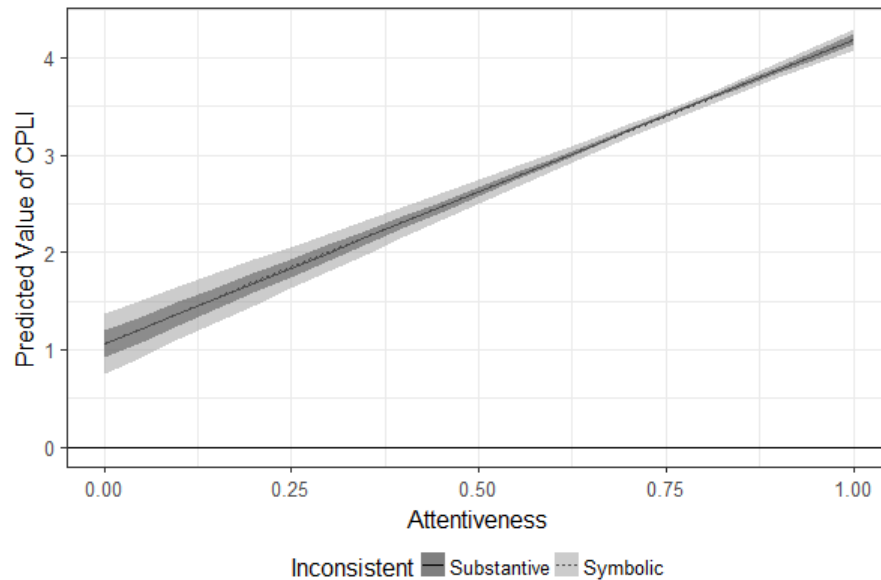


Figure 6.7: Marginal effects of inconsistency on CPLI, over attentiveness

tend to achieve higher CPLI performance bands than firms obtaining reasonable assurance. This counterintuitive result partly contradicts hypothesis 3b, which suggested that reasonable and limited assurance would be similarly rewarded by CDP, all else equal.

To observe the degree to which the explanatory variables moderate the relationship of *Attentiveness* to *CPLI*, model 4 adds interaction terms between *Inconsistency*, both levels of assurance, and *Attentiveness*. Model 4 results provide further evidence of support for hypothesis 2, with both baseline and interaction term coefficients on *Inconsistency* not significantly different from zero. Perhaps more interestingly, either level of assurance leads to higher *CPLI* only over higher levels of *Attentiveness*, suggesting assurance is an additional expression of motivation to achieve higher level of endorsement. Furthermore, this effect is significantly more pronounced for limited assurance, relative to reasonable assurance. Figure 6.8 displays these marginal effects analyses graphically. Note the significant upward slope of the marginal effect of limited assurance on CPLI relative to the flat slope (not significantly different from zero) of the marginal effect of reasonable assurance on CPLI.

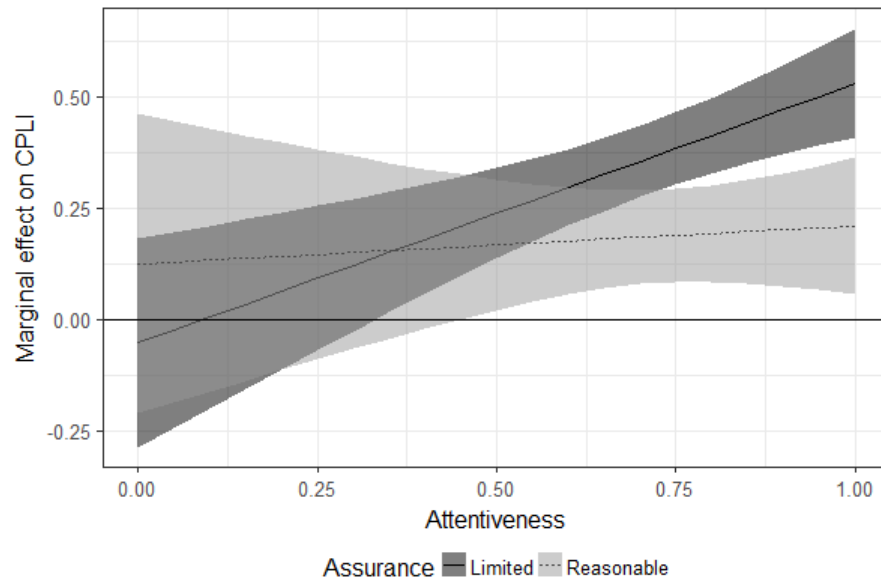


Figure 6.8: Marginal effects of assurance on CPLI, over attentiveness

Of particular note among control variables, the presence of both climate-related management incentives and related regulatory disclosures is consistently associated with higher CPLI over all four models. According to model 4 results, firms that indicate adoption of performance incentives for executive managers linked to climate change management are roughly 11% more likely to score a higher CPLI performance band than firms that do not, all other factors held constant. Furthermore, firms that disclose climate change strategy and performance through other regulatory disclosure channels are roughly 6% more likely to score a higher CPLI performance band.

Several robustness checks confirm the stability of results. Controlling for the presence of either level of assurance instead of both *Reasonable* and *Limited* produces results quantitatively similar to those on *Limited*; this is likely related to the substantially larger number of firms obtaining limited assurance than reasonable assurance (see Table 6.1: 14% of sample observations obtained reasonable assurance, and 38% of sample observations obtain limited assurance). Inclusion of a quadratic term on *Attentiveness* (as well as all the relevant interaction

terms) is significant (indicating presence of non-linear marginal effects), but the coefficients and marginal effects of the key variables are relatively unchanged; only the linear *Attentiveness* models are reported here for ease of interpretation. Since inclusion of some other control variables (e.g. *ImpactRatio*, *GHGIntensity*) reduces the sample due to missing observations, we evaluated the results without these controls; the results do not change qualitatively.

Factors influencing symbolic management

Results of the second analysis — predictors of symbolic management — are shown in Table 6.3. All models take *Inconsistency* as the dependent variable and employ a pooled logit regression without fixed effects; each successive model adds additional explanatory variables. A Hausman test indicates the pooled approach is consistent and contraindicates fixed effects, partly due to insufficient variation in the dependent variable within firms over time (random effects models returned quantitatively equivalent results). First, model 1 demonstrates the strong association of *Attentiveness* with symbolic disclosure, consistent with the measure validity discussion above. Furthermore, the coefficient on *LagRelativeCPLI* is negative and significant, suggesting that firms in a higher CPLI performance band than the average of all scored firms in the same industry are less likely to engage in symbolic management. Model 2 adds *Reasonable* and *Limited* assurance as explanatory variables; both coefficients are negative and significant, and are not significantly different from each other, suggesting that firms that obtain either type of assurance are less likely to engage in symbolic disclosure. Note that coefficients reported are log-odds, complicating the quantitative interpretation. As with the endorsement models above, marginal effects plots help to further illustrate the significance of results.

Model 3 adds interaction terms between both types of assurance and *Attentiveness*, providing a more rigorous test of Hypotheses 4a and 4b. Marginal effects analysis on the interaction terms indicates that whereas obtaining limited assurance does not significantly signal the absence of symbolic management (providing support for hypothesis 4a), firms that obtain reason-

Table 6.3: Factors influencing symbolic management (*Inconsistency*)

	(1)	(2)	(3)	(4)	(5)
<i>Attentiveness</i>	2.491*** (0.349)	2.643*** (0.351)	2.488*** (0.439)	2.555*** (0.503)	2.577*** (0.505)
<i>LagRelativeCPLI</i>	-0.119*** (0.046)	-0.088* (0.047)	-0.091* (0.048)	-0.091* (0.048)	-0.134** (0.054)
<i>Reasonable</i>		-0.335** (0.142)	-1.658** (0.762)	-1.505* (0.783)	-1.499* (0.785)
<i>Limited</i>		-0.291*** (0.111)	-0.257 (0.497)	-0.140 (0.504)	-0.109 (0.509)
<i>Reasonable * Attentiveness</i>			1.575* (0.891)	1.396 (0.922)	1.388 (0.924)
<i>Limited * Attentiveness</i>			-0.017 (0.618)	-0.165 (0.628)	-0.212 (0.635)
<i>RegDisclose</i>	-0.069 (0.108)	-0.041 (0.110)	-0.047 (0.110)	0.790* (0.441)	0.786* (0.441)
<i>MgmtIncentive</i>	-0.147 (0.101)	-0.141 (0.101)	-0.136 (0.102)	-1.136** (0.525)	-1.145** (0.525)
<i>RegDisclose * Attentiveness</i>				-1.063* (0.550)	-1.062* (0.550)
<i>MgmtIncentive * Attentiveness</i>				1.284** (0.649)	1.285** (0.650)
<i>ESI</i>	-0.187 (0.160)	-0.197 (0.159)	-0.202 (0.160)	-0.203 (0.159)	-0.212 (0.159)
<i>CFI</i>	-0.067 (0.122)	-0.073 (0.122)	-0.072 (0.122)	-0.080 (0.122)	-0.106 (0.125)
<i>LagRelativeCPLI * ESI</i>					0.029 (0.111)
<i>LagRelativeCPLI * CFI</i>					0.180* (0.099)
<i>ln Assets</i>	-0.003 (0.031)	0.012 (0.031)	0.013 (0.031)	0.016 (0.031)	0.017 (0.031)
<i>ROA</i>	0.020*** (0.006)	0.021*** (0.007)	0.021*** (0.006)	0.021*** (0.007)	0.021*** (0.007)
<i>ln GHGIntensity</i>	-0.031 (0.034)	-0.030 (0.033)	-0.030 (0.033)	-0.028 (0.033)	-0.025 (0.033)
Constant	-3.442*** (0.591)	-3.633*** (0.596)	-3.535*** (0.620)	-3.689*** (0.659)	-3.706*** (0.660)
Observations	3,836	3,836	3,836	3,836	3,836
Number of firms	1,307	1,307	1,307	1,307	1,307

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Robust standard errors in parentheses

All coefficients are pooled logit log-odds

able assurance are significantly less likely to engage in symbolic management over most levels of *Attentiveness*. The marginal effects are strongest in the mid-range of *Attentiveness*, with roughly 5% lower probability of symbolic management. See Figure 6.9 for marginal effects plots.

Among control variables, neither *RegDisclose* or *MgmtIncentives* has a significant effect on probability of symbolic management in models 1–3. Model 4 adds interaction terms between each of these two control variables and *Attentiveness* to evaluate the degree to which *Attentiveness* may moderate these effects. The inclusion of interaction terms is revealing: the adoption of management incentives for climate change management is negatively associated with symbolic management. However, that relationship trends toward zero with increasing attentiveness, suggesting that higher attentiveness to scoring methodology increases the likelihood that firms will engage in symbolic management (more specifically: attentiveness decreases the likelihood of engaging in substantive management). On the contrary, climate change disclosure through other regulatory channels is positively associated with symbolic management, a relationship that also trends toward zero at increasing attentiveness. These effects run counter to those of management incentives: firms disclosing through regulated channels are less likely to engage in symbolic management as they become more attentive to scoring methodology. Marginal effects plots of these results are also provided in Figure 6.9.

Finally, model 5 adds interaction terms between *LagRelativeCPLI*, a firm's CPLI score relative to industry peers, for both firms in environmentally sensitive industries (ESI) and firms in consumer-facing industries (CFI). Regardless of a firm's relative standing on CPLI among industry peers, *ESI* is not significantly associated with symbolic management; in fact, a modest negative effect ($p < 0.20$) is present across all levels of *LagRelativeCPLI*, suggesting the heightened regulatory and/or stakeholder scrutiny applied to these industry sectors leads firms to avoid risks of symbolic management on GHG emissions disclosures. Meanwhile, the effect of *CFI* on probability of symbolic management has a significant positive interaction with

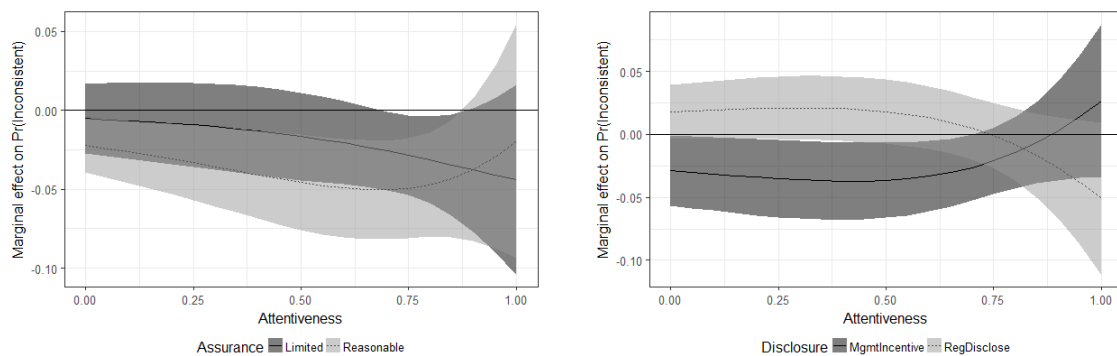


Figure 6.9: Marginal effects on inconsistency, over attentiveness: (a) Reasonable vs Limited Assurance and (b) Regulated Disclosure vs Management Incentives

LagRelativeCPLI, suggesting that CFI firms with CPLI above industry average are more likely to engage in symbolic management, perhaps for the purpose of maintaining any perceived competitive benefits associated with higher ratings. Figure 6.10 shows the marginal effects associated with these analyses.

Across all models, neither firm size ($\ln Assets$) or the magnitude of a firm's GHG emissions intensity per unit revenue ($\ln GHGIntensity$) is significantly associated with symbolic management. However, firm accounting profitability (ROA) is positively associated with probability of symbolic management across all models.

6.6 Discussion

The results summarized above suggest a number of compelling observations about the prevalence of symbolic management through VDEs. First, the finding that symbolic management (*Inconsistency*) has no significant effect on CDP's level of endorsement indicates that firms engaging in symbolic management are generally successful at concealing their true performance despite the relatively strong requirements set forth by the CDP questionnaire. This finding is of significant importance; whereas prior research has suggested that CDP and other

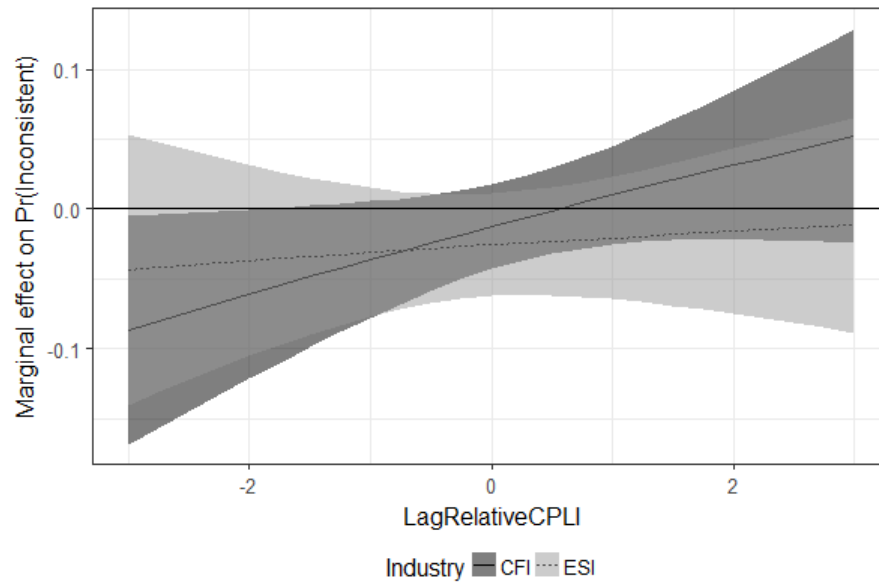


Figure 6.10: Marginal effects of industry on inconsistency, over relative CPLI rating

VDEs do not lead firms to a significantly higher level of performance on dimensions of concern (see Cho et al., 2012; Matisoff, 2013; Milne and Gray, 2013), our findings cast additional doubt on the ability of VDEs to consistently ensure a higher level of transparency. As CDP gained institutional credibility over time (see Figure 6.2), it arguably has inadvertently shifted from a powerful mechanism of transparency toward just another sustainability rating system. Given the broad awareness and deep penetration of CDP scores into evaluation criteria of institutional investors and other stakeholders, CDP's success has changed incentive structures for firms to strategically disclose information on climate-related performance and risk management, and not always for the better. Institutional theory has suggested and provided support for Campbell's Law: as the use of a ratings system becomes more widespread, corruptive pressures begin to dissipate the substantive meaning that originally made the ratings credible (Espeland and Sauder, 2007); our results are consistent with this notion. We posit our theory of the VDE as a "credibility shield" as an explanation. Sophisticated firms recognize that unaudited and unsubstantiated voluntary disclosure of non-financial performance is subject to

stakeholder scrutiny, and symbolic disclosure under such pretense carries risk of backfire (Ashforth and Gibbs, 1990). With a clear record of how disclosed performance will be rated (e.g., the CDP scoring methodology), enterprising firms are better able to identify opportunities for symbolic management with lower risk of detection and thus seek to achieve CDP endorsement to enhance the credibility of their claims and reduce overall stakeholder scrutiny.

This study also contributes to our understanding of the role of external assurance in not only verifying corporate disclosures but also as an additional signal of credibility when a firm's "type" is not observable. The results of tests of both hypotheses 3a/3b and 4a/4b are perhaps best considered in reverse order. The second model analysis (hypotheses 4a/4b) summarized in Table 6.3 indicates that while reasonable assurance has a significant negative relationship with symbolic management (as expected), limited assurance does not differentiate the presence of symbolic management. The former result provides empirical evidence consistent with recently developed economic theory; assurance serves primarily as a signaling mechanism, where substantive firms have sufficient incentive to incur the additional cost of obtaining a higher level of assurance in order to differentiate from lower performing firms (Bagnoli and Watts, 2017). The latter result is comparable to the test of hypothesis 2; neither VDE endorsement nor a lower level of assurance are sufficient to credibly convey the substantiveness of a firm's disclosure. Moreover, the observation that the negative association between reasonable assurance and symbolic management is attenuated at high levels of attentiveness (see Figure 6.9) further corroborates the notion that strategic motivation for VDE endorsement may lead firms to respond to perverse incentives offered by the VDE's credibility shield. This has important implications for the practice of assurance and its interpretation by stakeholders, regulators, and other third party intermediaries. Whereas the shortcomings of assurance practices have long been scrutinized by academics (e.g., Gürtürk and Hahn, 2016), our study provides direct empirical evidence of the ability of firms to obtain assurance for symbolic purposes.

Meanwhile, the results of the first analysis (hypotheses 3a/3b) indicate that firms obtaining

limited assurance — particularly if they are strategically motivated — tend to achieve higher CPLI scores, whereas firms obtaining reasonable assurance do not. Taken in context with the analysis discussed in the preceding paragraph, this suggests that limited assurance is potentially just another tool available to any firm seeking to enhance the credibility of its disclosure among stakeholders, regardless of whether those disclosures are symbolic or substantive. The comparatively minor association between reasonable assurance and CPLI score further suggests that obtaining reasonable assurance is of limited value in terms of its ability to substantiate higher levels of climate change performance, given the additional cost associated. Overall, the mirrored results between reasonable and limited assurance on these two analyses suggest a striking contrast in credibility and utility between the two levels. While reasonable assurance may provide a credible signal of substantive management, this signal appears to be undervalued by stakeholders and unrecognized by other intermediaries. Moreover, limited assurance can augment the credibility shield for symbolic management and help firms to achieve higher levels of VDE endorsement.

These results have significant implications for the credibility of CDP and VDEs in general. The promise of VDEs is to enhance transparency and truth in disclosure of corporate non-financial performance, particularly in terms of social and environmental impacts. Many VDEs, including CDP, arguably deliver on that promise to a large extent (Matisoff, 2013; Fabrizio and Kim, 2016). However, all disclosure institutions — even regulated and audited financial disclosures — are imperfect in some way (Healy and Wahlen, 1999). Invariably, as such institutions achieve legitimacy and gain credibility, the institution's endorsement of agent behavior becomes more valuable and frames incentives. The degree to which those incentives drive improved firm performance more than they motivate symbolic management is not addressed in this study; however, disclosure institutions must evolve to deal with these threats to credibility and ultimately legitimacy. For example, CDP has recently overhauled its performance rating system, ostensibly raising the bar to attain its "A-List", and arguably to mitigate the risk of

manipulation highlighted by this study. Integrating other corroborating signals may further strengthen the value of a VDE's data and assessments; CDP already engages with a number of other organizations (e.g., Global Reporting Initiative, RepRisk AG) to work toward integrated and interdependent performance assessments. Moreover, incorporating a validation model that rewards consistency not only internally, but with other channels of voluntary and regulated disclosure, can add credibility to assessments. As ratings schemes continue to proliferate and gain traction and influence among investors and other stakeholder groups, accurately measuring and reflecting true company performance along non-financial measures of interest will continue to escalate in importance for both the credibility of institutions and the external interests they seek to support (Chatterji et al., 2016).

This study is not without limitations; whereas symbolic firms typically employ multiple diverse methods to manipulate disclosures (Healy and Wahlen, 1999), we derive a single measure of symbolic management. Our measure *Inconsistency* was relatively simple to derive and stands up to rigorous validation. Other methods of symbolic management may yet be pervasive within the data but substantially more difficult to tease out. We suggest that future research might compare and verify self-reported data through VDEs against other public disclosures or information, and hope that this study may help motivate additional investigative efforts into the quantitative minutiae of disclosures. Furthermore, our sample is necessarily limited to CDP respondents; whereas firms endogenously select into this group, all analyses were designed within the context of already choosing to prepare a disclosure to CDP. As our interest is in evaluating propensity of symbolic disclosure through this specific VDE, non-disclosing firms are arguably not relevant. We do note that some firms disclose to CDP but choose to keep their disclosures confidential; we categorize such firms as non-disclosers and necessarily omit them from the sample.

6.7 Conclusion

This study offers a number of theoretical and empirical contributions to knowledge of symbolic management in voluntary corporate disclosures. First, we synthesize a theory of voluntary disclosure evaluators based on two disparate branches of theory (institutional and economic) typically used in the literature to describe the phenomenon of voluntary disclosure. Our theory articulates the idea of VDEs as “credibility shields” for firms seeking to enhance stakeholder perceptions of non-financial firm performance, and also promotes the selection among different levels of assurance as different signals of firm motivations in strategic disclosure. In articulating the role of VDEs as credibility shields, we offer a novel analysis of VDEs that extends beyond the motivation to simply disclose generally covered in the literature, and into the motivation to enhance the level of VDE endorsement obtained. Through forensic analysis of detailed firm disclosures to CDP, we develop empirical measures of both this motivation for endorsement and symbolic management. Our analytic results provide new empirical evidence both of symbolic management through VDEs and of the use of different quality levels of third party assurance by firms to either signal substantive management or provide additional external credibility for symbolic management. The study offers useful guidance both for design of VDE measures and methods and for stakeholders that make use of VDE endorsements that may reduce the incidence of symbolic management and its resulting inefficiencies.

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