WHEN GREEN ISN'T ALL THERE IS TO BE: AN ANALYSIS OF VOLUNTARY GREENHOUSE GAS REDUCTION GOALS

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Submitted to the

Faculty of the College of Arts and Sciences

of American University

in Partial Fulfillment of

the Requirements for the Degree of

Doctor of Philosophy

In

Economics

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April 23, 2015
Date

2015
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Washington, DC 20016

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ABSTRACT

This dissertation explores motivations behind setting voluntary greenhouse gas (GHG) emission reduction goals. It seeks to understand how the institutional environment in which firms operate shape their profit-maximizing decisions regarding GHG emissions. Such an environment is populated by various stakeholder groups that exert influence on the firm. Understanding how such groups impact the firm can (1) inform policies that take advantage of institutional arrangements to encourage more aggressive emissions reductions by firms and (2) demonstrate the limits of voluntary approaches in reducing GHG emissions.

The first essay develops a theoretical framework in which corporate social responsibility (CSR) related to climate change is modeled as the proportion of clean inputs firms use in their production processes. Stakeholder groups can have preferences for environmental CSR that impact a firm's profit function and constraints. The resulting framework demonstrates the various considerations that a firm may have in deciding on a profit-maximizing level of environmental CSR given various characteristics.

The second essay delves more deeply into the decision making process within the firm as it develops a strategic response to the issue of climate change. This is done by analyzing 17 interviews conducted with experts on environmental sustainability efforts in large firms. These suggest that companies may be prompted to respond to the issue of climate change by pressure from different groups, but cost considerations shape the degree of that response. Reduction goals

often encourage innovation at the firms as they examine their production process with the dual objectives of reducing costs and emissions.

The third essay explores the characteristics of firms that joined the U.S. Environmental Protection Agency's Climate Leaders program, a voluntary program through which member firms set and achieved GHG emissions reductions from 2002 to 2010. A panel of the S&P 500 members from 2002, 87 of which eventually joined Climate Leaders, is analyzed using a panel probit model and survival analysis. Results suggest that firms already engaged in sustainability activities were more likely to join the program. Additionally, larger firms, those located in more environmentally friendly states, and those located in areas with cleaner air are more likely to be in the program.

PREFACE

I am fundamentally interested in how institutional structures can be developed in order to encourage the reduction of greenhouse gas emissions from industry. Such structures can be formal or informal, and they determine how humanity manages the common-pool resource of the upper atmosphere, where greenhouse gases collect and impact the planet's climate. Each essay in my dissertation explores this question through a different perspective or methodology to shed light on the question of how institutions impact voluntary reduction efforts by firms. While they are all written to address this broad question, each essay has particular research questions and can be read separately. They are arranged here, however, in the order in which I believe they should be read.

The first essay of the dissertation builds a theoretical framework through which the motivations of firms that make voluntary greenhouse gas emission reductions can be understood. It seeks to build on a long tradition of theories of corporate social responsibility, applying it to the particular situation of greenhouse gases. The second essay looks within the firm to understand how decisions to set reduction goals and their levels are made. It analyzes the information gathered from interviews conducted with environmental sustainability managers and vice presidents at large U.S. firms in 2013 and 2014. The third essay analyzes the behavior of firms in the context of membership in the Climate Leaders program, a voluntary program established by the U.S. Environmental Protection Agency from 2002 to 2010 to encourage and guide member firms in setting voluntary reduction goals. The essay investigates key predictive characteristics of firms that join and are active in the program.

ACKNOWLEDGEMENTS

First and foremost I want to express my gratitude to my committee members: Maria Floro, Robert Feinberg, and Daniel Fiorino. Their support, guidance, and assistance has been invaluable to the completion of this dissertation. Their mentorship has enabled me to grow as a scholar through this process. I want to thank other faculty members and researchers who provided support at key points, including Barbara Bergmann, Jon Wisman, Aaron Boesenecker, Paul Winters, and Robert Durant of American University and Janet Peace of the Center for Climate and Energy Solutions.

I would also like to thank my friends, family, and fellow graduate students for their support, encouragement, and assistance over the course of this process. Specifically, I would like to thank Alexandra Olson, Kevin McGee, Leanne Roncolato, James O'Brien, Matthew Davis, Ervin Dervisevic, and Sarah Reksten. Additionally, I would like to thank Paula Warrick, Joan Echols, Chris Swanson, and Liz Romig at American University for their support, understanding, and guidance.

I also greatly appreciate the time that interview participants gave, without which my second essay could not have been written. Your knowledge and openness was invaluable.

Finally, I would like to thank American University for providing financial support in the form of a dissertation fellowship and a CAS travel grant. These were crucial to the completion of my degree.

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A FRAMEWORK FOR CSR DECISION MAKING WITHIN FIRMS

1.1 Introduction

Why do firms engage in corporate social responsibility (CSR)? While this question appears to be simple and straightforward, a robust literature on the subject suggests that it is actually quite complex. To begin to answer it, one must consider more general questions of what motivates the firm and the external parties that upon which it relies. Even the definition of CSR is a subject for debate.

The framework in this essay presents the idea that one dimension of (CSR), in the context of voluntary greenhouse gas (GHG) reduction, can be thought of as the proportion of capital that reduces emissions to total capital as an input to the production process. It assumes that firms produce goods have a choice between standard and clean, or low-emission, capital that "produces" CSR in addition to the firm's good. That choice determines the level of CSR that the firm is perceived to have.

Once firms and stakeholders are made aware of the issue of climate change by activists or the government, the appropriate amount of clean capital is chosen that allows a firm to maximize profits based on new information about its production process. Additionally, stakeholder pressure from groups such as consumers, regulators or workers pressure may impact the level of clean capital used. Therefore, the ways in which the firm addresses the preferences of various stakeholders on its operations are formalized. This framework acts to bring together a number of heretofore disparate ideas within the large theoretical literature on CSR, which has traditionally focused on stakeholder groups separately. It also provides a guide to considering why firms with different characteristics may have similar or different levels of CSR. Finally, the novel concept

of CSR as the proportion of clean capital used is well-suited to exploring questions of which firms engage in voluntary greenhouse gas emission reductions and why they choose to do so.

Greenhouse gases are emitted beyond a socially efficient level because the private and social costs of emissions are not equal. Thus, excessive emissions that lead to climate change can be considered negative externality that could theoretically be corrected through a Pigouvian tax or some similar regulation that would equalize the private and social costs and benefits of emissions. Voluntary reductions in GHG emissions therefore indicate that either the private marginal costs or benefits of polluting have changed. That is to say, voluntary reductions are made in response to new information that the firm receives about its production process by seeking ways to change the techniques or input mix used in order to reduce emissions. Such actions are akin to technical innovations and may be profitable. Additionally, stakeholder preferences can cause it to internalize a portion of the externality because it becomes more profitable to respond to the increased tastes for environmental protection. It can lead to higher revenues, decreased risk of costly regulation, and more motivated employees. This means that the severity of the market failure is reduced in a manner consistent with the firm's profit maximizing objective. Because such voluntary actions address the social problem of over-pollution without being required by law, they are considered CSR.

The essay will be organized as follows. Section two summarizes the literature on CSR definitions and the motivations for firms to invest in CSR. In section three, a basic framework showing the firm's decision to use clean or dirty inputs in the production process is explained. This includes a discussion of the timing of the firm's production decisions and revelation of information about climate change and the firm's GHG emissions. Then, considerations for other

stakeholders will be added to the framework and their impact on decision making are explained. In the final section, some concluding thoughts and ideas for future research are discussed.

1.2 Literature Review

There are a number of popular definitions of corporate social responsibility in recent literature. McWilliams, Siegel, and Wright (2006) note that "numerous definitions of CSR have been proposed and often no clear definition is given, making theoretical development and measurement difficult" (1). This still holds true. While almost all definitions agree that CSR is the extralegal provision of some social good by the firm, they vary in their precision and whether or not they consider the motivation of the firm to be important. An example of a precise definition is offered by ISO 26000 (2010), which says social responsibility is:

> Responsibility of an organization for the impacts of its decisions and activities on society and the environment, through transparent and ethical behavior that: 1) contributes to sustainable development, including health and the welfare of society; 2) takes into account the expectations of stakeholders; and 3) is in compliance with applicable law and consistent with international norms of behavior; and is integrated throughout the organization and practiced in its relationships.

Importantly, this definition does not consider the motivations of the company in performing such actions. There is disagreement among scholars as to whether this is central to the concept of CSR. For example, in his seminal work modeling the relationship between CSR and activists, Baron (2001) argues that "both motivation and performance are required for actions to receive the CSR label." Additionally, McWilliams and Siegel (2001) say that CSR is "beyond the interests of the firm." Elhauge (2005) simply defines CSR as "sacrificing profits in the social interest," a definition also used in Reinhardt, Satvins, and Vietor (2008). That is, they assume motives outside of traditional profit-maximization.

However, motivations are impossible to reliably determine. If a firm pays to build a school in a developing country and then mentions it in marketing materials, does this disqualify

it from the CSR label? The expenditure could reasonably be called marketing investment. However, the executives who agreed to devote resources to the school-building may be motivated by a desire to help provide education in a developing country. In order to justify such expenditure to shareholders, they would need to point out the improved reputation that such an activity could bring. Or it could be that they only see the marketing aspect of such a project and simply calculate a return on the investment. In reality, the motivations of human beings, especially many of them operating in complex institutional structures like a major corporation, are too difficult to determine, and, more importantly, an analysis can be conducted while remaining agnostic on the question of motivations for CSR beyond profit-maximization for the firm.[1]

In their review of the CSR literature from an economic perspective, Kitzmuller and Shimshack (2012) agree. They have a more complicated characterization of CSR, noting that "first, CSR manifests itself in some observable and measurable behavior or output…this outcome dimension [is referred to as] corporate social or environmental performance (CSP). Second, CSP exceeds levels set by obligatory regulation or standards enforced by law" (53). They note that this contradicts both Baron (2001) and McWilliams and Siegel (2001) in that "it is independent of any conjecture about the motivations underlying CSR" (54), and it is not necessarily beyond the interests of the firm.

What might induce firms to take actions to curb greenhouse gas emissions in the absence of legal requirements? A large body of literature explores the theoretical motivations of companies to undertake some sort of corporate social responsibility commitment, and many of

[1] As Bénabou and Tirole (2010) note "we see that, as with individual consumers or investors, corporate 'socially responsible behaviors' often carry much ambiguity as to their exact motivation" (12).

these motivations are relevant to the case of voluntary GHG emissions.[2] In most cases, models focus on the dynamics between a firm and a particular stakeholder group such as activists, consumers, employees, managers, shareholders, or regulators that explains CSR investments. More recently, reviews of this specific literature by economists have resulted in broader theories to explain CSR investments that are relevant to the exploration here.

The first of these frameworks has been developed by Kitzmuller and Shimshack (2012), who argue that CSR can be categorized depending on the types of preferences one assumes for stakeholders and shareholders. If shareholders have social preferences (that is, the well-being of potential victims of pollution is included in their utility function), CSR may be undertaken as a strategic tool even if it is not profitable for the firm. On the other hand, if shareholders have classical (selfish) preferences, CSR becomes only relevant if there is a possibility of increasing profits.[3] A review by Schmitz and Schrader (2013) uses a similar framework. For profit-seeking corporations, motivations for CSR can be explained as a response to the type of preferences that stakeholders have. In the case without social preferences, CSR can act directly as an advertisement, a signaler of product quality, a strategy to avoid regulations, or a response to government failure.[4] If stakeholders have social preferences, however, the firm may provide CSR in an effort to appease these groups.[5]

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[2] A ready answer to the above question may be changes in technology. That is, the introduction of cheap clean energy technology would obviously lower the cost of pollution abatement. However, such technological developments are endogenous to the framework developed here, and this is discussed further below. As yet, this is not a major motivating factor discussed in the literature.

[3] CSR is considered strategic in the sense that it allow a firm to capture a higher market share and differentiate itself from competitors. In this essay, CSR can be strategic, but it may serve other purposes too.

[4] By government failure, Schmitz & Schraeder (2013) mean that CSR can be seen as the provision of public goods or reduction in "public bads" provided by a firm. Governments may be unable to provide all of the public goods that are desired due to regulatory capture, for example, or if the pollution in question originates in another country. It may also be that the citizenry has different preferences for public good provision. If a large group, but not a majority, wants to have a public good provided, they may be able to convince a company to provide it rather than the government (4).

[5] Schmitz & Schraeder (2013) consider shareholders to be a stakeholder group, while Kitzmuller and Shimshack (2012) treat them separately. In this essay, the former approach is adopted.

Moving from abstract notions of stakeholder and shareholder preferences, Kitzmuller and Shimshack (2012) argue that CSR addresses these preferences through three mechanisms: markets (for both products and labor), politics (both public and internal to the firm), and isomorphism.[6] Crifo and Forget (2014) make a similar argument, suggesting that CSR is driven by considerations about regulation, competition, and contracts.[7] However, they also argue that the existence of social preferences is not sufficient to explain the range of CSR actions that are observed. Instead, social preferences are assumed but CSR is ultimately driven by market imperfections, such as the under-provision of public goods, incomplete contracts, or imperfect competition.

There are many cases though whereby CSR can still be profitable and therefore is rational for a firm to undertake regardless of the types of preferences that shareholders and managers have. This could be because companies improve the efficiency of their production process and happen to reduce their environmental impact with it (Lyon & Maxwell 2002; Busch-Pinkse 2012). Alternatively, it may be that pressure to reduce emissions, whatever the source of that pressure, can prompt the firm to innovate, improving its production process technology in an effort to reduce emissions that also trims costs (Porter & van der Linde 1995). This is also known as the Porter hypothesis, though it has traditionally been discussed in the context of mandatory environmental regulations only (Ambec et al 2011). Additionally, some question why the firm would be so ignorant of its production process, leaving cost-reducing changes undone (Prakash & Potoski 2012), while others consider the issue how firms understand their techniques and input mixes to be unsettled (Lyon & Maxwell 2002). The attention that GHG

[6] Isomorphism refers to social norms.

[7] Regulation can be thought of as analogous to Kitzmuller & Shimshack's (2012) political motivations; competition relates to the market drivers; contracts are analogous to isomorphic drivers.

reduction has received has also spurred the development of new renewable energy and energy-efficient technologies that allow firms, in some cases, to both reduce emissions and costs.

Pressure to reduce emissions can also come from stakeholder groups (Busch-Pinkse 2012). Consumers may be considered "socially responsible," and therefore motivate firms to provide more of a public good e.g. cleaner air or water alongside a private good to cater to those consumers (Bagnoli & Watts 2003; Lyon & Maxwell 2002). CSR may be driven by activist threats, leading them to provide more socially responsible goods (Baron 2001, 2012; Fedderson & Gilligan 2001; Calveras, Ganuza, & Llobet 2007). Firms operating in an area with regulatory uncertainty, especially with respect to climate change, may make CSR investments in an effort to pre-empt or influence future regulations or avoid the enforcement of existing regulations (Lyon & Maxwell 2002; Lyon & Maxwell 2004; McCluskey & Winfree 2009; Engau & Hoffman 2011).

There has been less agreement or consensus regarding the incentives for CSR given by shareholders and managers. For example, Baron (2007) argues that when investors anticipate CSR, they do not bear its cost in the form of reduced dividends. Instead, managers do through lowered income, and shareholders only pay for CSR when it is a surprise (i.e. not approved by them in advance). However, Cespa and Cestone (2007) seem to disagree, portraying CSR as an entrenchment strategy used by inefficient CEOs. Because these managers build relationships with stakeholders such that these groups could move against the firm if the manager is removed, even inefficient corporate officers can use this access to maintain their position against shareholders. Clark and Hebb (2005) take a more positive view of the role of shareholders, postulating that they use CSR to manage reputational risk. This has the added benefit of

promoting transparency of the firm's behavior and allowing it to be more easily observed both by shareholders and other stakeholders.

A number of mechanisms and relationships that encourage CSR among firms have been identified. However, most of these theoretical models are broad, and, most often, they simply refer to a final good that is considered "greener" than that of a competitor (Fedderson & Gilligan 2001; Bagnoli & Watts 2003; Baron 2007; Baron 2009). In another case, firms may find themselves pushed towards greater CSR due to changes in regulatory norms (or licenses) that can spill over from more environmentally-conscious jurisdictions (Gunningham, Kagan, & Thornton 2003).

In the following section, we develop a framework involving voluntary greenhouse gas reductions that can be used for the analysis of what drives this particular type of CSR and how that varies by firm type. Most importantly, such a framework presents a holistic way of thinking about CSR, in which the firm considers both its costs and preferences of the major stakeholder groups. Additionally, activists and regulators have a new role pressuring the firm to examine its own emissions, either directly through boycotts and media campaigns or through the threat of regulations. From this examination, the firm can determine the appropriate level of clean capital in which to invest.

1.3 Conceptual Framework

The goal of this framework is to understand the firm's decision making process regarding voluntary reduction goals in the context of a firm's profit and cost functions. We focus on large firms and assume that they are monopolists operating in markets with high barriers to entry.

Given this market structure, CSR can be a potential tool for product differentiation (Bagnoli & Watts 2003).[8]

Crucially, one can think of this framework as proceeding in two stages between which information regarding emissions is "revealed" to the firm about its own production process. In the first stage (the basic or naive framework), the firm maximizes profits normally, using only standard capital and labor. Neither the issue of climate change, nor the notion of clean capital are understood by the firm. Thus they have no role in the profit-maximizing decision. Stakeholders are unconcerned about the issue because the issue has not yet been publicized by scientists, governments, and/or activists. None of the external costs of greenhouse gas emissions are internalized by the firm unless they happen to come from regulated co-pollutants, such as ozone depleting chemicals.[9] The model behind the first stage is trivial because it is a relatively standard model of the firm. In the case of climate change, one can think of this as describing the state of the world before, say the mid-1990s or mid-2000s for most firms. Since the mid-nineties, a growing number of U.S. firms started paying attention to climate change. In the second stage, the firm becomes aware of climate change and the possible effects of existing mitigating technologies on costs and revenues.[10]

[8] The assumption of monopolistic firms is not necessary for assuming the existence of CSR. Even firms in a perfectly competitive market will not necessarily maximize profits unless a number of relatively specific conditions are met (Feinberg 1975 & 1980). However, it will be used here as this better reflects real-world market conditions for large firms.

[9] That is, the firm may engage in some GHG emissions abatement as a by-product of reducing other emissions, but GHG emission reduction is not measured or considered by the firm.

[10] The similar to the Lyon & Maxwell (2004) firm decision-making model, where regulators administering a voluntary environmental program provide the firm with information about green technology, which is costly. Because this process has occurred in the case of many firms that have not joined a government-run voluntary program, it is not modeled in the same way here. Instead, scientists or activists become aware of the problem, and then activists work to educate consumers, policy makers, and managers about the issue and its impacts. Additionally, some managers are educated by activists, and this group in turn attempts to educate all other parts of the company, from upper management in order to influence the strategic plan of the business, to employees to influence behavior.

First, we assume that the firm is a monopoly in its narrowly defined industry with a differentiated product, selling at price p. The firm produces quantity, q, of its good according to a measure of responsiveness of demand to price, B, and a measure of popularity of the good, A. Both A and B are positive. That is, the quantity produced is:

$$q = A - Bp \tag{1.1}$$

Re-writing this as an inverse demand curve, we solve the above for p and substitute $\alpha = \frac{A}{B}$ and $\beta = \frac{1}{B}$:

$$p = \alpha - \beta q \tag{1.2}$$

Total revenue for the firm is:

$$TR = (\alpha - \beta q)q \tag{1.3}$$

$$TR = \alpha q - \beta q^2 \tag{1.4}$$

For simplicity, we assume that the firm faces a constant marginal cost, c. This is a function of capital and labor, K and L. However, once the firm is made aware of the issue of climate change (the stage with which this framework is primarily concerned), it becomes aware that there are two types of capital: clean capital and standard capital, denoted by K_s and K_c, respectively.[11] They represent two different types of machines that firms can employ, where clean capital produces CSR in addition to the firm's production good. Clean capital is in some way more efficient (in terms of GHG emissions) than standard capital, either because it uses a cleaner fuel or it employs energy efficiency improvements. Clean capital is treated as a third input into production, meaning that while we assume that output is a product of capital and labor,

[11] This follows Acemoglu et al. (2012) who assume that firms can use either clean or dirty inputs in their production process. For example, firms may be able to choose from two types of machines or processes for producing output, and one of these may use less energy and therefore release fewer emissions than the other. The more energy-efficient machinery would be considered clean capital.

capital is a mixture of clean and standard capital. Additionally, clean capital is always a substitute for standard capital. Clean capital, standard capital, and labor have exogenous prices r_c, r_s, and w, respectively.

Both clean capital and standard capital have a declining marginal rate of technical substitution. That is, in an operation where only standard capital is used, the first units of clean capital can be substituted in for relatively low cost.[12] The opportunities to easily replace some standard capital with clean capital is typically referred to by managers in firms as "low-hanging fruit." Technology can be biased towards a particular type of capital, which brings about a higher marginal productivity, and thus leads to a change in the type of capital that firms use. Additionally, the firm is choosing between capital types with different prices, r_c and r_s. The firm will use clean capital to the extent that the ratio of marginal products between clean and standard capital is equal to the ratio between the prices of the two inputs. Therefore,

$$\frac{MP_{K_S}}{MP_{K_C}} = \frac{r_s}{r_c} \tag{1.5}$$

To understand how technology can impact the tradeoffs between clean and standard capital, we will discuss a case where a firm might have a Cobb-Douglas production function.[13] Additionally, total capital, K is made up of standard and clean capital: $K = K_s^{\tau} + K_c^{\nu}$ where $\tau + \nu = 1$ and represent the proportion of each type of capital used. Technology can impact the ratio of clean to standard capital in two ways. First, there are some processes for which there may be

[12] A simplifying assumption is made here to not consider changes in the use of labor that result from changes in the types of capital employed. Often, clean capital is more labor intensive than standard capital. One example of this is the use of wind turbines instead of coal to generate electricity. A large coal-fired power plant requires fewer workers to maintain than many windmills scattered over a larger area.

[13] The use of a Cobb-Douglas production function here is meant to illustrate a broader theoretical point only. It is impossible to characterize the production of all firms with a general function, but the logic demonstrated here should hold even in the case of other functions.

no clean capital available.[14] In that case, there is an absolute limit set on K_c in the production process, so $K_c^v < l$, where l represents the maximum amount of clean capital that may be used to produce a good. Alternatively, technology may evolve that makes clean capital relatively more cost-efficient. In that case, the parameter v will increase, indicating that the same amount of output can be produced using less clean capital. This is illustrated in figure 1.1.

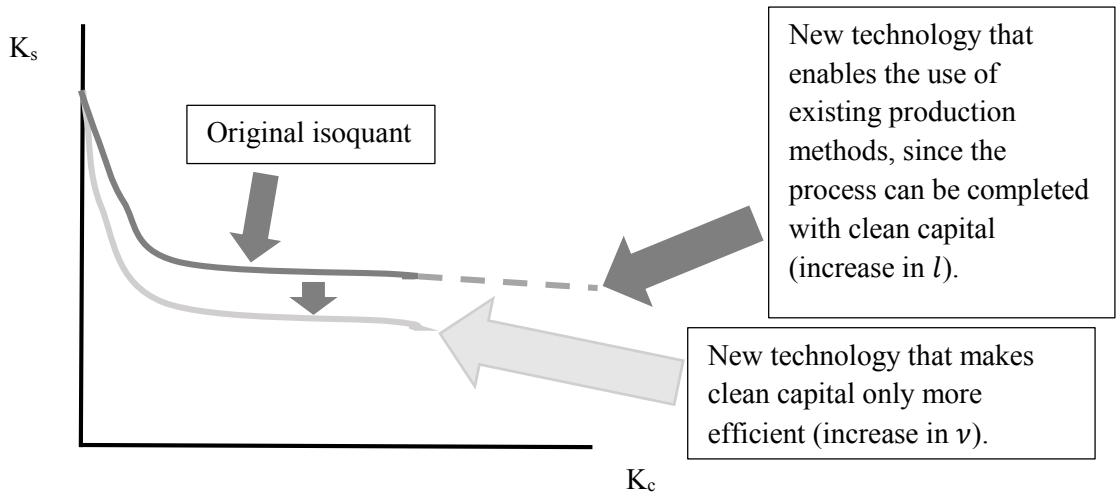

Figure 1.1 Tradeoffs between Clean and Standard Capital

The firm will choose its inputs in such a way that minimizes total costs, given the level of output chosen. Profits for the firm can thus be estimated as:

$$\pi = \alpha q - \beta q^2 - TC(r_s, r_c, w, K_s, K_c, L) \tag{1.6}$$

The profit-maximizing quantity of output, q^*, where marginal revenue is equal to marginal cost is:

$$\frac{\partial \pi}{\partial q} = \alpha - 2\beta q - c = 0 \tag{1.7}$$

$$q^* = \frac{\alpha - c}{2\beta} \tag{1.8}$$

[14] This assumption implies that there are limits to the amount of clean capital the firm can use to maintain production in the medium-run. In this case, the medium-run is a period in which the firm could replace much of its capital structure but where costs of lower-emission technologies do not change significantly.

Before an environmental issue such as climate change is understood by the firm, this is the process through which it chooses output levels and an input mix. It is unconcerned with the distinction between clean capital and standard capital for any environmental purpose. It is also unconcerned with CSR (or clean capital) investments explicitly. Instead of defining CSR related to greenhouse gas emissions as its own separate entity, it can be defined based on the nature of the type of capital that the firm uses. That is, it can be thought of as the ratio of clean capital to total capital used by the firm, or y.

$$y = \frac{K_C}{K_S + K_C} = \frac{K_C}{K} \tag{1.9}$$

Note that a firm may have a high level of CSR simply by choosing a high level of clean capital that happens to be profit-maximizing.[15] Because of efficiency gains that reduce overall costs, the use of some clean capital may be profit-maximizing, even in the absence of other incentives. Indeed, so far in this framework, that is the only way that a profit-maximizing firm would have a high level of CSR.

Once the sources of climate change are identified and publicized by the scientific community, activists learn about the extent of the externality produced by the current production methods (using standard capital). They give this information to policy makers and consumers, and that impact is described below.[16] They also provide this information to managers because they may find ways to lower emissions *and* make their production more efficient.[17] In response

[15] That is, the firm *appears* to be making efforts to be environmentally friendly when such actions are simply the profit-maximizing option for managers.

[16] This is similar to the role played by activists in Fedderson and Gilligan (2001), where they provide information about a firm's production process to consumers so that they can appropriately meet their preferences for socially responsible products. However, the informational role played by activists is greatly expanded here.

[17] Such information can be conveyed through direct partnerships between firms and NGOs to, for example, increase the amount of renewable energy the firm uses in a way that is profitable for the firm. It could also be delivered through the presence of activists and their proxies (such as policy makers who agree with them) at industry association gatherings. This also serves to socialize the problem among managers and create a culture where it is permissible and even expected to pursue emissions reductions within one's organization. Such industrial culture is briefly discussed in Kitzmuller and Shimshack (2012).

to this new information, firms recalculate their optimal choice of inputs, according to the additions to their objective function described in subsequent sections.[18] Such a two-stage approach explains why firms do not begin with a given amount of clean capital, but instead choose it through a decision making process that, in reality, involves setting greenhouse gas reduction goals. In order to meet such goals, firms start considering a switch from standard to clean capital in a manner that is both profit-maximizing and emissions-minimizing.[19]

Previous studies reveal that different firms have various considerations when it comes to choosing a level of CSR, as discussed above. Therefore, a series of cases will be examined in which the firm faces different external constraints and makes profit-maximizing production and CSR decisions based on these constraints. The above framework will be used to illustrate how the firm chooses the ratio of clean capital to total capital (CSR), and the types of firms that the case might represent will be discussed.

However, it is important to note that what is considered "socially responsible" in this framework is based on a general notion of a production process that produces less pollution or reduces a negative externality. That is, in the absence of a carbon price to correct for the externality, a socially responsible firm will be one where the marginal private cost of production

[18] This framework suggests that firms are able to make instantaneous and unlimited changes to their input mix, but this can be thought of as occurring over a number of years. There are a number of examples of firms reducing greenhouse gas emissions on the order of 30% to 50% within a decade of setting reduction goals.

[19] A similar story has been told in the context of public voluntary programs (PVPs; another term for voluntary environmental programs) by Lyon and Maxwell (2010). These programs for GHG emissions reductions usually offer firms a framework for setting reduction goals (that is, establishing a level of clean capital to use) and offer technical assistance for taking emissions inventories, which can be thought of as an examination of their production and cost functions through a new lens. As Lyon and Maxwell (2010) argue: "We believe that progress in the empirical analysis of PVPs will be facilitated if researchers emphasize that PVPs are information-oriented programs designed to diffuse abatement technologies and practices. In this view, many firms are not operating on the production possibilities frontier and environmental process improvements can be studied as a form of technology diffusion that may be enhanced by PVPs" (70).

is closer to the marginal social cost of production. It is important to note as well that CSR investment in the framework refers to a given level of clean capital and is therefore a continuous variable, where as in much of the literature, and when many voluntary programs are considered, it is more of a binary choice: a firm either makes a given commitment to the environment or it does not. Given that the levels and aggressiveness of voluntary goals can vary among firms, a continuous conceptualization of CSR commitments is considered appropriate.[20] The framework could easily be modified to account for discrete goals, whereby a firm meets the commitments in a program by having the proportion of capital that is considered clean, y, greater than a specified level necessary for the prescribed emission reductions. It should also be remembered that while the framework presented here is static aside from the trivial first stage described above, CSR commitments and goals take place over time. They usually involve a pledge by the firm to change from the current, lower proportion of clean capital to a higher level.[21]

The types of firms that typically pursue purely profit-maximizing CSR (the only case considered so far) without having to pay attention to stakeholders are primarily capital-intensive with relatively old capital stock. This is not because there is no scope for labor-intensive firms to pursue CSR, but rather because the benefits from stakeholder groups that desire CSR are relatively small in comparison to the investments that need to be made to boost the level of CSR in the firm. Capital-intensive firms would be most likely to benefit from the fuel switching and energy efficiency improvements that come with the greater use of clean capital, and the presence of old capital stock means that the firm will need to replace capital regardless of considerations

[20] The standard practice, depending on the growth trajectory of the firm, is to either have an absolute reduction goal (that is a reduction of total emissions by a certain percentage by a given year) or a normalized goal, such that emissions fall per-unit of something (such as per-dollar of revenue or per-unit of production).

[21] One could think of the first stage as being pre-goal, the time between stages as the period in which a firm enacts the goal, and the second stage as the immediate post-goal time. This assumes that the firm works to set a goal as soon as the new information about its production process is "revealed."

of sustainability. Obviously, since the use of more clean capital is profit-maximizing, these firms will tend to pursue their intended level of clean capital use without any additional incentives from a program. However, they would no doubt take advantage of such incentives, and voluntary programs can induce additional investments on the margin.

1.4 Stakeholder Roles in CSR Motivation

Consumer Preferences

In many cases, such as when a firm produces intermediate goods or electricity, most consumers will care little about the proportion of clean to total capital. If one defines 'consumers,' however, to include the buyers of intermediate products which may be other businesses, the factor of consumer pressure may become important. Increasingly, firms are asking questions to their suppliers about GHG emissions in order to measure the "upstream" emissions of their products. These buyer firms are often responding to their own customer inquiries or submitting disclosure forms to investor groups such as CDP or the Dow Sustainability Index.

There are many other cases where CSR is done to appeal to more traditional conceptions of consumers, even in the case of greenhouse gas emissions targets. Several retail firms joined EPA's Climate Leaders program, such as Abercrombie & Fitch, Best Buy, GAP, and Tiffany & Co. This was likely done in an effort to build a reputation among consumers as a "green" company. Also found in Climate Leaders are many major government contractors, who may have wished to appear proactive on climate change in order to cater to their government customer. Lockheed Martin, Northup Grumman, Raytheon, General Dynamics, Boeing, and Honeywell, consistently the largest recipients of Federal contracting money, were all members of the voluntary program in the 2000s.

The addition of consumer preference for CSR to the framework is straightforward where the strength of consumer preference for higher levels of CSR in terms of willingness to pay is shown through the parameter δ. Thus, demand is now:

$$p = \alpha - \beta q + \delta y \qquad where\ \delta \geq 0 \tag{1.10}$$

The resulting profit estimation equation is given below:

$$\pi = (\alpha + \delta y)q - \beta q^2 - TC(r_s, r_c, w, K_s, K_c, L) \tag{1.11}$$

Maximizing profits and finding optimal quantity, we now have:

$$\frac{\partial \pi}{\partial q} = (\alpha + \delta y)q - 2\beta q - c = 0 \tag{1.12}$$

$$q^* = \frac{\alpha + \delta y - c}{2\beta} \tag{1.13}$$

The incorporation of consumer preferences for CSR in this way both directly boosts demand and reduces the price elasticity of demand for the product.[22] Additionally, because $\frac{\partial q}{\partial y} = \delta$ and $\delta \geq 0$, a greater willingness to pay will boost production by the firm. Therefore, assuming a nonzero willingness to pay by consumers, $q^* > q$.

Here, marginal cost, *c*, appears to be independent of *y*. However, recall that *y* is actually a measure of the ratio of clean capital to total capital inputs. That choice of inputs does directly figure into the cost function and thus $c = f(y)$. This formulation simply describes the additional benefits that the firm can receive from CSR investments, or choosing a cleaner set of inputs. This may cause the firm to choose to increase costs in order to take advantage of the even greater revenues to be gained from selling "green" products. That is, the firm may decide to employ more clean capital that would raise costs but have a positive impact on its reputation and sales that justify this.

[22] Price elasticity of demand is $\eta = \left|-\frac{1}{\beta}\frac{p}{q}\right| = \left|-\frac{p}{\alpha - p + \delta y}\right|$. Therefore, as δ increases, $|\eta|$ falls.

Activist Threat

Closely related to the notion that consumers care about CSR is the idea that activists in the form of environmental NGOs can organize to affect demand for a firm's products if a desired level of CSR investment (clean capital) is not reached. This could happen through measures such as direct calls for a boycott, or, more likely in recent years, a media campaign and negative publicity for the firm.[23]

In the framework, the activist threat impacts the demand curve in the following manner, increasing the willingness of consumers to pay for CSR by μ. Threats therefore have the potential to encourage CSR investment by causing the firm to fail to maximize profits if it does not choose the new and higher appropriate level of clean capital.

$$p = \alpha + (\delta + \mu)y - \beta q \quad where\ \mu \geq 0 \tag{1.14}$$

Optimal quantity is now simply:

$$q^* = \frac{\alpha + (\delta + \mu)y - c}{2\beta} \tag{1.15}$$

Because $\frac{\partial q}{\partial y} = (\delta + \mu)$, a greater activist threat that makes CSR more valuable can also increase output for the firm.

Through their activities, activists make CSR, in the form of an increase in y more valuable for the firm. Therefore, the firm will be forgoing additional profits if it fails to invest in CSR when activists are demanding it. In practice, the ability of activists to impact demand depends on the credibility of the threat. This in turn depends on the preference that consumers have for CSR, as well as the ability of the activists to organize in order to carry out their threat.

[23] In this essay, the confrontational activist threat is treated in a very similar fashion to Baron (2001), which is the seminal work in this area and with a model that goes into more detail on this point than will be considered here.

That is, NGOs may intend to carry out their threat, but they may not be able to effectively communicate their message to the public.

Workers

The above cases assume that firms are relatively capital intensive, meaning that changes occur in the composition of capital, which can impose significant costs or benefits upon the firm. In reality, many firms that are not capital intensive also set voluntary GHG reduction goals. In the case of retail firms and service providers that have contact with consumers, this could be an effort to improve reputation and promote the firm's "green" brand. There are a number of business service firms though, which do not have significant contact with consumers or whose business customers do not exert pressure for emissions reductions. Primarily, these are in the information technology and financial service industries. They may decide to set GHG reduction goals in order to appeal to their workers, who presumably prefer working for a "green" employer.

To introduce this idea into the framework, the marginal product of labor is dependent on a productivity measure, $\theta(K, \sigma y)$, which is in turn dependent on the amount of capital used by the firm, the level of y, and σ, an exogenous variable representing worker interest in CSR. Additionally, we assume that $\frac{\partial MP_L}{\partial K} > 0$, $\frac{\delta MP_L}{\delta y} > 0, \frac{\partial^2 MP_L}{\partial y^2} < 0$. That is, the productivity of labor is higher with additional capital, and it is higher with additional investment in CSR through the choice of higher levels, but productivity increases at a declining rate with higher levels of CSR. This also impacts the marginal cost, as more productive workers make the labor input more efficient. Therefore, it becomes:

$$c = f(K, \sigma y) \tag{1.16}$$

And profits are now:

$$\pi = \alpha q + (\delta + \mu) y q - \beta q^2 - TC(r_s, r_c, w, K_s, K_c, L(\sigma y)) \tag{1.17}$$

Optimal quantity of output simply becomes:

$$q^* = \frac{\alpha + (\delta + \mu) y - c(K, \sigma y)}{2\beta} \tag{1.18}$$

If workers have a strong preference for CSR, profits will be higher with greater investments in CSR through the use of more clean capital. Similarly, as in the previous cases, higher levels of CSR boost optimal output because more productive labor lowers the need for a labor input and reduces costs at any level of output.

Regulatory Threat

Some firms, such as electric utilities, may be more wary of additional regulations that could be imposed by the government than threats from activists. This threat would take the form of a mandated proportion of clean to standard capital that would yield the minimum allowed level of emissions of the pollutant in question. The regulations in question may not necessarily be a blanket carbon price. Instead, they may target a specific product (such as regulations of refrigerants, which are mostly also greenhouse gases, often done under the Montreal Protocol).

In order to meet standards set by the government for emissions, the firm is forced to set clean and standard capital at K_c^r and K_c^r, which are the levels required by regulations. This ensures that emissions will fall within the acceptable range set by the government. We assume that non-compliance incurs fines that raise costs to the point where firms will always choose to comply with mandatory regulations. Such standards can be expressed in the following way. We define the optimal level of clean and standard capital for the firm as K_c^* and K_s^*, respectively. The ratio of clean to total capital, y, would be set in such a way that in order to meet the

emissions standard, the firm must use a higher-than-optimal level of clean capital (and thus a lower-than-optimal level of standard capital):

$$K_s^r < K_s^* \tag{1.19}$$

$$K_c^r > K_c^* \tag{1.20}$$

This means that the level of CSR investment will be greater than the profit-maximizing level of the clean to total capital ratio, y, for the firm.

$$y^* < y^r = \frac{K_c^r}{K} \tag{1.21}$$

This may still increase the firm's revenue and therefore offset the higher costs brought about by clean capital investment, if it increases demand by convincing consumers that it is due to the firm's socially responsible actions even though it is simply complying with mandatory regulations. However for increased regulations to be a credible threat so as to change firm behavior, fines must be high enough to lower non-compliance profits and the emissions reduction they must go beyond what the firm would have done on its own.

It may be that in order to stave off additional regulations, the firm can use a higher proportion of clean capital than it might have done with no threat, but still less than the regulatory amount, y^r. Let us suppose that a firm uses clean capital such that *y* is more than some minimum that will trigger additional regulations, defined as $y^m < y^r$. It is then assumed that y^m will still be high enough to convince regulators that there is no need to impose additional regulations on the firm. If the firm believes this is a possibility, then they will maximize profits according to the new constraint. That is, the firm will maximize profits:

$$\pi = \alpha q + (\delta + \mu) yq - \beta q^2 - TC(r_s, r_c, w, K_s, K_c, L(\sigma y)) \tag{1.22}$$

subject to the following constraint:

$$y \geq y^m \tag{1.23}$$

and choose the corresponding optimal q and y.

Deriving further optimization conditions would require specifying a production function for the firm that would act as an additional constraint, but this is not necessary to do for the purposes of this essay, which focuses on specifying the role of CSR. From this, it can be assumed that a credible regulatory threat will induce investment in clean capital even in the absence of mandatory regulations. However, it is also assumed that this level is lower than what would be required with mandatory rules.

The Role of Shareholders and Production Choices

Choosing the profit-maximizing level of output given stakeholder preferences requires several steps. This framework assumes that the firm has perfect information about the stakeholders' preferences and their potential impact on costs and revenues as a result of their choice of y. Thus, the firm can calculate its cost and revenue functions according to the stakeholder preferences, and choose the appropriate level of output. Firms may not face pressure from all stakeholders, but if they do, the higher preferences of one group for action may cause the firm to "over-comply" with the preferences of other groups. For example, if a firm is concerned that it faces potential regulations, such that it sets $y > y^m$ but also faces pressure from activists that push it to use even more clean capital, its ultimate level could be $y > y^r > y^m$, rendering mandatory regulations irrelevant.[24]

This process to choose the appropriate level of clean capital ultimately means that the firm believes it is maximizing profits in each of the periods described in the framework. However, as Baron (2001) considers, it may be the case that the company's shareholders have non-pecuniary preferences such as gaining some non-monetary benefits from the knowledge that

[24] One could also consider the case of a three period framework, where a higher level of y in period 2 persuades regulators that the firm could meet even stricter standards, and thus the threat of limits on emissions would increase for the third period.

they own "green" companies.[25] If they do have a preference for CSR that can only be acquired by sacrificing profits, utility maximization is at odds with profit maximization, as shown by Feinberg (1975). That is, investors may pressure a firm to use more clean capital, even though the resulting y is sub-optimal from a profit-maximizing perspective. The shareholders will, through an internal negotiation process at meetings and through votes, determine their average preference for CSR. If they have no social preference for it or a preference that is less than or equal to y, they will simply accept the profit-maximizing level that the firm has presented to them.[26] This is because the level of y is assumed to be compatible with their goal of profit-maximization for the firm. However, if their preference for CSR is higher than what the firm arrives at through simple profit maximization, they will ask the firm to produce a level of CSR that maximizes their utility, despite the lower returns to investment. That is,

$$U^s = \rho\pi + (1-\rho)y \tag{1.24}$$

where $0 < \rho \leq 1$ represents the relative weights placed on profits and CSR. Shareholders are willing to accept a lower return because they will get satisfaction from knowing that the firm uses more clean capital.

1.5 Determinants of CSR Investment & Conclusions

The amount of CSR (clean capital) investment by the firm therefore depends on several things. First, clean capital can be thought of as a standard third input into production (one that is a very good substitute for standard capital until a large proportion of standard capital has been

[25] Baron (2001) refers to this as altruism. It is an impossible task to understand the "true" motivations of shareholders that claim to have an interest in environmentally sustainable firms. They may simply have relatively long time horizons and wish to ensure that the firm remains profitable even in the face of climate change and a future price on carbon. Still, there is a case that at least *some* shareholders, such as institutional investors like state pension funds or universities, have non-pecuniary preferences because of the occasional practice of divestment from socially controversial firms.

[26] Following Feinberg (1975), profit-maximization here is considered to be a useful assumption rather than a necessary result.

replaced). Because of this, the absolute level of clean capital used will depend on technology, its relative price, and the firm's production decision.[27]

Second, firm *characteristics* determine which stakeholders matter. That is, a firm can be described by a series of attributes, such as size, location, industry, composition of shareholders, and whether it makes final or intermediate goods. These characteristics will then determine the value of the parameters above, namely consumer willingness to pay (δ), the degree of activist threat (μ), the degree of worker preference for CSR (σ), and the preference of shareholders for CSR (ρ). These shape the ultimate costs and benefits of using more clean capital because they can act as institutional coordinates. A firm that has the characteristic of producing final goods, for example, may set stronger reduction goals to appeal to consumers. A firm that has the characteristic of being in the utility industry may be driven to reduce emissions by the fear of regulations.

Stakeholders will then have an impact on the firm's profit function through their preferences for CSR in the form of the ratio of clean to standard capital. It may be that consumers will purchase more of the firm's product with higher levels of CSR, or activists will less aggressively campaign against the firm, sparing it from reduced revenues. Capital-intensive firms may face regulatory threats unless they appear to be making efforts to incorporate clean capital into their production process, or they may find that workers are more productive if they believe they are working for a "green" company. Finally, it may be that shareholders have non-pecuniary preferences and wish for the firm to use a higher level of clean capital.

[27] Just as in standard profit-maximization models, the firm's choice here is to determine the profit-maximizing quantity given the costs and revenues of different levels of production. The level of clean capital is simply a byproduct of this process, though the appropriate level of clean capital is chosen by the firm in the same sense that it chooses the appropriate level of any other input.

It is important to mention the role of path dependence affecting firm decisions in the future. If a firm has been building a reputation among consumers as a company that "cares" about the environment in the past, for example, consumers will expect the firm to maintain that level of clean capital or use even more in the future. These expectations may set the company on a new path where investing in more CSR and publicizing it is a route to higher profits. This also suggests the importance not only of stakeholders' preferences but also those who are employed by the firm as managers and their preferences; firms, after all, are composed of individuals working in concert who have a particular set of beliefs about the state of the world.

The above conceptual framework is admittedly general in nature and only provides a basic rubric of the areas in a firm's decision making process in which CSR considerations are taken into account. Future research can help refine the above framework in order to arrive at more specific propositions regarding the types of firms that would be likely to have stakeholders with CSR or social preferences. Another fruitful area of research is a deeper examination of the interaction of time and information about the environmental issue that enables us to identify and assess the firm's strategic reaction to the issue at hand.

CHAPTER 2

ANALYSIS OF INTERVIEWS WITH ENVIRONMENTAL SUSTAINABILITY MANAGERS AT LARGE U.S. FIRMS

2.1 Introduction

Since the failure of the United States Senate to approve a system of tradable allowances for greenhouse gas emissions in 2010, there has been little serious discussion of a national carbon pricing scheme on emissions from industrial sources. Regulations drafted by the U.S. Environmental Protection Agency (EPA) to regulate emissions under the Clean Air Act would require states to reduce greenhouse gas emissions from electricity generation according to plans currently being negotiated; broader mandatory limits are not currently being discussed. However, voluntary actions by large firms to reduce emissions has received much publicity.[28] Such efforts can involve setting a goal for direct emissions from a firm from production or goals for emissions reductions from product use.

Commitments to reductions by firms appear to be growing. An early indicator was the U.S. Environmental Protection Agency's (EPA's) voluntary Climate Leaders program, which provided assistance to member firms in developing a greenhouse gas inventory and voluntary reduction goals and ran from 2002 to 2010. By the end of the program, its 368 member companies were responsible for roughly 8% of US greenhouse gas emissions and earned combined revenues equivalent to 12% of US gross domestic product (U.S. Environmental Protection Agency 2009). More recently, CDP (formerly the Carbon Disclosure Project) has submitted annual questionnaires to firms on behalf of investors inviting them to document their

[28] See, for example, Davenport (2014).

goals.[29] In 2014, at least 235 S&P 500 members had voluntary reduction goals while 67 reported not having a goal (CDP North America 2014).[30]

Standard economic assumptions of profit-maximization suggest that firms weigh the costs and benefits of setting and achieving a goal and choosing the option that offers the greatest net benefits. However, if firms could have increased profits by improving efficiency or switching to renewable energy, why would they have not done so already? The Porter (1991) hypothesis suggests that environmental regulations can pressure firms to innovate by making managers and engineers to reexamine their production methods to seek opportunities for pollution reduction or face cost increases. It has typically been applied in the context of mandatory limits on pollution though. However, Ambec et al. (2011) note that the hypothesis has not been investigated in the context of other initiatives such as voluntary disclosure, programs, and goals.

This essay will investigate the motivations for firms to set voluntary goals for greenhouse gas reduction, including their methods for determining specific goals, and their policy engagement strategies. Interviews can be especially useful for this inquiry, as they can capture more and richer details about this process than surveys and quantitative data and are more generalizable than case studies. This essay will analyze results from 16 interviews conducted with officials at major firms with a presence in the United States in 2013 and 2014. The qualitative analysis will be done by grouping the response of firms to the policy uncertainty presented by the issue of climate change under broad themes and according to a framework first

[29] Investors pay a membership fee to CDP for access to detailed responses by firms to questionnaires regarding greenhouse gas emissions, water usage, and impacts on deforestation. The organization claims to represent 767 institutional investors with a combined $92 trillion in assets (CDP North America 2014).

[30] Other companies either declined to participate (68), did not respond to the questionnaire (86), did not make their response public (33), or answered their questionnaire too late to be included in the 2014 data (10).

presented by Engau and Hoffman (2011) in the context of Galbraith's (1971) theory of the firm and its technostructure. Interview questions were organized into three themes: (1) the role of business in society and its legacy; (2) climate change policy decisions by the firm; and (3) politics and government policy.

This essay will be organized as follows. The next section will outline the relevant literature on qualitative research in economics and interview- and survey-based studies of environmental sustainability decision making within firms. Then, a framework of the technostructure and strategic responses will be developed. In section 2.4, the details of the research design and methodology will be discussed. Section 2.5 will analyze the results of the study, and the final section will offer conclusions and possible directions for future research.

2.2 Literature Review

The use of qualitative methods in economics is somewhat controversial, and these methods are generally viewed with skepticism. For example, Milton Friedman (1966) argues that "answers given by businessmen to questions about the factors affecting their decisions…is about on par with testing theories of longevity by asking octogenarians how they account for their long life" (31). In her survey of qualitative contributions to economics, Starr (2014) writes that economists tend to have three primary concerns about the value of such research. First, the perspective of the researcher may influence the results. Second, self-reported information is likely to be of dubious quality. Third, the richness of the data causes difficulty when attempting to test abstractions of variables of interest. However, Starr (2014) argues that well-designed studies will suffer from none of these problems. That is, researchers can take steps such as carefully documenting procedures and protocols, finding opportunities to cross-check data against other sources of information (known as triangulation), and following established methods

of asking questions designed to elicit more reliable information from subjects. She concludes that "well-done qualitative work can provide scientifically valuable and intellectually helpful ways of adding to the stock of economic knowledge, especially when applied to research questions for which they are well suited" (258).

A prime example of qualitative research in economics is Bewley (1999), which seeks to understand the mechanisms behind wage rigidity in a recession. In justifying his methods of interviewing businesspeople about their decisions, Bewley advises testing as many aspects of the phenomena of interest as possible. This is because "we should want as complete as possible an explanation of the causes of these phenomena, so that we can learn what will happen when the circumstances creating the phenomena change, because of policy intervention or for other reasons (10)." Furthermore, he notes, "it would be presumptuous to ignore the testimony of people who make economic decisions and observe and participate in economic life. To do so would be to make economics a religion rather than a responsible analysis of experience. Good instincts about a subject can be developed only by contact with the phenomena studied" (14).

In the case of Bewley (1999), it was the unsatisfactory explanations of wage rigidity by neoclassical economists that justified the qualitative approach. There was little published information on theories of wage rigidity that actually allowed for the verification of the assumptions required for labor markets to clear, or as to possible explanations of why they might not (5-7).[31] There is an analogously unsatisfactory situation in the area of green behavior by firms. The determinants of green behavior by firms are still largely unknown, either on an empirical basis or a theoretical one. One crucial step in understanding the observed variation in the green behavior of firms is to investigate the way in which key actors operate within a firm's

[31] Bewley notes, for example, that he had found no evidence available to support the idea that firms offer the choice of a pay cut to employees before laying them off.

technostructure with regards to these issues, as well as the views of those people within the firm that work to set and implement environmental goals. Such an interview approach can be more generalizable than case studies, and offers an opportunity to probe responses for further insight.[32] Few interview-based studies have approached these questions. When they have, they tended to be in rather specific contexts or in cases of mandatory regulations (for example, see Kagan, Thornton, and Gunningham (2003) or Ueker-Mercado and Walker (2012)).[33]

However, several survey-based studies have posed questions to business executives about their motivations for undertaking voluntary environmental or climate sustainability actions. Berns et al. (2009) survey 1,560 business executives on the benefits of and obstacles to sustainability activities, and have a number of relevant findings. Thirty-five percent of respondents say that the greatest benefit from environmental sustainability actions is improved reputation; followed by 10% who cite cost savings as the paramount benefit. When asked about the most significant internal challenges to addressing sustainability issues, 21% of subjects cited "outdated mental models and perspectives on sustainability," followed closely by the 20% who cited "too many competing priorities/don't know what to do first" (53, 58). Finally, 40% of respondents cited senior leadership as the primary stakeholder group driving the embrace of sustainability issues, followed by consumers at 18% (62).

More relevant to this study is the survey on company motivations for setting greenhouse gas reduction goals conducted by the Association for Climate Change Officers (ACCO), which surveyed more than 100 firms, colleges and universities, and government agencies (2013).

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[32] This point is made by both Kagan, Thornton, and Gunningham (2003) and Bewley (1999) in their justifications for using interviews as opposed to case studies or surveys.

[33] Kagan, Thornton, and Gunningham (2003) interview managers at 14 pulp and paper manufacturing mills about the impact of regulation and enforcement on environmental behavior. Ueker-Mercado and Walker (2012) interview 18 facilities managers at sporting and event center on their motivations for voluntary environmental actions.

Respondents were asked to rate the importance of various drivers of their greenhouse gas reduction goals on an ascending scale from 0 to 6. The primary drivers of the corporate respondents were "being a socially responsible corporate citizen" (5.07), "elevating corporate reputation" (4.89), and "reducing costs" (4.87). If one assumes a profit-maximizing firm, then the motivation for being "socially responsible" is reflected in the other, more pecuniary factors cited.[34] Further, when respondents were asked to name the challenges they faced in implementing their goals, two-thirds cited "limited financial and human capacity," and 40% said that it was a questionable return on investment (ROI).

Finally, Engau and Hoffman (2011) survey 112 business executives from major economies on their strategic responses to uncertainty regarding climate regulations. They construct a framework to sort firms according to their responses. Firms can choose to avoid potential uncertainty, reduce that uncertainty, adapt their corporate structure, or disregard the threat. They conclude that firms pursue a mix of all four strategies, though North American firms are more likely to undertake adaptation strategies. These consist of actions such as changing the organizational design of the firm, restructuring the firm's portfolio, and diversification.

2.3 Conceptual Framework

Such decisions are usually made by committees located within the technostructure of the firm. John Kenneth Galbraith first introduced the idea of the technostructure as a vital part of the organization of very large firms in industrialized countries (1971). Because large firms are very

[34] There is further evidence that firms are not altruistic here. Their second-lowest rated driver for goal setting was "providing health benefits." If companies were driven by this, it may suggest that they wished to be "socially responsible" apart from the impact that it has on reputation, costs, and other factors that impact profits.

complex and processing huge amounts of information for planning production, decisions tend to be made by groups. As Galbraith explains in his definition of the technostructure:

> "it extends from the most senior officials of the corporation to where it meets, at the outer perimeter, the white- and blue-collar workers whose function is to conform more or less mechanically to instruction or routine. It embraces all who bring specialized knowledge, talent, or experience to group decision-making. This, not the management, is the guiding intelligence – the brain – of the enterprise" (84).

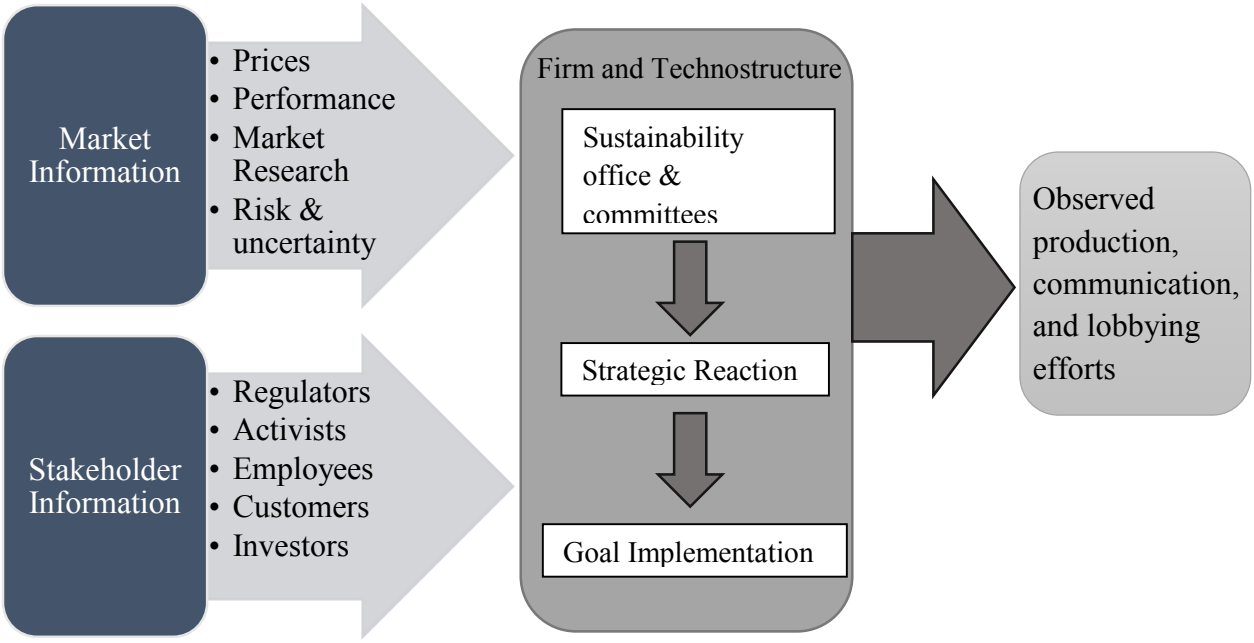

Figure 2.1 Decision making within the firm

The technostructure "selects products and chooses production techniques, including the number and type of workers to employ; they develop marketing and pricing policy; they conduct research and development; and they are responsible for organizing access to finance… [they] choose those goals and strategies that facilitate its survival and reproduction" (Dunn 2011, 108). Therefore, the crucial decisions that are required for the shaping and implementation of greenhouse gas emission reduction goals all take place within this framework. Indeed, Engau and Hoffman (2011) cite Galbraith's ideas of the technostructure among their sources when

formulating their framework of strategic reaction to the uncertainty brought about by the issue of climate change.

Table 2.1 Strategic responses to regulatory uncertainty

Strategy	Approach	Description
Avoid	Stabilization	Increase predictability through implementation of standard procedures and establishment of long-term contracts such as renewable energy power purchasing agreements
	Withdrawal	Exit business in uncertain markets and focus on predictable markets whose environments are less likely to be impacted by climate policy
Reduce	Investigation	Collect additional information on items such as the firm's current carbon footprint; draw on professional expertise to be applied in decision-making process regarding the issue of climate change
	Simplification	Reduce number of uncertain factors considered in decision-making process through the reduction of greenhouse gas emissions
	Influencing	Manipulate determining circumstances or actors that constitute uncertainty through lobbying efforts or establishing goodwill with stakeholder groups
Adapt	Internal design	Change organizational design by establishing committees or offices responsible for environmental sustainability initiatives or providing incentives for workers to engage in sustainability programs
	Flexibility	Enlarge range of strategic options, e.g., through diversification or developing "green" products to sell enabling customers to reduce emissions
	Imitation	Examine and copy strategy of successful competitors such as those who have successful environmental sustainability initiatives as measured by aggressive reductions and documented cost reductions
Disregard	Business as usual	Pretend that uncertainty does not affect decisions

Source: Adapted from Table 1 in Engau and Hoffman (2011)

The resulting framework showing the assumed decision making process is presented in Figure 2.1.[35] The technostructure within the firm receives information from markets relating to prices of goods, the firm's performance, beliefs about risk and uncertainty, and market research

[35] This is the decision making process that was usually found to exist at the very large firms studied in this essay.

that they commission. Additionally, they receive information from stakeholder groups such as regulators, activists, employees, consumers, and investors. This combined information is then discussed by groups within sustainability offices and relevant cross-departmental committees so that the firm's strategic reaction can be formulated. This may or may not involve setting a voluntary greenhouse gas reduction goal. One requirement for a goal to be set is a lack of opposition from upper management, especially the CEO. The CEO may choose to impose his or her preference for a goal on the rest of the firm, but opposition from the executive is impossible to overcome.[36] If a goal is decided upon, it can then be implemented. This results in observable actions taken by the firm, such as changes to production, announcements of goals, joining voluntary environmental programs, and lobbying efforts.

Table 2.1 elaborates on the strategic responses that firms can undertake within the technostructure once the issue of climate change is brought to their attention. The strategies outlined in Engau and Hoffman (2011) of avoidance, reduction, adaptation, and disregarding have multiple approaches that the firm may consider pursuing as a best response to uncertainty regarding climate regulations and impact.[37] Firms may select a blend of strategies and approaches that result from the very uncertainty, in this case, of regulatory actions of the state and climate change-related market fluctuations, to which they react; multiple strategies can be thought of as hedging against various regulatory threats or other demand from stakeholders. Only the approaches observed are mentioned in the table. They include actions such as taking a greenhouse gas inventory (investigation), the formation of internal committees responsible for

[36] An EPA official interviewed for this project said this about the influence of the CEO in relation to firms setting voluntary goals: "The CEO is everything to these companies. He or she is like a messiah -- they do talk about them in those terms. If there's a CEO who has a real say on this particular issue...and more do these days, they can go full board on [setting goals]."

[37] Until the firm is made aware of such uncertainty, there is no reason for them to pursue environmental sustainability as a strategy. Similar logic is used to explain the anticompetitive behavior of firms in the absence of regulatory threats that increase the potential cost of such actions (Hüschelrath, Leheyda, & Beschorner 2011).

monitoring the issue of climate change (internal design), setting and meeting greenhouse gas reduction goals (simplification), lobbying regulators (influencing), and others. This will be investigated more thoroughly in the results below.

2.4 Research Design and Methodology

The interviews conducted for this study were semi-structured, meaning that there was a list of predetermined questions. However, all were not necessarily asked of every subject, and they were not asked in the same order. This was done for two reasons. First, conducting interviews with less structure allows the subjects to tell stories in their own terms, which can be useful for uncovering new variables and providing new directions for the researcher to explore. Additionally, this design follows Bewley (1999), who finds less-structured interviews to be more revealing. According to him, "interviews were best when I made it clear to people that they were in charge and that I wanted to hear what they thought I needed to know to understand wage rigidity. … They revealed most when speaking freely, with few interruptions from me. When I tried a more organized method, insisting on a fixed list of questions, answers were often inconsistent."

Interview subjects were recruited through attending conferences, meetings, or events on the subject of business and sustainability, or referrals from climate policy experts.[38] This method of relying on contacts met through climate policy events or climate policy experts produces bias in the sample. To some extent this is unavoidable. Companies that are not as engaged with environmental sustainability would have been unlikely to participate in the study, and this is

[38] When asked to provide referrals to other potential respondents, subjects said they could not. This seems largely to be because subjects know few sustainability professionals outside their very specific industry, or they felt that referring someone for the study would be asking that person for a favor that they may have been hesitant to use for this purpose. This should not necessarily be seen as detracting from the study though. Getting referrals through snowball sampling may have led to less variation in the companies being sampled.

reflected in several subjects that were approached and declined interviews.[39] Such firms may not have an environmental sustainability office or staff concerned with greenhouse gas emissions. This leaves a sample of companies that claim to care about environmental sustainability for some reason, to the extent that they have employees working in some capacity to improve that sustainability or publicize claims about such improvements. That is not to say that the subjects interviewed were all parts of companies that unabashedly supported an aggressive price on carbon. Their views were much more nuanced, and, especially in the case where subjects were no longer with the company in question, resistance or retreat from climate policy commitments was discussed. This essay seeks to understand why *this group* of companies chooses to embark on environmental sustainability initiatives and how they make decisions about such investments.

Contact was made with subjects usually through a referral or a cold introduction at gatherings of sustainability professionals in the Washington, DC area. If the subject was met at an event, there was a short conversation about the research project, and then they were asked if they could be contacted with additional question. At this point, subjects would then either give their contact information or provide the information of the appropriate person to speak with in the company. This would be followed with an email asking to arrange a convenient time to meet in person or over the telephone. At this point, the subjects would be shown the consent form, so that they were aware of their rights and the confidentiality protocols.

Interviews took place between July 2013 and August 2014. Out of the 16 interviews conducted, 3 were completed in person, 2 were competed via Skype with a video connection, and the remaining 11 were conducted over the telephone. In one case, 2 subjects from the same company were interviewed at the same time on a conference call, as the subjects worked in

[39] Subjects that declined interviews were in the oil & gas, retail, and defense contracting industries.

different parts of the company that were both relevant to the study. Therefore, 16 interviews were conducted, but there are 17 subjects in total. All interviews lasted for about an hour, which was the amount of time that was agreed to in the consent form. All of the interviews were audio recorded and later transcribed.

The questions (see appendix B) were not asked in any particular order; the flow of conversation dictated this, and not all questions were asked of every subject. This was largely due to the fact that some of the questions were answered in responses to others. In between questions, the interviewer would listen and only ask for clarification or to guide the conversation back towards a relevant topic if it strayed too far.

The consent form that each participant signed included a confidentiality agreement that stipulated quotations would be non-attributable. For that reason, selections from interview transcripts presented in this paper have been lightly edited to remove identifiable information, such as the company's name or a reference to specific material that could lead to the identification of the speaker.[40] Transcript selections have also been lightly edited for clarity.

Sixteen subjects were interviewed at 15 companies. Additionally, one U.S. Environmental Protection Agency (EPA) official was interviewed to provide perspective on the agency's voluntary programs and confirm several themes found in the company interviews. Some characteristics of the firms that employ subjects and the subjects themselves are listed below. While this sample is small, the subjects are very knowledgeable about the decision making process in their own firm or across industries more broadly.[41]

[40] This could include things such as the name of a particular division, a person who works there, specific sustainability targets, or awards and distinctions that the company has received.

[41] Note that this sample size is not inconsistent with surveys in the industrial organization literature. For example, Feinberg (1985) analyzes responses from 24 lawyers regarding European competition policy.

Table 2.2 Salient Characteristics of Respondents

Characteristics		Number of Subjects	Percent of Total
Industry			
	Manufacturing*	7	44%
	FIRE (Finance, Insurance, Real Estate)	3	19%
	Waste Disposal	2	13%
	Aviation	1	6%
	Electric utility	1	6%
	Mining	1	6%
	Renewable Energy Consulting	1	6%
Position			
	Vice President	5	31%
	Manager	5	31%
	Director	2	13%
	Senior Analyst	1	6%
	Senior Consultant	1	6%
	Communications Specialist	1	6%
	Adviser	1	6%
Background**			
	Law	4	25%
	Engineering	3	19%
	Public policy	2	13%
	Economics	2	13%
	Business	2	13%
	Communications	2	13%
	Environmental Science	1	6%
Sex			
	Female	9	56%
	Male	7	44%

***** Including wood, chemicals, automobiles, appliances, heavy manufacturing, and packaging.
****** Background refers to most advanced degree subject attained and where primary area of work has been.

Twelve of the 15 private-sector employers of interview subjects are Fortune 500 companies; an additional one company is in the Fortune 1000. Eleven of the 15 private-sector employers of interview subjects are members of the S&P 500 index of major American companies. Three of the 15 are members of the Dow Jones Industrial Average.[42] Table 2.2

[42] Of the two firms not on a major index, both are headquartered outside the United States.

provides a description of the sample interviewed according to industry, position, background, and sex.

The method of analysis followed King and Horrocks (2010), a widely-used qualitative research design text. After interviews were conducted, audio recordings were transcribed using NVivo software. Descriptive coding was then used to categorize responses by subject. Next, interpretive coding was added to this to group the descriptive codes to understand their meaning. Finally, the interpretative codes were classified under broad themes that were identified across and within cases. The themes are more detailed than the ones used in the questionnaire, although the response themes can be broadly grouped within the questionnaire themes. Here, "themes are recurrent and distinctive features of participants' accounts, characterizing particular perceptions and/or experiences, which the researcher sees as relevant to the research question" (King and Horrocks 2010, 53).

2.5 Results

Environmental sustainability offices exist on a wide variety of models within the technostructure of companies that subjects work for. In the case of 4 of the 15 firms interviewed, there is no dedicated office for environmental sustainability and goal setting within the technostructure. Instead, environmental sustainability policy is either made by a single official in coordination with the Chief Executive Officer (in 2 cases), or by a committee of key officials from various parts of the company who serve on a part-time capacity (in the other 2 cases). In 2 other cases, sustainability offices are located overseas because the companies were not based in the United States. However, there was discussion of how goals and policy set internationally were applied within the United States, developed further below.

The remaining 9 firms have sustainability offices that have responsibilities that typically include setting or proposing internal environmental sustainability goals for the company, overseeing the implementation of these goals, coordinating the development of products with reduced environmental impact, and both external and internal reporting of environmental sustainability efforts. There are no consistent patterns in whether these responsibilities are organized under the auspices of a single officer, or whether it is split up. For example, a chemical company has separate teams in different physical locations for setting internal goals and developing goals regarding products. There is no consistent mandate or pattern of who, exactly the heads of these offices report to. In several cases, the head of the sustainability office is a vice president who would report to either the CEO or a C-suite-level official.[43] In others, the office is located one step further down in the corporate hierarchy, reporting to a vice president of sustainability, communications, or environment, health, and safety.

In four cases, environmental sustainability efforts are led by an official responsible for government affairs and policy engagement with the firm. In three other cases – all manufacturing firms -- the sustainability office is housed within the Environment, Health, and Safety (EHS) office. The presence of a dedicated office for environmental sustainability seems to depend both on the industry and the history of environmental regulatory compliance within the company. That is, companies in industries such as chemicals or other heavy manufacturing that have a long history of interacting with environmental regulators tend to have the structures in place to organize beyond-compliance environmental initiatives.

[43] Such C-suite officials could include the Chief Science Officer or the Chief Sustainability Officer.

2.5.1 *Types of Voluntary Goals*

When discussing voluntary goals with subjects, several distinctions emerged in the types of initiatives that were undertaken as part of the strategic reaction. The primary focus of this work is on what may be traditionally associated with voluntary environmental measures: efforts to reduce the internal environmental impact of the firm, beyond what is required in regulations. These can be thought of as efforts to reduce uncertainty for the firm in the Engau and Hoffman (2011) framework through the approach of simplification. Questions were primarily about goals to reduce greenhouse gas emissions specifically, but these were often closely associated with other initiatives for the firm like energy efficiency measures, renewable energy targets, or waste reduction goals. Such targets could be met through the replacement of capital with more efficient iterations or using electricity generated from renewable energy. Additionally, firms rely on changes in employee behavior through engagement programs to help meet goals, which can fall under the auspices of reducing uncertainty or adapting to it through internal changes to the structure of the firm.[44] This could involve campaigns to encourage employees to do things like turn lights off when not using rooms, or it could be much more complex, such as discussions about changes in work process that would lead to fewer emissions.

Some firms acknowledged that the emissions from the use of their products contributed far more to climate change than their production processes. In these cases, they often set efficiency goals for these products, sometimes in response to customer demands, either from consumers, or from business customers, as will be discussed further below. Such targets are referred to as "market-facing goals." This is one of the few actions mentioned could be

[44] "Employee engagement program" is the term used by subjects to describe efforts to encourage environmentally friendly behavioral changes among employees or other programming designed to showcase the environmental commitments of the firm.

considered a strategy of avoidance through the withdrawal approach from uncertain markets, focusing on more certain areas instead. It could also be considered adaptation through increased flexibility. This also explains the approach of companies who decide that climate change is a business opportunity for them to take advantage of by providing products to firms who are trying to cope with uncertainty.

Finally, some goal-setting is undertaken regarding climate adaptation after companies conducted climate risk analyses of their assets.[45] These could include goals for reducing water use if facilities are thought to be in areas that may become more prone to drought or infrastructure investment to prevent flooding in the future, to name two examples discussed by respondents. Other firms invest in renewable energy to hedge against future price increases in fossil fuels or potential unreliability in the energy supply. These are further examples of reducing uncertainty through simplification.

2.5.2 *Goal-Setting Process*

Firms examined in this study have a variety of process for setting greenhouse gas reduction goals within their technostructure, some of which are much more complex than others. In the more elaborate cases, sustainability offices assess potential targets and feasibility by meeting with different units in the company. This allows them to process information from a variety of sources so that they are able to formulate their strategic response. For example, the director at an industrial manufacturing conglomerate described their goal-setting process, which had recently been completed. They began, as he said, by looking "at a wide variety of potential issues of interest to the corporation, kind of a materiality assessment, probably through about six months of iterative back and forth through surveys and analysis and peer analysis and

[45] Such efforts are referred to as encouraging "business resilience."

benchmarking."[46] This concludes with the identification of the material issues for the corporation by the technostructure.[47] Then the strategic response can be prepared.

Next, targets and goals are sent to other parts of the technostructure and management for agreement.[48] Finally, the board of directors approves the goals, and the environmental sustainability office monitors progress towards implementation of the goal. The director at the manufacturing conglomerate explained that the firm does this "by tracking what in some cases can be thousands of individual projects at our manufacturing facilities that are designed to help the facility or business unit reach its goals."

The vice president of the bank emphasized the identification of and conversations with internal and external stakeholders in their goal-setting process. The goals, she said,

> "were set through a number of conversations with our internal stakeholders and talking to our [properties division], looking at the work that they're doing and understanding what was realistic and what we could meet, but also aspirational and what we could strive for and do better -- so our greenhouse gas reduction goals, our LEED goal, etcetera were set with that in mind.[49] We've also taken on a continual process of looking at those goals and refreshing them as necessary… So it's a continual process of working with our internal stakeholders to make sure that we're on track to meet those goals but also resetting them if we have met them because we always want to be aspiring to that new target.

[46] "Materiality assessment" is the term used for the process by which "material" or important issues for the firm related to social and environmental responsibility (i.e. possible externalities that the firm might face pressure to correct).

[47] "And we always do it in 5 year periods, and then we get work groups to work on each of the material issues, to define what would be, by our estimation, what would be aggressive targets that are both consistent with what we've done in the past and where we think we want to be in the future. We benchmark those against peers and leading corporations to make sure that others think we might be being aggressive too; we don't want to be self-congratulatory. And then we button those down."

[48] As the director noted, the goals are "presented to a variety of senior management organizations within [the company] including the presidents of our different businesses, our board of directors. We have a couple of different councils -- there's a technology council, for example, that's some of the senior scientists and engineers in the corporation…we run it by these guys to see what they think. So, for example, the new goals that we have for our product development went in front of the tech council on that to see if, you know, we were covering all the bases from their estimation.

[49] LEED refers to Leadership in Energy and Environmental Design, and it is a certification program established by the U.S. Green Building Council. Different levels of achievement, such as silver, gold, and platinum require building features or design to enhance sustainability to a certain degree.

A similar process was used by the waste management company, though this was annual, according to their vice president. They begin with an assessment of long-range (5 to 10 year) forecasts of customer priorities, such as sustainability goals that business customers have. Then they formulate a response based on that information.[50] The vice president of a wood manufacturing firm described their process for setting goals, which was very similar:

> "As [the issue of climate change] started to develop more in Europe and we thought 'hmm, that seems to have some momentum.' So in 2006, what we did was a fairly classic scenario planning process. We brought in experts from all over the company to look at the state of what we know about what's happening in this world of climate change, some science and probably more of an emphasis on policy and then we had our tax and economic people there… then we brought to them the current state of information. We had already started to do an analysis of our company's footprint… You cannot impact a pulp and paper mill without spending tens of millions of dollars typically to do something that big. So we said 'let's get ahead of it' and so we mapped out -- that was when we made a GHG reduction commitment.

Others, especially those employed by heavy industry, noted their longer history of concern with air pollution issues. For example, the manager of a chemical company had this to say about their goal-setting process:

> "If I think back to the origins of sustainability at [the company]…We were a big energy user, and we were a big polluter. And so, you know, in the late '80s and early '90s when attention was just starting to be focused, there was this idea that there's an obligation to set a target, and there was a lot of low-hanging fruit at that point.[51] And so you could make some pretty amazing reductions by just tightening up things and making some investments that really drove some steep reductions. And since then we've done more incremental progress but still a pretty steep reduction curve for a large energy-using company.

She also stressed the importance of company culture to the goal-setting process.[52]

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[50] "We tracked that really carefully and did customer analysis to see what their goals are, how they change over time, what they do, and whether they're reported publicly -- so really we're very data intensive in terms of trying to test whether or not this was a sufficient driver, whether we could start putting some money behind it. It seemed to us that there was enough of a driver… we began to think that, eventually, people would want to continually re-use resources to the extent that they could rather than put them in holes in the ground."

[51] Low-hanging fruit refers to projects with relatively low costs. This concept is further discussed below.

[52] Corporate culture broadly refers to the role of social norms. This follows a similar discussion found in Kitzmuller and Shimshack (2012). In the case of the chemical firm, because it "is filled with engineers…people want to know, not exactly how you're going to meet the goal before you set it, but when you set a goal, the cultural

The former vice president of the appliance maker indicated his company had a less-exhaustive process. He noted that if he had not acted his company likely would not have set a goal at all. As he explained, "the company would and many parts of the manufacturing sector would rather these sorts of issues just go away," that is, a strategy of disregarding uncertainty. Instead, he says that he attempted to justify the sustainability goal, using market and stakeholder information to formulate an alternative strategic response.

> "And so my challenge in the role that I played at the company was to look at the strategic objectives of the company and find out whether or not the role that I played in government relations and public policy could facilitate in our achieving our strategic objectives, which in their simplest terms are the creation of value for shareholders, the growth of the company, the acceptance and premium associated with our brand… I went in to the CEO's office and said 'we need to have one of these things and here's how we can do it…I've run some preliminary numbers and we can achieve an absolute reduction'... We had another meeting, I brought in some people to show him the data, and he said 'fine, go do it.'

It can therefore be seen that the types of companies that have these sorts of greenhouse gas reduction goals take a similar approach to determining what they should be. That is predicated on wider processes within the company about identifying potential concerns and developing plans and goals in an attempt to assuage those concerns.

2.5.3 *Motivations for Setting Voluntary Goals*

As expected, there is wide variation in the stated motivations of companies for setting voluntary greenhouse gas reduction goals. As discussed above, a goal may or may not result from new information that the firm's technostructure receives from markets and stakeholders. Such information shapes the firm's strategic response to the issue of climate change. This

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vibe is 'we want to know that you can get there.' And so I think there's kind of this -- and I think you'll see this with a lot of the things we do on sustainability. We want to be bold and we want to have an impact, but being run by a lot of engineers means that you also have a plan."

response in turn shapes the goal's implementation, provided there is not opposition from upper-management.

Table 2.3 Professed Motivations for Voluntary Environmental Action

Motivation	Number Mentioning Factor (percent of total)
Cost reductions	9 (64%)
Investors	6 (43%)
Regulators	6 (43%)
Employees	5 (36%)
Broader reputation/credibility	5 (36%)
Customers	4 (29%)
Activists/NGOs	4 (29%)

Note: Most firms mentioned more than one factor.[53]

Quite often, the goals are designed to appease some sort of internal or external stakeholder group, such as employees, regulators, investors, customers, or activists. They may also be driven directly by management or the CEO themselves as a more general cost-minimization strategy for the firm. As a policy adviser at a mining company noted though, when asked about the motivation for goal-setting, "I think it was management, but they were internalizing the shareholder and stakeholder worries at the same time." The role of each stakeholder group in company decision making will be discussed in turn, in addition to a more direct interest in cost-savings by firms. The factors that firms mentioned as being important to their beyond-compliance environmental efforts are listed in table 2.3.

In the taxonomy used by Engau and Hoffman (2011) to identify strategic responses, the vast majority of firms have decided to reduce emissions and adapt their internal structures to confront the issues. There were 3 cases (19%) where firms discussed disregarding climate

[53] In some cases, it was possible to discern a clear primary motivation for companies to set voluntary environmental sustainability goals. For example, if a firm discussed their goals in terms of cost reductions, these tended to be the major factor in shaping them. However, in several cases, it was less clear. Even when pressed, subjects often had difficulty pinpointing what they believed was the primary motivator.

change. However, for all firms, the response was a mixture of several broad strategies and approaches.

Cost reductions

The idea that firms facing environmental regulation would innovate and develop cost reduction strategies is known as the Porter hypothesis after Porter (1991) and Porter and van der Linde (1995). However, the hypothesis assumes that regulations are mandatory (Ambec et al. 2011). In spite of this, one of the strongest results from the interviews is apparent support of the Porter hypothesis with regard to the threat of climate regulations or the expectation among stakeholders of reduced emissions. Such innovation can be undertaken through a number of channels in the Engau and Hoffman (2011) framework, as will be discussed below.

In only one case did a participant directly say that they were able to justify spending money on environmental initiatives without a "business case," or an adequate return on the investment. However, the firm in question was in financial services, with relatively small projects, such as installing plug-in electric vehicle stations for employees to use. The subject claimed that the expense was justified on the grounds of both its small size in monetary terms and the importance of maintaining the company's reputation as a leader in the field of environmental sustainability. This could be viewed as a strategic response of "reduction" where the firm is influencing the circumstances of uncertainty.

In all other cases, subjects said that they had to show a positive return on investment to their superiors from internal projects. With manufacturing firms, this involves demonstrating that projects designed to reduce emissions have an appropriate payback period. As a sustainability manager at a chemical company said, "our CEO and CFO can direct that capital to high risk but potentially very high reward opportunities in our businesses, like a new product that

could deliver high returns over time, but it's risky. And then you've got your energy efficiency investments which are extremely certain and might have good ROIs but maybe not quite as steep as some of these other major, sexier products."[54] She framed the choice of project to improve sustainability as part of the process of balancing the firm's portfolio of investment spending in terms of the time horizon of the payoffs. This can be seen as strategic response of "reduce" through a simplification approach, where the investment in clean capital shrinks uncertainty for the firm.

A vice president of a packaging manufacturing firm agreed with the sustainability manger.

> "Now there are always going to be projects that have shorter payback and longer payback, and we're always going to favor the shorter ones from a financial perspective, but we will pursue the other projects when they're strategic. But we always seem to have plenty of projects queued up -- we're more limited by cash flow than we are by financial attractiveness… So now cash-flow becomes more of a consideration than asking if we have a project with a 2-year payback. [55]

The vice president then elaborated on the options that his company has for greenhouse gas reduction projects.

> "From a financial attractiveness point of view, large companies should almost always have a wide range of opportunities in front of them. They come from different places. We have over a hundred facilities -- so at any given time, they can be doing re-lamping or HVAC or process improvement upgrades, or maybe we bring two facilities together where they were doing different parts of a conversion operations and now they're doing it as an integrated process.

In addition to capital investments such as improving energy efficiency, as the subject from the packaging firm noted, firms also engage in process improvements to save costs, which

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[54] A "steeper" ROI here means that the projected revenue stream from a project is greater at any point in time – thus the slope of a line showing revenues over time would have a more positive, or steeper, slope.

[55] The subject was not asked what they mean by "strategic" here, but one could assume from the context that a "strategic" project is one that has profit considerations that may not be encapsulated by a simple return on investment framework. The reduction in uncertainty, for example, could be seen as an additional benefit of investments that reduce emissions.

can contribute to voluntary goals and reduce uncertainty. The same subject elaborated on the idea of process improvements this way:

> "There's an interesting dynamic because within a plant environment or a production environment, there's always lean operations. There's continuous improvements, and that's driven by just looking at how people can be more efficient, improve yields, prevent leaks, things like that…That's where the sustainability group comes in. We serve as a catalyst sometimes to get groups to think outside their normal parameters on things that might be possible or things that they can do.

This suggests innovation as a response to the issue of climate change, not only to reduce uncertainty for the firm, but to enhance profitability. This is consistent with the idea of the Porter hypothesis in the context of voluntary environmental actions. The subject was then asked to discuss a specific project that highlighted what how his group asks other parts of the firm to approach production processes differently.

> "A few years ago, we had a lot of emissions of sulfur hexafluoride -- it's used in one of our processes. And the greenhouse gas number on it is really high.[56] So there's definitely a cost to it if it's leaking out, but it's got such a big GHG impact. So we went around to all of the plants and taught them how to do turnaround on it and recover it and recycle it. And so they not only save cost, and we actually gave them the equipment to do that, but it had a huge impact on reducing our GHG emissions as a result. So intuitively, they knew that there were some cost savings to be had there, but they didn't really have a sense of how big they were and they certainly didn't have a sense of how big the climate impact was. So by coming in and helping educate them and showing them processes about recovery and recycling the material, it's now standard procedure in our plants.

In still another example of the cost-savings motivation from a manufacturing firm, the director of environmental sustainability for an industrial conglomerate discussed the relationship between goal setting and project selection. In this case, sustainability goals are set by corporate headquarters and given to individual business units. Each part of the business is then allowed to

[56] The "greenhouse gas number" refers to the global warming potential (GWP) of the gas, which describes its impact on warming the atmosphere as a factor of the impact of carbon dioxide (with a GWP of 1). The GWP of sulfur hexafluoride is 16,300 times that of carbon dioxide.

decide how they will meet their targets through project selections, presumably choosing things that have an appropriate return on investment for them as well.[57]

Subjects from manufacturing companies were divided on whether their firms gave special consideration to projects that had a purported environmental benefit when competing against others for internal funding. In the above case, sustainability appears to have been one dimension among many that was important to the firm, and could vary in its importance across business units. If a unit has trouble meeting its goals, the director explained that sustainability initiatives may have priority. Additionally, in the case of one German company, a sustainability manager noted that headquarters would provide additional support for these projects: "So let's say a project would need a two-year payback, but if a project would include an environmental solution or a sustainable benefit, they'll allow a longer payback period." This is yet another example of a preference for a "simplification" approach within the firm's strategic response to climate change.

However, other firms do not consider sustainability when assessing projects for funding. As a sustainability analyst from an automobile manufacturer noted, "Well, I hate talking in absolutes, but there has to be a business case for everything we do in sustainability -- at the end of the day, we're a business. Sustainability can't happen without profitability." In two other cases, subjects made clear that sustainability projects had to compete alongside others without any special treatment in terms of which project yielded the highest profit returns.

[57] "The process within the business is always to put forward a project to define a [greenhouse gas] reduction, and the projects are like any other project or any other investment. They're assessed for potential funding, and, historically, we've found that there are enough decent energy-related projects. At least there have been up until now. We're convinced there's plenty of them still out there for us, that energy projects tend to have a return on the order of two years or less for us. So those tend to have a relatively good acceptance from management and tend to do fairly well when competing for 'cap ex' dollars. Because, you know, a one-year return is a pretty good project, regardless of what it is, so management tends to think those are OK… But at the end of the day, while management looks at each project, and tries to do their best in terms of funding, it is not negotiable that you have to hit your targets." Note: "cap ex dollars" refers to funds for capital expenditures.

Reducing uncertainty from energy and fuel costs were priorities discussed by other subjects. For example, a renewable energy consultant said that her clients were often interested in renewable energy projects for their price certainty. When speaking about solar power specifically, she said that "there's this understanding that energy prices are going up... And this is a good way to hedge against future price increases. So, long-term, solar projects are providing greater return on investments and greater value to the customers." The EPA official who oversees voluntary programs agreed.[58]

For the airline, fuel is the single biggest cost and source of greenhouse gas emissions. Therefore, as the sustainability manager of one airline notes:

> "Our environmental group doesn't have to say anything about the cost of fuel. That's on the forefront of our senior leaders' minds every day because it's our single biggest cost… Since 1995, our fuel efficiency as an industry has improved by ninety-something percent, so we're dramatically more fuel efficient than we have been in the past. And it's not because we're environmental good guys, it's because the cost of fuel has gone through the roof making all of us look for ways to be more fuel efficient.

It is clear that most of the firms that employ the subjects were interested in the cost-savings that could be achieved alongside reductions in greenhouse gas emissions reductions. However, if that is the case, then why have firms only started to pay serious attention to the issue in the past decade or so?[59] Subjects at the firms interviewed shared their stories of this process. In most cases, they believed that some set of stakeholders (e.g. regulators, investors, consumers, activists, etc.) expected them to set goals for reductions and report on progress towards those goals.

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[58] "Coming at [these companies] is energy prices. Because the more efficient and lean you are in terms of production and all of this, then the more prepared you are as things get higher whether it's regulation or scarcity. But I think that's what they should be focused on, not some mythical legislation [to set a price on carbon]. And that's just a straight-up business decision. That's just thinking about what is usually a company's second biggest cost, and taking care of it."

[59] This timeframe is supported not only by evidence from the interviews, but by the rise of the public voluntary programs, such as Climate Leaders, which began in 2002, and the beginning of widespread reporting of emissions by large firms to the Carbon Disclosure Project (CDP) in the late 2000s.

Regulators

For many firms, especially large emitters of any regulated substance, their relationship with the agencies that oversee such limits is crucial. Out of the 15 relevant firms interviewed, 6 cited regulatory relationships as a factor in their goal setting and sustainability efforts. As one manager responsible for reporting at an electric utility explained: "[Many people] think that sustainability is about making yourself look green to consumers and for us, it's communicating with investors and analysts and regulators that our company is doing the right thing for the right reasons, that we're sustainable as a company, that we're concerned with the use of natural resources because we want those resources to be sustainable." For this company, sustainability initiatives are therefore part of a reduce strategy where the firm seeks to influence circumstances and actors in an effort to keep uncertainty low.

A vice president at a wood products manufacturing firm described a similar strategy of influencing when describing why her firm decided to set a voluntary reduction goal:

> "We looked at policy. We said clearly there's a policy reaction [to climate change], and our conclusion was that we had a big carbon footprint in the carbon dioxide emissions from large manufacturing operations, but we had this enormous carbon sequestration print in our forests. So we have both risks and opportunities, and we ought to be looking at making sure policy decisions understand what we have to offer as a solution, which is good forest management and that we take reasonable precautionary risks on the manufacturing side too because we became convinced that at some point in the future, carbon dioxide emissions would be regulated. So we said, 'let's try to control our future' and start that process now rather than wait until some date in the future and have a year or two or three years, which is sort of the maximum you ever get in a regulatory sense, and all of a sudden have to make a lot of changes.

Subjects described the process of merely understanding their own emissions as tedious.[60] Most said they believed that, at some point in the foreseeable future, greenhouse gas emissions

[60] For example, the sustainability manager at the airline described the process of conducting the inventory: "What we thought would be like a three month project became about a yearlong project to figure out all of our GHG sources… It was fascinating for a while, but it got to the point where I couldn't believe we were trying to find a chemical inventory of the chemicals we use in maintenance in order to see how many of those had GHGs in them,

would be regulated in some form in the states where they have major operations.[61] For several firms, this meant that they should set voluntary goals and participate in voluntary programs in order to earn verified credit for their early actions.

Investors

Subjects at only 2 firms said that investors were an important driver in their efforts to set voluntary reduction goals. In both cases, 1 utility and 1 financial services firm, their sustainability goal-setting efforts began with a question from investors about their actions to plan for climate change impacts and possible regulations. There were 3 additional firms that cited investor requests for information on the issue as a supporting factor in making the case for internal sustainability actions. In two other cases, however, the respondents indicated that investors merely wanted to know that management was paying attention to the issue.

The vice president at a wood products manufacturing firm put it this way:

> "Now the area our shareholders cared about is: Were we taking steps? Did we recognize climate as a risk? And were we taking steps to mitigate the risk? So we included a very thorough discussion of that in our sustainability report. Whenever we met with analysts or shareholders from those large funds, there would be a slide in there about what we were doing to manage all environmental risk, but climate change was always included in that. I would talk to the person who's the head of our investor relations, and I asked 'do they actually care about it?' And she goes 'no, I mean they don't really care what your answer is, they just care that we know and that we're doing something about it.'

This suggests a willingness among the investors to leave such matters to the technostructure of the firm. At least for the majority of firms, investors still have not taken much of an interest in the issue, perhaps because they do not have information, and/or are not convinced that environmental issues are a priority. They may also trust that relevant sustainability concerns will

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like propellants and things like that. It was pretty onerous, especially with the subsidiaries, because you had to find out, for example, how much lease space they had in 2007, and they might have gone out of business or merged or something. So there were a lot of little pieces we were pursuing for numbers that were tiny."

[61] This is elaborated on much more below in the section on Climate Policy Engagement.

be taken care of by the firm in such a way that maximizes shareholder value. This idea was suggested by another vice president from a waste management company:

> "We, every few years, poll all of our investors to ask what's important to them, and I was so excited because I got the chance to ask some questions about 'How about our market edge in terms of new conversion technologies and our investments?' And you know what they said? 'Totally uninterested.' All this sustainability stuff was dead last [in their priorities]. All they cared about was the dividend. So it's really, really depressing.

However, in the case of the electric utility, investors did have an impact:

> "Some investors are very interested in this, and some investors aren't interested at all. I think we received a letter from CalPERS asking that we start to disclose our emissions through CDP, though this was before my time.[62] They're obviously a pretty significant investor... So as a publicly traded company, you get one letter like that and it changes a lot. The company says that we need to put some people on it and figure out how to calculate it, how to report it, how to improve it. It just instantly changes -- it's a little bit of a paradigm shift.

This suggests that while there are some investors considering the potential impact of climate change mitigation or adaptation on their firms, knowledge and concern of the issue has not reached a critical level that makes it part of regular discussion for shareholders, and hence there is an absence of any pressure for a strategic response from them. Therefore, for most (though not all) firms, these stakeholder concerns are not heavily used in formulating a strategic response. This is a surprising result, given the presence of organizations such as CDP (formerly the Carbon Disclosure Project), which sends questionnaires to firms in which they are asked to disclose their greenhouse gas emissions and reduction goals. The organization does this on behalf of nearly 800 paying member investors who control more than $92 trillion in assets globally (CDP North America 2014). Therefore, "activist" investors may have been thought to play a role in prompting firms to set goals.

[62] CalPERS refers to the California Public Employees' Retirement System, a large institutional shareholder in many public companies.

Employees

Several people mentioned employees as key stakeholders that prompted the creation of sustainability goals, largely in an effort to retain talent. Responses to demand for sustainability by employees could be considered an adaptation response where the internal design of the firm is modified according to new information. In addition to efforts emanating from the technostructure, employees might also drive grassroots sustainability efforts within the company. While the impact of their actions in terms of emissions and cost-savings may be debatable, especially for firms in low-emitting industries, interview subjects spoke of using this as a justification for further actions with other management officials. While only 4 companies interviewed discussed the role that employees play in sustainability strategy, this could be an under-representation of the true numbers, even at the 15 relevant companies concerned here. In many cases, it seemed that the management of employee engagement efforts were either located elsewhere within the technostructure or were informal and so interview subjects might not have had the relevant information.[63]

The vice president of a bank said she saw such programs as a way to have more engaged employees and achieve the adoption of what she viewed as aggressive sustainability goals by management:

> "We know from the research that team members, particularly Millennial-age-bracket team members, want to get involved in their company's social and environmental programs, and we really had a lot of enthusiasm about the efforts. So that's really where the efforts began -- how do we really engage this group of folks? But we very quickly knew we had to create a program to engage them, but we also wanted it to be strategic, so we tied it to our company's goals. So we did set a number of goals as a part of our [new] environmental commitments.

[63] One manager at a chemical company noted that such activities for employees were organized at the plant-level, and so only facilities that had sufficient interest would hold events. This suggests that such efforts may not be monitored by sustainability offices, and impacts are hard to measure.

The vice president of another financial services firm discussed the importance of sustainability efforts for recruitment noting that his company's reputation as a leader in the area of environmental sustainability "could capture potential employees and keep them. And we do -- when our people go out to recruit, they do have one sheet about not just the environment but other measures that talk about social responsibility."

Such responses from financial services firms should be expected. They are not large emitters of greenhouse gases, and thus emissions reductions, especially from behavioral changes that employee engagement programs encourage, are relatively low-cost. Further, they believe that they employ workers who are likely to have an interest in issues like sustainability. Therefore, the combination of relatively low costs and relatively high benefits from such measures may explain why these efforts were mentioned by financial services firms over others.

However, the sustainability analyst with the automaker echoed many of the same ideas in his description of the role of current and potential employees in the company's sustainability thinking. For them, sustainability efforts could help with retention, attract talent, and encourage employees to discover cost-savings.[64] This seemed to largely extend to low-cost communications initiatives for the firm though. That is, they simply focused on communicating other efforts that they were planning for other reasons such as cost concerns instead of having extra initiatives and projects designed for the sole purpose of appealing to employees.

[64] "Employees, for us, you want to come to work every day and know that your values align with those of the company you're working with... Our team half-jokingly talks about -- but I think we're mostly serious about it -- we want everyone to come to work and work on sustainability issues. So we want to communicate that and spread that and inspire people to go out and take the initiative to become sustainability advocates on their own. You know, we want to attract the best and the brightest. Today more than ever, you look at the research on Millennials and they'll tell you that they are values-driven talent, more so than ever. It's an evolved way of thinking and we need to be mindful of that -- if we want to attract the best and the brightest, we need to show them that what we stand for is what they're aligned with."

It would be difficult to say from this evidence that employee demand for sustainability initiatives is pressing companies more generally to take on more aggressive initiatives than they would otherwise. There is though, in several cases, a strong interest of communicating achievements to employees and the perception that this is of interest to many workers. One participant noted that this was part of "building the culture" of sustainability at the company.

Customers and Reputation

In only a few cases did firms say that customers were a primary motivator for their goals, though several suggested that more general reputational concerns were driving their efforts.[65] Building this reputation can be seen as an influencing approach to the strategic response of reduction. However, it should be noted that many of the firms employing subjects interviewed (11 out of 16) primarily produce intermediate goods, and none of the firms are in the retail sector where branding and customer priorities may have more consideration. In the case of several companies though, it was their business customers who prompted them to examine production processes, as in the case of the automobile manufacturer.[66]

This suggests that other companies are seeking additional information for their own decision making process, or an investigation approach under a reduction strategy for the firm. By understanding their emissions from suppliers, they can better calculate their exposure to potential cost increases associated with climate regulations. Several other companies noted that these ideas were more relevant for market-facing goals. That is, firms are diversifying or

[65] Concerns about reputation led to the question of with whom they were concerned. This was difficult for subjects to articulate. In some cases, it actually meant another stakeholder group, but there was also a general impression in several cases that this was an attempt to placate, even if they were not identified as important to the company.

[66] "Fleet customers -- there's a whole separate section in terms of what they submit in terms of bids to all the automakers. We have to produce a series of environmental disclosures that talks about how we source our products, how we make them, and the full spectrum of products that we would provide. They're not looking for pure economic numbers, they're looking for the next step in terms of environmental disclosure.

modifying their portfolio of products to reflect new information regarding climate change. This can be seen as an adaptation response using the approach of flexibility. The vice president of the packaging manufacturer said that environmental performance of their products is important to customers:

> "The second reason [we pay attention to environmental sustainability] and it probably trumps [our concerns about our production efficiency] is this issue of reputation, of trying to demonstrate to our customers and even our customers' customers to drive towards more than just things on the financial side. So now we're talking about brand equity[67]... It's hard to be reactive in that mode. You've got to be ahead of the curve and pre-emptive in many ways. So I think that's driving a lot of what's going on in the company right now of trying to get out in front of a lot of these issues such as climate change, so just as it was important to our bottom line, it's important to our customers' bottom line.

He then discussed an example of shrink-wrap made by his company that is designed to be thinner than previous iterations. Such an improvement enables products to be wrapped using less heat (and therefore at lower cost), and allows companies that use large amounts of the material to improve their energy efficiency.

The vice president at the appliance manufacturer discussed his company's findings on the importance of environmental sustainability to customers. His firm hired a consultant in the early 2000s to identify drivers of customer loyalty regarding appliances. The consultant conducted a survey of consumers to this end, and some questions regarding corporate social responsibility and environmental sustainability were included (another example of an investigation approach).

> "One of the most surprising findings was how significant a loyalty driver these environmental dimensions were. So that changed the whole picture… Resources were allocated based on their relationship to this data, and so this gave me the opportunity to spend time with senior leadership down to the director level, all of our various brand organizations and manufacturing organizations, talking about how much public policy has an impact on our business and how if we can be perceived to be a leader in this area despite the fact that consumers might not initially pay more for it, when it came to how they felt about the brand that they owned and their willingness to make repurchase decisions further down the line of another [company]-branded product, then all of a

[67] That is, the value generated by the brand. This can be thought of as the ability to extract additional producer surplus due to real or perceived product differentiation.

> sudden I had a nice, consistent with the core of the business strategy link on the environmental dimension.

Additionally, consumers may care not only about the environmental impact of the products that they buy, but of the company that produces them. As the manager at a chemical company noted, she sees the internal goals for the firm as intimately connected to their market-facing goals. She explained:

> "I think there's some baseline good corporate citizen role to this, and I think especially as [the company] has a bigger portfolio that goes into renewable energy and goes into supporting energy storage, you know, that our products are helping drive reductions. I think it also means you need to have your own house in order before you go selling solutions to people that will help them reduce GHG emissions too.

This sentiment was echoed elsewhere when it came to retaining customers. The renewable energy consultant discussed two cases in which her company had provided renewable energy to firms in order to meet greenhouse gas reduction goals.[68]

For other companies that may not be such large emitters of greenhouse gas emissions, such as all three financial services firms, their reputation with the broader public instead of major customers mattered more to them. The vice president of a major bank said that their efforts started with the "reputational piece" before they realized that goals could be justified using other things like employee engagement and cost savings. Participants at both insurance companies saw the reputational piece as important, but clearly not in order to attract customers.[69]

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[68] "and then other companies, [a major consumer products firm], for example, they actually did a survey with customers to see if sustainability actually matters to them, whether it's a factor in their purchases, and the customers said that it did impact them, so they saw it as a way not just of getting new business but also as a way of keeping current business…one which was similar to [this] case was another company that said that they needed to meet their goal because of a client was asking them to. So if they didn't improve their performance then they may lose the client.

[69] For example, the former senior manager at one company said this about demand for insurance products that took into account climate change impacts: "I would say that there is a recognition that you want to avoid any reputation risk, and so if it is good to be seen as 'green' and good to be innovative, you clearly do want to do that -- I think the highest levels of the company recognize that and want to avoid any kind of negative connotation for the company for not doing something. But I don't think they saw a really high demand from clients. That element is not there yet. So you don't have the insurance client willing to pay more for property insurance that promotes green building even though we might produce that and offer that. That level of awareness isn't there on the demand side.

One firm, however, was still interested in offering environmentally sustainable products in anticipation of eventual demand for them. As the former manager noted, company officials supported this, though most important was the provision of information about company practices to customers.

> They would say that 'this costs us more to offer this type of coverage, and so it's good for us to offer it and put it out there -- we want to have a suite of green products, but I don't think the business case is there yet.' Now, hopefully it will be, and you'll have clients or brokers who are asking or demanding that or, I think that what they did start to see was companies asking for our positions and sustainability plan and what we're doing to be green, probably more than demanding the products. So that starts to become a motivation and then we get calls from random parts of the company in different regions asking 'what do we do to be green?'[70] … Because sometimes in deciding which insurer to go to, people would want to know what our position on some of these sustainability issues is and what we were doing, and that was important to them.

A vice president at the other insurance company noted that his company had been widely recognized for its leadership in the area of sustainability, discussing a number of rankings and lists that the firm had been a part of. He was less optimistic about the ability of these initiatives to attract customers, but noted that the company still found it important to maintain its position, which garnered general goodwill for the company and was relatively inexpensive for a firm that is not capital- or emissions-intensive. When the company is highly regarded in this area, he noted,

> "that captures the attention not just of the CEO but of the whole company, and so now we've got a stake where we want to try to maintain this leadership position -- it's not to gain customers really, because we sell through brokers -- our agents even if they do know about that metric, they're not going to say to a small company, like a small medical office looking and reviewing its options for insurance in Kansas 'you've got…these [options], but I really think you ought to go with [the interviewed company] because of all of them, they've won more green rankings' -- that's not a sales pitch.

[70] Such inquiries reflect the role of the sustainability office within the technostructure as the group that determines what "green" means for the firm. In some cases, such as construction, there are generally accepted standards as to what constitutes "green building" (Leadership in Energy & Environmental Design or LEED certification). But in more firm-specific areas, it may be left to the office to define best practices.

Subjects at several companies noted that reputational concerns play a large role in at least how they communicate with stakeholders about environmental sustainability activities. Most do not believe that aggressive sustainability draws more consumers to them, but, in some cases, institutional customers such as governments, other companies, or non-profit entities inquire about sustainability practices. In other cases, firms are concerned with "market-facing goals" related to selling reduced-impact products that could assist with climate mitigation efforts at other firms or among consumers.

Put in the strategic response framework, firms that talk about consumers are largely pursuing either reduction or adaptation strategies. Within reduction strategies, they tend to be investigating and influencing actors to reduce later uncertainty surrounding possible climate policies and stakeholder preferences. Firms pursuing an adaptation strategy through market-facing goals are pursuing a flexibility approach to diversify their product portfolio.

Activists

Firms seemed to be interested in using activist groups as part of a reduction strategy, to influence the perception of the firm by those groups and other stakeholders, or to provide information and expertise about reduction opportunities through their experience with, for example, renewable energy power purchasing agreements. Discussing confrontation with groups was difficult, and in several cases, subjects shifted discussion away from the topic of confrontation with activist groups, preferring instead to draw attention to partnerships that many companies had developed with various environmental organizations.[71] In other instances, however, subjects were candid in discussing their environmental goals as an effort to deflect

[71] These could include things such as the funding of deforestation reduction initiatives, pairing with community groups to facilitate the siting of a plant, or receiving information from NGOs on best environmental practices in an area like renewable energy purchasing.

potential criticism for not paying attention to climate change. All of the firms interviewed were likely to attract the attention of activist groups because of their size, but some are more "visible" to the public than others, and these seemed to pay more attention to working with various groups.

The manager at a chemical company noted that non-government organizations (NGOs) did expect the company to take action to reduce emissions:

> "I see a lot of push from NGO's or in the global policy sense and there's a focus on US and China and within that you focus on the big industries as a wedge and then within that you look at the energy intensive pieces of that and we [as a company are in that wedge]… [the company] should be focused in some way on reducing and not increasing their emissions.

The starkest description came from the sustainability manager of the airline, noting that their main concern is activists in Europe rather than the United States:

> "Well, in Europe, they've done a good job of demonizing the airlines….So I think there's the fear that in some markets, like Europe, we could become the next tobacco industry. That's certainly not something we would aspire to. We want to be perceived as trying to reign in our emissions voluntarily rather than people ripping off our arm and beating us over the head with it to make us do the right thing. So I think the CEOs of the airlines realize that they have to be evolving their fleet and fixing their existing airplanes.

The vice president of the appliance maker agreed, and was more explicit when asked to describe his company's motivation for setting what was a comparatively modest greenhouse gas reduction goal. He explained that he led efforts to set the goal, in part because

> "I wanted to take that issue off the table with the people who were evaluating our company on these dimensions. So there were elements of a 'check the box' quality to it, but it also gave us a platform for us to talk about what we thought was important, which was the use phase of the product and environmental impact of that phase of the product, as opposed to what in some cases for us would be very, very costly factory-specific changes that we didn't think made sense.

Similarly, the vice president of the insurance company said that his firm could risk being targeted by activists if it was perceived to be behind others in the industry.[72] This meant that they would

[72] "I'd say in the beginning it was -- the motivation seems to be 'well, let's make sure nobody picks on us' -- that we are not outliers in our industry -- so there's kind of a reputational motivation in a backward way and that is,

want to use an adaptation strategy and an imitation approach to reducing the uncertainty that potential boycotts or policy actions that activists could generate.

The analyst at the automaker framed his company's relationship with NGOs differently. He noted that the firm looked to environmental groups to find opportunities for greenhouse gas reduction and renewable energy use:

> "Nonprofit groups, advocacy organizations, these groups like the environmental NGOs that are active on policy issues that are active in local communities; people that can help further the impact and opportunity related to something as simple as a renewable energy project or like a power purchasing agreement with a third party. We may not understand all the rules or all of the implications of a particular [power-purchasing agreement] but they can come in and help facilitate or advise. They can also advise on a whole range of things like I said like policy issues. They can look for opportunities to align and they can become incredible advocates to help burnish our corporate reputation and further our efforts, so NGO's are definitely an important group.

Even the airline sustainability manager noted that there are many NGOs who are cooperating and willing to work with the company and industry, especially in developing policy ideas for a global price on carbon that the airlines hope for.[73]

The waste management firm saw inquiries from environmental NGOs as a major driver of their goal setting. As the vice president noted, a major reason they set goals "is all these geeky features that all these NGOs ask about. Stuff like 'what is your risk management process' and things like that and those actually kind of matter. That was very helpful to us."

It appears that where firms consider activists to be important, they are mainly portrayed as a collaborative resource to provide advice on setting or implementing goals. Unfortunately, it is more difficult to ascertain the impact that these groups have since it may be reasonable to

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we don't want anybody to think we're not pulling our fair share. So let's get involved with this, figure out where things stand, and do the right thing but we just want to make sure that we're not laggards in the field.

[73] "Like in the EU, some try to portray us as an evil industry destroying the environment, and we certainly use our fair share of fuel, so I guess there's some truth to that. More and more, the NGOs seem to be wanting to partner with companies rather than vilify them… There's some groups we partner with on that issue of trying to get airlines to agree on what a global market based measure might look like -- some NGOs are happy to provide some suggestions and expertise on what that might look like and what other industries are doing.

assume that this may be an area where, even when speaking confidentially, subjects may not have wished to discuss confrontations with activist groups. It is clear, however, that firms in relatively polluting industries with larger carbon footprints worry more about activist impressions of the firm than other companies. Companies then attempt to improve their reputation by finding groups considered credible by other activists and working with them on some initiatives that may be either small or provide cost-savings to the firm. For example, in one case, a subject cited the assistance that groups provided the firm in negotiating renewable energy power purchasing agreements. The group brought expertise in the local area and with those sorts of agreements, and the firm reduced its emissions and lowered energy costs or reduced energy price uncertainty.

The motivations for companies to set voluntary greenhouse gas reduction goals are myriad and complex. When asked directly about the roles that different groups play, subjects most often discussed multiple groups as crucial to the process, but tended to cite internal cost-savings as the most critical factor in what their goals actually turned out to be. That is, simplification and reduction of uncertainty were the primary approach taken, though other reactions were found. Overall, stakeholder groups seem to play more of a role in prompting the firm to take action in the first place; there is pressure by these groups and then the goal setting process begins. Part of this process involves the firm learning new information about technology and its production process, and then incorporating that information into its strategic response.

2.5.4 *Reducing Uncertainty Through Innovation*

The concept of low-hanging fruit in sustainability means that firms will tend to pursue projects that have greatest net benefits first. One potential concern is that relatively low-cost, high-benefit sustainability projects may become more difficult to discover over time. A

countervailing force against this is the development of new technology, which continuously lowers the cost of production and provides to more low-cost opportunities for reduction. If the rate at which new technology is developed does not exceed the rate at which sustainability projects are pursued, so-called low-hanging fruit will not disappear. This theme emerged in the last few interviews, and, most subjects were skeptical that chances for profitable emission reduction would disappear completely.

For example, this is the response of the vice president of the packaging company when asked about the potential for low-cost ideas to be completely exploited:

> "I've heard it said that people have been picking up the low-hanging fruit. I haven't really seen that. At any given point in time, there's a lot of good ideas, and you rely on people to take the initiative -- in a company of our size, I guess I would say there's always low-hanging fruit -- you just don't always know where it is. And so the more you educate people, the more you find stuff. Now there are always going to be projects that have shorter payback and longer payback, and we're always going to favor the shorter ones from a financial perspective. We will pursue the other projects when they're strategic, but we always seem to have plenty of projects queued up.

However, the chemical company manager was slightly less optimistic in her assessment of opportunities. She noted, "one of my colleagues who works a lot on energy issues says 'low-hanging fruit always grows back,' and it's true -- it's not that you do something once and then 'problem solved.' You have 200 facilities. You're never done with those minor tweaks, but I think it's totally true that you do get to a point where the step-changes are going to be really significant capital investments." This sentiment was echoed by other subjects.[74]

[74] For example, the director at the manufacturing conglomerate said: "I think our belief is that at some point, maybe, in the future, we may find we've done everything we possibly can that's out there that's potentially adequate from a [return on investment] standpoint. And if and when we get to that point, we'll then start talking about 'OK, maybe our continuation of these goals at these levels is something we have to revisit.' But for now, we're not seeing any evidence of a lack of opportunity that would make us think we can't continue to hit the goals we've made for ourselves for the next five years… For now, we certainly believe that, by and large, it's all acceptable from a financial standpoint.

The question for the technostructure, then, is when such opportunities will be fully exploited. This leads to some skepticism regarding aggressive goals. According to the director at the industrial conglomerate, senior management questioned whether these could be attained when the company switched from normalized goals (such as reductions per dollar of revenue) that outlined environmental performance improvements but controlled for company growth to absolute reduction goals.[75] He describes senior management's sentiment and the CEO's response to this.

In some cases, such fears were realized. The former vice-president of the appliance manufacturer said that his industry had started "hitting the wall…on what up-side it sees in continued pursuit of a climate mitigating strategy" with its products. As he described, the appliance industry had, through working with regulators, greatly improved the efficiency of appliances over the past few decades. At this point, he suggested that the marginal costs of further improvements in efficiency were relatively high.[76] Instead, the industry is looking at other options. For example, he said,

> "once you take a refrigerator down to [using the energy of] a 50 watt light bulb, the societal benefit of making it a 40 watt light bulb is not very great. But the cost to the manufacturer is significant. But on the other hand, if the refrigerator can function on 700 watts for half an hour to defrost itself every day, and this could happen not during a peak period or during a time of the grid's choosing such as at night when the windmills are active, that can be quite significant. But that's challenging, and there's a whole bunch of other integrated public policies that are required.

[75] He describes senior management's sentiment and the CEO's response: "There was a huge amount of pushback back then from our senior management, who said 'We're going to grow the business, so you're telling me we're going to have to have less waste or less GHG emissions and we're going to double the size of our manufacturing output -- how is that going to happen? And [the CEO] said 'Well, you're going to make it happen because I'm telling you you're going to make it happen.' So in the first five years after he defined absolute goals, we blew the cover off the goals. I mean we almost doubled what we said we were going to do. So then he came back and said 'see? I told you so. Now do it again.' And people said 'wait a minute. We just took all the low-hanging fruit, and we need to grow the business' and [the CEO] said 'yeah, but those are the same arguments you gave me five years ago and so do it again,' and so we did it again.

[76] This assumes that marginal costs are determined by technology and existing industrial structure. Because in this instance, emissions referenced are from the use-phase of a product, there are no externalities for the producer (those are found in the production phase). Instead, the manufacturer produces products that allow consumers to produce externalities as they do not have to pay for the full social cost of the energy that the appliance uses.

That is, while the low-hanging fruit may be largely taken, in his estimation, for major appliances during the use-phase, there are other advances that can further reduce the indirect emissions from these sources. This involves the development of so-called "smart" appliances that are able to communicate with the electric grid and optimize their energy use over time.

While opinions varied somewhat on the matter, in the case of the chemical and appliance maker, otherwise, subjects were skeptical that low-hanging fruit would meet constraints in the near future. That is, subjects did not believe that the marginal costs of additional emissions reductions would quickly increase in the next several years. At this point, firms appear to be learning about new technologies and potential avenues for reduction at a faster rate than they can implement projects.

2.5.5 *Beliefs About Climate Change*

In several cases, subjects discussed their personal beliefs about climate change and the future of climate policy. Everyone interviewed said that they believe in anthropogenic climate change that will have large impacts on the global economic system. In several cases, this was directly mentioned, and in others, their language surrounding comments on climate adaptation by their company was infused with the idea. This is not surprising, however, given the non-random selection of the firm representatives being interviewed. If anything, they are likely to be more knowledgeable or more aware of environmental issues. Such beliefs, however, can be indicative and important for understanding the priorities and assumptions made by the firm's technostructure about the future interplay of environment, markets, and business.

The vice president at the bank explained her opinion that she was well-positioned to have a large impact on climate change with her company:

> "Personally, I think business can be one of the biggest drivers of this. Because if we're doing it appropriately, we're making the business more sustainable and efficient. And we've had so much government inaction until recently that businesses had to really lead the charge. I would say that for many of us in this work and within [the company], we see tremendous opportunity with the leverage that we have. For me personally, with [more than 250,000 employees] that we could influence, if we could just get… each of them to change one habit, think of that effect. It doesn't even have to be a work habit, it could be a home habit or a community habit. Just some sort of opening of their minds and an awareness of it and being open to more education about something. All of those things can lead to broader social change. So things might not move as quickly as we'd like in a big large corporate entity, but when they do move, we can move tremendous amounts of capital, of people, of thought into this effort. And so I do think that we all believe that this is where our talents are best put to use if we want to create the most change.

The renewable energy consultant discussed her experience working with sustainability managers who are similarly passionate about the issue to craft arguments for using renewable energy that do not rely on this belief.[77]

As this suggests, while employees who work on these issues tend to be believers in anthropogenic climate change, others within the company are not.[78] One subject who works for a company based in Germany discussed a major difference in corporate culture that she saw: "We always talk about our support of climate change and our support of the IPCC, but in the US there are still people who don't believe it exists.[79] In Germany, that's not the case. It's a given, it's a fact. No one would question it, really."

Such a variation of beliefs within the technostructure matters most with upper-management, especially the Chief Executive Officer (CEO) of the firm. While Galbraith (1971)

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[77] "Because we're mainly engaging the sustainability, climate, and energy people, they're believers and we're believers, but we also learn to be pragmatic and we learn how to sell sustainability activities to the CFOs -- how to show that sustainability is actually helping companies save money and not just an added cost, which is nice to do. It's something our company believes in. It's something we always laugh about when we talk to sustainability people because they know they have to be pragmatic.

[78] While some degree of belief in climate change may be random, it is also likely influenced by factors such as education, position within the firm, and location of the firm. The latter would reflect local politics, which in many parts of the United States is extremely skeptical of the idea of anthropogenic climate change.

[79] The IPCC refers to the United Nations Intergovernmental Panel on Climate Change, the primary international body coordinating regulatory negotiations between countries and synthesizing relevant research from the scientific community.

was skeptical of the influence that upper-management would have on the firm's priorities because of the technostructure, subjects frequently discussed the crucial factor of the CEO's beliefs and passion for climate mitigation and adaptation in their ability to marshal resources and set goals for emissions reduction. For example, in the case of the packaging firm, the company had a new CEO step in two years earlier, and, according to the subject, this had an impact on the company's attitude towards climate change as it re-thought its business strategy. He noted that the CEO was passionate about the issue, and this acted as a catalyst for further action.

The director of environmental sustainability at the industrial conglomerate spoke of his company's long experience with environmental goal-setting, explaining that a CEO who was also chairman of the company's Board of Directors had started this focus. That CEO, the subject said, was much more motivated by concerns of economic efficiency and risk-management than any sort of altruism.[80] The manager at the utility agreed, noting that implementing goals is a

> "management approach. Does the senior executive leadership of your company see that these things are important to track? Do they see merit to the company in tracking them? Not feel-good, pat-yourself-on-the-back merit, but asking 'as a company, it would be really good to know -- what was our violation rate of all of our environmental sections? What was the percent of violations? Was it 2% or 15%?' That's something as a CEO you'd want to know.

However, CEOs are reliant on the technostructure for information they receive about the state of the company. For instance, the former vice president of the appliance manufacturer noted that his CEO had not resisted efforts to have a goal once he was convinced that it would

[80] "The history of our goals, it's interesting in that our program was begun by a prior chairman, who in 1988 defined what he felt was the need for us to do a better job with environmental management. His position was that we had had a couple of pretty significant fines on hazardous waste for some old hazardous waste sites, and he felt that those were real wake-up calls… He really did not appreciate the fines. They were expensive, and he thought that was very wasteful. He felt that was an indicator that we were not efficient and that we weren't paying attention to overall efficiency and environmental management. And it's interesting if you talk to people who were there or you read some of his old speeches, he mentions that there's some environmental benefit. But an awful lot of what he saw that drove him to make these rules was couched more in terms of efficiency and kind of risk management, as opposed to 'Mother Earth' and 'let's make the world a little greener of a place.'"

not be too costly for the company. As he explained: "a little before 2003, I went in to the CEO's office and said 'we need to have one of these things and here's how we can do it'…We had another meeting, I brought in some people to show him the data, and he said 'fine, go do it.'"

It appears that CEOs and other high-level executives can quash efforts at goal-setting if they are set against them though. In one case, a subject noted that there had been a CEO change at her company, and the new executive was extremely skeptical of climate change efforts. He and other new managers stopped many of the initiatives that this subject had been hired to pursue. When asked where resistance to sustainability initiatives within the company was coming from, this was her response:

> "I believe it was at the highest level of the company, which was the CEO. I'm no longer at [the company], I can say that it's very hierarchical. And it's very much 'I report to this person, this person reports to that person'… it's direct reporting of what to do or what to support or what they'll approve, and then it's done. I think a lot of the [sustainability] initiatives came from middle management that then had to be approved at higher levels. But if then there would have been CEO leadership on those issues instead of us trying to convince more senior people that this is what we should do, and 'here's the business case' and 'this is why it's important, why don't you get this?' And I've read stories and you've probably found in other companies you've interviewed where the CEO is on board and he or she is actually driving some of that. That does not exist at [the company], even to this day.

That is, sustainability initiative proposals that originated within the technostructure were subsequently quashed by upper management. The subject additionally noted that the CEO's apparent lack of belief in anthropogenic climate change crippled efforts within the company to act on the issue.[81]

[81] "I believe that the current CEO -- I'm not even sure that he believes in climate change... It's baffling. And then some of the work that we're doing in the lower levels to represent [the company] then conflicts with some of those statements that climate change had nothing to do with Hurricane Sandy or 'oh, this was a really cold winter so I don't see much climate change' -- I mean, he's said stuff like that, so then it's very difficult to have any credibility on the other, positive things that you're trying to highlight.

The EPA official noted that a number of firms in Climate Leaders had engaged CEOs "that were just gung-ho, really engaged at all levels of their corporation -- the CEO demanded that they have a strong set of goals." But when asked why this was a priority for some and not for other executives, he noted that "people have different visions and ways that they evaluate risk and it's cultural too. You probably get a lot of Southern companies that just aren't going to, no matter how obvious it is, they're just not going to bend [their position on climate change]."

The consensus among subjects was that CEOs have an extremely important role to play in determining a company's view of climate change and in directing the efforts of the technostructure on the matter.[82] Much of this may be driven by the executive's understanding of the market and regulatory forces that the company faces. That is, the CEO may simply be pursuing a profit-maximizing strategy for the firm.[83] If an executive pays insufficient attention or too much attention to the issue of sustainability, shareholders may wish to replace the CEO. However, the large changes that occur when a new CEO is appointed and therefore most open to influence by the technostructure suggest that there is at least some flexibility in how this issue is pursued.

Specifically, a CEO may have a vision of the company as a sustainability leader, seeing this as an achievable goal given the cost structure and market that the firm faces. If they then devote resources to crafting that reputation through goal-setting, disclosure, and communication with customers and the business community, a sustainability strategy can *become* the profit-maximizing strategy. That is, the firm must pay for the upkeep of its sustainable reputation. Failing to do so would incur costs through loss of sales from the reputational damage or more

[82] However, they are also influenced by the technostructure as this is the body providing the executive with information about the company.

[83] Of course, it is impossible to prove that a firm is pursuing a profit-maximizing strategy empirically.

strained relationships with regulators that lead to stricter policing of environmental practices. To some extent, therefore, this introduces an element of randomness into the sustainability strategy of firms that can be difficult to quantify, and it could be one reason why it is difficult to find or to provide empirical evidence on predictors of environmental sustainability.

2.5.6 *The Role of Voluntary Programs and Climate Leaders*

Six of the companies subjects worked for were members of the Climate Leaders program, and one was considering joining the program when it was discontinued. Several firms could also discuss experiences with or the role of other voluntary environmental programs. Multiple subjects said that Climate Leaders was useful for its knowledge-transmission component. That is, sustainability professionals from members of the program would gather and share best practices for setting goals and achieving them. Some other program participants valued the credibility that emissions reductions achieved under the program lent to them. Members had to submit their data detailing reductions to EPA, which then worked with consultants to verify that the inventory and accounting of reductions was being carried out according to an appropriate methodology. Subjects were asked why they would go through this process, and they discussed the importance of credibility. For example, the senior manager at the airline, said this explicitly: "I think it's about credibility. If you're going to set a public goal, you want it to be credible, and Climate Leaders seemed to be one way to do that."

Such credibility in GHG reductions could possibly lead to the recognition of early action to address emissions under any future mandatory regulation scheme. The vice president of the industrial manufacturing conglomerate noted that:

> "We're reducing GHG gas emissions and reducing energy for various reasons, but we joined Climate Leaders primarily because we believed that that was going to be the best way to document it if and when there was, in fact, a cap-and-trade program in the United States. So we felt that going through EPA would allow -- say there was a cap-and-trade

> program. This would be a formal record that we had done x things. Back then when we were talking about cap-and-trade, they were talking about early action credit, and so this was going to be a way to formally document early action.

This response may suggest that the program only certified reductions that companies would have made anyway. However, an EPA official who had worked on the Climate Leaders program had this to say when asked about the extent to which the program helped achieved additional greenhouse gas emissions reductions:

> "Yeah, I think it did make a difference. Because almost every company that started participating in it almost immediately realized how much there was to this, much more than they expected or knew. So immediately they're getting more out of it, they're immediately more educated and more aware of this whole world of emissions accounting and reporting and the importance of transparency, and all this stuff. And then goal-setting as well, benchmarking and why that's important in terms of calling yourself a leader.

The official said that in addition to introducing companies to the process of emissions reduction, the program spurred greater reductions because members were introduced to best practices in areas such as emissions accounting. This ensured that reductions were done correctly and communicated properly, he argued.

Perhaps as expected, the EPA official believed that this justified the program's existence and funding, as the program usually encouraged members to do more than they originally thought they could.[84] The vice president of the bank broadly agreed with this sentiment. When discussing the role of the program in her company's goal-setting, she said:

> "That program and the [Carbon Disclosure Project] (CDP) were sort of the leading parts of developing our initial GHG commitments. We used our 2008 baseline and we announced them in 2010. So that work was done in collaboration with Climate Leaders in preparation to report to CDP. So I think that was a quite influential program in helping us understand some of what our peers were doing in that space, learning best practices, and setting our own agenda for GHG emissions reduction.

[84] "So I think it served a lot of different purposes. I can't imagine in any instance where a company got nothing out of it, and they didn't do something in addition to what they would have done. Now again, I could be naive there. I mean, it was always a negotiation. It was never 'Alright, Climate Leaders, here's the goal we're proposing,' and we'd be like 'Oh my god, that's amazing! You're going to do what!?' We had to push people."

The knowledge-transmission component was highlighted by other subjects too as a major benefit of the program. For example, the same senior manager at the chemical company indicated that it gave them good exposure to other people in the field:

> "I think it was a nice network of other people from companies that are grappling with similar questions, and it probably was trying to raise the bar for action by highlighting people who are doing a great job. Then you get other people who want to do a great job, and so I think it was just that… It's nice to bring together like communities of people from corporations that are in really different sectors and then it just gives you more information and dots to connect as you're thinking about your own company's strategy.

However, others were not so enthusiastic about the program. In one case, the vice-president of a financial services firm had trouble recalling the difference that it had made for his company.[85] In another case, the former vice-president of the appliance manufacturer criticized the program for only focusing on reducing a firm's internal emissions and not those of their products. He cited the example of General Motors:

> "I remember when GM got [recognition from Climate Leaders] for improving the efficiency of their factory by 10% but they were churning SUVs out of that factory, whose emissions impact dwarfed any emissions savings associated with the factory.[86] And, of course, [EPA's Climate Leaders Office] had no substantive answer to it. The answer was all political. They said 'we want to have an event at GM and celebrate GM doing this.' And that to me is a classic example of a government program that is much less than it appears because people were achieving their awards irrespective of what they were producing in the factories that were improving their efficiency, or they were ignoring other ways that things were achieved such as through spinning off assets or closing factories because of excess production or whatever.

No other subjects raised this concern when discussing the program though, even those that had been involved with it and who address emissions reductions in their products' use. The

[85] "We talked internally about when we were going to do something, our facilities managers, who were mostly running the relationship with that program, would say that we were doing something because it was encouraged by Climate Leaders to do something in particular -- I don't remember exactly how it worked or whether there was a point system or something. But I think you got credit for some actions and not for others. So there were some discussions -- very intentional about being in Climate Leaders and meeting the voluntary goals that came about because of Climate Leaders."

[86] General Motors' goal, according to EPA, was to reduce total greenhouse gas emissions from all North American facilities by 10% below 2000 levels between 2000 and 2005.

view on Climate Leaders among the subjects appears to be that it was primarily a knowledge-sharing program that helped them understand what is involved in taking an inventory of greenhouse gas emissions and setting feasible reduction goals. That is, it was part of a strategic response of reduction, allowing companies to investigate their own emissions and potentially influence regulators by receiving credit for early action in the event of a carbon price. Now that interested companies that would make potential members are more comfortable with the goal-setting process and monitoring reductions and a national carbon pricing program seems unlikely to be introduced in the near future, attitudes about the usefulness of such a program now were mixed.

For example, the senior manager at a chemical company said that the reporting requirements in such a program would likely be too burdensome.[87] In contrast, the analyst at the automobile maker thought that voluntary programs could help harmonize reporting requirements, which varied substantially among private voluntary programs.[88]

The EPA official formerly involved with Climate Leaders saw a more substantial potential role for such a program in the future. He said that there was still a role for something

[87] "[The company has] been doing this for a long time. I think we get it... The recognition piece is nice, and I think it's nice to have the federal government do that… I think by creating such rigorous requirements for companies that are doing this for voluntary reasons that people are just like 'why are you doing this? It would be better to spend the limited people-time that I have on just implementing energy efficiency projects at our sites rather than going to a three times a year meeting with [the Department of Energy] (DOE) and entering all this information into DOE's system to make sure that we're compliant.' So I think the federal government risks that by also not wanting to appear too cozy or too promoting of big companies... And so they create these systems where they really want companies to perform and be upper-echelon. I think a lot of companies are doing that or are a little bit below the upper-echelon, but a voluntary program isn't going to be what pushes them. But this is also probably in the context of the federal government being sort of stuck and not being able to -- they're looking for everything they can do within their existing authorities.

[88] "There's so many different reporting standards out there right now that it can be confusing and it can be daunting, just from a practical standpoint. There's a lot of companies that have, for example, a full-time person dedicated to the annual disclosures related to the Dow Jones Sustainability Index. Quite honestly, if there's a role that the government wants to play to harmonize all the disclosure requests that are out there, we'd certainly be interested.

like Climate Leaders because it lent a credibility and scrutiny that an NGO simply could not have:

> "With Climate Leaders, the strength of it was this goal setting aspect. And companies signing the document that said 'I will do this with an official government body. I can't submit false information to the government.' … so I think that's where you have the power of the public institutions like EPA... When companies are participating with the agency, you immediately have a level of scrutiny and validity that maybe an NGO doesn't have. And that's why, in many cases, companies join -- they want that EPA stamp of approval. Because in many cases they're working with the agency on a lot of other areas, whether they're getting dinged for polluting or dinged for something else. But this is an opportunity to have a positive relationship with the EPA. And have their brand of approval that they can tell their customers. They can say 'we're with EPA, so we're an environmentally friendly company.' And so I think because of that, the power of dealing with a federal body and immediate credibility that comes with it, that's why it's still a good place to have that kind of volunteer program.

There is no discussion of reviving a program such as climate leaders at the federal level, according to the subjects who were asked about this. Overall, while the program had its critics, the members that took advantage of the resources offered by the program seem to have appreciated the knowledge-transmission benefit. That is, the program helped companies learn more about their production process and improved their ability to boost efficiency in terms of output of greenhouse gas emissions as a byproduct.

2.5.7 *Climate Policy Engagement*

Substantial discussions with subjects were also had regarding their company's position on a carbon price in the United States and their company's efforts at engagement with climate policy at the federal government level. This can be seen as another component of the company's strategic reaction to information regarding climate change and the possibility of new policies being implemented to mitigate climate change. While many of the companies that employ subjects are not necessarily hostile to the idea of some form of national carbon price, there were many nuances to corporate positions. In most cases, firms were interested in engaging in policy

discussions in order to influence actors and reduce policy uncertainty. However, there were other cases, further discussed below, where firms pursued an adaptation strategy of cooperation with other firms to potentially block or dilute potential policies.

Carbon pricing schemes fall under two main categories: a carbon tax or a cap-and-trade system on emissions. Both set a price on greenhouse gas emissions that is designed to correct for the externality such pollution produces, aligning the social and private costs of pollution. In the case of a carbon tax, this is done directly through a mandated tax level, while in the case of cap-and-trade, the price is set through the buying and selling of emissions permits. Either policy should have the same theoretical effect, and, therefore, no distinction was made between the two when discussing the concept with subjects.[89]

The positions that each subject associated with their company are listed in table 2.4 below. Six companies where subjects are employed had official positions supporting a carbon price in some form. Only 1 subject indicated that his company opposed a federal carbon price in the United States, while a further 7 companies preferred not to take positions on the issue.

Reasons for support of a carbon price varied considerably. In the case of the electric utility, for example, the subject explained that her company had invested substantially in renewable energy and natural gas generation. These fuels would receive favorable treatment under a carbon pricing scheme. As she explained: "I think it makes business sense for us. We have invested and own low carbon energy infrastructure -- we own natural gas pipelines, wind farms, solar farms, natural gas storage facilities, this is all low carbon stuff. Find an energy

[89] If carbon pricing was being seriously discussed at the federal level, such a distinction would have perhaps been warranted as the two systems can lead to very different distributional outcomes both between them and depending on the specifics of the system design. For example, a cap-and-trade system that gives permits away to emitters creates windfall profits for those firms that benefit them greatly.

company that's heavily invested in coal, and they're going to have a different position… a lot of this really gets down to the bottom line."

Table 2.4: Opinions on Mandatory Federal Carbon Price in the United States[90]

Position	Number (%)	Industries
Support	4 (28%)	Electric utility; Chemicals; Automobiles; Solid Waste
Support International Price Only	2 (14%)	Airline; Chemicals
Oppose	1 (7%)	Appliances
No Position	7 (50%)	Financial services; Heavy Industry Conglomerate; Mining; Packaging; Wood Products

The solid waste disposal company is another example of a heavily regulated company that was supportive of efforts to regulate greenhouse gas emissions through carbon pricing because the subject indicated her company was comfortable complying with these sorts of things.[91] Within the Engau and Hoffman (2011) strategic response framework, this could be seen as an "influencing" approach within the reduction strategy. That is, companies attempted to manipulate the actors that were shaping the policy uncertainty they faced. For example, the vice president of the wood products manufacturer explained that her company wanted to influence the development of regulations and felt that they needed to come out in support of carbon price in order to do that: "We wanted to be seen as a thought leader on climate. And we believed we

[90] While 15 companies were interviewed, 1 was a renewable energy consulting firm that offered perspectives on other company's carbon pricing positions. Therefore, only the 14 companies of interest are included here.

[91] "We would also say that our industry sector has been a success story if you look at the diminution of methane emissions at landfills and the [evolution of the] waste industry over time has been the result of rigorous EPA standards implemented by the states and.. we feel comfortable with reasonable regulations that make sense and that constantly drive down the volume of carbon emitted. The classic case in point would be our advocacy for heavy duty truck fuel efficiency standards.. we are fans of regulation when there's a serious environmental problem that needs to be addressed without free riders."

would not be credible as a thought leader if we weren't willing to put a stake in the ground on GHG reduction. So we did that work first. We felt like we had to have a climate statement that we would make to the world, and then we would engage in policy debates." This led the company to become involved with several national and regional groups discussing climate policy. This occurred during the mid-2000s, when the company believed that mandatory regulations on greenhouse gas emissions were very likely.[92]

The manager at the chemical company also argued that setting a national carbon price would help the company manage policy uncertainty in the future:

> "So I think that what we're really trying to do is just saying: take away the uncertainty, take away the politics and think about what society will need and needs today and how can we start setting goals for ourselves and shaping what we want our product portfolio to deliver in terms of impacts to society? How can we plant some of those seeds in our innovation and R&D communities within [the company] to have them think about things that sometimes take decades to actually commercialize. Getting from the very basic R&D that happens all the way to a commercial product can take a very long time.

However, because there is no serious proposal at the federal level for a carbon price, the manager said that her company was not advocating forcefully for it even though they had been more vocal during the 2000s.

> "A comprehensive, economy-wide price on carbon is not something we're talking a lot about with policymakers or with anybody, really, because it's not a conversation that's happening a lot right now. But because of our product portfolio, we talk about the need to reduce GHG emissions and we would talk about how a carbon price would benefit that. But because it's not top of mind for people who are driving policy, it doesn't end up being a conversation topic when our government affairs people have their ten minutes with the members [of Congress].

[92] "And then we looked at policy, we said clearly there's a policy reaction… we became convinced that at some point in the future, carbon dioxide emissions would be regulated. So we said, 'let's try to control our future' and start that process now rather than wait until some date in the future and have a year or two or three years, which is sort of the maximum you ever get in a regulatory sense, and all of a sudden have to make a lot of changes… at the time, we were taking 2014 to 2016 for a likely timeframe where there would be regulation on GHG emissions. Even though at the time, we didn't know how it would play out, but we figured we had about ten years."

In two cases, subjects were careful to note that they would expect a federal carbon price to be internationally coordinated whenever it did come about, which was thought to be several years away, at least. In the case of one of the chemical companies, this was due to the fact that their facilities are relatively mobile, according to the subject. The manager at the company said: "Look at cement globally or aluminum globally. You could figure out how to globally apply some sort of similar impact so that you don't end up pushing industries into a place because we're portable. And so I think it's why we are that piece of the pie that's not feeling a carbon price yet." That is, this firm believes that putting a price on carbon by any single national jurisdiction could prompt some industry to re-locate to jurisdictions where it would not be taxed for the externality. Similarly, the sustainability manager of the airline noted that his industry was advocating for a global approach to prevent multiple jurisdictions from taxing the same unit of fuel on airplanes.[93]

The sole opponent of mandatory carbon pricing was the appliance maker, according to their former vice-president. His firm pursued a strategy of disregarding policy uncertainty from climate change, taking a business-as-usual approach. The vice president had played a significant role in shaping the company's climate policy when he had been there, he said, and he did not believe that an American price on carbon would be effective. It would not induce other countries to follow the example, he said.

> "So then the question becomes, how long will individual parts of the world be willing to impose a strategic cost disadvantage on themselves in pursuit of this goal, just to model good behavior for countries like Russia and Saudi Arabia who are frankly just not going to respond to models of good behavior? Now that sounds very pessimistic, but I'm extremely optimistic about technology. I think that energy is a cost, and people don't

[93] "So we're saying well, if we're going to have to have an emissions fee, it should be a consistent global approach to how you do it. So since the governments aren't going to ever get on board with that, it's pretty much up to the airlines to do that for themselves, and then they can take it to the UN and commit to having a tax or having a fee that's applied consistently and only once for a given amount of fuel. So for us, that makes a lot of sense because of our vulnerability since we're always crossing country boundaries.

> want to pay it for a variety of reasons. it has consistently gone up as an input cost… so there are very good economic reasons for companies to pursue reduction in energy waste, in improving efficiency of the grid, in more predictable and reliable energy sources, and so I still see incredible progress continuing in this area, and I just don't see it driven by agreement to a massive carbon tax.

He explained that such a policy is not likely to be enacted in the United States in the foreseeable future, but companies still need to appear to be progressive on the issue in order to avoid attracting attention to themselves. This can help further reduce uncertainty about future regulations. As he explained:

> "I was quite candid with our financial and strategic leadership within the company in forecasting that I did not see either the political will for a serious carbon price mechanism… so we never made a business decision based on the possibility of being rewarded under a carbon pricing system or punished, frankly. And I think that prediction so far is pretty accurate. Now, what I would say is that there's a reason we were still focused on it. We faced these re-tooling costs if there were new rules related to materials we were going to use, so we needed to be perceived as progressive on these issues and thoughtful.[94]

Several other firms refused to take a position on the matter. Some subjects described this as a quiet way of the firm voicing opposition, and others said that they were afraid of offending clients who were large greenhouse gas emitters by advocating for a policy that they would strongly oppose. Still others said that their company would only speak through trade associations, which they regarded as having a larger voice on policy issues and less directly exposing the company to potential criticism. This can be seen as a postponement approach as part of an avoidance strategy within the Engau and Hoffman (2011) framework. That is, firms are deferring decisions and waiting for more certainty before making a commitment to policy.

For example, the vice president of the packaging firm would only provide a limited statement on his company's position on a carbon price:

[94] The subject later cited the example of insulating foam that was used in a product that emitted hydrofluorocarbons (HFCs) during the production process that may be regulated under a carbon pricing scheme.

> "We haven't taken a public position. We are members of many trade associations. [One association we're a member of has] a very strong statement against regulating carbon emissions, but we're also members of other associations that are either neutral or in some cases positive. So I guess as a company we don't have a separate statement, but we are members of associations that do. And that's the best I can say about that.

The vice president of the insurance company discussed his company's hesitancy to take a position on the matter:

> "We have not taken this up in any systematic fashion, but if we were asked to opine as a company about having a national carbon policy, my guess is that we would decline to do so. Because there's not a direct role there, as you suggest. If you look at other carbon trading schemes, it's first utilities, then transportation, then things like mining -- financial services just isn't even on the list of things that they would ever think to cap.

The subject who had worked as a senior manager at the other insurance company, however, framed her company's efforts to not discuss the issue around certain clients.

> "That was something I heard all the time around the office 'well, we don't want to upset or annoy our clients -- we don't want to rock the boat on any of those things, so if we take no position whatsoever, that would be better.' Even though they came out with a positive statement and did take some steps with the GHG inventory and offsets, a lot of that was not highlighted with the global marine and energy clients. They did not want that to come up in the board room… We didn't want to do too much because we didn't want to upset our clients. So I think it was a constant tug of war between -- we want to be out front and an innovative leader because we were known as an innovative leader of many things… but on this particular issue, very, very careful steps.

The former advisor to the mining company said that while they had been engaged in policy discussions before the Waxman-Markey bill that would have implemented a cap-and-trade system failed to garner enough votes for passage in the U.S. House of Representatives, afterwards, the company went silent on the question of a carbon price:

> "There was not ever opposition but in being silent on some of these issues, it can be interpreted as 'well, you don't really see this as a compelling vision of the future.' I think that would probably be true. They just became less enthusiastic for [a carbon price]. Not necessarily the long term prospect, but that it would play a role on the opportunity or the threat side just became more and more minimized. Climate change policy went from being a moral imperative to being inevitable to being 'they will do something' to 'probably not any time soon.'

As one would expect, companies have analyzed how likely carbon pricing schemes would impact their business and craft their positions accordingly. Some choose to be more actively engaged in policy discussions, some work through trade associations, and others simply prefer to be disengaged and reactive to whatever policy decisions are made. That is, some companies pursue postponement approaches, while others attempt to influence incentive structures. No companies believe that a federal carbon pricing scheme will be implemented in the near future, but some do think that the Clean Air Act may be used increasingly to manage emissions in different sectors.

2.6 Conclusions

The interviews discussed in this essay spanned a wide range of subjects. The technostructure of the firm has a variety of responses to the uncertainty posed by the issue of climate change and its regulation. The strategies of firms included a mix of avoidance, reduction, and adaptation pursued through a variety of approaches. Most commonly, firms sought to reduce uncertainty through investigation of their emissions, simplification of their production processes, and influencing actors and stakeholders. It became clear that when most firms set greenhouse gas emissions reduction goals, they are doing so in order to reduce production costs. That is, by investigating ways to reduce emissions, firms learn something new about their production function. This suggests support for the Porter (1991) hypothesis, even in the presence of voluntary environmental regulations. However, firms also cited stakeholders, such as managers, regulators, customers, investors, and employees as having an impact on their goal-setting. These groups did not necessarily inspire the firm to set goals in the first place, but they were sometimes used as justification for additional action. They might also shape the

actions that the firm takes to meet its goals if they form a key audience for communications about the goals and progress.

The formality of the goal-setting process varied across firms, with some the technostructure at some companies conducting rigorous inventories and cost-benefit analyses to determine the appropriate levels of commitment. Others calculated goals much more quickly, essentially guessing at a reasonable reduction that they could achieve. Most firms set absolute reduction goals for themselves, but subjects at several of the more growth-oriented firms said that they needed normalized targets to accommodate their expected enlargement. Some firms also set goals for emissions reductions from their products, seeing this as advantageous from a marketing perspective.

The process of meeting internal reduction targets was also different across companies. Some put projects with estimated reductions through the same approval process for capital expenditures that anything else would go through. Other subjects, especially at relatively low-emitting firms, said that the process was more informal, completed by committees or projects were undertaken on an *ad-hoc* basis.

Subjects also discussed the importance of new technology for meeting reduction commitments, both internally and for products that the companies sell. Sustainability goals promote research and development within the firm in these areas as well as learning about the production process. Subjects overwhelmingly said that they did not believe that all of the low-cost projects for sustainability were being completed. The process of learning and introducing new technology should continue for the foreseeable future, most subjects agreed.

Companies were split in their support of a federal carbon price in the United States. Several firms support it in official statements, while several others took no position for various

reasons. Many of those that support a carbon price, however, would want exceptions or free allowances for themselves. Subjects were universally pessimistic about the possibility of any major carbon pricing legislation being enacted in the United States in the foreseeable future.

Sustainability managers all appeared to believe in anthropogenic climate change, though some discussed elements in their company where there was skepticism about this. The most important attitudes that many identified were those of CEOs, which could influence the technostructure by imposing various policy decrees and requirements within the firm. Executive visions of the firm's environmental sustainability role were absolutely critical to the success of goal-setting efforts within the firm. Subjects discussed the power that CEOs have to set priorities for the firm's technostructure, including greenhouse gas emissions reduction. They are able to prevent initiatives from taking shape or cancel goals that had been agreed to, or they are able to channel resources to the sustainability office and their efforts at emission reductions.

A number of policy recommendations flow from these results. When designing voluntary programs related to greenhouse gas emission reductions, public and private organizations should consider the structure of companies that they wish to attract to the program. They should investigate their possible incentives for joining the program, such as cost reductions, knowledge-transmission, or appealing to certain stakeholder groups. Voluntary programs could, perhaps, be designed to encourage greater participation by discussing methods of communicating success with these groups. Additionally, activists seeking to encourage sustainability efforts from companies should understand the vital roles played by executives. They may wish to place an emphasis on discussing with the CEO or other executives ways in which sustainability strategies can align with other business goals. If such an alignment is seen to be impossible, efforts could be re-directed elsewhere.

Finally, the emphasis on cost savings and the importance of CEO attitudes that the interviews suggest should serve as a reminder of the limits of voluntary actions to reduce greenhouse gas emissions. While many firms have started to discuss environmental sustainability commitments at great length, and many have achieved significant reductions in emissions, this action will only continue for as long as it is still profitable for firms. Given the scope of emissions reductions that are recommended by bodies such as the World Bank (2012) to avoid warming of 4 degrees Celsius globally, the marginal cost of reductions will begin to rise eventually for many firms. It is unrealistic to think that firms will achieve these reductions without additional government regulation, such as carbon pricing or agreements with energy-intensive industries, to help coordinate reductions.

Because of the importance of understanding the motivations and limits of voluntary actions to reduce greenhouse gas emissions, future research should continue to investigate these questions. Subjects at other firms should be interviewed to better understand the variation among sustainability initiatives across industries and locations. Smaller firms should also be investigated, as their motivations and constraints regarding these actions may be different due to the competitiveness of markets in which they operate. Results from these investigations should then be used to develop new theoretical models of decision making that can help economists and policy makers better understand the processes at work on a more fundamental level.

CHAPTER 3

DETERMINANTS OF VOLUNTARY ENVIRONMENTAL PROGRAM MEMBERSHIP: THE CASE OF EPA'S CLIMATE LEADERS

3.1 Introduction

Given growing concerns with environmental problems and especially the issue of climate change, there have been a number of efforts in recent years to encourage voluntary reductions in pollution, waste, and energy use through various initiatives at the federal, state, and local level. Such programs are often viewed by regulators as a more politically palatable alternative to direct regulation schemes. Yet from a profit-maximizing perspective, companies have little incentive to join such programs since voluntary reductions are expected to raise costs. This paper explores the motivations and characteristics of companies that join and remain active members in these initiatives.

The U.S. Environmental Protection Agency (EPA) administers many federal voluntary environmental program (VEPs) dealing with a host of environmental issues from solid waste and energy use to greenhouse gas (GHG) emissions and clean water. All of these programs share the characteristics of non-compulsory membership, requiring member companies to adopt policies not required by law, and having the goal of these policies be the production of positive social externalities (Potoski & Prakash 2009). EPA's Climate Leaders program, the program of interest here, was active from 2002 to 2010 and was an early attempt by the U.S. government to encourage companies to voluntarily assess their GHG emissions and set goals for reductions.

It is unclear as to why some companies joined this program while others did not. Such motivations cannot be directly observed, but understanding the types of firms that tended to join the program can help shed a light on why they may choose to do so. A number of studies have investigated the characteristics of firms that commit to a particular type of corporate social

responsibility (CSR) or join a given VEP.[95] However, most of these studies look at EPA's 33/50 VEP, which targeted companies using toxic wastes in the early 1990s or programs whose members were electric utilities. This study will determine whether similar characteristics, such as being located in an environmentally friendly area, local air quality, size, or environmental record, may predict membership in the Climate Leaders program. The Climate Leaders program drew members from a wider variety of industries beyond the heavy manufacturing firms and electric utilities that were the targets of other programs such as retail and financial services.

This essay will begin by discussing the literature on motivations to join a public voluntary environmental program and key empirical studies of the types of firms that do so. Next, the role of voluntary programs in greenhouse gas regulations in the United States will be outlined, with an emphasis on the Climate Leaders program. The data description will follow. Then, the probit model and results is discussed, followed by the survival analysis. The essay will end with some conclusions and implications for future research and policy.

3.2 Voluntary Environmental Programs in the United States

There are three main types of voluntary environmental actions by firms (Lyon & Maxwell 2002; Alberini & Segerson 2002). Some engage in unilateral actions where they set their own environmental sustainability goals. Others negotiate bilateral agreements with regulatory bodies, often through a trade association that represents the entire industry.[96] Finally, firms may join a public voluntary environmental program (VEP).[97] Public VEPs have three main features: government regulations do not mandate that firms must join; the program's

[95] See Arora and Cason (1996); Khanna and Damon (1999); Videras and Alberini (2000); Gamper-Rabrindran (2006); Innes and Sam (2008); Sam, Khanna, and Innes (2009); and Bi and Khanna (2012).

[96] This method of voluntary environmental action is much more common in Europe than the United States.

[97] These are also known variously in the literature as voluntary government programs, government clubs, public voluntary schemes or public voluntary programs.

regulations require firms to adopt policies that are not required by law; and the objective of this policy adoption is the production of positive social externalities (Potoski & Prakash 2009).

Although the literature on motivations for firm participation in voluntary environmental programs is distinct from the CSR literature, they arrive at similar conclusions. Lyon and Maxwell (2002) produce a framework for such motivations arguing that there are three possible reasons for companies to join. First, it may be that companies have improved the efficiency of their production process, and they just happen to produce environmental improvements as a byproduct. Second, green consumers and investors may wish to demand or supply more environmentally friendly products. Third, companies may be attempting to preempt or shape regulatory decisions, a point also made by Khanna (2001). Additionally, as Kim and Lyon (2011) point out, firms may wish to receive credit for early actions if the pollutant in question is eventually regulated through a mandatory framework.

Such programs have arisen to supplement more traditional so-called "command and control" approaches because of the high compliance costs associated with strengthening direct regulation of pollutants. While early pollution rules tended to cover major hazards emitted from a few large sources, subsequent regulations have expanded the number of regulated pollutants, which come from a larger number of often non-point (or mobile) sources (Prakash & Potoski 2012). The lure of voluntary programs is their promise of flexibility and reduced costs of compliance for firms, as well as the benefits of public recognition, improved reputation, reduced costs of capital (as firms are thought to be exposed to less risk of environmental fines), and information on how to make reductions (Khanna 2001).

Potoski and Prakash (2009) characterize environmental program membership as a club good, in that it is possible to exclude non-member firms, but consumption of the club benefits is

non-rivalrous among member firms. However, unlike traditional club goods, which are designed to produce membership benefits for participants, VEPs attempt to induce the production of positive social externalities. For example, through encouraging firms to reduce greenhouse gas emissions, the firm may benefit from lower costs, but society benefits from marginally reduced impacts of climate change. Fiorino (2009) argues that VEPs serve to augment direct regulation rather than replace it and that the main goal of many government-run environmental clubs is to encourage the adoption of environmental management systems by firms.

However, Fiorino (2009) does acknowledge that voluntary programs have been subject to criticisms in that they are a threat to agency independence and they recognize firms for doing what they would have done anyway.[98] Khanna (2001) also notes that firms may be able to join a voluntary program and preempt regulation with a lower amount of abatement, which may not be welfare maximizing. More generally, voluntary programs must overcome the collective action problem of free riding and shirking if they are to be successful (Potoski & Prakash 2009).

3.3 Motivation for Joining Voluntary Environmental Programs

Evaluating the success of VEPs is notoriously difficult. Doing so requires an understanding of what would have happened in the absence of the program (Morgenstern & Pizer 2007). Not surprisingly, empirical studies have not been able to consistently identify the motivations for members to join VEPs or their environmental impact. Lyon and Maxwell (2010) believe that ascertaining motivation is particularly problematic due to the multitude of possible reasons for a company to join, such as demands from different stakeholder groups. Furthermore, they emphasize the role of VEPs in disseminating information among members about pollution

[98] That is, employees at firms who develop strong and positive relationships with regulators at a government agency may be able to impact their treatment by that agency. Lyon and Maxwell (2010) also note that firms may be rewarded through these programs for actions they would have pursued regardless.

abatement, the impact of which is difficult to identify through econometric analysis. Next, we turn to studies that evaluate the characteristics of firms that join VEPs in the United States to understand what has been tested in other contexts.

Only one previous study has looked at the US Climate Leaders program. Fisher-Vanden and Thorburn (2012) examine characteristics of firms that joined Climate Leaders, but they use a substantially different set of variables than other studies on voluntary programs. First, through an event study, they find the intriguing result that announcements of joining the program lead to a fall in stock price for a firm within three days of making it, suggesting that the move is not viewed as profit-maximizing by at least most investors. Additionally, they run cross-sectional probit regressions to understand the different characteristics of members and non-members. The investigation only takes into account the first six years of the program (through 2008). The study uses only data from the year in which the firms announce their membership in the program, rather than panel data as this study does.

The authors find a number of significant factors in the decision to participate in Climate Leaders, including the number of articles that mention climate change and corporations' role in climate policy (as a measure of public attention to the issue), the price of crude oil, firm size, membership in the NASDAQ (a negative relationship), whether the firm is located in a state that is a member of the Regional Greenhouse Gas Initiative (RGGI), the number of shareholder proposals related to climate change, whether the firm has a positive environmental reputation, and a measure of corporate governance within the firm.[99] They conclude that companies with weaker corporate governance and more powerful managers are more likely to join the program,

[99] The authors argue that firms with weaker governance may be more susceptible to making decisions that may not be profit-maximizing, as the event study portion of the article suggestions (Fisher-Vanden & Thorburn 2011).

even in the face of evidence that shareholder value is reduced. However, this conclusion is generally an outlier in the broader literature on VEPs. It may be that investors with preferences for higher profits in the short-run flee firms that join the program, while those with longer time horizons exert pressure for the company to join. It may not be that the decision to join is not profit-maximizing, but rather serves to align the time preferences of managers and investors regarding company profits. Because this is the only study of the characteristics of Climate Leaders members, it is also helpful to look at other work in this area to determine what is known about the characteristics of companies that have joined VEPs.

Most of the previous studies on US voluntary environmental programs evaluate 3 or 4 previous programs: a) the EPA-sponsored 33/50 program, which was implemented in the early 1990s as a response by the US government to a major industrial poison gas leak in India killing more than 3,000 people in 1984[100]; b) Climate Challenge, a Department of Energy program promoting voluntary greenhouse gas reduction program; and c) the Department of Energy's 1605b voluntary greenhouse gas emissions registry (Arora & Cason 1996; Khanna & Damon 1999; Karamanos 1999; Videras & Alberini 2000; Gamper-Rabindran 2006; Innes & Sam 2008; Sam, Khanna, & Innes 2009; Kim & Lyon 2011; Bi & Khanna 2012).[101] In the case of 33/50, most members of the program were in the chemicals, transportation, primary metals, fabricated metals, and rubber and plastic products industries.[102] Data for toxic releases for both participants

[100] The EPA Administrator at the time gathered a small group of chemical industry leaders to explain that they would reduce toxic emissions, either voluntarily or through direct regulations (Lyon and Maxwell 2004, 243).

[101] This program enlisted firms whose production processes generate toxic wastes such as cadmium, chromium, lead, mercury, and nickel compounds. Participants pledged to reduce releases of such chemicals below 1998 levels by 33% in 1992 and 50% in 1995.

[102] Firms in these sectors have traditionally been heavy polluters, and they attracted increasing attention for this beginning in the 1970s and 1980s. Thus, they were on the forefront of regulatory efforts.

and non-participants is available, allowing for the outcomes of the program to be investigated and explaining the popularity of the program for study.[103]

While the vast majority of studies focus on 33/50, the Department of Energy's (DoE's) Climate Challenge program is the subject of Karamanos (1999), and Kim and Lyon (2011) study participation in DoE's 1605b voluntary greenhouse gas emissions registry. [104] Videras and Alberini (2000) study participation in three EPA programs: 33/50, WasteWi$e, and Green Lights.[105] Both the 33/50 studies and investigations of these programs use probit models to determine the characteristics of firm's who have participated.

The most consistent finding by the studies of these VEPs is that larger firms as measured by the number of employees, sales, number of facilities, or operating revenue are more likely to join.[106] The reasons for this finding vary however. Arora and Cason (1996) and Innes and Sam (2008) argue that larger firms have a greater liability exposure when creating environmental risks, driving their increased participation in 33/50. Karamanos (1999), on the other hand, reasons that this is because larger companies may be more susceptible to pressure from stakeholders and outside groups (Karamanos 1999). They also face more internal pressure from employees to improve environmental practices.

An alternative theory posed by Kim and Lyon (2011) in their analysis of DOE's 1605b reporting program concerns the allocation of permits in the event that a tradable scheme, such as

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[103] Whether and by how much the program actually caused pollution reductions beyond what firms may have done without it is still debated. Vidovic and Khanna (2007) argue that the program had no effect. Gamper-Rabindran (2006) finds that the effectiveness of the program varied considerably by industry. However, Khanna and Damon (1999), Innes and Sam (2008), Sam, Khanna, and Innes (2009), and Bi and Khanna (2012) maintain that the program was generally effective.

[104] The Climate Challenge program was active from 1994 to 2000, working with electric utilities to reduce GHG emissions. The 1605b program was active from 1992 to 2011, providing electric utilities a forum for registering voluntary GHG reduction initiatives and their impacts.

[105] WasteWi$e works with firms to reduce solid waste; Green Lights aims to improve the efficiency of lighting in participating firms.

[106] Sam, Khanna, and Innes (2009), Innes and Sam (2008), Videras and Alberini (2000), Karamanos (1999), Khanna and Damon (1999), and Arora and Cason (1996) all find this result.

cap-and-trade is introduced. Larger firms are likely to be eligible for more credit for early actions taken to reduce emissions, meaning that they would be allocated more free or low-cost permits. Therefore, they would have more of an incentive to join a voluntary program, such as 1605b. Similar motivations may have driven participation in Climate Leaders.

Another widely investigated argument is that firms with more direct contact with consumers are more likely to participate in voluntary programs. This rests on the idea raised by Lyon and Maxwell (2010) that there is demand for environmentally friendly products or for products of more environmentally conscious firms. However, the findings in the literature are decidedly mixed. EPA believes a major incentive for participation in the 33/50 program was public recognition that would improve a firm's reputation (Arora & Cason 1996). Arora and Cason (1996) hypothesize that firms closer to final consumers are more likely to participate, and, using a measure of advertising expenditures, find support for this. Vidovic and Khanna (2007) find support for the idea as well, in one model that they test. Other papers use a firm's Standard Industrial Classification (SIC) code to determine whether they sell final goods. Khanna and Damon (1999) find this to be significant, while Videras and Alberini (2000), Innes and Sam (2008), and Sam, Khanna, and Innes (2009) do not. Karamanos (1999), working with a sample of electric utilities, uses the proportion of residential customers a utility has as an measure of consumer contact, and he finds this to be insignificant. However, Videras and Alberini (2000) find that firms that produce a final good are more likely to participate in the WasteWi$e and Green Lights programs. [107]

[107] The authors believe that firms participated in WasteWi$e and Green Lights partially to cater to customers with a stronger preference for "green" products. They do not find that producers of final goods are more likely to join 33/50 though. They speculate that this may be because their analysis looks at the later years of the program, when the value of positive publicity from membership in the program may have been reduced as it was a clear success.

Studies of VEPs have not yielded a conclusive link between public perception and firm participation, and this question has not been vigorously investigated in the context of a GHG reduction program, which is particularly relevant for current policy. Karamanos (1999) admits that his measure of consumer contact is flawed and that electric utilities are not the best for testing this hypothesis.

Another factor of consistent study in the participation decision of firms is the strength of local environmental movements. Local pressure and the culture in which managers are immersed may encourage some firms to join voluntary programs. Bi and Khanna (2012) use League of Conservation voting scores of Congressional delegations, while Sam, Khanna, and Innes (2009) use Sierra Club membership as a proxy for this. Both find positive and significant relationships with these measures and firm participation. However, Innes and Sam (2008), Karamanos (1999), and Kim and Lyon (2011), who also use these measures, do not find a relationship to participation in voluntary programs. Similarly, some studies find that firms operating in areas with poorer air quality are more likely to join programs (Karamanos 1999; Bi & Khanna 2012).

Firm location aside, another possible reason behind firms' participation in VEPs is the firm's decided commitment to address environmental issues (Fisher-Vanden & Thorburn 2012). Others studies such as those by Khanna & Damon (1999), Videras & Alberini (2000), and Innes & Sam (2008) suggest the opposite: they find that firms with a poor environmental record are more likely to join VEPs. This argument indicates the use of pre-emptive actions of firms to avoid being targeted by regulators. That is, the firms want to signal to regulators that they are making an effort to change their practices. However, the finding here is inconsistent, as Arora &

Cason (1996) and Fisher-Vanden & Thorburn (2012) do not find a relationship between poor environmental records and membership in 33/50 or Climate Leaders, respectively.

Table 3.1: Characteristics of Firms that Join Voluntary Environmental Programs

Hypothesis Tested	**Study, Measure (Data Source)**	**Empirical Results**
Larger firms are more likely to participate in voluntary programs	Arora & Cason (1996), # of employees (Dunn & Bradstreet), # of facilities (EPA)	Employees: Positive and significant Facilities: Insignificant
	Karamanos (1999), sales (Energy Information Administration)	Positive and significant
	Khanna & Damon (1999), # of facilities, (S&P Compustat)	Insignificant
	Videras & Alberini (2000), # of employees (S&P Compustat)	Positive and significant
	Innes & Same(2008), # of employees (S&P Compustat)	Positive and significant
	Sam, Khanna, & Innes (2009), sales (S&P Compustat)	Positive and significant
Firms closer to consumers are more likely to participate	Arora & Cason (1996), advertising intensity (S&P Compustat)	Positive and significant
	Karamanos (1999), % customers residential for utilities (Energy Information Administration)	Insignificant
	Khanna & Damon (1999), firm produces final good (U.S. Census Bureau)	Positive and significant
	Videras & Alberini (2000), firm produces final good (U.S. Census Bureau)	Positive and significant for Green Lights and WasteWi$e; insignificant for 33/50
	Innes & Sam (2008), firm produces final good (U.S. Census Bureau)	Insignificant
	Sam, Khanna, & Innes (2009), firm produces final good (U.S. Census Bureau)	Insignificant
Firms in areas with stronger environmental movements are more likely to participate	Karamanos (1999), Sierra Club membership (study on membership)	Positive and weakly significant in one specification only
	Innes & Sam (2008), Sierra Club membership (Sierra Club)	Positive and significant
	Sam, Khanna, & Innes (2009), Sierra Club membership (Sierra Club)	Positive and significant
	Kim & Lyon (2011), Sierra Club membership (Sierra Club); LCV scores (League of Conservation Voters)	Sierra Club: insignificant; LCV score: insignificant

	Bi & Khanna (2012), LCV score (League of Conservation Voters)	Positive & significant
Firms with poor past environmental compliance records are more likely to join	Arora & Cason (1996), facility noncompliance with air standards (EPA)	Insignificant
	Khanna & Damon (1999), number of Superfund sites for firm[108] (EPA)	Positive and significant
	Videras & Alberini (2000), number of superfund sites and various fines (EPA)	Mixed results across measures, specifications, and programs; fines are positive and significant for 33/50
	Innes & Sam (2008), number of Superfund sites for firm (EPA)	Positive and significant
	Fisher-Vanden & Thorburn (2011), KLD concerns (KLD Research & Analytics)	Insignificant
Firms with a good past environmental compliance record are more likely to participate	Arora & Cason (1996), facility noncompliance with air standards (EPA)[109]	Insignificant
	Fisher-Vander & Thorburn (2011), KLD environmental strengths (KLD Research & Analytics)	Positive and significant
Firms operating in areas with poorer air quality are more likely to join	Karamanos (1999), air quality index (EPA)	Positive and significant
	Bi & Khanna (2012), county nonattainment index, (EPA)	Positive and significant

To summarize, the results from several studies in the literature suggest that larger firms are more likely to join VEPs in the United States, and it is also likely that firms in more environmentally friendly areas and firms located in areas with poorer air quality are more likely to join. Other hypotheses that have been tested produce inconsistent results though, both across different programs and when studying participation in 33/50. The lone study on the Climate Leaders program focused on the effect of firm participation on stock prices rather than on the question of firm motivation in participation. It also used a relatively small sample of companies,

[108] That is, the number of Superfund sites for which the firm is a potentially responsible party (PRP)

[109] This is the same test applied to the previous hypothesis – however, both possibilities were articulated as separate but related hypotheses by the authors.

did not cover the full program period, and did not control for the timing of the decision to join. Table 3.1 summarizes the hypotheses that have been tested and the study results.

3.4 Greenhouse Gas Regulations in the United States

Efforts at some sort of greenhouse gas regulation by the federal government in the United States began with the first Bush Administration, which favored a voluntary approach. Indeed, officials from the U.S. refused to endorse a timetable for specific reductions at the United Nations Conference on Environment and Development, or Earth Summit, in Rio de Janeiro in 1992. However, when Bill Clinton became president in January 1993, his administration suggested more aggressive and mandatory measures for reductions, such as a carbon tax and, more famously, a tax based on the energy content of fuels, measured in British Thermal Units (BTUs). In their place, a slew of subsidies and voluntary programs were started through the release of the President's Climate Change Action Plan in 1993. The VEPs established by the plan include Green Lights, Climate Wise, and Energy Star Buildings. Such programs were part of the more general movement to voluntary programs in the 1990s and 2000s. The prospect of mandatory regulations on greenhouse gas emissions at the federal level remained a distant prospect, as the United States did not ratify the Kyoto Protocol. The second Bush administration did not show any appetite for renewing a push for mandatory GHG regulations and instead continued to organize voluntary environmental programs.

One of these was Climate Leaders, which was established in February 2002 and suspended in September 2010.[110] Member companies would take an inventory of their

[110] The program was officially suspended because other programs existed at the federal and state levels of government and in the private sector that could encourage the reduction of greenhouse gas emissions voluntarily Futran (2011). In an interview for this dissertation, an EPA employee familiar with Climate Leaders suggested that there was also a strong sentiment within the Obama administration that the program should be removed in preparations for mandatory regulations on greenhouse gas emissions that they believed would be coming. This idea is confirmed by subjects interviewed by Futran (2011) as well.

greenhouse gas emissions, set a goal for reduction that was considered aggressive for their industry, and then work to meet that goal. EPA consultants would both verify that the goal is "aggressive" and that the company is meeting their goal, based on data that the member would submit. In return, EPA offered technical assistance in taking the GHG inventory and a limited amount of publicity for the firm, which would be known as a Climate Leader. It also offered the opportunity for environmental sustainability managers at member companies to network and share best practices.

Large companies that joined were considered "significant emitter partners" and offered more direct technical assistance by EPA.[111] Small businesses that joined were offered access to online tools for greenhouse gas management and considered part of the "small business network." By the end of the program, there were 210 significant emitter partners and 157 members of the small business network. As of 2009, companies in the program were responsible for 8% of the total US greenhouse gas emissions (U.S. Environmental Protection Agency 2009). Because members of the small business networks had a different experience with the program, this study only considers the experience of the significant emitter partners (SEPs). Figure 3.1 shows the number of new SEPs joining Climate Leaders each year.

Whenever a company joined Climate Leaders, their status within the program would be listed as Goal Under Development. EPA expected the development of the GHG emissions inventory and preparation of the inventory management plan to take about a year, and negotiation of a reduction goal may take up to two years. At this point, a firm would become a Goal Setter, and when they achieved the goal, they could become a Goal Achiever and could set

[111] It is unclear whether there was a specific set of criteria to determine how large a company had to be to be considered a significant emitter partner. Those firms that were had access to a certain number of consulting hours from EPA to facilitate the development of a greenhouse gas emissions inventory.

a new goal. However, a 2006 Government Accountability Office (GAO) report found that many companies were taking substantially longer complete this process (United States Government Accountability Office 2006, 10). This lagging by some firms continued for the duration of the program, and by its end in September 2010, 26 firms that had joined before 2009 still had not set goals.

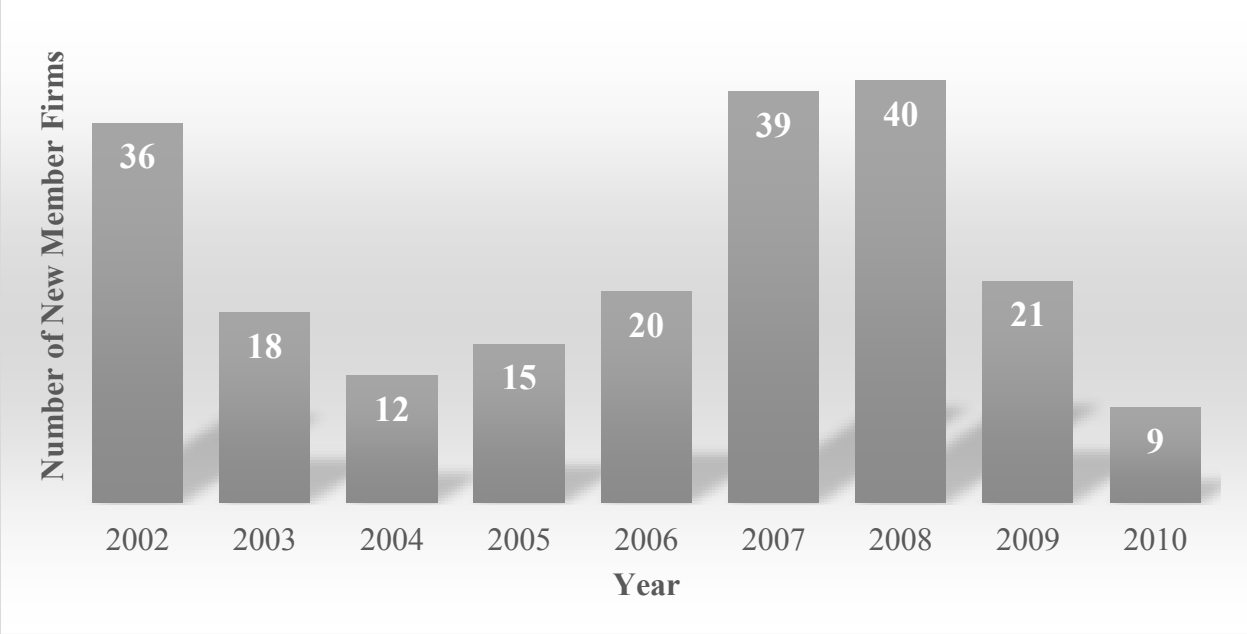


Figure 3.1: New Climate Leaders Members by Year

While the agreement that a company signed pledged it to setting an absolute reduction goal, this often did not happen in practice. Of the 210 SEPs, only 81 set absolute reduction goals. Seventy-six set normalized goals, reducing emissions per employee, per dollar of revenue, per unit produced, or some other unit. [112] Of the companies that set goals, 45 are listed as having achieved them. In many cases, goals were not achieved because the year in which any achievement could be evaluated was beyond 2010, when the program ceased. However, in 11

[112] 5 members pledged to become net-zero emitters of GHG emissions, while 48 members did not set goals – though many of these joined the program in its final months.

cases, companies simply did not achieve the goals to which they had pledged. Achievement of the goal was determined by data that the company reported and verified by contractors.

The GHG inventory, goal setting, and goal achievement rely substantially on the company being honest about its emissions over time as it is based on self-reporting. Companies were not required to verify that the information reported to EPA is accurate, though many larger companies would engage third-party auditors (Hsueh & Prakash 2009, 96). While the goals and standards set by Climate Leaders are relatively stringent, EPA had no written policy outlining sanctions for members who did not meet their goals (Hsueh & Prakash 2009, 96; U.S. Government Accountability Office 2006, 14).

EPA sent member companies a termination letter in September 2010 that encouraged them to participate in other voluntary programs administered instead by NGOs or states.[113] The termination of the program came as a surprise to members, occurring only a month before their annual meeting and with no previous discussion. This was perceived as an attempt by the Obama administration EPA to distance itself from a program that began under the Bush administration and sometimes criticized as being "too industry-friendly" (Futran 2011, 29-31).

However, there are still a host of voluntary programs administered by EPA such as Energy Star, the Green Power Partnership, the Mobile Air Conditioning Protection Partnership, and the Voluntary Aluminum Industrial Partnership. None directly deal with broad GHG emissions reduction, but several target specific GHGs, such as perfluorocarbons (PFCs), hydrofluorocarbons (HFCs) or methane. In general, under the Obama administration, the agency has attempted to move towards more formal regulation. It has proposed rules to regulate

[113] The private voluntary programs include the Carbon Disclosure Project (CDP) and The Climate Registry (TCR).

emissions from both new and existing power plants, and, beginning in January 2010, it required all major GHG emitting facilities to report their releases.

The sorts of commitments made by companies under Climate Leaders are often replicated in other initiatives by the state or private sector. For example, utilities in the Northeast are regulated by the Regional Greenhouse Gas Initiative (RGGI) cap-and-trade program, and large emitters in California also must acquire emissions permits under their cap-and-trade scheme. On the private sector side, investor groups are more vocal about requiring companies to publicly disclose information on their GHG emissions, including reduction goals that they have set. Many large companies therefore fill out a detailed report for CDP, or Carbon Disclosure Project, and the Dow Jones Sustainability Index. Companies that are large suppliers of inputs for other firms must also answer inquiries from their customers attempting to assess their upstream emissions.[114] While disclosing emissions does not necessarily entail setting a goal, firms that provide a detailed breakdown of their emissions sources tend to have one.[115] The goals set under the program can be seen as a proxy for aggressive sustainability commitments by companies more generally, and this begs the question of why companies might choose to do this.

3.5 Testable Hypotheses

I build on the previous work on VEPs regarding the specific characteristics of the firm that can help identify the underlying factors or reasons for joining a given voluntary program. Specifically, the following hypotheses will be tested:

[114] Upstream, or Scope 3, emissions refer to greenhouse gas emissions from suppliers.

[115] This probably has to do with the fact that firms learn about their production process by taking an emissions inventory and therefore identify opportunities to both reduce emissions and cut costs.

1. **Larger firms are more likely to join and stay active in Climate Leaders than smaller firms**

Larger firms could be more likely to attract the attention of activists and regulators and seek to preempt such confrontations by appearing to take action on their own (Karamanos 1999; Videras & Alberini 2000). This suggests that larger firms will therefore both face a higher demand for CSR investments from these parties but will also attach more importance to those demands. They may also face lower costs due to economies of scale and have more resources available to commit to an environmental initiative (Sam, Khanna, & Innes 2009). In the context of a climate program, larger firms may hope to be eligible for more free emissions permits in the event that a regulatory scheme follows the voluntary program (Kim & Lyon 2011).

2. **Firms with a worse environmental record are more likely to join and remain active than those with a better environmental record**

Voluntary programs offer recognition for participation among stakeholder groups that may have a preference for "green" firms. Member firms may hope that such recognition obscures their past failures to meet mandatory pollution requirements, especially from EPA (Arora & Cason 1996; Videras & Alberini 2000). Perhaps more relevant to pollutants like greenhouse gases is the idea that joining a program will reduce the threat of liabilities and compliance costs for future rules (Khanna & Damon 1999; Kim & Lyon 2011). Alternatively, firms that already have a record of strong environmental commitments may see a voluntary program as a way to get more official recognition for their actions, or to receive assistance in broadening efforts to reduce environmental impacts that they have already been pursuing. This hypothesis has been tested before, though there has been no theoretical justification for it and the results have been insignificant (Arora & Cason 1996; Fisher-Vanden & Thorburn 2011).

3. **Firms in states where environmental protection is a higher priority among the population are more likely to join and stay active than those in areas where it is less of a priority.**

For firms in these areas, joining a VEP can lead to better relationships with environmental groups. This can in turn result in lower regulatory costs, as these groups are more likely to be powerful and better able to lobby the government for additional regulations. Therefore, joining a voluntary program where environmentalism is strong is another indicator of regulatory pre-emption by the firm (Karamanos 1999; Innes & Sam 2008; Sam, Khanna, & Innes 2009; Bi & Khanna 2012).

4. **Firms in counties with poorer air quality are more likely to join and remain active**

When a pollution levels within a county are higher than limits mandated by EPA for several pollutants (known as criteria pollutants), that area will be subject to more stringent regulatory controls.[116] Firms operating in such counties may join a voluntary program to avoid further regulation, as larger polluters may be especially targeted (Karamanos 1999; Bi & Khanna 2012). While carbon dioxide and other greenhouse gases are not criteria pollutants, they are often released with these pollutants. If emissions of these co-pollutants are reduced, greenhouse gas emissions will also tend to be reduced if the method for pollution control includes fuel switching or use of energy efficiency improvements.

[116] Criteria pollutants are ozone, particulate matter, carbon monoxide, nitrogen oxides, sulfur dioxide, and lead. They are referred to as criteria pollutants because EPA regulates them by developing criteria based on human and environmental health to determine appropriate pollution levels.

5. **Firms that have more direct contact with consumers are more likely to join Climate Leaders and remain active members**

EPA cites public recognition as a major incentive for VEPs (Arora & Cason 1996). Joining these programs can promote a positive image among consumers that are concerned with the environment and those that demand green products, thereby increasing sales revenue and perhaps market share (Karamanos 1999; Khanna & Damon 1999; Videras & Alberini 2000; Innes & Sam 2008; Sam, Khanna, & Innes 2009).

6. **Firms in industries that require a large proportion of skilled workers are more likely to join and stay active**

Firms in competitive industries whose employees are relatively skilled will use membership in VEPs in conjunction with firm-level initiatives to demonstrate that they are environmentally friendly. This stems from a belief among managers that skilled employees, especially younger employees, value working at an "ethical" workplace. Thus, participation in a VEP helps promote a positive image of the company among workers, making it easier to retain them.

7. **Firms that are recipients of large government contracts are more likely to join the program and remain active**

Firms competing for government contracts may see that appearing to be more environmentally friendly helps them win these contracts. It can help participating firms in differentiating themselves from competitors and in maintaining strong favorable relationships with the government more generally. This helps the firms increase profits.

3.6 Data Description

The sample is drawn from firms that were members of the S&P 500 index in 2002. Standard & Poor's constructs the index based on a number of criteria. Member companies must have large market capitalization, adequate liquidity, a major presence in the U.S., and they must be publicly traded, contribute to the index's sector balance, and be financially viable. The panel examined here is unbalanced because firms may be acquired by another entity, go bankrupt, be temporarily de-listed from stock exchanges, or data may be unavailable for unknown reasons. As a result, the panel starts with 480 member firms and by 2010 is reduced to 373 firms, yielding 3,893 total observations over the 8 years of the program. Table 3.2 shows the total number of firms in the panel in each year considered.

Table 3.2: Panel Attrition: Number of Firms with All Data Available

Year	Number of Firms
2002	480
2003	474
2004	469
2005	460
2006	441
2007	418
2008	397
2009	381
2010	373

Of these sample firms, 87 (18% of total) have joined the Climate Leaders Program. Table 3.3 shows the reasons that firms leave the panel and the number of those firms that were members of the program. By far the biggest reason for panel attrition is acquisition by another entity, which causes 85 (18%) firms to leave the sample. However, it is other public companies that are already in the sample that acquire more firms than any other source. This means that the information on those firms is still captured here, though the decision-making structures of these companies are no doubt subsumed by those of the firms that acquire them. Additionally, while

about 22% of the starting firms in the panel leave or are dropped at some point, only 11% of the 87 Climate Leaders members, or 10 firms, do this.

Table 3.3: Reasons for Panel Attrition

Major Reason	**Notes**	**Number of Firms (% of total attrition)**	**CL Members**
Acquired		*80 (60%)*	
	By other public company, not in sample	28 (21%)	1
	By other public company, in sample	39 (29%)	2
	By private equity firm/private company	3 (2%)	0
	Merger	9 (7%)	1
	Government takeover	1(0.75%)	1
DC Headquarters[117]		*2 (1.5%)*	*0*
Went Private		*15 (11%)*	*1*
Temp. De-Listing	Due to filing problems/scandal or low trading	*7 (5%)*	*2*
Bankrupt	Either temporary or liquidation	*6 (4.5%)*	*0*
Unknown		*20 (15%)*	*2*
Merged into other ticker[118]		*3 (2%)*	*0*
	TOTAL	*133*	*10*

Source: Author's investigation of news releases and company websites. [119]

Table 3.4 provides the names, descriptions, and sources for all variables used in the analysis. The dependent variable used in the probit regressions is firm participation in a given year. Firms are assigned a 1 in a given year if are active program members, and a 0 if they are not. That is, the firm is assumed to make a decision to be an active participant in the program each year.[120] While it was possible to drop out of the program, only 2 firms in the sample did

[117] Because of the use of state-level variables in the models below, firms that are headquartered in the District of Columbia could not be included.

[118] In several cases, firms would be listed under two ticker symbols, which would then be merged in to a single entry. In the panel, it appears as though one of the firms exits when this happens.

[119] Because a few firms leave the panel and re-enter, the total number of firms that leave will not correspond to the total number of firms left in the panel at the end of the period.

[120] This reflects the decisions that firms had to make to actively proceed through the program stages. For instance, once making the decision to join the program, the firm had to take action to submit a greenhouse gas reduction goal. Once that was completed, they had to take actions to meet that goal. At each stage, not all firms

so.[121] Instead, some firms were simply inactive in the sense that they joined the program and then never set or achieved their stated goals.[122] In a few cases firms will be inactive for a few years and then set a goal towards the end of the program, in which case, they are assumed to once again be active program participants.

Table 3.4: Variable Description

Name	Description	Source
CL Member	Dummy variable; 1 if firm is active program member in a given year, 0 otherwise	EPA Data
Revenues	Hundreds of thousands of dollars, yearly, lagged one year	S&P Compustat Database
LCV Score	League of Conservation Voters House delegation average score on environmental legislation, yearly	LCV Reports
Air Quality	Number of pollutants for which county with company HQ has nonattainment status, yearly	EPA Green Book
KLD Scores	Series of dummy variables indicating whether a firm raises a particular environmental concern or possesses a particular environmental "strength", yearly, lagged one year	MSCI Inc.
Final Good	Dummy variable denoting whether a firm produces final goods and/or services, time invariant	Author calculations
High Tech Employees	Variable 0-4 with higher values indicating a higher proportion of high-tech employment in the industry (by 4-digit NAICS code), time invariant	Hecker (2005)
Contractor	Federal contract amounts as a percentage of revenues, yearly, lagged one year	USAspending.gov, Federal Procurement Data System
Democratic Congress	Dummy variable noting whether Democrats controlled both houses of Congress in a given year, yearly	Author calculations

chose to do this, implying that the decision to remain in the program and progress through stages was not a passive one or a choice only made once.

[121] Target and U.S. Steel left the program at some point. However, in the Climate Leaders membership agreement signed with EPA, the agency promises not to comment on companies leaving the program. So it is not possible to determine exactly when they left.

[122] According to EPA, firms should be able to set their goals within two years of joining the program (Government Accountability Office, 2006). If a firm did not do this, it is considered inactive in the program. Additionally, if a firm does not meet its goals, it is considered inactive. Appendix C shows results from a specification run where firms that never set goals are not considered members in the program at all. The results are largely consistent with what is found with the broader definition of membership.

The size of the firm is measured using the natural log of each firm's yearly revenue in hundreds of thousands of dollars, as recorded in the company's filed income statements and obtained from S&P's Compustat Database. The views of the population in a company's home state towards the environment are proxied using the average score received by the state's House of Representatives delegation by the League of Conservation Voters (LCV). Each year, the LCV produces a report that lists the votes taken by each member of Congress on environmental bills. Each member is given a score from 0 to 100, with a higher score meaning that their voting record is more environmentally-friendly, as determined by the LCV.

Air quality is measured at the county level for the location of the company's headquarters.[123] EPA's Greenbook lists for each county the years in which it is out of compliance with air standards for criteria air pollutants, including ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, particulate matter, and lead. The number of pollution standards for which the county is in nonattainment is listed for each firm each year.

A firm's previous environmental performance is measured using a score developed by MSCI Inc., known as the KLD Social Ratings, and lagged one year. These rate a company with a 1 if the firm's action is cause for environmental concern within the following seven areas.

1. Hazardous Waste – the firm has large liabilities for hazardous waste sites or has been fined for waste management violations
2. Regulatory Problems – the firm has received fines for causing environmental damage or violations of operating permits
3. Ozone Depleting Chemicals -- the company is a top manufacturer of such chemicals
4. Substantial emissions – the firm's legal emissions of EPA-designated toxic chemicals are among the highest reported
5. Agricultural chemicals – the company produces chemicals such as pesticides or fertilizers

[123] Because many companies in this group will have multiple facilities, it is impossible to evaluate this at the facility level, even though this may be more relevant in some ways. However, using local air quality at headquarters will capture an aspect of the environment where the decision makers are. If executives work in an area with bad air, they may be more aware of environmental issues (especially regarding air pollution). On the other hand, it may show a tolerance for relatively dirty air.

6. Climate change – the firm receives a substantial portion of its revenue from the sale or combustion of fossil fuels
7. Other concern – the company has been involved in some other environmental controversy that is not covered by other KLD ratings[124]

Similarly, there are KLD ratings for environmental strengths in 6 areas.[125]

1. Beneficial Products and Services – the firm derives substantial revenue from "innovative remediation products, environmental services, or products that promote the efficient use of energy, or it has developed innovative products with environmental benefits" (8).
2. Pollution Prevention – The firm has strong pollution prevention programs including both emissions and toxic-use reduction.
3. Recycling – The firm either uses recycled materials substantially in its manufacturing process or is a major participant in the recycling industry.
4. Clean Energy – The firm has taken significant measures to reduce its impact on climate change and air pollution through the use of renewable energy and clean fuels or improved energy efficiency. The firm has committed to promoting climate-friendly policies outside its own practices.
5. Communications – The firm publishes a substantive environmental report or has notably effective internal systems in place to promote environmental best practices.
6. Other Strength – The company has demonstrated commitments to other environmentally proactive activities.

Different model specifications below use either the total number of strengths and concerns for a firm or include a series of dummy variables listing each concern. In all cases, strengths and concerns are lagged one year. The concern of Climate Change is not used in the case of the panel probit models as it would likely be endogenous. Firms in the Climate Leaders program may be less likely to receive this concern designation because they are in the program.

The proximity of a firm to consumers is measured by denoting companies that produce primarily final goods and/or services for consumers. This was determined by examining each company and their primary business. In almost all cases, firms overwhelmingly make either intermediate or final goods.

[124] These descriptions are paraphrased from a guide to the data (KLD 2006).

[125] KLD introduced a new measure in 2006, management systems. This is not included in any strength total in this paper because it was introduced mid-way through the panel period.

The proportion of "high-tech" workers in an industry is incorporated through the use of a categorical variable with a value of 0 to 4, similar to that developed by Hecker (2005).[126] Higher values are associated with a larger proportion of high-tech workers. Industries are sorted by 4-digit NAICS codes, and high-tech workers are considered to be those in disciplines such as engineering, computer programming, and science.[127] There are four levels of technology that Hecker assigns. In the highest level, between 25% and 60% of employees work in technology-oriented occupations. At the next highest level, 15% to 25% of employees are in these positions. Those at the next highest level have between 10% and 15% of employees in technology-oriented occupations. And at the lowest level of designation, roughly 5% to 10% of employees are in these roles. Firms that receive a zero for the variable in this study have less than 5% of their employees in technology-oriented occupations.

To determine whether a firm is a large recipient of Federal contracts, the total amount of contracts received as a percent of revenue is calculated for each year. The data on contract amounts is gathered from usaspending.gov, which in turn downloads data from the Federal Procurement Data System.

Finally, a dummy variable is used to indicate whether or not Democrats control both Houses of Congress in a given year. This is used to control for the fact that there was a major change in power as a result of the 2006 elections, and Democrats were elected with a platform that included implementing an economy-wide carbon pricing scheme. This change is also

[126] Hecker (2005) sorts industries by levels, where "Level I" industries have the highest proportion of high-tech employees, there are Level II and Level III industries, and industries that meet at least one criterion of Hecker's (2005) high-tech industry classification. Here, Level I industries are given a value of 4, Level II industries are given a value of 3, and so on.

[127] Specifically, Hecker (2005) defines high-tech employees as those in the following occupational groups: computer and mathematical scientists; engineers; drafters, engineering, and mapping technicians; life scientists; physical scientists; life, physical, and social science technicians; computer and information systems managers; engineering managers; and natural sciences managers.

reflected in the pattern in Figure 3.1, where new membership in Climate Leaders falls each year between 2002 and 2006 and then jumps in 2007, probably reflecting sentiment that the Democratic Congress was more likely to enact mandatory GHG regulations.

Table 3.5: Summary Statistics

Variable	CL Members	Non-Members	T-Statistic
Revenues (Millions of dollars)	22974.63	14052.55	-2.670***
LCV House Score	59.783	53.910	-2.553***
County Nonattainment Score	1.059	1.135	0.690
Final Good (1 = final good)	0.552	0.528	-0.408
Contracts (as % of total revenues)	0.024	0.011	-1.675**
High Tech Employees	1.828	1.384	-2.184**
KLD Scores (All dummy variables)			
Hazardous Waste	0.261	0.137	-3.117***
Regulatory Problems	0.247	0.147	-2.651***
Ozone-Depleting	0.013	0.003	-1.480*
Substantial Emitter	0.228	0.127	-2.913***
Ag. Chemicals	0.027	0.006	-2.012**
Climate Change	0.086	0.092	0.183
Other Concerns	0.093	0.031	-3.152***
Total Concerns	0.954	0.542	-3.382***
Beneficial Products	0.106	0.035	-3.428***
Pollution Prevention	0.146	0.034	-5.095***
Recycling	0.083	0.030	-2.713***
Clean Energy	0.224	0.076	-5.438***
Management Systems	0.420	0.194	-4.671***
Other Strengths	0.084	0.033	-3.377***
Total Strengths	0.826	0.278	-7.954***
Number of Firms	87	393	

* *p<0.1; ** p<0.05; *** p<0.01* for difference in mean test between the two groups

Table 3.5 provides the summary statistics for the variables used in the probit regression. Averages are taken for a company during the time it is in the panel (which varies for some), and

then this is averaged across the entire group of 480 firms that are in the panel for at least one year. A t-test of the difference in means is also run to provide some indication of the significance in the differences between firms eventually joined Climate Leaders and those who did not.

Casual observation and the t-tests yield some interesting patterns. It appears that members of Climate Leaders tend to be larger companies (even amongst a group of large companies). They are also headquartered in states with members of Congress that have a more environmentally friendly voting record. Climate Leader members also tend to be located in counties with slightly cleaner air. Strangely, program members have both a worse environmental record as measured by the number of "concerns" assigned to them by the KLD score and a higher number of "strengths" than non-members. They are also more likely to be recipients of large federal contracts. Member firms are not significantly more consumer-oriented, nor do they seem to have a higher proportion of employees in high-tech occupations.

3.7 Methodology: Probit Analysis

First, a series of probit regressions will be used to determine the characteristics of firms more likely to join Climate Leaders and remain active. However, there may be endogeneity concerns with this method. To ensure the validity of the probit results, survival analysis will then be used to examine which kinds of firms are more likely to join Climate Leaders sooner.

The initial analysis using probit regressions seeks to explain a binary variable indicating whether a firm was an active member of the Climate Leaders program in a given year. This is modeled as a decision that the firm makes each year.[128] A panel probit regression will be used to

[128] Because the program progressed in stages of setting and meeting voluntary goals, this can be seen as realistic. Firms could and did halt their participation in the program at various stages. However, the significant results are robust when controlling for participation in the previous year in the probit regressions, though their marginal effects are diminished. This effect, as expected, is especially strong for the "within-firm" results, where all

model the probability that a firm is in the program in a given year. Before performing these tests, there are a number of econometric issues that need to be addressed.

First, because the panel is grouped by firms, which are themselves complex and large organizations, there will undoubtedly be unobserved heterogeneity across firms that could impact the decision to join and needs to be taken into account. Following the treatment by Bartels (2008), the probit model can be represented with the following two equations:

$$P_{it} = \beta_{0i} + \beta_1 c_{it} + \varepsilon_{it} \tag{3.1}$$

$$\beta_{0i} = \gamma_0 + \gamma_1 d_i + u_i \tag{3.2}$$

Where P_{it} represents the probability of firm *i* joining Climate Leaders in year *t*, which is dependent on a number of variables, c_{it}, that vary across companies and time, and with an error term ϵ_{it}. The second equation shows that the intercept for each company can be decomposed into a series of variables that do not vary with time, d_i. These are used to control for certain unchanging characteristics of companies (such as whether they primarily produce final goods). Additionally, u_i represents the unobserved heterogeneity across clusters. These can be expressed in a single equation.

$$P_{it} = \gamma_0 + \beta_1 c_{it} + \gamma_1 d_i + u_i + \varepsilon_{it} \tag{3.3}$$

Completely pooling the data (that is, assuming that $u_i = 0$) simply ignores the problem of unobserved heterogeneity and could lead to biased results. The coefficients produced in this instance will assume that within- and between-firm effects are equal.[129]

significant variation in firm membership can be explained by past participation. This is to be expected, however, as few firms left the program. Survival analysis, which is discussed in a later section, also controls for past participation in the program.

[129] Econometric tests confirm the need for this approach as the within- and between-cluster effects are significantly different from pooled results. Furthermore, there is a significant reduction in error from unobserved heterogeneity (about 26% for time varying variables and 8% for time invariant variables) by using the clustering approach.

Such concerns usually lead researchers to use either fixed or random effects. However, the fixed effects model absorbs all variation between firms when in this particular case, these are the variables of most interest and relevance to the research question. Additionally, discrete choice models using fixed effects suffer from inconsistent parameter estimates (Neyman & Scott 1948; Lancaster 2000; Greene 2004). The alternative then is to use a random effects model, though this requires one to assume that time-varying company-level variables are uncorrelated with the random effects term to achieve consistent estimators (Greene 2004; Bartels 2008). Such an assumption seems unrealistic here. For example, there may be some element of unobserved heterogeneity such as corporate management effectiveness that would be accounted for by the random effects term that drives both high revenues and participation in the Climate Leaders program.

The approach used here again follows Bartels (2008). First, for each firm-level time-varying variable, the between-firm effects are calculated using the firm-specific mean of that variable. That is, a firm specific mean of c_{it} is calculated, $\bar{c}_i$. Then, the within-firm effects are calculated by de-meaning the variable. That is, the within-firm effect is isolated as $c_{it}^W = c_{it} - \bar{c}_i$. Because of this de-meaning, the within- and between-firm variations become completely uncorrelated and a standard random effects model can now be used. Coefficients provided now give separate within- and between-firm effects. The final regression is expressed as:

$$P_{it} = \gamma_0 + \beta_1 c_{it}^W + \gamma_1 d_i + \gamma_2 \bar{c}_i + u_i + \varepsilon_{it} \qquad (3.4)$$

3.8 Results: Probit Analysis

Table 3.6 shows the between-firm marginal effects of a decision to join and remain active in Climate Leaders in any given year.[130] Model 1 shows results from pooling the KLD strengths

[130] An alternative specification limited the indicator of membership only to firms that set goals in Climate Leaders, thus excluding firms that joined and never set goals. The only difference in these results from those

and concerns and Model 2 shows results from breaking those up individually. The most striking result is the large and significant coefficients of some of the KLD strengths. For one, a firm that is recognized as a leader in the recycling industry or with the use of recycled materials in its production process is twice as likely to be an active program member, with a marginal effect of just over 2. Other strengths that seem to matter are pollution prevention and clean energy, with marginal effects of nearly 4 and 2.5, respectively. These two strengths seem like natural complements to a program designed to encourage GHG emissions reductions. Recall that the pollution prevention strength is given if the firm has programs in place to reduce toxic waste and other emissions. The clean energy strength is given if the firm is a substantial user of renewable energy and other clean fuels. However, the question of endogeneity arises here since it may be the case that once firms join Climate Leaders, they are more likely to earn these distinctions. The next section will show through the use of survival analysis that this does not appear to be the case.

The significance of the KLD strength measures also supports the findings of Fisher-Vanden & Thorburn (2012), who reached the same results using a different technique, a different sample of firms, mostly different control variables, and work with program data through 2008. All of this suggests that it is the firms who are already leading in the areas of environmental sustainability that are more likely to join Climate Leaders, rather than the program inducing a change in the behavior of firms. The latter would have been evident if, say, the marginal effects of the environmental concern measures had been positive and significant.

outlined below was a large and significant (at the 5% level) of the "ozone-depleting chemicals" concern, with a marginal effect of 9.4. However, this was the only specification tested in which this variable was significant at any level.

Table 3.6: Marginal Effects (Between Firm Effects)

Variable	Model 1	Model 2
Log Revenue	0.718 (0.180)***	0.725 (0.194)***
LCV House	0.035 (0.009)***	0.034 (0.010)***
Air Quality	-0.487 (0.200)**	-0.581 (0.220)***
Contract Percent	0.016 (0.027)	0.013 (0.027)
Final Good	0.045 (0.374)	-0.177 (0.403)
High Tech Employees	0.147 (0.108)	0.107 (0.119)
KLD Scores		
Hazardous Waste	--	0.242 (0.674)
Regulatory Problems	--	-0.177 (0.682)
Ozone-Depleting Chemicals	--	4.144 (4.850)
Substantial Emissions	--	-0.698 (0.758)
Agricultural Chemicals	--	-2.477 (2.719)
Other Concerns	--	0.806 (0.956)
Total KLD Concerns	0.018 (0.206)	--
Beneficial Products	--	0.579 (0.883)
Pollution Prevention	--	3.791 (1.037)***
Recycling	--	2.076 (0.970)**
Clean Energy	--	2.626 (0.807)***
Other Strengths	--	0.217 (1.455)
Total KLD Strengths	1.898 (0.351)***	--
Democratic Congress	1.333 (0.187)***	1.277 (0.203)***
Total Observations	3889	3886
χ^2	211.22	202.51
Log Likelihood	-514.285	-502.51

*Note: * p<0.1; ** p<0.05; *** p<0.01*

The above results show that the size of a company in terms of revenues is significant and positive, which confirms the findings of previous studies.[131] If a firm's log revenues increase by one (meaning that revenues increase by a factor of 10), that firm is about 72% more likely to be an active program member. This result is interesting because it is so strong even among a group like the S&P 500, in which all firms are already large. It is clear that the largest firms are more

[131] Results did not change when using employees as a measure of size instead.

likely to be active members in the program. The marginal effects of the year dummy indicates that the election of the Democratic Congress in 2006 has brought about a 136% higher probability that a firm will be an active member of the program.[132] Again, this is an unsurprising result given the platform on which many Democrats were elected and the notable increase in new program members after 2006.

Two of the results that were not significant warrant discussion since they do not support the results of other studies. The first of these is the dummy variable for firms that produce primarily final goods. Results on similar variables for other programs, such as WasteWi$e, Climate Wise, and 33/50 have been mixed. This is not necessarily surprising since different VEPs are likely to attract different kinds of firms. There is little reason to think that firms joined Climate Leaders primarily for public recognition that may have improved reputation among consumers and therefore sales.[133]

Other studies have also reported mixed results on the significance of variables measuring a firm's environmental compliance record. In the case of Climate Leaders, having a poor record does not seem to have any impact on the decision to be an active program member. It is therefore unlikely that firms were generally joining in an effort to ingratiate themselves to regulators and atone for past environmental compliance problems.[134]

Table 3.7 shows the within-firm marginal effects for Models 1 and 2, again pooling and listing individually the KLD concerns, respectively. That is, significant variables show the factors that increase the chances that a particular firm will be an active member of Climate

[132] Including year fixed effects in an alternative specification did not significantly change results.

[133] Running the model with a dummy for whether a company operates retail stores yields a similar non-significant result.

[134] However, interviews with environmental sustainability managers suggest that some companies did join hoping to get early credit for actions to reduce emissions in the event that any sort of tax or trading scheme was introduced at the federal level.

Leaders when that variable changes. While the between-firm effects show that a firm with higher average revenue is more likely to join Climate Leaders, the within-firm marginal effect of about 0.7 shows that when a firm's revenues increase, it is more likely to be an active member. The result for LCV score (0.2) is also similar to the between-firm effects; as a particular firm's state becomes more environmentally friendly, it is more likely to be in Climate Leaders.

Table 3.7: Marginal Effects (Within Firm Effects)

Variable	Model 1	Model 2
Log Revenue	0.728 (0.283)**	0.832 (0.296)***
LCV House	0.020 (0.010)**	0.020 (0.010)**
Air Quality	0.385 (0.128)***	0.405 (0.135)***
Contract Percent	0.010 (0.030)	0.011 (0.031)
KLD Scores		
Hazardous Waste	--	-0.164 (0.430)
Regulatory Problems	--	0.530 (0.290)*
Ozone-Depleting Chemicals	--	-0.888 (0.970)
Substantial Emissions	--	-0.869 (0.338)**
Agricultural Chemicals	--	-4.104 (4.784)
Other Concerns	--	-0.288 (0.460)
Total KLD Concerns	-0.163 (0.157)	--
Beneficial Products	--	0.530 (0.382)
Pollution Prevention	--	-0.321 (0.560)
Recycling	--	1.079 (0.584)**
Clean Energy	--	0.289 (0.263)
Other Strengths	--	0.171 (0.314)
Total KLD Strengths	0.279 (0.149)***	--
Total Observations	3889	3889
χ^2	211.22	202.51
Log Likelihood	-514.285	-502.51

Note: Time invariant variables, such as the final goods or technology indicators are unchanged here from the above table. The Democratic Congress control variable is also the same. Tables 3.6 and 3.7 show results from the same regressions, but for ease of presentation, the between- and within-firm effects were split between the two tables.
** p<0.1; ** p<0.05; *** p<0.01*

Interestingly, the air quality score has the opposite sign as the between-firm effects, now at 0.4. This means that as a particular county's air becomes dirtier, a firm is more likely to be an active member. This could happen because stronger regulatory threats to the firm accompany the deteriorated air quality, even if that firm is not a major factor behind the worsening air quality. Changes in a firm's environmental strengths, however, are less of a factor in the probability of being an active member. The overall significance of the strengths seems to largely be driven by the recycling strength, which still has a large impact of 1.07. The substantial emission concern is also significant here at -0.87, indicating that if a firm becomes identified as a large emitter of EPA-designated toxic chemicals, it becomes far less likely to join the program.

3.9 Application of Survival Analysis

While the probit analysis helps identify why companies join and remain in the program, it does not examine the decision to join alone separately from the decision to remain an active member. Additionally, the significance of some environmental strengths such as Clean Energy and Pollution Prevention may, in part, be caused by endogeneity. That is, a firm that joins Climate Leaders may, in subsequent years, be more likely to be labelled as using Clean Energy because of their membership in the program.

An alternative way to model the decision of firms to join the Climate Leaders program is through survival analysis, where such endogeneity is not a concern.[135] Here, the variable of interest is the time to an event, in this case, either the end of the program period or the time of the decision to join. All firms would have had the opportunity to join from the beginning to the

[135] For more information on this methodology, see Hosmer, Jr., Lemeshow, & May (2008) and Jenkins (2004). For examples of applications in economics, see Agarwal and Audretsch (2001) and Giovannetti, Ricchiuti, & Velucchi (2011).

end of the program, though a number drop out of the panel because of factors discussed in the Data Description section.

Survival analysis looks only at the decision to join the program, and not the decision to be an active program member each year as the panel probit does. This approach allows for a better understanding of this lone decision to join, which is important since few companies leave the program. More specifically, it analyzes the factors that impact the probability of joining the program sooner.[136] Because companies that join the program fall out of the sample after their change in status, endogeneity is not a problem.

Further, the Cox proportional hazards regression model used here does not assume that the underlying distribution of probabilities for firm membership is normal. The regression model estimates a hazard function for each firm, $h_i(t)$, which can be expressed as:

$$h_i(t) = h(t, x_{it}) = h_0(t)\exp(x'_{it}\beta) \tag{3.5}$$

Here, $h_0(t)$ is a baseline hazard function that represents the probability that a firm will have joined Climate Leaders at time *t*, conditional on having "survived" (i.e. not joined) until that time, x_{it} is a vector of independent variables for each firm, observed in multiple periods, and β is a vector of unknown parameters to be estimated. The Cox model is considered "semi-parametric" because it makes no assumptions about the functional form of $h_0(t)$.

The analysis here makes use of multi-record data, where observations are made of a firm's variables of interest each year until that firm leaves the panel or joins Climate Leaders.[137] That is, a firm can leave the panel either by joining Climate Leaders, remaining in the panel until the end of the program period (remaining observations here are considered censored), or through

[136] Firms that joined the program on the first possible day (2 cases) are dropped in order to run the model.

[137] That is, a firm can leave the panel in three ways: it joins Climate Leaders, the program period ends without the firm joining Climate Leaders, or the firm exits for another reason discussed in the data description section, such as bankruptcy or acquisition by another company.

some other factor discussed in the Data Description section like bankruptcy or acquisition by another firm. The multi-record analysis allows for the inclusion of time-varying variables, which are the primary variables of interest in this case.

First, the survival functions of different groups of firms are tested for homogeneity. These functions chart how the probability of a firm joining Climate Leaders changes over time as they fall into different discrete groups. At any given point in the program period, the probability of firms in these groups joining Climate Leaders is determined. Log-rank and Wilcoxon tests of significance between groups are reported below. This gives some indication of variables that may matter more for survival rates. Groups that have significantly different hazard functions provide an indication of which variables to include in the regression.

Such differences can also be shown visually by displaying the Nelson-Aalen cumulative hazard functions for each group, which takes the following form:

$$\widehat{\Lambda}(t_i) = \sum_{j=1}^{i} \frac{d_j}{n_j} \tag{3.6}$$

Where $\widehat{\Lambda}(t_i)$ is the Nelson-Aalen estimator of the probability of joining Climate Leaders at any given time. The proportion of join events at time j is d_j, and n_j refers to the number of firms left in the panel at time j. The resulting functions are shown graphically below for different groups of firms.

The results of the survival function homogeneity tests are shown in table 3.8, using the same independent variables as the probit models. The χ^2 statistic for each test is given, as well as the p-value for the test. Higher χ^2 values indicate that survival functions are more likely to be different. P-values (in parentheses) indicate the significance of the finding, with lower values associated with more significant differences. The analysis indicates that groups of firms in the

sample differ in their probability of joining Climate Leaders at any given time in a number of ways.

Table 3.8: Tests of Homogeneity χ^2 values

Variable	Log-Rank	Wilcoxon
Revenues	**23.65 (0.000)**	**28.06 (0.000)**
LCV Score	**7.50 (0.006)**	**9.22 (0.002)**
Air Quality	2.00 (0.920)	2.43 (0.877)
Final Good	0.16 (0.689)	0.10 (0.750)
High Tech Employees	**9.54 (0.049)**	**10.70 (0.030)**
Contractor	**14.29 (0.000)**	**16.66 (0.000)**
KLD Scores		
Hazardous Waste	**5.65 (0.017)**	**7.99 (0.005)**
Regulatory Problems	**1.81 (0.179)**	**2.54 (0.111)**
Ozone-Depleting Chemicals	1.60 (0.205)	0.87 (0.351)
Substantial Emissions	0.02 (0.901)	0.15 (0.700)
Agricultural Chemicals	**3.34 (0.068)**	**2.40 (0.121)**
Other Concerns	**4.98 (0.026)**	**4.68 (0.031)**
Total KLD Concerns	**11.05 (0.051)**	**10.78 (0.056)**
Beneficial Products	**16.81 (0.000)**	**16.41 (0.000)**
Pollution Prevention	**29.76 (0.000)**	**36.33 (0.000)**
Recycling	**2.22 (0.136)**	**3.64 (0.057)**
Clean Energy	1.13 (0.287)	1.61 (0.204)
Other Strengths	0.07 (0.792)	0.03 (0.858)
Total KLD Strengths	**33.41 (0.00)**	**38.67 (0.00)**

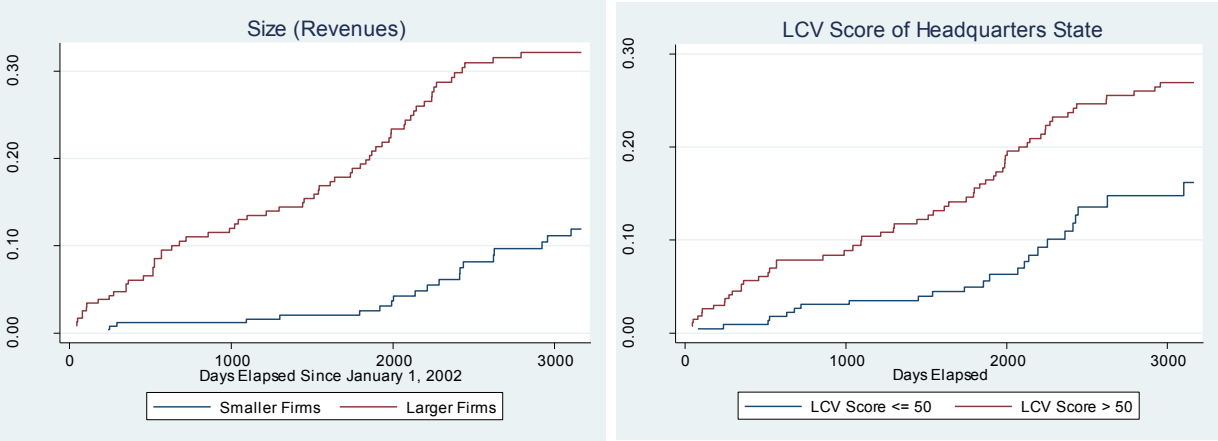
Note: p-values in parentheses; numbers in bold indicate a p-value of less than 0.2.

Firms in the sample were divided into groups for each independent variable. For example, the two groups of firms compared in terms of revenue include those whose revenue are above the median value for all firms in the panel, referred to as "large" and those whose revenue is below the median value, referred to as "small. The next variable indicates that the firms were divided into two groups based on whether than are in an environmentally friendly state – if their average LCV score is above 50 – or an environmentally unfriendly state – if their average LCV score is below 50. Since the other variables, such as whether a firm produces final good or its air

quality scores, are categorical with less than 5 levels, the tests of homogeneity were applied directly using such categories.

The tests of homogeneity suggest that results are broadly similar to the probit regressions. There seems to be a difference in the survival rates of firms according to size, whether they are in states with high LCV scores, whether they have a poor environmental compliance record or environmental strengths, whether they are large contractors, and whether they employ many workers in high-tech occupations. Air quality and whether the firm produces primarily final goods do not seem to impact the probability of joining the program.

By placing firms into binary groups for each variable, the differences in probability of joining the program at any given time can be represented graphically in terms of Nelson-Aalen cumulative hazard functions. These graphs are shown in figure 3.2. The start date (day 0) in each case refers to January 1, 2002.[138]



[138] This is slightly before the beginning of the program on February 13, 2002. However, this date was chosen because firms that join on the very first day of the program are dropped from the sample. The previous month was chosen because months were used as the time variable in specifications not reported here to check the robustness of results.

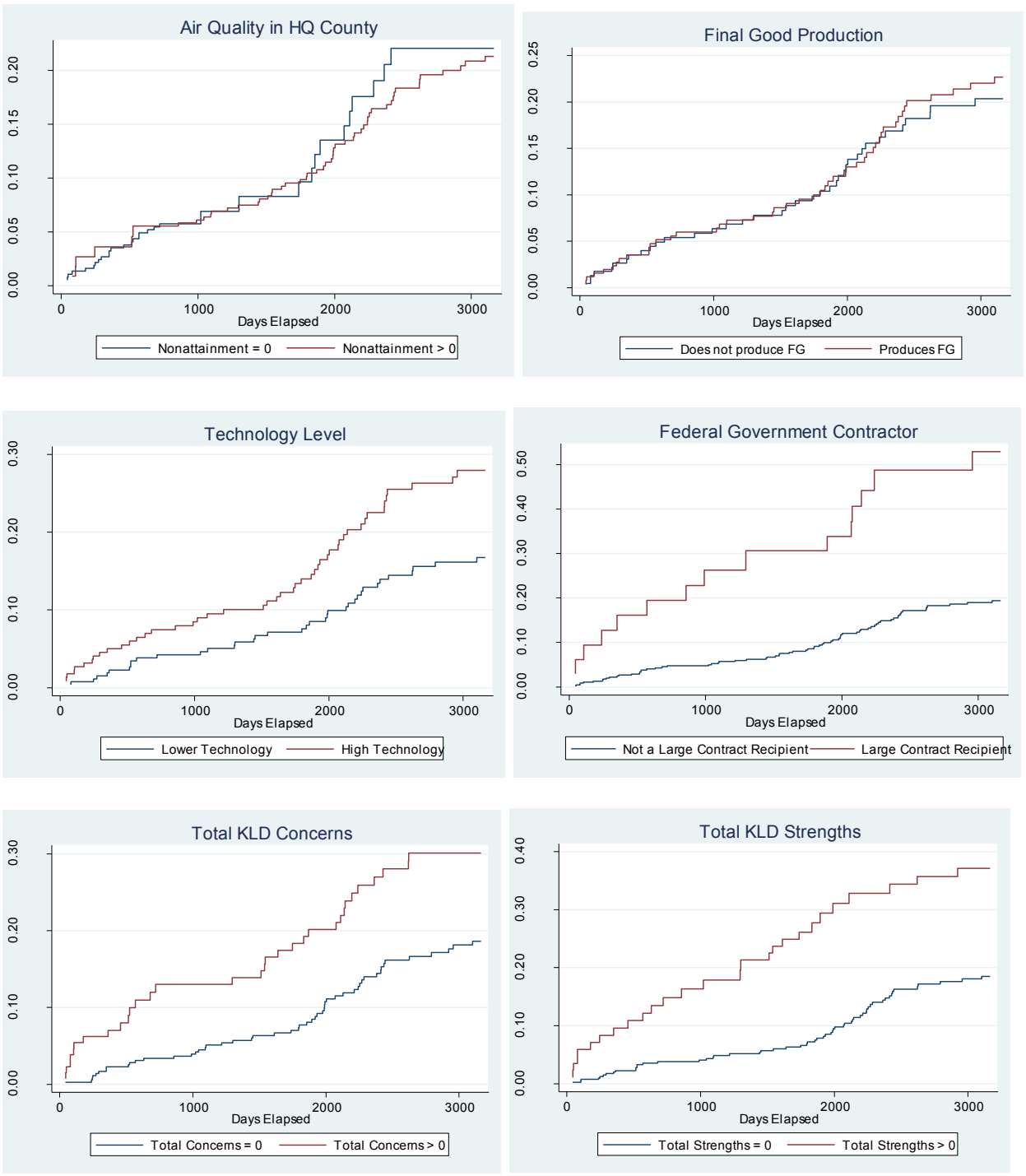


Figure 3.2: Nelson-Aalen Cumulative Hazard Functions by group

While these tests are suggestive of some differences between firms that join sooner and those that join later or do not join, they are too rudimentary to enable us to make definite

conclusions.[139] Table 3.9 presents the results of three Cox proportional hazard regression models. Recall that the dependent variable here is the time to event (joining Climate Leaders). The coefficients for each variable represent the hazard ratios. A ratio of one represents no change in the probability of joining at any given time when a one-unit change of the independent variable occurs. A ratio above one means that the firm with a one-unit change is more likely to join sooner, by $(1 - \beta_i \times 100)\%$. That is, if a coefficient is 1.05, then the firm is 5% more likely to join the program sooner if it is observed with a value one-unit higher than another identical firm. Conversely, if a coefficient is less than one, the chances of a firm joining the program sooner fall with a unit increase in that variable.

The first model presented uses all of the independent variables from the probit section and does not break out the KLD concerns and strengths into separate categories. This shows the overall significance of the KLD scores as two groups. The second model lists the different categories of KLD strengths and concerns. The third specification only uses the variables that were found to have significantly different survival functions among groups in the tests of homogeneity. The first model is found to be the best fit, with the lowest χ^2 statistic, but the third model provides more information while being consistent with the results from the first.

Overall, the results of the survival analysis are consistent with most results from the probit analysis. However, the two sets of coefficients are not directly comparable since the underlying assumptions and the structure of the specified models are different and therefore the coefficients have different interpretations. The marginal effects in the probit models measure the change in probability of a firm being an active member in Climate Leaders in any given year due

[139] That is, they are similar to a difference of mean test that may be performed among groups to supply some initial observations before a regression is run. Essentially, there are no controls for other factors in these tests, and therefore a regression that includes multiple variables is necessary.

to a unit change in the independent variable. The hazard ratios measure the change in probability of a firm joining the program sooner due to a unit change in the independent variable. The survival analysis also controls for endogeneity, which may be a concern for some variables in the probit models.

Table 3.9: Cox Regression Hazard Ratios

Variable	Model 1	Model 2	Model 3
Log Revenues	1.615 (0.148)***	1.691 (0.156)***	1.650 (0.151)***
LCV Score	1.019 (0.006)***	1.017 (0.006)***	1.015 (0.006)**
Air quality	0.806 (0.093)*	0.828 (0.094)*	--
High-tech employment	1.210 (0.087)***	1.275 (0.092)***	1.235 (0.091)***
Final good	1.211 (0.288)	1.300 (0.330)	--
Contracts (as % of revenues)	0.9999 (0.006)	1.0004 (0.007)	0.998 (0.008)
KLD Scores			
Hazardous Waste	--	1.333 (0.496)	0.956 (0.330)
Regulatory Problems	--	0.940 (0.356)	0.966 (0.353)
Ozone-Depleting Chemicals	--	1.301 (1.330)	--
Substantial Emissions	--	0.518 (0.212)	--
Agricultural Chemicals	--	0.964 (0.640)	0.634 (0.402)
Climate Change	--	0.795 (0.395)	0.644 (0.322)
Other Concerns	--	1.410 (0.635)	1.448 (0.636)
Total KLD Concerns	0.904 (0.089)	--	--
Beneficial Products	--	2.767 (1.076)***	2.618 (1.013)**
Pollution Prevention	--	3.797 (1.335)***	3.104 (1.102)***
Recycling	--	2.736 (1.384)**	2.099 (1.109)
Clean Energy	--	0.578 (0.260)	--
Other Strengths	--	0.483 (0.243)	--
Total KLD Strengths	1.565 (0.251)**	--	--
Log-pseudolikelihood	-479.89	-469.12	-474.75
χ^2	55.99	154.71	86.91
Total Observations	3535	3535	3535

Note: Robust standard errors clustered at the firm level are in parenthesis.
** p<0.1; ** p<0.05; *** p<0.01*

The variables that are significant (and have the same sign) in both models are log revenues, the LCV score, the air quality score, KLD strengths, and, specifically, Pollution Prevention and Recycling.[140] Interestingly, the Clean Energy strength is not significant, while it is strongly significant in the probit models. This suggests that endogeneity may be a concern regarding the use of this variable, though it does not appear to be a concern in the other two cases.[141] While the coefficients between the two sets of models are not directly comparable, it is encouraging that they are also roughly similar in sign and significance.

The two variables that are significant in the Cox regressions but not with the probit analysis are the high-tech employees score and the Beneficial Products KLD strength. This is likely caused by the fact that a slightly different set of observations are used in the survival analysis since the firms that join Climate Leaders drop out of the panel. Accordingly, these results should be seen as tentative and not robust.

From these two investigations of the characteristics of firms that join Climate Leaders, some observations can be made about the types of firms that tend to join VEPs such as Climate Leaders. They will tend to be larger (even among a group of large firms) and located in more environmentally friendly areas with cleaner air. They are also more likely to be firms that are already engaged in environmentally sustainable practices, employing pollution prevention technology and recycled materials in their production process. The fact that Climate Leaders member tend to have more KLD strengths is also consistent with Fisher-Vanden & Thorburn's

[140] All comparisons between the Cox regression model and probit models refer to the between-firm effects found in the probit.

[141] The fact that it is significant in the probit models but not the survival analysis suggests that the results in the probit models could be biased because membership in Climate Leaders could be used as evidence that the firm should be awarded the Clean Energy strength.

(2012) study of the characteristics of members, though they did not include individual strengths as separate variables in their analysis.

3.10 Conclusions

This study examines the characteristics of companies that join and remain active members of EPA's Climate Leaders program. Understanding which companies tend to join and play an active role in such voluntary programs can help policymakers better target future endeavors and encourage higher levels of participation. The fact that Climate Leaders appealed to firms in a variety of industries also allows an investigation that has so far largely been done in the context of programs catering to electric utilities or heavy manufacturing firms alone.

The probit analysis portion models the decision to be an active member of Climate Leaders, joining the program, setting a goal in a timely manner, and meeting that goal. It finds several factors predict which firms are more likely to take part in the program, such as size; environmental strengths such as pollution prevention and recycling; being located in an environmentally friendly state; and being located in an area with cleaner air. Additionally, the arrival of the Democratic Congress in 2007 seems to be associated with more firms joining the program. The survival analysis portion considers only the decision to join the program, bringing a new approach to the literature on VEP membership. These results are largely consistent with the probit analysis and lend strength to the findings discussed above.

These results suggest that the firms that take advantage of a program such as Climate Leaders will already have internal structures in place to manage their environmental impact through the use things such as clean energy or recycling programs. They will be headquartered in and draw staff from more environmentally friendly parts of the country and they will have a record of good environmental performance. Policy makers should understand that this is a

relatively limited group of firms and should consider who their voluntary programs are designed to attract. Additionally, they should consider the interaction with stakeholder groups like activists, consumers, or other regulators that the program could have in encouraging membership and reductions. Climate Leaders may have been successful at getting high-profile firms to be early adopters of GHG inventories and voluntary goals, but such programs undoubtedly have limits as they cannot hope to fully correct for the negative externality associated with greenhouse gas emissions. Climate Leaders was discontinued and no comprehensive federal program has taken its place. Instead, firms now largely disclose emissions and their voluntary goals through their own sustainability reports and participation in private programs.

How substantial the emissions reductions can be from such programs remains to be seen. This study does not address the question of the degree to which firms in the programs actually reduced emissions or met their reduction goals compared to competitors. Future work should do so, both for Climate Leaders and in the context of private sector replacements such as CDP and the Dow Sustainability Index.

However, this study makes progress on that front by helping to answer the question of why firms engage in these voluntary actions in the first place. Climate Leaders is a program that has been the subject of little investigation, though it reached a broader swath of firms than many other voluntary programs. The use of probit analysis, which is the standard methodology for studying the characteristics of VEP members, in addition to the use of survival analysis, which is novel, provides robustness to the results. These results can lead help policy makers and NGOs better design public and private voluntary programs with widespread participation and understand how much such voluntary actions can be relied on for greenhouse gas emission reductions.

APPENDIX A

MATHEMATICAL DERIVATIONS FROM CHAPTER 1

Consumers

Recall that the original demand function facing the firm contains positive parameters *A* and *B*:

$$q = A - Bp$$

If consumers have a preference for additional CSR as measured by the firm's use of clean capital in production, *y*, higher levels will boost demand for the firm's product by *D*:

$$q = A + Dy - Bp$$

Solving for *p* to produce the inverse demand curve, we have:

$$p = \alpha + \delta y - \beta p$$

Where $\alpha = \frac{A}{B}; \delta = \frac{D}{B}$; and $\beta = \frac{1}{B}$.

Profits are now:

$$\pi = (\alpha + \delta y - \beta q)q - TC$$

Choosing quantity to maximize profits, we have:

$$\frac{\partial \pi}{\partial q} = \alpha + \delta y - 2\beta q - c = 0$$

Solving for q, we have:

$$q^* = \frac{\alpha + \delta y - c}{2\beta}$$

Activists

Activist campaigns can reduce demand for a product by *m*, but this acts through consumer preferences for CSR:

$$q = A + (D - m)y - Bp$$

Therefore, we have:

$$p = \alpha + (\delta + \mu)y - \beta p$$

Where $\mu = \frac{m}{B}$.

Therefore, profits are now:

$$\pi = (\alpha + (\delta + \mu)y - \beta q)q - TC$$

Choosing quantity to maximize profits, we have:

$$\frac{\partial \pi}{\partial q} = \alpha + (\delta + \mu)y - 2\beta q - c = 0$$

Solving for q, we have:

$$q^* = \frac{\alpha + (\delta + \mu)y - c}{2\beta}$$

Workers

Once again, this is analogous to the above derivation, except that marginal cost is now influenced by the level of y directly because of its impact on worker productivity. Thus, profits are:

$$\pi = (\alpha + (\delta - \mu)y - \beta q)q - TC(r_s, r_c, w, K_s, K_c, L(\theta(y, \sigma)))$$

Maximizing profits, we have:

$$\frac{\partial \pi}{\partial q} = \alpha + (\delta - \mu)y - 2\beta q - c(y, \sigma) = 0$$

And optimal quantity is:

$$q^* = \frac{\alpha + (\delta - \mu)y - c(y, \sigma)}{2\beta}$$

APPENDIX B

INTERVIEW QUESTIONNAIRE

Asked to all participants:

Describe the role of your office or department in shaping the climate policy of your company.

Where else in the company have you worked? What is your previous experience outside the company?

Theme 1: The Role of Business in Society & its Legacy

Should business be effective agents, not just of meeting consumer needs and creating wealth and jobs, but also of addressing social problems? If so, how can they do this?

Do you believe that the planet's ecosystems will be radically changed in the next 100 years? What role does this play in your work now?

What are the roles of other stakeholders such as the government, the public and consumers in general in addressing social problems such as climate change?

Theme 2: Climate Change Policy Decisions by the Firm

What has made your firm pay attention to the issue of climate change?

Tell me about the process for assessing your company's options for climate change mitigation/adaptation strategies.

How do you present these options to other units within your company for approval? Which costs and benefits do they care about the most?

Possible follow-up question: *How do you view potential partners in civil society when assessing your options? What role do these stakeholders play?*

How does your firm evaluate these options and select a course of action? What sort of return is evaluated when your firm evaluates these options by calculating on return on investments? Are there tradeoffs?

What is the role of your company's sustainability strategy in your branding?

What is the role of your sustainability strategy in your firm's efforts to retain high-quality employees?

What is the role of your sustainability strategy in building relationships with regulators?

Tell me about the role of socially active investors in your company's sustainability strategies.

If not previously mentioned: *Do your company's sustainability efforts focus primarily on mitigating or adapting to the impacts of climate change?*

Theme 3: Politics and government policy

What sorts of public policies can enhance the positive impacts of your company's actions on social problems?

Would you like to see more voluntary programs?

Would you like to see a national carbon pricing scheme?

Tell me about the role that climate policy and environmental issues play in your political contributions and participation.

Tell me about the decision to join/not join the Climate Leaders program.

- If firm was not a member*: Does your firm make similar commitments to those made in the program?* (explain if necessary what this means)

Is your firm a member of any other voluntary environmental program at the federal level? If so, tell me about the process that led you to join the program?

APPENDIX C

SENSITIVITY TESTS FOR CHAPTER 3

The following tables show results from probit models run using a more restricted definition of program membership. In this case, only firms that set goals in Climate Leaders are considered members. Those firms that joined the program but never set goals are not included.

Table C.1: Restricted Membership Marginal Effects (Between Firm Effects)

Variable	Model 1	Model 2
Log Revenue	0.894 (0.227)***	0.989 (0.228)***
LCV House	0.049 (0.012)***	0.052 (0.012)***
Air Quality	-0.634 (0.240)***	-0.841 (0.254)***
Contract Percent	0.037 (0.022)**	0.035 (0.024)
Final Good	-0.177 (0.452)	-0.686 (0.483)
High Tech Employees	0.073 (0.130)	-0.018 (0.140)
KLD Scores		
Hazardous Waste	--	0.089 (0.752)
Regulatory Problems	--	-0.259 (0.728)
Ozone-Depleting Chemicals	--	9.386 (4.557)**
Substantial Emissions	--	-0.514 (0.810)
Agricultural Chemicals	--	-3.370)
Other Concerns	--	1.074 (1.067)
Total KLD Concerns	0.093 (0.242)	--
Beneficial Products	--	-0.063 (1.030)
Pollution Prevention	--	5.136 (0.900)***
Recycling	--	2.697 (0.980)***
Clean Energy	--	4.076 (0.946)***
Other Strengths	--	-0.162 (1.564)
Total KLD Strengths	2.473 (0.382)***	--
Democratic Congress	1.860 (0.244)***	1.853 (0.270)***
Total Observations	3889	3889
χ^2	201.82	220.68
Log Likelihood	-414.62	-396.370

*Note: * p<0.1; ** p<0.05; *** p<0.01*

Table C.2: Restricted Membership Marginal Effects (Within Firm Effects)

Variable	Model 1	Model 2
Log Revenue	0.666 (0.341)*	0.756 (0.363)**
LCV House	0.029 (0.012)**	0.027 (0.013)**
Air Quality	0.516 (0.158)***	0.524 (0.172)***
Contract Percent	0.017 (0.043)	0.016 (0.044)
KLD Scores		
Hazardous Waste	--	0.770 (0.575)
Regulatory Problems	--	0.711 (0.374)*
Ozone-Depleting Chemicals	--	-10.982 (5.197)**
Substantial Emissions	--	-0.998 (0.399)**
Agricultural Chemicals	--	-5.613 (5.525)
Other Concerns	--	0.123 (0.607)
Total KLD Concerns	0.024 (0.189)	--
Beneficial Products	--	0.459 (0.481)
Pollution Prevention	--	-0.783 (0.659)
Recycling	--	1.284 (0.695)*
Clean Energy	--	0.670 (0.346)*
Other Strengths	--	0.433 (0.402)
Total KLD Strengths	0.396 (0.177)**	--
Total Observations	3889	3889
χ^2	201.82	220.68
Log Likelihood	-414.619	-396.370

Note: Time invariant variables, such as the final goods or technology indicators are unchanged here from the above table. The Democratic Congress control variable is also the same. Tables 6 and 7 show results from the same regressions, but for ease of presentation, the between- and within-firm effects were split between the two tables.
** p<0.1; ** p<0.05; *** p<0.01*

The following tables show results from probit models run using time fixed effects instead of a single dummy variable to control for the time period when control of Congress switched to Democrats after the 2006 election.

Table C.3: Time Fixed Effects Marginal Effects (Between Firm Effects)

Variable	Model 1	Model 2
Log Revenue	0.724 (0.205)***	0.039 (0.011)***
LCV House	0.389 (0.010)***	0.039 (0.011)***
Air Quality	-0.488 (0.222)**	-0.592 (0.232)**
Contract Percent	0.021 (0.410)	0.013 (0.029)
Final Good	0.016 (0.410)	-0.253 (0.423)
High Tech Employees	0.155 (0.121)	0.121 (0.126)
KLD Scores		
Hazardous Waste	--	0.152 (0.696)
Regulatory Problems	--	-0.114 (0.708)
Ozone-Depleting Chemicals	--	4.388 (4.645)
Substantial Emissions	--	-0.800 (0.708)
Agricultural Chemicals	--	-3.089 (2.938)
Other Concerns	--	1.060 (1.018)
Total KLD Concerns	0.020 (0.231)	--
Beneficial Products	--	0.588 (0.946)
Pollution Prevention	--	4.283 (1.157)***
Recycling	--	2.154 (1.010)**
Clean Energy	--	2.770 (0.833)***
Other Strengths	--	0.784 (1.561)
Total KLD Strengths	2.278 (0.405)***	--
Total Observations	3889	3889
χ^2	199.93	185.87
Log Likelihood	-485.183	-474.641

*Note: * p<0.1; ** p<0.05; *** p<0.01*

Table C.4: Time Fixed Effects Marginal Effects (Within Firm Effects)

Variable	Model 1	Model 2
Log Revenue	0.090 (0.342)	0.132 (0.349)
LCV House	0.020 (0.010)*	0.020 (0.011)*
Air Quality	-0.058 (0.176)	-0.041 (.185)
Contract Percent	0.021 (0.028)	-0.005 (0.040)
KLD Scores		
Hazardous Waste	--	-.421 (0.451)
Regulatory Problems	--	0.373 (0.329)
Ozone-Depleting Chemicals	--	-1.146 (0.983)
Substantial Emissions	--	-1.053 (0.375)***
Agricultural Chemicals	--	-4.996 (5.233)
Other Concerns	--	0.519 (0.498)
Total KLD Concerns	0.020 (0.206)	--
Beneficial Products	--	0.304 (0.416)
Pollution Prevention	--	-0.731 (0.638)
Recycling	--	0.923 (0.637)
Clean Energy	--	0.021 (0.286)
Other Strengths	--	-0.010 (0.342)
Total KLD Strengths	2.278 (0.032)***	--
Total Observations	3889	3889
χ^2	199.93	185.87
Log Likelihood	-485.18	-474.64

Note: Time invariant variables, such as the final goods or technology indicators are unchanged here from the above table. The Democratic Congress control variable is also the same. Tables 6 and 7 show results from the same regressions, but for ease of presentation, the between- and within-firm effects were split between the two tables.
** p<0.1; ** p<0.05; *** p<0.01*

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