AN EMPIRICAL ASSESSMENT OF THE RELATIONSHIP BETWEEN CORPORATE SOCIAL RESPONSIBILITY AND WATER CONSERVATION

A Thesis
submitted to the Faculty of the
Graduate School of Arts and Sciences
of Georgetown University
in partial fulfillment of the requirements for the
degree of
Masters
In Public Policy

By

Nathaniel Thomas Millard, B.A.

Washington, D.C.
December 10, 2021

AN EMPIRICAL ASSESSMENT OF THE RELATIONSHIP BETWEEN CORPORATE SOCIAL RESPONSIBILITY AND WATER CONSERVATION

Nathaniel Thomas Millard, B.A.

Thesis Advisor: Zeynal Karaca, Ph.D.

ABSTRACT

The pursuit of both profits and altruistic outcomes is a growing private sector trend known as corporate social responsibility (CSR). Past literature has focused on the relationship between a firm's CSR practices and its financial performance. This thesis contributes to existing literature by empirically assessing whether a firm's CSR practices have any true association with one main altruistic outcome - water conservation. This thesis uses the data on environmental, social, and governance from Standard & Poors 500 companies between 2010 and 2019. We ultimately find a positive association between CSR practices and water withdrawal. We also find that a firm's size and business activity were significantly correlated with water withdrawal. These findings potentially indicate that CSR practices may not be effective at improving the real-world outcome of water conservation. Policymakers interested in improving corporate water conservation may wish to incentivize CSR only with strict performance guidelines or seek alternative mechanisms to reduce water withdrawal altogether.

ACKNOWLEDGMENTS

The research and writing of this thesis are
dedicated to my parents, fiancée, friends, and thesis advisor.

Many thanks,
Nathaniel

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1. INTRODUCTION

In recent years, the private sector has embraced a movement to consider not only profits, but altruistic outcomes as well. This movement, broadly defined as corporate social responsibility (CSR), stems from a belief that companies hold responsibilities to society. CSR strategies have been attractive to companies based on their proven instrumental value and moral imperatives. Despite the widespread adoption of these programs, there is limited empirical evidence to explain the effectiveness of CSR strategies on altruistic outcomes of interest.

In order to directly address this research gap, this thesis explores the relationship between a company's CSR strategy and its water conservation. Although CSR strategies may be related to many different outcomes, we focus narrowly on water conservation given its unique importance. For example, the average U.S. citizen uses an astonishing 82 gallons of water per day for indoor home uses (US Geological Survey, 2015). This daily estimate grows even larger when we factor the hidden uses of water into the equation, including farming food stuffs, generating electricity, and manufacturing consumer goods. In the near future, this pattern of extreme water consumption will be threatened by climate change and its spillover effects on the water cycle. The ubiquity and severity of the water conservation problem makes it an ideal variable for evaluation.

The findings of this thesis may have potential policy implications. If there is an association between CSR strategies and water conservation, then governments may consider developing policy instruments to capitalize on this potential pathway to improve water conservation. For example, governments may mandate reporting of extra-financial information, consider CSR criteria in public contracts, and implement other regulatory or

tax initiatives to promote CSR practices. Alternatively, if there is not an association between CSR strategies and conservation, then governments may prioritize other policy instruments to improve water conservation and companies will require alternative justifications for adopting CSR strategies.

2. BACKGROUND AND LITERATURE REVIEW

CSR has evolved to encompass a kaleidoscopic set of different theories and practices. In its broadest sense, CSR refers to the belief that companies hold responsibilities to society (Financial Times, 2016). However, for the purposes of this investigation, we will describe CSR as a management concept that manifests this belief. This definition is useful because it enables us to compare the relationship between real-world CSR practices and important social outcomes. In this section, we will explore this concept's history, research, practice, and motivation for further study.

2.1. History of Corporate Social Responsibility

The origins of CSR share a common ancestry with our modern economic system. As humanity lurched through multiple economic revolutions over time, critics have engaged in a perennial discussion about the proper role of commercial activity in society. More specifically, the development of modern CSR can be traced across three recent periods of this economic history: The Industrial Revolution, the mid-twentieth-century, and globalization (Blowfield and Murray, 2020). The zeitgeist in each of these periods would leave its imprint on the concept of CSR.

In the nineteenth and early twentieth century, the Industrial Revolution significantly altered the business-society relationship. On one hand, a select group of

entrepreneurs, colloquially known as "robber barons," benefitted enormously from the twin forces of urbanization and manufacturing innovation (Gershon, 2016). On the other hand, many citizens experienced greater amounts of inequality, overcrowding, and exploitation. Two groups of pioneers penned the early themes of CSR against this historical backdrop. First, certain industrial titans promoted pro-social beliefs about their business practices - often based on religious ethics or principles of Victorian philanthropy. For example, Andrew Carnegie, the Scottish-American industrialist, famously argued that "surplus wealth is a sacred trust which its possessor is bound to administer in his lifetime for the good of the community" in his 1889 essay titled "Gospel of Wealth" (Carnegie, 1889). Second, "muckraking" journalists highlighted corporate practices that had negative implications on communities, which often helped to spur later reforms (Jensen, 2011). During this period, CSR focused primarily on the behavior of industry leaders and deploying their accrued wealth to support society.

In the mid-twentieth century, US legal changes refashioned the business-society relationship yet again. The legal definition of the firm changed, which prompted companies to merge and grow into much larger, impersonal organizations (Quinn, 1962). Many of these large corporations were later saddled with public blame due to claims of corporate greed causing the Great Depression and war profiteering during World War II. In response, President Franklin Delano Roosevelt launched the "New Deal" in the 1930s, part of which attempted to limit the power of corporations (Blowfield and Murray, 2020). This philosophy also undergirded much of the consumer rights movement and regulatory initiatives (e.g. National Traffic and Motor Safety Act of 1966, Clean Air Act of 1970, et

cetera) during the late 1950s and 1960s (Cochran, 2007). These events shifted the focus of CSR policies to the company-level vice the individual business leader-level.

Of note, the mid-twentieth century also hosted two notable writers about the business-society relationship. Both writers offered opposing perspectives about the nature of a company's social responsibilities. The first author, Howard Bowen, initiated this discussion in his book, titled "Social Responsibilities of the Businessman," in 1953. Bowen argued that businesses have social obligations due to the influence and consequences of their actions (Bowen, 1953). Many later authors would build on Bowen's thesis by exploring the extent to which companies held these responsibilities. For example, Archie Carroll proposed a practical model to identify economic, legal, ethical, and philanthropic responsibilities (Carroll, 1979). The second author, Milton Friedman, famously argued that the sole responsibility of a corporation is to earn profit for its shareholders in a New York Times Magazine article, titled "The Social Responsibility of Business is to Increase its Profits," in 1970. According to Friedman, CSR was a "subversive doctrine" destined to be exploited by moralistic executives and threaten the free enterprise society (Friedman, 1970). These two seminal works are vital touchstones in the ongoing debate about CSR.

In the late twentieth and early twenty-first century, globalization changed the business-society relationship to its present form. Globalization, referring to the exponential growth of worldwide flows of data, capital, goods, and services, is generally associated with the relative weakening of national governments and greater attention to the behavior of multinational corporations (Albrow, 1990). This paradigm shift explains the greater attention given to companies' responsibilities to society over the past few

decades. Although CSR in the past two periods explored the subjective responsibilities of businesses to society, recent scholars have researched the objective aspects of CSR management. We will explore these contemporary research findings and practice of CSR in the following section.

2.2. Research and Practice of Corporate Social Responsibility

Contemporary literature has concentrated on the relationship between corporate social responsibility and a firm's financial performance. Although the results from this patchwork of research studies are difficult to compare due to different methodological approaches, variable selection, and measurement issues, there appears to be a positive correlation between CSR practices and a firm's key performance indicators (Cowe, 2002). Some researchers have identified better causal effects by focusing, more specifically, on the relationship between CSR and less tangible qualities of a firm's performance like its brand reputation (Nan and Heo, 2007), ability to attract new employees, and workforce motivation (Hedblom, Hickman, and List; 2019). These positive findings may compel more corporations to engage in CSR initiatives, but they provide no commentary on whether these initiatives actually benefit society. Therefore, the effectiveness of CSR initiatives on improving outcomes for society is a research agenda of great importance and ample room for improvement.

There are few challenges in evaluation of the effectiveness of CSR initiatives on improving outcomes for society. The first challenge is the heterogenous implementation of CSR strategies across companies of different nationalities, industries, and sizes. This heterogeneity can be expressed in multiple ways. A company may have different purposes for implementing a CSR strategy like employing a defensive approach (e.g.

pursuing risk reduction, protecting a company's reputation) versus an offensive strategy (e.g. using a company to solve social problems based on its instrumental or intrinsic value) (Kramer and Kania, 2006). A company may also structure its CSR strategy in different ways (e.g. outsourced to another organization, managed internally by a committee, managed internally by a dual-hatted human resources department, managed by embedded personnel throughout a company's core departments) (Blowfield and Murray, 2020). This heterogeneity creates difficulties in measuring the true essence of CSR.

The second challenge is the veracity of a company's CSR reporting. Traditionally, companies provide regular reporting on financial performance to governmental entities and shareholders, consistent with generally accepted accounting principles. However, the United Nations Global Compact report advocated for the incorporation of extra-financial information in capital markets in 2005 (UN, 2005). Since then, companies started to release this extra-financial information (i.e. environmental, social, and corporate governance [ESG] data), and ratings agencies began compiling this data for investors' use. This data has been adopted en masse by asset managers, as evidenced by the fact that the Principles for Responsible Investment (PRI) network has grown to approximately 3,000 signatories with US$103 trillion assets under management in 2020 (PRI, 2020). Despite its growing appeal, ESG data has some notable biases.

These biases can be divided into four categories. First, a company reports ESG data on a voluntary basis. By extension, estimates based on ESG data are likely to overestimate true effects because they are often reported by larger companies with the resources to provide extra-financial information, companies seeking positive publicity for

providing extra-financial information, and companies selectively providing extra-financial information on certain areas and omitting other areas. Second, a company is not legally bound by its reported ESG data and its reported data is rarely verified by external parties. Third, the absence of generally accepted accounting principles for ESG data limits the ability to compare companies. Fourth, ratings agencies employ different methodologies in compiling ESG data, which further deteriorates our ability to compare companies.

2.3. Importance of Water Conservation

Water conservation is an ideal outcome to measure a company's social impact for two reasons. First, as a common pool resource, water's importance is diffused across many stakeholders. Second, water conservation is at the center of many other social outcomes like health, peace, equity, and meaning. For example, water scarcity may threaten health outcomes for nearby populations, place stress on social institutions leading to civil conflict, result in inequitable resource distributions, and be less accessible for recreational and transcendent experiences. Both of these imperatives are particularly acute amidst the looming global water crisis.

Past research may provide useful insights into the relationship between CSR strategies and water conservation. Case studies have been the dominant research method to evaluate this relationship. For example, Patagonia's "Our Common Waters" campaign supported the removal of multiple damns and halted other ill-conceived water projects between 2011 and 2013 (Patagonia, 2013). In addition, Unilever's Sustainable Living Program led to a significant reduction in its water usage - primarily by deploying a laundry detergent product that required less water in developing countries (Gelles, 2015).

While these case studies offer internally valid examples of the relationship between CSR strategy and water conservation, further investigation is required to determine whether this is a common trend.

3. CONCEPTUAL FRAMEWORK AND HYPOTHESES

We developed a broad conceptual framework to explore the relationship between CSR and water conservation. These concepts exist within a multidimensional and multifactor framework. A simplified version of this framework is illustrated in Figure 1. The three main dimensions to consider are the company, the government, and the environment. Each dimension contains notable characteristics and has relationships with the other dimensions. We will describe each of the three dimensions and relationships in greater detail below.

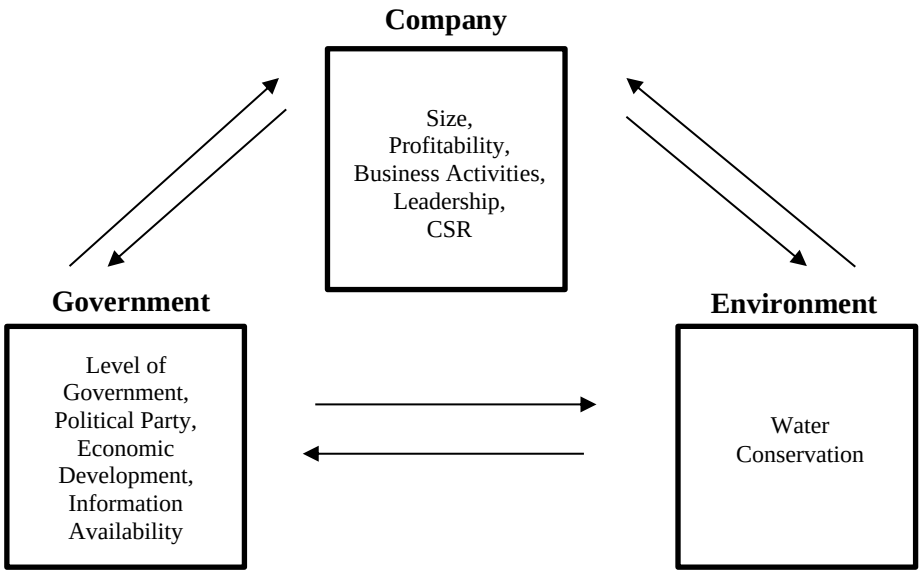

Figure 1: A Conceptual Multi-Dimensional Framework on Water Conservation

First, we will begin with companies. The behavior of companies is generally determined by characteristics like its size, profitability, type of business activities, leadership, and CSR. A company has a multi-directional relationship with the environmental. In one direction, a company has a theoretical relationship with its environment through its CSR activities. In the other direction, environmental outcomes may also affect companies for two reasons. The first reason is that the rivalrous and non-excludable nature of common pool resources entices actors to overuse them. The second reason is that the pro-social behavior of companies in some areas may produce a "moral licensing" effect amongst its employees to engage in anti-social behavior in other areas.

Second, we will consider the environment. Although there are many potential environmental characteristics, we will narrowly focus on water conservation in this investigation. The environment has a multi-directional relationship with government. In one direction, government is the traditional actor that is responsible for environmental stewardship given its diffused benefits. In the other direction, environmental conditions may spur governments to act – especially if bolstered by environmental interest groups.

Last, we will reflect on government. The actions of governments are generally determined by their level (i.e. international, national, state, local), the incumbent political party, economic development, and the availability of information. Government has a multi-directional relationship with companies. In one direction, government can impose regulations or taxes on companies to modify their behavior. In the other direction, companies can lobby governments to shape the regulatory environment to fit their interests.

Based on this conceptual framework, we intend to analyze the relations among key aforementioned factors and water consumption. We will estimate a flexible functional model where we view the consumption of water as a function of several key measures, such as CSR, firm size and profitability. More specifically, our analytic model would be as follows:

Water Conservation = f(CSR, Size, Profitability, Business Activities)

where, the control variables include a company's size, profitability, and business activities. First, larger companies are more likely to have the resources to employ a CSR strategy and are also more likely to consume greater amounts of water. Second, profitable companies are more likely to have discretionary funds to spend on the development of a CSR strategy and the efficiency of its water infrastructure. Third, certain types of business activities will likely have different market sensitivities or pressures that affect both CSR strategy and water conservation.

Of note, we will also attempt to control for government characteristics and a company's leadership. These characteristics are difficult to include in our model due to the limited availability of data at our unit of analysis. However, in order to partially mitigate this bias, we will restrict our sample to publicly traded companies in the United States and use certain modeling techniques to limit the bias of a company's fixed characteristics.

Prior to performing our analysis, we posit the following null and alternative hypotheses about the relationship between our key independent variable (i.e. CSR strategy) and our dependent variable (i.e. water conservation). Our null hypothesis states that there is no association between a company's CSR strategy and its water

conservation, holding all other variables in the model equal. Our alternative hypothesis states that there is an association between a company's CSR strategy and its water conservation, holding all other variables in the model equal. We anticipate that there will be a negative association between CSR strategies and water conservation based on a priori reasoning about the purpose of these corporate practices and the aforementioned findings of multiple case studies.

4. DATA AND METHODS

4.1. Data

This thesis uses data from the ASSET4 ESG database (ASSET4) from the Thomson Reuters Datastream (https://www.thomsonone.com/). The ASSET4 database contains annual company-level data on over 10,000 publicly-traded companies across 76 countries – reported from fiscal year 2002 to present-day. Thomson Reuters research analysts manually collect more than 450 data points per company. This data spans four main categories: economic performance, environmental performance, social performance, and corporate governance performance. Research analysts are permitted to contact the company's investor relations offices to learn where the data is located, but otherwise the data must publicly available and objective (i.e. derived from stock exchange filings, CSRs, annual reports, non-governmental websites, and news sources).

This thesis will also use two samples of the constituent companies of the Standard and Poors (S&P) 500 Index from the ASSET4 database. In both samples, the unit of observation is the company-year. The S&P 500 is an index that tracks 500 publicly-traded companies that meet certain criteria. For example, a company must be based in the

United States, have market capitalization above $8.2 billion USD, offer the majority of its stock to the public, maintain a stock price of at least $1, and have at least four consecutive quarters of positive earnings (S&P Global, 2021). This sample is useful because the performance of the S&P 500 index is a leading US economic indicator because it represents 80% of the total US stock market capitalization at any given time, and its industry composition is generally reflective of the US economy (S&P Global, 2020).

The first sample will include data on the constituent companies of the S&P 500 index between 2010 and 2019. A significant portion of these companies did not report relevant extra-financial information during this period. This thesis will provide descriptive statistics and regression statistics for the companies that did report their extra-financial information during this period.

The second sample will include data on the constituent companies of the S&P 500 index that reported their total water withdrawal for all ten years of the sample (i.e. 2010 through 2019). This alteration assumes that the companies that did report their extra-financial information are representative of their industry. This thesis will perform a sensitivity analysis using this second sample of altered data

4.2.Variable Specification

This thesis also draws six variables for each observation in the sample. These variables correspond to the concepts in the conceptual framework described in the previous section. Table 1 provides an overview of these concepts, their purpose, the chosen variable, and the variable's measurement. We will describe each of these variables' specifications in greater detail below.

Table 1. Variable Definitions

Concept	Variable Type	Variable Definition	Variable Measurement
Water Conservation	Dependent Variable	Total Water Withdrawal	A numeric variable that measures a company's total reported water withdrawal in gallons
Voluntary Activities	Independent Variable	CSR Strategy Score	A numeric variable that measures a company's practices to integrate environmental, social, and governmental dimensions into its decision-making.
Business Activities	Control Variable	Industry	Ten binary variables that classifies a company into a single industry based on the Financial Times Stock Exchange (FTSE) Global Classification System
Size	Control Variable	Total Assets	A numeric variable that measures the sum of a company's current and long-term items of economic-value
		Number of Employees	A numeric variable that measures the total number of people reportedly employed by a company
Profitability	Control Variable	Net Profit Margin	A numeric variable that measures a company's revenue minus its costs, operating expenses, interests, and taxes, then divided by its revenue

We use the total gallons of water that a company reportedly withdrawals from the environment to measure a company's water conservation. Of note, these values do not account for the water quantity that a company recycles on an annual basis. This measure is a continuous, ratio variable.

We use a company's CSR strategy score to measure that company's voluntary activities. This score is a percentile ranking of each company across all governance indicators (i.e. support for UN Sustainable Development Goals, presence of a CSR committee, presence of a CSR external audit, presence of CSR reporting, presence of stakeholder engagement, signatory status in extra-financial reporting guidelines, and existence of an integrated strategy for management decision-making and analysis). The percentile rank scoring methodology is based on three factors: the number of companies with a worse value, the number of companies with the same value, and the number of companies with a value at all. This measure is a numerical variable ranging from 0 to

100, where higher values indicate relatively better practices to integrate ESG dimensions into decision-making (Thomson Reuters, 2021).

We employ four control variables. First, we use a company's industry as a measure of a company's business activities. A company's industry is categorized into one of ten categories from the Financial Times Stock Exchange (FTSE) Global Classification System based on the activity type that generates the most revenue for that company. This measure is a binary variable for each industry classification.

Second, we use a company's total assets to measure a company's size. This variable is calculated by summing the current and long-term items of economic value (e.g. cash, account receivables, inventory, fixed assets, and intangibles) held by a company, as reported on its balance sheet. This measure is a continuous, ratio variable.

Third, we also use a company's number of employees to measure a company's size. This variable is the total number of people reportedly employed by a company – excluding part-time employees and contractors. This measure is a discrete variable.

Finally, we use a company's net profit margin to measure a company's profitability. This variable is equivalent to a company's revenue minus costs, operating expenses, interests, and taxes, then divided by revenue. This measure is a continuous, ratio variable.

4.3 Analytical Methods

We use an empirical strategy with three main components. First, we review descriptive results for the firm's voluntary activities, water conservation, size, business activity, and profitability across multiple years. Second, we estimate the relationship

between a firm's total water withdrawal and its voluntary activities using the following general linear model:

$$Y_{it} = \alpha_{it} + \beta X_{it} + \varepsilon_{it}$$

where Y_{it} is total water withdrawal for a company (i) in a given year (t); X represents a vector for a set of independent variables (i.e. CSR, firm size, business activity, and profitability, industry, year); and ε represents the residual error. Third, we performed a set of panel regressions with the above model specifications using an unbalanced and balanced dataset. These models employed fixed effects and random effects separately. We used the Hausman specification test to determine whether fixed effects or random effects are most appropriate in each case.

5. RESULTS

5.1 Descriptive Results

The overall dataset contains approximately 2,000 observations, each of which represents a company-year. Table 2 outlines the number of companies that reported their total water withdrawal by year and by industry. Table 3 to Table 8 summarize the performance of these observations across all relevant variables. When applicable, we also describe the variables' center, spread, and density. Table 9 describes the relationships between relevant variables.

5.1.1 Dependent Variable – Total Water Withdrawal

Table 3 outlines the total water withdrawal in our sample by year and by industry. In regard to the variable's center, the mean total water withdrawal in our sample is 588.7 million gallons with a standard deviation of 2.925 billion gallons, and the median total

water withdrawal is 5.289 million gallons. In regard to the variable's spread, the range of total water withdrawal in our sample is from 175.44 gallons to 3.920 billion gallons. In regard to the variable's density, the distribution of total water withdrawal in our sample is unimodal with right skew. Of note, only 58.64% of the companies in our sample reported their total water withdrawal.

Table 2. Number of Companies Reporting Total Water Withdrawal Across Years

Industry	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Resources	4(19)	4(19)	7(19)	8(21)	11(21)	12(21)	14(21)	16(21)	16(21)	17(21)
Basic Industries	14(23)	15(23)	15(23)	13(22)	14(22)	14(22)	15(22)	15(22)	14(22)	17(22)
General Industries	20(85)	20(85)	24(85)	23(83)	26(83)	29(83)	32(83)	37(83)	41(83)	42(83)
Cyclical Consumer Goods	22(57)	26(57)	26(57)	27(57)	30(57)	30(57)	35(57)	37(57)	37(57)	39(57)
Non-Cyclical Consumer Goods	14(55)	14(55)	19(55)	19(56)	21(56)	24(56)	25(56)	27(56)	28(56)	30(56)
Cyclical Services	10(68)	10(68)	12(68)	17(68)	28(68)	21(68)	23(68)	24(68)	26(68)	27(68)
Non-Cyclical Services	1(4)	1(4)	2(4)	2(6)	2(6)	2(6)	3(6)	3(6)	4(6)	5(6)
Utilities	18(31)	18(31)	20(31)	22(29)	21(29)	23(29)	25(29)	26(29)	25(29)	27(29)
Financials	10(92)	10(92)	19(92)	25(95)	28(95)	28(95)	33(95)	36(95)	40(95)	42(95)
Information Technology	17(66)	17(66)	19(66)	22(63)	27(63)	30(63)	30(63)	34(63)	34(63)	36(63)
Total	130	149	163	178	198	213	235	255	265	282

Note: *The numerical values in parentheses are the total number of companies by sector in the sample.*
Source: *Thomson Reuters ASSET4 ESG Data (https://www.thomsonone.com/)*

17

Table 3. Mean Water Withdrawal of Companies Across Years

Industry	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Resources	40.6	144.3	124.6	95.7	96.4	141.1	117.0	103.4	111.2	108.0
Basic Industries	194.6	144.2	172.5	189.4	252.9	258.1	247.6	240.1	295.4	452.4
General Industries	8.6	6.8	6.9	7.5	6.7	5.9	14.0	12.7	11.9	11.0
Cyclical Consumer Goods	42.1	37.1	34.9	36.0	32.7	50.7	28.0	28.3	29.1	28.0
Non-Cyclical Consumer Goods	14.4	9.5	6.7	7.8	22.9	5.9	6.7	5.8	6.0	6.1
Cyclical Services	24.7	13.9	13.5	11.9	11.5	28.5	27.9	17.2	16.7	16.8
Non-Cyclical Services	12.9	12.9	7.4	7.0	6.8	6.9	4.2	3.4	5.0	4.1
Utilities	701.9	540.5	527.8	526.5	666.2	520.6	472.5	432.7	412.5	359.5
Financials	3.3	2.7	3.2	11.9	43.9	3.3	3.1	3.1	3.4	3.2
Information Technology	5.0	5.3	5.2	5.0	5.2	5.0	5.0	5.8	6.0	6.2
Total	1007.0	756.3	678.2	679.6	746.2	599.7	536.1	471.2	421.0	387.1

Note: *The numerical values are in millions.*
Source: *Thomson Reuters ASSET4 ESG Data* (https://www.thomsonone.com/)

5.1.2 Independent Variable – Presence of CSR Committee

Table 4 outlines the mean CSR strategy scores in our sample by year and industry. In regard to the variable's center, the mean CSR strategy score is 69.79 and the median CSR strategy score is 75. In regard to the variable's range, the CSR strategy scores range from 0 to 99.59. In regard to the variable's density, the CSR strategy score is unimodal with a slight leftward skew. Of note, 1.3% of these values for companies in our dataset were missing.

Table 4. Mean Corporate Social Responsibility Strategy Scores Across Years

Industry	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Resources	78.7	79.3	79.3	69.0	65.0	67.9	68.9	70.4	74.0	77.9
Basic Industries	74.0	78.2	77.1	80.6	80.0	78.0	79	76.4	73.3	80.2
General Industries	62.2	67.1	67.1	70.4	67.3	66.2	62.0	61.3	62.4	68.5
Cyclical Consumer Goods	71.7	72.3	72.3	72.8	70.8	73.5	69.5	76.1	77.1	81.6
Non-Cyclical Consumer Goods	75.3	65.3	65.3	65.6	66.1	66.6	66.1	70.2	76.5	73.9
Cyclical Services	61.9	60.3	60.3	67.2	67.5	56.6	59.4	64.9	70.8	77.7
Non-Cyclical Services	59.7	63.7	63.7	63.0	62.5	62.4	41.4	28.1	42.3	75.5
Utilities	68.1	73.5	73.5	73.6	76.1	69.7	68.4	73.5	77.8	77.5
Financials	62.6	57.4	57.4	56.3	62.0	67.5	67.5	74.6	74.3	78.7
Information Technology	65.0	71.6	71.6	70.2	65.0	63.7	64.8	66.2	68.3	69.2
Total	68.6	69.6	68.8	68.9	68.3	67.4	66.2	69.6	71.7	75.7

Source: *Thomson Reuters ASSET4 ESG Data* (https://www.thomsonone.com/)

5.1.3 Control Variable – Industry

Table 5 outlines the industry classifications, examples of sectors within each industry classification, and the total number of companies within each industry. In our sample, the most common industry is "Cyclical Consumer Goods" and the least common is "Non-Cyclical Services."

Table 5. Industry Classifications

Name	Examples	Number of Total Companies
Resources	Mining, Oil, Gas	111
Basic Industries	Chemicals, Construction, Building Materials, Paper, Steel, Other Metals	146
General Industries	Aerospace, Defense, Industrial Electronics, Engineering, Machinery	298
Cyclical Consumer Goods	Automobiles, Household Goods, Textiles	309
Non-Cyclical Consumer Goods	Beverages, Food Producers, Health, Household Products, Pharmaceuticals, Biotechnology,	224
Cyclical Services	General Retailers, Leisure, Media, Entertainment, Support Services, Transport	188
Non-Cyclical Services	Food Retailers, Drug Retailers, Telecommunication Services	25
Utilities	Electricity, Gas, Water	227
Financials	Banks, Insurances, Investment, Real Estate	274
Information Technology	IT Hardware, IT Software	266

5.1.4 Control Variable – Total Assets

Table 6 outlines the total assets in our sample by year and by industry. In regard to the variable's center, the mean total assets in our sample is $61 million USD with a standard deviation of $207 million USD, and the median total assets is $1.53 million USD. In regard to the variable's spread, the range of total assets in our sample is from $341,369 USD to $2.69 billion USD. In regard to the variable's density, the distribution of total assets in our sample is unimodal with right skew. Of note, 1.3% of these values for companies in our dataset were missing.

Table 6. Mean Total Assets of Companies Across Years

Industry	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Resources	63.9	133.5	124.3	120.3	98.6	86.7	75.7	70.1	70.1	74.4
Basic Industries	15.0	15.5	16.4	19.0	18.7	17.9	15.8	16.4	23.3	28.2
General Industries	59.4	51.9	54.7	56.0	50.4	41.1	33.0	31.3	30.4	32.5
Cyclical Consumer Goods	28.1	32.0	30.9	33.0	32.4	30.0	33.2	34.3	35.7	37.8
Non-Cyclical Consumer Goods	49.6	43.6	44.8	44.6	42.0	47.2	49.3	50.3	50.9	49.4
Cyclical Services	23.7	21.5	21.8	30.0	31.2	26.5	29.6	29.3	36.6	41.9
Non-Cyclical Services	268.5	270.3	163.2	164.8	171.5	225.1	172.2	174.0	219.1	195.7
Utilities	32.1	36.0	42.1	42.0	44.6	45.2	48.0	48.5	52.2	54.7
Financials	746.3	665.9	642.3	495.6	468.0	464.1	412.2	368.6	343.1	343.8
Information Technology	32.0	42.3	44.1	42.6	42.7	45.7	46.8	48.5	48.7	56.7
Total	92.8	96.9	113.8	108.6	104.1	98.2	94.3	88.5	90.4	92.7

Note: *The numerical values are in millions.*
Source: *Thomson Reuters ASSET4 ESG Data* (https://www.thomsonone.com/)

5.1.5 Control Variable – Number of Employees

Table 7 outlines the number of employees in our sample by year and by industry. In regard to the variable's center, the mean number of employees in our sample is 48,739 employees with a standard deviation of 122,332 employees, and the median is 16,500 employees. In regard to the variable's spread, the range of employees in our sample is from 52 employees to 2.3 million employees. In regard to the variable's density, the distribution of total assets in our sample is unimodal with right skew. Of note, 3.72% of these values for companies in our dataset were missing.

Table 7. Mean Number of Employees in Companies Across Years

Industry	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Resources	20.3	41.1	51.0	45.9	43.8	42.2	31.7	25.8	25.5	27.3
Basic Industries	24.6	21.1	22.3	23.6	23.2	23.3	22.4	20.5	21.3	30.0
General Industries	96.2	82.7	84.5	90.6	85.0	89.0	78.9	75.5	71.9	73.9
Cyclical Consumer Goods	53.0	58.1	55.8	58.1	61.1	59.2	60.7	58.5	55.4	56.5
Non-Cyclical Consumer Goods	68.7	57.9	51.0	42.0	39.9	45.9	45.9	45.3	45.4	48.0
Cyclical Services	107.0	77.6	79.3	125.4	121.4	93.6	107.1	98.2	128.1	125.7
Non-Cyclical Services	282.7	265.4	152.6	144.5	145.2	144.3	124.8	106.4	114.9	94.2
Utilities	12.3	12.5	13.0	13.4	13.5	13.5	13.2	13.3	13.4	12.7
Financials	96.8	80.2	78.8	59.1	53.3	52.6	44.8	39.6	36.7	34.7
Information Technology	70.9	81.4	79.0	71.1	65.6	60.7	67.2	50.2	50.1	51.4
Total	63.3	58.8	59.3	61.1	59.1	57.0	56.3	51.2	53.9	54.1

Note: *The numerical values are in thousands.*
Source: *Thomson Reuters ASSET4 ESG Data* (https://www.thomsonone.com/)

5.1.6 Control Variable – Net Profit Margin

Table 8 outlines the net profit margins in our sample by year and by industry. In regard to the variable's center, the mean net profit margin is 10.87 percentage points with a standard deviation of 17.42 percentage points, and the median is 10.05 percentage points. In regard to the variable's spread, the range of net profit margin in our sample is from -526.35 percentage points to 180.39 percentage points. In regard to its density, the distribution of net profit margins in our sample is approximately normally distributed. Of note, 1% of these values for companies in our dataset were missing.

Table 8. Mean Net Profit Margins of Companies Across Years

Industry	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Resources	10.9	11.1	10.5	11.7	4.8	-49.1	-21.3	-4.4	11.9	-1.3
Basic Industries	11.9	9.7	9.5	6.2	7.6	3.3	3.9	9.9	11.2	7.9
General Industries	8.1	9.2	9.4	9.8	10.6	9.6	10.0	12.8	10.4	11.4
Cyclical Consumer Goods	11.2	10.7	9.4	9.8	10.1	10.3	12.7	11.0	11.3	9.8
Non-Cyclical Consumer Goods	15.4	14.7	11.5	16.6	15.1	13.1	13.2	9.8	14.9	19.3
Cyclical Services	2.0	8.5	4.9	8.4	7.2	8.8	11.2	11.2	10.3	9.0
Non-Cyclical Services	16.0	3.1	5.0	6.4	4.5	7.0	5.1	11.8	8.1	10.4
Utilities	9.2	9.6	8.5	8.8	9.7	8.1	7.5	8.8	11.8	14.1
Financials	9.7	12.4	13.6	16.3	19.3	18.8	21.3	19.7	23.2	24.7
Information Technology	14.5	16.3	13.8	13.3	14.6	14.2	16.2	15.1	16.2	16.7
Total	10.6	11.3	10.2	11.4	11.8	8.0	10.7	11.7	13.9	13.7

Source: *Thomson Reuters ASSET4 ESG Data* (https://www.thomsonone.com/)

5.1.7 Correlations for Numeric Variables

Correlation analysis provides a simple method to assess the direction and magnitude of our aforementioned numeric variables. Table 9 outlines the correlations for each of our numeric variables. As demonstrated in Table 9, our variables possess a mix of positive and negative correlations. The highest correlation is between the total assets variable and the number of employees variable.

Table 9. Correlations of Numeric Variables

	Total Water Withdrawal	Number of Employees	Net Profit Margins	Total Assets	CSR Strategy Score
CSR Strategy Score	0.10	0.14	0.02	0.08	1.0
Total Assets	-0.02	0.39	0.05	1.0	
Net Profit Margins	-0.04	-0.05	1.0		
Number of Employees	-0.09	1.0			
Total Water Withdrawal	1.0				

5.2 Regression Results

This section presents the results for the two sets of models that estimate the relationship between CSR and water conservation. Tables 10 and 11 display the regression results for each of these models. The Appendix provides the additional regression results that we conducted to assess the robustness of our results.

Table 10 displays the regression results for the general linear models. Model (1) assesses the relationship between the dependent variable and the independent variables. Model (2) builds on these specifications by adding a trend variable. Model (3) builds on these specifications by controlling for industry types (adding dummy variables for each industry – excluding Non-Cyclical Services to avoid perfect collinearity). Model (3) has the greatest fit of the data, as measured by r-squared.

Table 11 displays the results for the fixed and random effect panel data regression models for the unbalanced panel data. Model (4) and (5) estimate the relationship between the dependent variable and the independent variables. Models (6) and (7) build

on these specifications by adding a trend variable. Models (8) and (9) build on these specifications by adding dummy variables for each industry. In each of these pairs of models, the former displays the fixed effect results and the latter displays the random effect results. The Hausman specification test favored Models (4), (6), and (9). Of note, Model (9) excludes Utilities to avoid perfect collinearity and Model (8) excludes many similar industry types to avoid perfect collinearity. Model (9) has the greatest fit of the data, as measured by r-squared.

These models present three main findings. First, CSR was generally statistically significant and positively associated with total water withdrawal. For example, a one-unit increase in a firm's CSR strategy score is associated with an increase between 0.4% and 2% in a firm's total water withdrawal, holding firm size, profitability, year, and business activities constant. In comparison to the results of our sensitivity analysis in the Appendix, we find that the direction of the relationship between CSR and total water withdrawal remained positive, but the significance and magnitude of the relationship varied.

Second, the trend variable was statistically significant and negatively associated with total water withdrawal. For example, each additional year was associated with a 3 - 6% decrease in total water withdrawal, holding firm size, profitability, and business activities constant. This result demonstrates that companies are likely conserving more water over time. This relationship is robust to changes in our estimation based on the sensitivity analysis results contained in the Appendix.

Third, the variables for both firm size and industry specification were generally statistically significant but varied in terms of their direction and magnitude. These results

indicate that a firm's size and business activities are connected to a firm's total water withdrawal. However, these results were not robust to changes in our estimation based on the sensitivity analysis results contained in the Appendix.

Table 10: Regression Results of General Linear Models

Variables	(1)	(2)	(3)
Corporate Social Responsibility (0-100)	0.03***(10.99)	0.03***(11.42)	0.02***(8.70)
Log of Total Assets	0.43***(8.56)	0.05***(8.97)	0.45***(8.86)
Log of Number of Employees	-0.18***(-3.95)	-0.21***(-4.50)	0.11*(2.43)
Net Profit Margin	-0.022***(-5.77)	-0.02***(-5.50)	0.01*(2.02)
Trend		-0.12***(-5.84)	-0.06***(-4.42)
Industry (Basic)			4.17***(10.61)
Industry (Cyclical Consumer Goods)			2.22***(5.89)
Industry (Cyclical Services)			1.40***(3.61)
Industry (Finance)			-0.37(-0.97)
Industry (General)			0.98*(2.58)
Industry (IT)			0.40(1.06)
Industry (Non-Cyclical Consumer Goods)			0.71(1.87)
Industry (Non-Cyclical Services)			
Industry (Resources)			2.90***(7.30)
Industry (Utilities)			6.65***(17.57)
Constant	8.57***(11.44)	9.19***(12.24)	4.28***(5.81)
Observations	2,038	2,038	2,038
R-Squared (Overall)	0.1159	0.1301	0.6108

Note: *t-values in parentheses; * refers to p < 0.05, ** refers to p < 0.01, and *** refers to p < 0.001*
Source: *Thomson Reuters ASSET4 ESG Data* (https://www.thomsonone.com/)

Table 11: Regression Results of Panel Data Models

	(4)	(5)	(6)	(7)	(8)	(9)
Corporate Social Responsibility (0-100)	0.002(1.95)	0.002**(2.59)	0.003**(2.83)	0.004***(3.74)	0.03**(2.72)	0.004**(3.32)
Log of Total Assets	0.03(0.42)	0.13*(2.14)	0.16*(2.03)	0.26***(3.85)	0.17**(2.23)	0.21**(3.24)
Log of Number of Employees	0.412***(4.63)	0.29***(4.18)	0.35***(3.88)	0.23**(3.39)	0.32***(3.60)	0.34***(5.00)
Net Profit Margin	-0.00(-0.32)	-0.00(-0.67)	-0.00(-0.22)	-0.00(-0.52)	-0.00(-0.26)	-0.00(-0.20)
Trend			-0.03***(-3.64)	-0.03***(-4.73)	-0.02***(-3.31)	-0.03***(-4.02)
Industry (Basic)					3.01***(6.59)	-2.87***(-6.01)
Industry (Cyclical Consumer Goods)					0.02(0.02)	-5.09***(-11.23)
Industry (Cyclical Services)					-0.22(-0.49)	-5.95***(-12.70)
Industry (Finance)						-6.53***(-15.49)
Industry (General)						-6.19***(-13.58)
Industry (IT)						-6.28***(-13.77)
Industry (Non-Cyclical Consumer Goods)						-6.05***(-13.15)
Industry (Non-Cyclical Services)						-7.45***(-8.95)
Industry (Resources)						-3.84***(-6.84)
Industry (Utilities)						
Constant	10.93***(10.61)	9.99***(10.86)	9.41***(8.49)	8.53***(8.85)	9.24***(8.40)	13.39***(14.06)
Control for Company Effects	Yes	No	Yes	No	Yes	No
Control for Year Effects	Yes	No	Yes	No	Yes	No
Observations	2,038	2,038	2,038	2,038	2,038	2,038
R-Squared (Overall)	0.0077	0.0223	0.0242	0.0443	0.0773	0.5924

Note: *t-values in parentheses; * refers to p < 0.05, ** refers to p < 0.01, and *** refers to p < 0.001*
Source: *Thomson Reuters ASSET4 ESG Data* (https://www.thomsonone.com/)

6. DISCUSSION

This study demonstrates that CSR practices are not associated with water conservation. In fact, CSR practices are positively associated with water withdrawal. This finding does not support our hypothesis or the general expectation that CSR practices are effective. Although the significance and magnitude of this effect is sensitive to model specification and data used, it is possible that the true effect of CSR initiatives is much higher because extra-financial reporting tends to have an optimism bias as mentioned previously in the Literature Review section.

This finding has two possible explanations that fit into past literature. First, CSR initiatives may have no practical impact on real-world outcomes. This explanation tracks with the notion of "greenwashing" in which companies adopt CSR initiatives solely for their business case-use. Second, CSR initiatives may actually cause companies to engage in more harmful activities in some areas. This explanation is consistent with past research on the "moral licensing" effects of CSR initiatives.

This finding also has implications for policymakers. If policymakers are interested in improving water conservation by corporations, this study indicates that they should not issue incentives for CSR initiatives without strict performance guidelines. For example, the adoption of guidelines similar to the B-Corp certification may be useful to maximize effectiveness. In addition, policymakers may wish to consider tax or regulatory approaches unrelated to a company's CSR activities. This study offers that optimal policies may need to be sensitive to industry-specific considerations under these forms of intervention.

6.1 Limitations and Future Research

This study has several limitations. The first limitation is the measurement of a firm's CSR strategy. We adopted this measurement from Thomson Reuters ASSET4, but acknowledge that there are many other ESG data sources with different measurement methodologies. Moreover, we assume that these measurements adequately encapsulate the qualitative phenomena of a firm's voluntary activities, which may be inherently flawed given the dynamics surrounding companies reporting extra-financial information. The second limitation is the risk of omitted variable bias. For example, despite our best attempts to control for related factors, a variable may exist that is associated with both a firm's total water withdrawal and CSR activities and its absence would bias our results.

These limitations generate opportunities for future research. This field of study would greatly benefit from improving the veracity of ESG scoring methodologies. Researchers may be able to achieve this objective by comparing the relative efficacy of multiple methodologies, combining multiple methodologies into one super-score, or building boutique formulas. In addition, researchers may seek to explore the effectiveness of CSR activities on other real-world outcomes like greenhouse gas emissions, energy use, or social equality.

7. APPENDIX

Table A1. Sensitivity Analysis of the General Linear Models

	(1)	(2)	(3)
Corporate Social Responsibility (0-100)	0.01**(2.95)	0.01**(3.17)	0.001***(3.60)
Log of Total Assets	0.65***(9.17)	0.66***(9.33)	0.46***(7.14)
Log of Number of Employees	-0.51***(-7.40)	-0.52***(-7.51)	0.27***(4.37)
Net Profit Margin	-0.02***(-3.67)	-0.02***(-3.62)	-0.00(-0.16)
Trend		-0.06*(-2.06)	-0.04***(-2.66)
Industry (Basic)			0.71(1.96)
Industry (Cyclical Consumer Goods)			-0.38(-1.06)
Industry (Cyclical Services)			-1.49***(-3.61)
Industry (Finance)			-3.9***(-10.88)
Industry (General)			-2.23***(-5.96)
Industry (IT)			-2.77***(-7.61)
Industry (Non-Cyclical Consumer Goods)			-2.13***(-5.89)
Industry (Non-Cyclical Services)			-2.88***(-4.76)
Industry (Resources)			
Industry (Utilities)			3.54***(10.81)
Constant	9.89***(9.61)	9.99***(9.72)	6.21***(7.31)
Observations	1,070	1,070	1,070
R-Squared (Overall)	0.1015	0.1042	0.6671

Note: *t-values in parentheses; * refers to p < 0.05, ** refers to p < 0.01, and *** refers to p < 0.001*
Source: *Thomson Reuters ASSET4 ESG Data* (https://www.thomsonone.com/)

Table A2. Sensitivity Analysis of the Panel Data Models

	(4)	(5)	(6)	(7)	(8)	(9)
Corporate Social Responsibility (0-100)	-0.001(-0.61)	-0.001(-0.52)	-0.00004(0.983)	0.0003(0.18)	-0.0002(-0.15)	0.0002(0.11)
Log of Total Assets	-0.02(-0.24)	0.08(1.10)	0.15(1.55)	0.25***(2.91)	0.17(1.82)	0.20*(2.46)
Log of Number of Employees	0.53***(5.06)	0.33***(3.49)	0.42***(3.89)	0.23*(2.33)	0.38***(3.60)	0.39***(4.30)
Net Profit Margin	-0.00(-0.41)	-0.00)-0.56)	-0.00(-0.41)	-0.00(-0.54)	-0.00(-0.45)	-0.00(-0.48)
Trend			-0.028**(-3.48)	-0.03***(-4.12)	-0.02**(-3.16)	-0.03***(-3.50)
Industry (Basic)					2.99***(7.05)	-3.49***(-6.41)
Industry (Cyclical Consumer Goods)						-4.23***(-7.70)
Industry (Cyclical Services)					-0.17(-0.40)	-5.76***(9.55)
Industry (Finance)						-6.75***(-12.14)
Industry (General)						-6.16***(-10.55)
Industry (IT)						-6.61***(-11.38)
Industry (Non-Cyclical Consumer Goods)						-5.71***(-10.30)
Industry (Non-Cyclical Services)						-6.17***(-3.83)
Industry (Resources)						-3.35**(-3.44)
Industry (Utilities)						
Constant	11.48***(9.49)	11.73***(10.06)	9.83***(7.60)	10.00***(8.12)	9.56***(7.57)	13.70***(11.83)
Control for Company Effects	Yes	No	Yes	No	Yes	No
Control for Year Effects	Yes	No	Yes	No	Yes	No
Observations	1,070	1,070	1,070	1,070	1,070	1,070
R-Squared (Overall)	0.0075	0.0005	0.0000	0.0079	0.0166	0.6555

Note: *t-values in parentheses; * refers to p < 0.05, ** refers to p < 0.01, and *** refers to p < 0.001. Even models display fixed effect results and odd models display random effect results. The Hausman specification test preferred Models 4, 7, and 9.*

Source: *Thomson Reuters ASSET4 ESG Data* (https://www.thomsonone.com/)

8. REFERENCES

Blowfield, Michael, and Alan Murray. 2014. “Corporate Responsibility.” *Oxford University Press.*

Bowen, Howard. 2013. “Social Responsibilities of the Businessman.” *University of Iowa Press*.

Carnegie, Andrew. 1889. “The Gospel of Wealth.” *The North American Review.*

Carroll, Archie. 1979. “A Three-Dimensional Conceptual Model of Corporate Performance." *Academy of Management Review.*

Cochran, Philip. 2007. “*The Evolution of Corporate Social Responsibility*.” Business Horizons.

Cowe, Roger. 2002. “Developing Value.” *SustainAbility Ltd*.

Dieter, C.A.. 2015. “Estimated Use of Water in the United States in 2015.” *U.S. Geological Survey Circular*.

Friedman, Milton. 1970. “The Social Responsibility of Business is to Increase its Profits.” *The New York Times.*

Gelles, David.2015. “Unilever Finds that Shrinking its Footprint is a Giant Task.” *The New York Times.*

Gerson, Livia. 2016. “The Social Responsibility of American Industrialists.” *Jstor Daily.*

Hedblom, Daniel, Brent Hickman, and John List. 2019. “Toward an Understanding of Corporate Social Responsibility: Theory and Field Experimental Evidence.” *National Bureau of Economic Research.*

Jensen, Carl. 2011. “Stories that Changed America: Muckrakers of the 20th century.” *Seven Stories Press.*

Kramer, Mark, and John Kania. 2006. “Game changing CSR.” *Corporate Social Responsibility Initiative Working Paper*.

Nan, Xiaoli, and Kwangjun Heo. 2007. “*Consumer Responses to Corporate Social Responsibility (CSR) Initiatives: Examining the Role of Brand-Cause Fit in Cause-Related Marketing*.” Journal of Advertising.

Patagonia. 2013. “Highlights from Patagonia’s “Our Common Waters” Environmental Campaign 2011-2013.” https://www.patagonia.com/stories/highlights-from-patagonias-our-common-waters-environmental-campaign-2011-2013/story-18045.html/.

Principles for Responsible Investment (PRI). 2020. “Annual Report.” https://www.unpri.org/annual-report-2020/foreword.

S&P Global. 2021. “S&P U.S. Indices Methodologies.” https://www.spglobal.com/spdji/en/documents/methodologies/methodology-sp-us-indices.pdf.

S&P Global. 2020. “Overview.” https://www.spglobal.com/spdji/en/indices/equity/sp-500/#overview.

Financial Times. 2014. “Financial Times Lexicon.” https://www.ft.com/.

Quinn, Theodore. 1948. “I Quit Monster Business: An Appeal for Independent, De-centralized Enterprise—To Save Individual Opportunity and Freedom in America.” *Public Relations, Inc.*

Thomson Reuters Datastream. 2021. *ASSET4 ESG*. Subscription Service. https://www.thomsonone.com/DirectoryServices/2006-04-01/Web.Public/Login.aspx?brandname=datastream&version=2.9.9.14751&protocol=0.

United Nations Global Compact. 2004. *The Ten Principles.* https://www.unglobalcompact.org/what-is-gc/mission/principles.