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Sustainability and Business Performance

A thesis submitted in partial satisfaction
of the requirements of the University Honors Program
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by

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Abstract:

With climate change becoming more and more of an ominous reality, the concept of sustainability is gaining more and more traction, throughout both consumers and businesses. Companies that have implemented “green” initiatives have found that there are various potential benefits that can be derived from these sustainable practices. This study aims to quantify those benefits and examine how sustainable businesses perform in comparison to their non-sustainable counterparts. Using Newsweek’s Green Rankings, and several statistical tests, it was found that there are no statistically significant differences between sustainable firms and non-sustainable firms, showing that while sustainability may not yield any short-term benefits, there are also no additional costs incurred to implement sustainable practices.

Introduction:

In today’s environment, the concept of sustainability is increasingly important and needs to be brought to the forefront of our attention. Because of the ever-growing realities of climate change and global warming, sustainability has been attracting more attention and companies are implementing “green” initiatives in order to reduce their organizational environmental footprint. Some businesses, however, find the costs of sustainability to be too high and burdensome and continue operating as usual.

When people think of global warming, greenhouse gas emissions, and pollution, they usually attribute it to a few industries, namely the oil and gas, mining,

and chemical industries. This, however, is not the case. Global warming does not stem from only a few industries but from a wide range of industries. These environmental impacts are not localized, but are felt widespread and across the world. In addition, from these environmental impacts stem both health problems and social justice issues that need to be tackled.

This research paper aims to examine whether integrating sustainability into companies' business models can actually make firms more competitive and be able to outperform their non-sustainable counterparts. This paper will first provide some background information and context for the study; second will be a literature review to discuss publications pertaining to business sustainability; next will be the methodology and procedure of the research, followed by a discussion and interpretation of the results, and lastly a conclusion that will include limitations of this study and potential directions for future research.

Background Information:

Climate change is not a recent phenomenon. Since the 1960's, atmospheric carbon dioxide levels have been steadily increasing. Measured from the top of Mauna Kea in Hawaii, the Scripps Institution of Oceanography and the National Oceanic and Atmospheric Administration found that from 1960 to 2010 carbon dioxide levels have risen from below 320 parts per million to over 400 parts per million (see Figure 1) (ESRL).

This increase in carbon dioxide, along with other greenhouse gas emissions, has opened the door to many environmental problems. It has been predicted that at

our current consumption and pollution rates, global sea levels will rise by anywhere from seven to twenty-three inches, numerous species will face extinction from habitat destruction, and storms will become more intense (“Global Warming Fast Facts”). These problems will only continue to be exacerbated by the rapid development and growth of the emerging markets.

The impacts of climate change are not only felt environmentally, but also economically and socially. Rising sea levels could cause more than 100 million people to fall into extreme poverty, and submerge homes of over half a billion (Ap). The connection has even been made between climate change and social unrest, with the U.S. Department of Defense citing climate change as a “threat multiplier” (Miller, Ansari). The civil war in Syria starting in March of 2011 has been used as an example, with studies showing that although drought was not the sole driver of the violence, “water shortages in the Fertile Crescent in Syria, Iraq, and Turkey killed livestock, drove up food prices, sickened children, and forced 1.5 million rural residents to the outskirts of Syria’s jam-packed cities” (Welch).

The forces behind all of these detrimental impacts – environmental, economic, and social – are not confined to one country or a specific industry, but come from an array of industries and from across the globe. The EPA has estimated that mining has contaminated 40% of the watersheds in the western U.S. (“Hard Rock Mining Pollution”). The oil and gas industry has been cited as the largest source of volatile organic compounds (VOCs), a group of chemicals that contribute to ground-level ozone (more commonly known as smog) (“Natural Gas Production Industry”). Chemical manufacturing has a large environmental and social impact by

potentially exposing around 5.3 million people worldwide to dangerous chemicals and having lasting effects on the environment (“Chemical Manufacturing”). Some of these industries are relatively overlooked, given their impacts, both environmentally and socially. The apparel industry, for example, is the second most polluting industry after the oil and gas industry. The average American produces eighty-two pounds of textile waste each year, which equates to more than 11 million tons of textile waste from the U.S. alone. Cotton production, in order to produce these textiles, is responsible for 18% of the total pesticide use and 25% of global insecticide use (*The True Cost*). Another example of a relatively overlooked industry is the technology and electronics industry – through the manufacturing of printed wiring boards and semiconductor chips, the technology industry was found to have contaminated rivers and underground wells near manufacturing facilities (“High-Tech Industry Contaminating Rivers”). This contamination has manifested itself in the form of various health problems, including dermal issues, stomach ailments, and even cancers (*The True Cost*).

It is clear that we cannot continue consuming resources and polluting the earth at our current rate, and steps must be taken towards preserving the environment. A landmark regarding climate change was achieved in December 2015, when 196 countries voted to adopt an agreement to curb global warming at the COP21 talks in Paris. This agreement aims to limit the global increase in average temperature to “well below 2 degrees Celsius above preindustrial levels and [pursue] efforts to limit the temperature increase to 1.5 degrees Celsius” (Chappell). The agreement is comprehensive; covering both developed and developing nations

along with all types of emissions. The key areas of the agreement include mitigation, transparency and accountability, adaptation, loss and damage, and support. It was hailed by many global leaders as “monumental” and a “renaissance for human kind” (“COP21”). President Obama gave a statement praising the COP21 agreement, saying that it is “the best chance of saving the one planet that we’ve got” (Sutter, Berlinger, Ellis). Although this deal lays the groundwork for global sustainability, much has yet to be done in order to make this vision a reality.

While the COP21 agreement is a huge victory for advocates of sustainability, governments can only do so much. Effective change must also come from the consumer level. Fortunately, consumers are recognizing the need for change; in a survey done by Nielsen, a global information and measurement company, it was found that 55% of online consumers across sixty countries say that they are willing to pay a premium for products and services from companies that are committed to sustainability. The propensity to buy socially responsible products ranged from about 40-65% across the continents, with Asia-Pacific coming in first at 64% and Europe coming last at 40% (“Global Consumers”).

Interestingly, the Nielsen Global Survey also found that millennials appear to be more responsive to sustainability initiatives. Of all the people surveyed who respond to going “green”, just over half of the respondents who will pay extra for sustainability and check the packaging for green labeling are millennials. This data presents a potential opportunity (or problem) for companies, as the millennial generation, defined as people who are born in the general range between 1980 and 2000, is now the largest and most diverse generation in the U.S. population. Making

up approximately one-third of the population, the ninety-two million millennials now play a significant role in the U.S. economy, forcing companies to pay attention to their wants and needs (“15 Facts about Millennials”). Millennials spend around 91% of their earnings, just below the national average of 92%. Because of their substantial population, millennials represent a huge demand to fill. This increased demand by the millennial generation also comes with increased socially-conscious and environmentally-conscious spending habits. Millennials, who value authenticity more than content, now expect brands to give back to society – 75% of millennials state that it is quite important that companies give back to society (Schwabel).

With this change in consumer spending habits, companies are recognizing the increasing importance of implementing sustainable initiatives. Companies are taking steps towards increased transparency and social responsibility, using their influence to drive change both within the industry and also on the consumer side.

There are, however, skeptics who believe that from a business perspective, it is too costly to go “green.” Critics assert that environmentally friendly business practices can tighten margins and that if they do breakeven with these higher upfront costs, it will take years. These higher upfront costs for going green can include the installation and maintenance of sustainable equipment, a revision of a company’s supply chain, monitoring and reporting a firm’s sustainable practices, and sustainability certifications. Along with these initial costs come hidden costs of going sustainable. As renewable energy sources become more prevalent, so too will our dependence on copper, whose wastes will ironically “constitute the largest quantity of metal mining and processing wastes generated in the United States”

(Carter). Because copper does not decay and is the perfect conductor of electricity, it is used in almost every electrical device. Furthermore, sustainable devices contain significantly more copper than regular appliances – one windmill has approximately 8,000 pounds of copper, and while an average car contains about fifty pounds of copper, an electric car carries three times that. This shift to green technology includes an increased reliance on copper mining, which has enormous environmental impacts. It was estimated that a proposed copper mine in Alaska would destroy up to eighty-seven miles of salmon rivers and 4,300 acres of salmon wetlands, which would effectively decimate the fishery. Additionally, because copper mines are mostly open pit mines, the dust and debris from these mines could have both environmental and health effects. In this regard, for the sake of green technology, we might be taking one step forward and two steps back. Essentially, cynics believe it is unsustainable to be sustainable.

This thesis aims to prove otherwise: that going “green” is not only sustainable for the environment, but that it can also provide socially-responsible firms a competitive advantage and help them outperform their non-sustainable counterparts.

Literature Review:

While there is no hard evidence that sustainable companies can outperform their non-sustainable competitors, many studies illustrate that sustainability can indeed add value to a firm. The articles included in this literature review come from

many different perspectives but all address the issue of sustainability and business performance.

In an article written by Anthony C. Ng and Zabihollah Rezaee, business sustainability performance is examined and how it can affect a firm's cost of equity (Ng, Rezaee). By using industry adjusted earnings to price ratios and an expected return model the cost of equity was calculated for a sample of more than 3,000 firms from the period of 1990 to 2013. From their research, Ng and Rezaee found that out of the three factors of ESG (environment, social, and governance), "only environmental and governance sustainability performance reduce cost of equity in a manner consistent with prior research. Social sustainability performance, however, is not significantly associated with cost of equity capital" (146). This study, however, is somewhat limited as it only addresses the equity side of the cost of capital and leaves out the relationship between business sustainability performance and the cost of debt.

Another study that closely examined the relationship between sustainability and performance was done in 2014 by Yongtao Tan, J. Jorge Ochoa, Craig Langston, and Liyin Shen (Yongtao, Ochoa, Langston, Shen). They performed an empirical study on sustainability in the construction industry. By using a regression analysis, it was determined that there was "an inverse U-shape curve exists between sustainability performance and international revenue, and a U-shape curve between sustainability performance and international revenue growth" (277). This research addresses both sides of the sustainability argument – sustainability is positively correlated with international revenue and growth, but there is a point at which

being sustainable starts to be unprofitable. It is important to keep in mind that this study is limited to the construction industry, although it would be interesting to see if this result is consistent over a broad variety of industries.

In a world where top management is becoming more scrutinized, a study was done to examine the effects that sustainable management, defined as “a business approach that takes into account the pattern in ecosystem organization in decision-making and management practices, including assessment indicators in economic environmental and social dimensions” (Gomes et al. 85), has on business performance. This study was limited to the mining industry in Brazil and was conducted using a survey. The questionnaire was broken into four sections: respondent profile, business characterization, sustainability management practices, and corporate performance, with scores in each category ranging from 0.1 (low agreement) to 1.0 (maximum agreement). It was found that “sustainable management of the supply chain, continual improvement in the environmental area, continual improvement in health and safety, transparency with stakeholders and community development were associated to business performance” (91). If these results are not exclusive to only the Brazilian mining sector, this study would indicate that businesses with increased sustainability management enjoy increased business performance.

Additionally, it was found in a study performed in Italy that sustainability positively impacts a company in regards to both market and image performance (Dangelico, Pontrandolfo). Two hypotheses were developed: the capabilities to implement energy-focused environmental actions, pollution-focused actions, and

materials-focused actions positively affect a firm's market performance, and image performance. Through a structured questionnaire and a regression analysis to interpret the data, it was determined that a company's market performance is positively correlated to its capabilities to implement energy and pollution-focused environmental actions, while its image performance was positively related to its materials-focused capabilities.

A firm does not need its own innovative sustainable practices to reap enhanced economic benefits, but can participate in government led programs and realize improved financial performance. An empirical study was done examining the relationship between participating in Voluntary Environmental Programs (VEPs) and economic performance (Moon, Bae, Leong). Through regression analyses, it was found that firms' participation in VEPs positively impacts economic performance and that a poor sustainability history negatively affects a firm's bottom line.

Although firms do not need to have their own internal "green" practices to improve their business performance, companies who actively incorporate sustainable policies become more resilient than those organizations that do not. In a research study published in the Strategic Management Journal, it was found that firms with social and environmental practices (SEPs) experience increased organizational resilience, defined as "the firm's ability to sense and correct maladaptive tendencies and cope positively with unexpected situations" (Ortiz, Bansal. 1). When compared to corporations with low SEPs using a matched-pair design, sustainable firms with higher organizational resilience enjoy "lower financial volatility, higher long-term growth, and a higher survival rate over 15

years of data” (14). This study also tested the hypothesis of whether sustainable firms gouge their profitability due to the higher upfront costs of SEPs. There was no conclusive data to support this hypothesis, which can undermine the long-standing belief that sustainability is too costly to be worth it.

Along with the studies that examine how sustainability relates to a company’s competitiveness, there is also published literature on how sustainability can add value to a firm.

When examining the core of a company, it was found in several studies that having a sustainable business model creates value (Seay). As “executives are increasingly recognizing that long-term economic growth is not possible unless such growth is socially and environmentally sustainable” (47), companies are looking inward to redevelop their business model in order to keep up with the sustainability trends that are occurring. In this study, it was found that by implementing a sustainable business model, integrating sustainability into the DNA of a company, businesses can benefit through an improved brand image, cost savings, improved employee retention, market share growth, risk mitigation, and innovation.

The additional costs of implementing sustainable practices is what deters some companies from being “green,” but a study was done that looks at how managers balance social, environmental, and financial performance simultaneously (Epstein, Buhovac, Yuthas). Through interviews with managers at Nike, Proctor & Gamble, the Home Depot, and Nissan North America (these companies were chosen because of their leading practices in sustainability), it was found that managers view the trade-off between sustainability and financial performance only in the short-

term, and that instead of viewing this conflict as a hindrance, “they are using the tensions creatively as a source of new ideas and innovation” (Epstein 43). The managers at these companies also recognize the financial value of stakeholder reactions to sustainability and use this knowledge to leverage better financial performance.

In addition to creating value for firms, sustainability can also influence consumers’ attitudes towards products. A study examined the impact that sustainable-labeling had on consumer demand and was done using a regression analysis involving a two-by-two impact frame (personal impact vs. company impact) with EI (environmental involvement) as the measured variable (Cho). It was found that when the ad emphasized company environmental impacts, high-EI customers valued the company favorable, while when the ad underscored personal environmental impacts, low-EI consumers responded more favorably towards the brand.

Along with research done on the relationship between sustainability and business performance, there have also been studies done through the lens of an investor. Overall, it was found that while socially responsible investing (SRI) does have some benefits, there are no significant abnormal returns associated with this method of investing.

In a study done over five years (from December 2005 to December 2010) examining the Brazilian stock markets, specifically the Brazilian Mercantile and the Futures and Stock Exchange, it was found that sustainable investments provide increased liquidity and low diversifiable risk but they do not provide satisfactory

financial returns. These results were found by comparing the Corporate Sustainability Index to market and sector indices, and also using various metrics such as Sharpe, Treynor, Sortino, and Omega. This study showed that while providing some benefits, “the constraints imposed by [sustainable investing] in capital allocation in Brazil may be harming their return and risk attractiveness” (Arias, Samanez).

Although it was found that the constraints associated with SRI may be detrimental to a portfolio’s risk and return, another study found that the market rewards firms with high corporate sustainability performance. By monitoring the Dow Jones Sustainability Europe Index from 2009 to 2013, the results showed that following the announcement of the addition (or removal) of a firm to the index, the respective stock experienced a significant but temporary increase (or decrease) in return. Additionally, during the period following the change, industry leaders’ stocks enjoyed a permanent and significant growth in stock returns (Stekelenburg, Georgakopoulos, Sotiropoulou, Vasileiou, Vlachos).

Although there is much literature about the benefits derived from sustainability, there are critics who denounce “green” practices for the main reason that it requires too much capital and does not provide adequate return (Patrick, Malk). It is acknowledged that sustainable practices and methods have higher upfront costs – reports show the total cost per megawatt hour of a solar thermal and photovoltaic cycle will be more than four times that of a natural gas cycle, and on and offshore winds cost two and a half times the price of gas. Critics capitalize on these facts and insist that sustainability does not sustain and instead, “spends

resources that would much more likely go into market efficiency [and] wastes public monies and costs jobs” (Bloomberg, Michaels). In Spain, it was reported that the cost of creating “green jobs” and solar subsidies eroded away Spain’s economy so much that it gave rise to a chance of government default. This example in Spain clearly illustrates that sustainability could actually be economically unsustainable.

Taking all arguments into consideration, the benefits derived from sustainability still seem to outweigh the associated costs. This literature review was vital to my senior thesis – I learned what other relevant research has been done and enabled me to develop my thesis more thoroughly. Through my senior thesis, I hope to bring this important issue of sustainability to more light. With more awareness will hopefully come smarter and more sustainable consumer spending habits, for in order to make a difference, we must first start with ourselves.

Hypothesis:

After conducting a literature review and exploring what research has already been done regarding business performance and sustainability, several hypotheses were formed.

Hypothesis 1: Sustainable companies will experience increased sales revenues over non-sustainable companies.

Hypothesis 2: Sustainable companies will have higher cost of goods sold (COGS) than their non-sustainable counterparts.

Hypothesis 3: Sustainable companies will have higher profit margins than their non-sustainable competitors.

Method and Procedure:

To test these hypotheses, several statistical tests, such as T-tests and regression analyses, were performed. In order to conduct such tests, a metric was needed to measure the degree of companies' sustainability. For this study, Newsweek's 2014 and 2015 Green Rankings (which pulled data from fiscal years 2013 and 2014, respectively) were used as a sustainability measurement. These rankings were built on six core principles: transparency, objectivity, public data, comparability, engagement, and stakeholders. Newsweek partnered with Corporate Knights Capital, an independent investment research firm, and also with HIP Investor, a rating company, to conduct the research and publish the rankings. The rankings include the largest 500 U.S. publicly traded companies (by market capitalization) and take into consideration eight factors when scoring a company: combined energy productivity, combined greenhouse gas productivity, combined water productivity, combined waste productivity, green revenue score, green pay link, sustainability board committee, and audited environmental metrics. These eight key performance indicators (KPI) are weighted at 15%, 15%, 15%, 15%, 20%, 10%, 5%, and 5%, respectively. The KPIs are then condensed into one overall weighted green score for each company. For each key performance indicator, Newsweek first gathered data and established a metric for that specific KPI. The

firms were then categorized by quartiles and given different weights, appropriate to their respective quartile. Finally, those values are then totaled to yield a score for that specific KPI. The primary data used to rank these firms was gathered through annual reports, audited financial statements, proxy statements, and sustainability reports, while secondary data was obtained through HIP Investor and Bloomberg (Heaps, Yow).

Using Newsweek's green scores, various statistical tests were conducted to examine sustainability's effect on different variables. To test the hypotheses, four variables were chosen – these variables were cost of goods sold, revenue, profit margin, and operating expense. In order to stay consistent, all of the variables were scaled by total assets, except for profit margin (which is net income divided by revenues). All accounting data is from the Compustat database.

Results:

With a sample size of 980 observations, and using 949 observations (31 observations had missing values), statistical tests were conducted to determine the relationship between sustainability and the variables mentioned above. All of the data was scaled, which is to say that the size effect was eliminated. By nature, larger firms should have higher COGS, higher revenues, and therefore higher green scores. If the data were not scaled, it would not give an accurate depiction of the relationship between sustainability and the variables. Instead, because of the size effect, the statistical tests would essentially measure which firms were largest rather than which firms performed better on a sustainable basis.

A t-test was first performed to determine whether or not there were any significant differences between the non-sustainable and sustainable firms in the study. The P-values ($P > t$) are derived from the t-statistic and as seen in Table 2, none of the P-values are below the alpha levels (otherwise known as the significance levels) of both 0.05 and 0.1. This indicates that there were no significant differences between sustainable and non-sustainable firms found through the t-tests.

The t-value represent the calculated difference between the variables being measured, in this case non-sustainable (0) and sustainable (1), in units of standard error. The greater the t-value, the greater the evidence against the null hypothesis – which is that there is no significant difference between the two variables. Therefore, the closer the t-value is to zero, the more likely it is that the variables are not statistically different. The P-value is the probability of obtaining the observed results when the null hypothesis is true. Thus, a small p-value (below the alpha level of 0.05) indicates strong evidence against the null hypothesis and to reject it, meaning that the two variables are statistically different. If the p-value is large (above 0.05), however, it shows weak evidence against the null hypothesis and to accept it. The two methods of measuring t and p-values, Pooled and Satterthwaite, differ in that the Satterthwaite method does not assume the variances of the two samples are equal. The Pooled method calculates the standard error from taking an arithmetic average of the standard deviations, while the Satterthwaite method calculates the standard error using a weighted average of the two variances.

Following the t-test, a regression analysis was done in order to measure the

strength of the relationships between the variables and the green scores. The following linear regression equation was used during the analysis:

$$\text{Variable} = \alpha + \beta(\text{green score}) + \varepsilon$$

From this equation, we were able to calculate beta and a resulting t-value. In Table 3, the parameter estimate represents the coefficient, or beta, of the green score. This essentially is the slope of the regression line, so a coefficient closer to zero means the independent variable (in this case the green score) does not have much impact on the dependent variables (COGS, revenue, profit margin, or operating expense).

The t-values that were extracted from the analysis allowed us to determine whether or not the relationship between the green score and the variable being tested was statistically significant. Similar to the t-tests performed, none of the P-values generated from the regression analysis were less than the alpha levels of either 0.05 or 0.1, showing that none of the relationships between sustainability and the four tested variables are statistically significant.

From these tests, it can be stated that sustainability has little to no impact on cost of goods sold, revenue, profit margin, or operating expense. All three hypotheses were found to be null through these statistical studies.

Discussion:

Because of the limited access to research data, this study was confined to using only a two-year time frame. This short time horizon may skew the results and not provide a comprehensive understanding of the correlations between green scores and the other variables, as previous literature suggests that the benefits derived from sustainability are usually felt over the long run. If data, specifically the green scores, from prior years were available, a longer time frame (five to ten years) could be used, which might yield more fruitful results.

From these results, however, it is encouraging to see that sustainability does not eat into the bottom line. Many non-sustainable companies claim that being green is too costly but the findings show that sustainability does not have a negative impact on the cost of goods sold, profit margin, or operating expenses. This should encourage companies to implement (or maintain) green initiatives, as there are many potential benefits with little downside.

An interesting finding, although not statistically significant, is that the correlation between the green score and cost of goods sold is slightly negative. With a slope of -0.04627 , this result would suggest that sustainability, instead of increasing the cost of goods sold as hypothesized, would actually decrease COGS (if statistically significant). These cost savings would flow down to the bottom line and therefore increase profit margin, as seen in the regression analysis results for profit margin (the correlation is slightly positive, with a slope of 0.02780). Unfortunately, however, none of these results are statistically significant and therefore cannot be considered in the final results.

Limitations and potential future research:

This research had significant limitations – namely access to data – that hindered the results. Because sustainability metrics are relatively new, not a lot of credible data sources are publicly available. Although some sustainable data sources are available for purchase (Higg Index, Sustainalytics, etc.), these financial burdens were outside of the scope of this research and therefore these resources were not an option. Various companies were contacted in an attempt to receive access to their internal sustainability data for academic use, however, the majority of these companies do not respond to student requests (due to the high volume of emails these firms receive each day).

The Newsweek Green Rankings also had some limitations. First, although Newsweek performed and published green rankings in years prior to 2014, Newsweek used an entirely different method in 2014 whose format was not consistent with the format of previous years. Essentially, the 2014 report is the first in its current format, and so this research was limited to the rankings of the past two years. Secondly, these rankings have some missing data points, which are automatically recorded as zero, negatively impacting a company's green score. Additionally, there is "an inherent lack of context as to the use of certain environmental resources" in the Newsweek Green Rankings (Heaps, Yow).

Although limited, this research opens the door for future research on the topic of sustainability impacting business performance. Future studies can replicate this study, but use a longer time series in hopes to produce more worthwhile and thorough results. Building on this study's results, future research can explore the

relationship between cost of goods sold and a company's green score to determine whether sustainability can indeed decrease a firm's COGS. While this study used accounting data, future research can look at financial data, using stock performance to determine how markets react to sustainability initiatives by companies. As sustainability has only recently gained traction, there are still a lot of research opportunities on the topic that can be explored; this thesis is merely scratching the surface.

Conclusion:

It is now widely acknowledged that climate change is a real phenomenon. With this acceptance also comes a recognition that something needs to be done. We, as a human race, cannot continue to live outside our means and consume at our current rate. Environmental impacts stem from every industry and across the globe.

The U.S. Environmental Protection Agency defines sustainability as the ability to "create and maintain the conditions under which humans and nature can exist in productive harmony to support present and future generations" ("Learn About Sustainability"). This thesis set out to explore the impacts of sustainability on business performance, measuring four specific variables – cost of goods sold, revenue, profit margin, and operating expenses. Although the results were mostly inconclusive, with none of the correlations being statistically significant, some promising conclusions were extracted from the results. The results from the statistical tests show that sustainability does not cost notably more to implement, negating the claim that companies use when defending why they are not

sustainable. As green practices do not erode away the bottom line, the results from this research should encourage more firms to either take steps towards being green, or maintain what sustainable initiatives they already had. With the various potential benefits that sustainability provides and little to no downside, why should not all companies make efforts to become sustainable?

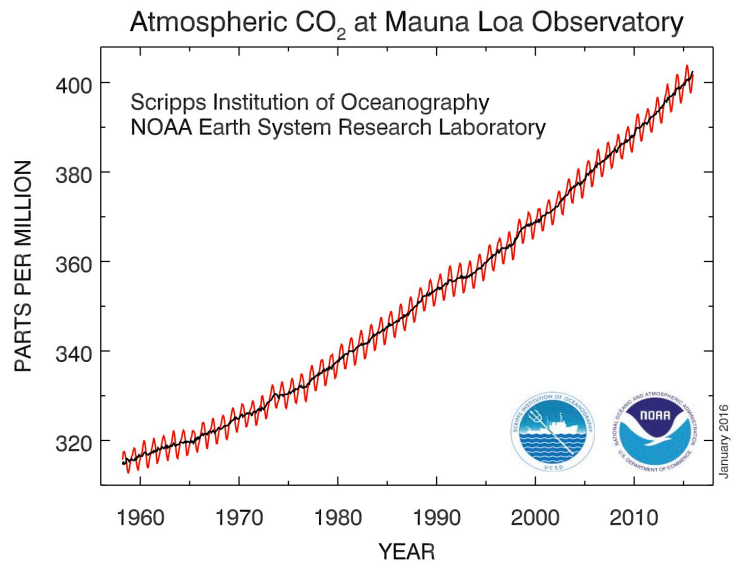


Figure 1: Graph illustrating the atmospheric CO₂ levels measured at Mauna Loa, Hawaii since 1960

No. of Obs	980
Obs. Used	949
Obs. With Missing Values	31

Table 1: 980 observations were included in this study, however, 31 of those observations had missing values and were thus excluded from the tests. The following statistical results were generated from the remaining 949 observations.

	T-TEST			
	COGS	Revenue	Profit Margin	Op. Expense
Avg Non-Sustainable (0)	1432.7000	1.8037	0.0073	1.6931
Avg Sustainable (1)	3301.6000	1.6860	-0.0010	1.5117
Difference	-1868.9000	0.1177	0.0083	0.1814
T-value (Pooled)	-1.6100	0.6600	0.2700	0.9800
T-value (Satterthwaite)	-1.6700	0.6600	0.2700	0.9700
Pr > t (Pooled)	0.1148	0.5125	0.7911	0.3332
Pr > t (Satterthwaite)	0.1065	0.5132	0.7861	0.3375

Table 2: A table showing the results of the T-test performed on the four variables and sustainability.

	REGRESSION ANALYSIS			
	COGS	Revenue	Profit Margin	Op. Expense
Parameter Estimate (Intercept)	0.4928	0.7326	0.1017	0.6026
Parameter Estimate (Green Score)	-0.0463	0.0434	0.0278	0.0277
T-value (Intercept)	13.5400	17.6000	9.7600	15.2000
T-value (Green Score)	-0.4800	0.3900	1.0000	0.2600
Pr > t (Intercept)	<0.0001	<0.0001	<0.0001	<0.0001
Pr > t (Green Score)	0.6349	0.6968	0.3187	0.7938

Table 3: A table containing the results of the regression analysis done on the four variables and the green score.

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