DOES IT PAY TO BE SUSTAINABLE? CORPORATE SUSTAINABILITY AND CORPORATE FINANCIAL PERFORMANCE: A STUDY BASED ON THE DOW JONES SUSTAINABILITY INDEX (DJSI)

By

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LIST OF ABBREVIATIONS

CFP	Corporate Financial Performance
CS	Corporate Sustainability
CSR	Corporate Social Responsibility
DID	Difference In Difference
DJGI	Dow Jones Global Indexes
DJSI	Dow Jones Sustainability Index
FD	First Difference
KLD	Kinder, Lydenberg, Domini index of social performance
MVA	Market Value-Added
NASDAQ	National Association of Securities Dealers Automated Quotations (American Stock Market)
NYSE	New York Stock Exchange
OLS	Ordinary Least Squares
PSM	Propensity Score Matching
ROA	Return On Assets
ROE	Return On Equity
ROS	Return On Sales
SAM	Sustainable Asset Management
S&P 500	Standards and Poor's 500

Abstract of Thesis Presented to the Graduate School
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Several attempts have been made to analyze the benefits of creating long term value for shareholders and stakeholders through corporate sustainability (CS), however empirical evidence has been mixed. This thesis has considered some core issues like covering a relatively longer time frame and accounting for the recessionary economic conditions that dominated the selected period. The Propensity Score Matching method was used to select comparable firms for analysis. Then, standardized multi-period panel data on financial performance and First Difference and Difference in Difference methods were applied to address the objectives of the study.

This study proved the existence of a positive association between financial performance and CS, and found that a period of eight years was sufficient to reap the benefits of CS investment. Second, the financial performance of firms was sensitive to the level of CS applied. Third, the recession of 2008-09 had an insignificant influence on the relationship between CS and corporate financial performance (CFP). Fourth, on average, firms continuously practicing CS had an 11.3% higher *Tobin's q* and a 7.1% higher return on assets (ROA) compared to firms that never practiced CS. In addition, on average, the firms that were persistently involved in CS had a higher *Tobin's q* by 6% and a higher *ROA* by 3.1% compared to those firms occasionally

investing in such practices. The significant differences among the three groups of firms persisted since the beginning of the study period in 2000, which suggests that corporate managers can quickly capture the benefits of CS. Fifth, empirical analysis revealed that the *Utilities, Retail Trade, Information* and *Services* industries were more efficient in capturing the benefits of CS investment during the study period of 8 years. Finally, only the *Retail Trade* and *Information* industries were found to be sensitive to the level of CS applied by firms.

CHAPTER 1
INTRODUCTION

Preamble

Firms that operate in a complex global environment constantly search for competitive advantages to ensure they are capable of creating value in the long-term (López et al. 2007). These firms are incentivized by their internal and external stakeholders to initiate and implement a variety of sustainable practices into their operations (Searcy and Elkhawas 2012). The concept of sustainability is generally perceived as the potential for long-term maintenance of well being of all stakeholders. It integrates the considerations of economic growth, social equity and environmental protection. When firms adopt sustainable practices, it is referred to as Corporate Sustainability (CS). Corporate sustainability is a business approach that considers all social, cultural, and economic dimensions to create long-term value that is not limited to shareholders only, but towards the natural environment as well. It is an investment strategy that ideally seeks to balance the needs of present and prospective stakeholders (Report of the United Nations World Commission on Environment and Development 1987). This presupposes that gaining competitive advantage while maintaining a balance between investors' needs and resource availability in the future is a complicated objective. Therefore, CS measures the firm's capability to adopt economic, environmental and social dimensions into its operations, and how such adoption will be effectively reflected on the firm itself and the society (Artiach et al. 2010). Adopting sustainable activities that contribute to sustainable development is professed as engaging in corporate social practices as well (Lacy et al. 2010).

Although, CS is the most commonly used concept to address such goals, there are several researchers who conceptualize the affiliation between corporations and society as Corporate Social Responsibility (CSR) (Lourenc et al. 2012). Both CS and CSR are widely acknowledged

and related to the concept of sustainability (Holme and Watts 2000). In this study, we focused more on CS since it is the most broadly used concept, although some authors still argue that these two concepts are distinct (Cheung 2011; Lo and Sheu 2007; López et al. 2007).

Researchers are interested in studying the impact of adopting sustainable practices, which has led to the emergence of sustainability indexes. This study focused on the Dow Jones Sustainability Index (DJSI), specifically the Dow Jones Sustainability Index North America (DJSI NA). The (DJSI) was established in 1999 and is the first ever family of global sustainability stock market investment benchmarks and is the largest global resource for index-based concepts, data and research; it has become a reference point in sustainability investing. In addition, the study utilized the Standard and Poor's 500 (S&P 500) which is a stock market index based on the market capitalization of 500 large companies having common stock listed on the NYSE or NASDAQ.

Researchers have investigated the relationship between CS and corporate financial performance (CFP); however, findings have been inconsistent. Although, the association is still debatable among researchers, they have agreed that, over a longer time period, sustainable practices can be managed to produce new strategic opportunities and control the accompanying risks.

Justification of the Research Problem and the Expected Contribution

Since it could be hard to detect the true relationship in a short time horizon, researchers suggest considering a longer time frame for those firms that adopt sustainable practices, which in turn could strengthen the detected relationship. Although firms could improve their profitability during the beginning years of their involvement in sustainable activities, this benefit could be offset later by incurring greater costs or a reallocation of resources. Therefore, the general performance of firms may not reflect any improvement, which can be misinterpreted as no

association between CS and CFP. Researchers have reported diverse findings. Factors like the length of the study period, the length of time since firms first started investing in CS, and the general economic conditions during the selected period could significantly alter the results. Accordingly, this research has considered these issues by covering a relatively longer time frame and observing firms for up to 4 years after starting to invest in CS. In addition, this study accounted for the recessionary economic conditions that dominated the selected period.

Since the time frame of this study is from 1999 to 2012, there is a need to account for the financial crisis that affected the U.S. and global economy during the time frame of the study. It is commonly acknowledged that recessions influence corporate performance, which in turn may confound our main objective of clearly detecting the relationship between CS and CFP. Specifically, we are interested in whether the recession could either enforce or mitigate the association between CS and CFP. This is the first attempt that analyzes the impact of a recession on the relationship between CS and CFP. Moreover, to ensure high quality findings, we constructed the data carefully in order to detect any phenomena that may lower the precision of the coefficient estimates. Such phenomena are expected to be one of the causes of the inconsistency in the results of previous studies in this field. Data construction is one of the strengths of this study, which in turn gives our results a higher level of confidence. Furthermore, this study evaluated the effect of CS among industries to determine which industries are faster in absorbing the benefits of adopting sustainable practices.

Additionally, the methodology followed in this study is different than previous studies in two ways. First, we applied the Propensity Score Matching (PSM) method to ensure that the selection of companies is balanced, and thus, the comparisons are better than previous work. This method is advantageous in formulating the distribution of observed baseline covariates in

order to equalize these measures between treated and untreated subject firms (Austin 2011). Second, we used the Difference in Difference (DID) method for panel data using the First Difference (FD) to analyze the relationship. The method is effective for this research since outcomes are observed for two time periods and two groups, one of which is the treatment group. The well known two-period panel data FD and DID model is applied here, but because several periods were analyzed, we refer to it as multi-period panel data FD and DID. The multi-period panel data FD and DID method is also re-formulated to account for the recession and annual growth of firms continuously listed in the index. Empirical analysis is expected to detect a clear relationship between CS and CFP and expose differences in performance between firms that always engage in CS and those firms that never used such practices.

Objectives and Hypotheses of the Study

The first objective of this study is to test whether there was a significant difference in financial performance between firms that continuously practiced sustainability activities and those firms that never invested in such practices while accounting for the persistence of sustainability effects during the global recession of 2008-09. The second objective is to determine whether corporate performance is sensitive to the level of corporate sustainability (CS) activities utilized by firms and if such sensitivity persisted during the 2008-09 recession. The third objective has two parts. The first part aims to find out by how much these persistently listed firms gained compared to the firms that have never been listed. The second part is to determine by how much these persistently listed firms gained compared to firms that were dropped from the listing at certain points. The fourth objective is to analyze the effects of CS among industries by determining which industries were faster in absorbing the benefits of investing in CS, and secondly, by testing the sensitivity of industries to the level of CS applied by firms.

The Dow Jones Sustainability Index

The Dow Jones Sustainability Group Index is the most commonly used index in similar studies due to its excellent reputation and high quality assessment (Lo and Sheu 2007; López et al. 2007; Consolandi et al. 2009; Cheung 2011; Robinson et al. 2011; Ziegler and Schröder 2010). Due to the increasing interest in sustainability and its long-term value creation to corporations and shareholders, organizations have invested in developing such indexes. Corporate sustainability criteria are employed to generate economic, environmental and social benefits and control risks associated with them. A study conducted by SustAinability (2004) concluded that the requirements for firms to be assessed under DJSI are more far reaching than in other indexes that perform sustainability assessment. The DJSI defines sustainability as the follows:

> Sustainability is a company's capacity to prosper in a hypercompetitive and changing global business environment. Companies that anticipate and manage current and future economic, environmental and social opportunities and risks by focusing on quality, innovation and productivity will emerge as leaders that are more likely to create a competitive advantage and long-term stakeholder value. (DJSI guidebook 2012)

Companies that are managed to respond efficiently to challenges and strategic opportunities offered by global and local markets are assessed by DJSI and identified as sustainable companies due to their ability to generate long term value to shareholders. The index also performs comparisons of these sustainable companies against their competitors within their industries to identify sustainability leaders. Firms included in the DJSI North America consist of the top 20% of the 600 largest firms from Canada and the United States in the S&P Global Broad Market IndexSM that lead the field in terms of sustainability (DJSI guidebook 2012)[1]. The Sustainable Asset Management (SAM) group evaluates the sustainability activities of

[1]The DJSI Guidebook is available at http://www.sustainabilityindex.com.

prospective firms. The methodology of SAM captures both universal and specific-to-industry criteria for evaluating economic, environmental and social dimensions of sustainability (DJSI guidebook 2012). All companies are eligible to participate in the assessment. For non-participating companies, the organization RobecoSAM reserves the right to assess them using the same methods and tools based on their disclosed information for public purposes to ensure a best-in-class assortment. Companies are assessed and assigned a score between 0-100, then ranked against other companies within the same industry. Lastly, the top 10% of firms from each industry are listed in the Dow Jones Sustainability World Index.

Accordingly, firms continually enhance their sustainability activities to ensure their inclusion in the index. An increasing number of firms have a strategic goal to be continuously listed in the index. Consequently, the there is competition for index membership, which in turn encourages companies within the same industry to participate in sustainability.

Researchers consider studies based on the DJSI to contribute to the research literature since there is a consensus that the index is a good proxy for CS (Garcia-Castro et al. 2010; Waddock and Graves 1997; McWilliams and Siegel 2000; Becchetti et al. 2005).

The Recession of 2008-2009

The National Bureau of Economic Research (the official arbiter of U.S. recessions), defines the term recession as:

> A general slowdown in economic activity, a downturn in the business cycle, a reduction in the amount of goods and services produced and sold; these are all characteristics of a recession. (BLS spotlight on statistics 2012)[2]

[2]BLS spotlight on statistics 2012 is available at http://www.bls.gov/spotlight/2012/recession/pdf/recession_bls spotlight.pdf

They declared that the U.S. suffered ten recessions between 1948 and 2011. The latest one began in December 2007 and ended in June 2009, although many indicators suggest that the U.S. economy still has not achieved a full recovery from this latest recession. The duration of this recession is within the time frame of this study, which motivated an interest to analyze whether the 2008-2009 financial crisis had an impact on the relationship between CS and CFP (BLS spotlight on statistics 2012). Moreover, this recession represents an economic condition that may cause misleading findings if not accounted for.

The second chapter of this thesis provides a review of literature on the definition of sustainability and the analytical methods used to estimate the relationship between CS and CFP. The third chapter explains the methods followed to gather data and identify the variables for analysis of CS and CFP. The fourth chapter presents the analytical methodology adopted in this study to estimate the relationship between CS and CFP. The fifth chapter describes the data management procedures used in this study. The sixth chapter describes the statistical results of the analysis. The seventh chapter summarizes the key findings and conclusions.

CHAPTER 2
LITERATURE REVIEW

Definition of Sustainability

The concept of sustainability is one of the set of terms that has materialized in the fields of natural resources, management research and applied ecology. Although this concept is generally understood as a good thing, it still conjures up different thoughts by environmental scientists and managers. Sustainability is a favorable and appealing mechanism in the world of "green" investments.

Researchers have tried to bring a common definition for emerging terms over the past decade, such as sustainability. Their main objective was to give a rationale for a definition of sustainability that will provide a common ground for future communication and management action (Allen and Hoekstra 1993).

The concept of sustainability has been used widely in several disciplines and a variety of contexts. The meaning of it depends heavily on the applied context; it could have a social, economic or ecological meaning. The definition can be narrow or broad depending on the issue being considered (Brown et al. 1987). Therefore, it is truly hard to find a single definition for the concept of sustainability and there is no commonly used method of measuring it (López et al. 2007). However, since sustainability creates value, it is essential to agree on a method to define and measure it. The concept of sustainability is generally perceived as the potential for long-term maintenance of well-being. It integrates considerations of economic growth, social equity and environmental protection.

Corporate Financial Performance and Corporate Sustainability

The incentive to gain competitive advantage encourages companies to engage in sustainability activities. These activities are acknowledged to provide internal and external

benefits to companies (Branco and Rodrigues 2006; Orlitzky et al. 2003). Internally, investment in current and future economic, environmental and social opportunities provides benefits by focusing on quality, innovation and productivity, and helps companies in developing new resources and capabilities which are related to improving their profitability. Also, CS can positively impact employees' productivity and performance by affecting their motivation and morale, toward being committed and loyal to the company (Brammer et al. 2007), thereby enabling companies to save on expenses for recruitment and training of new employees (Vitaliano 2010). Externally, engaging in CS has a positive effect on corporate reputation (Gallego-Alvarez et al. 2010; Hussainey and Salama 2010; Orlitzky 2008). Improved reputation has been recognized as an important invisible endowment that supplies sustainable advantage to a firm over its competitors (Roberts and Dowling 2002). So, these companies would be able to establish better relations with customers, investors, bankers, suppliers, and competitors as well as attract high qualified employees, which in turn improve financial performance. For a company to maintain access to scarce resources, it needs to nurture relationships with key stakeholders who control access to resources (Roberts 1992).

Although the findings of previous research have been inconsistent, it is agreed among researchers that, over a longer time period, sustainable practices can be managed to produce new strategic opportunities and control risks. CS requires firms to disclose more information than those is typically required for U.S. corporations (López et al. 2007) and to invest in training, product quality and safely (Waddock and Graves 1997). So, over the short term, expenses for implementation of CS practices could exceed the incremental revenue that such practices generate (Simpson and Kohers 2002. p. 102). López et al. (2007) have indicated in their study the following:

> Another factor is that assigning resources to investments that take into account sustainability criteria depends on the availability of surplus funds, or on the allocation of resources that were destined a priori to another purpose. This may affect profit, since the availability of funds is limited. Only in the long-term can the firm plan to obtain new funds to finance practices that require larger investments.

So, it is suggested that only in the long run can firms acquire the benefits of their implemented sustainability activities. Since there is no consensus on what "long-term" means and because of the period of record for the DJSI, the maximum possible period to identify the firms that continuously practice CS is from 2005 to 2012[1]. We are interested to determine if it pays to be sustainable in about eight years of continuously practicing sustainability[2].

Correlation between CS and CFP: Three perspectives

Fairly few research papers have been published that analyzed the link between adopting sustainable practices and the effect on the firm's performance. These studies report different and contradictory results. The cause of such inconsistent results is explained by the fact that they followed different methodologies and used different measures of sustainability (Griffin and Mahon 1997; Simpson and Kohers 2002). Some researchers have indicated no clear or neutral relationship between CS and CFP (Curran and Moran 2007; Garcia-Castro et al. 2010; Surroca et al. 2010; McWilliams and Siegel 2000). A majority of studies, however, have found a positive (increasing) or weakly positive association (Waddock and Graves 1997; Berman et al. 1999; Graves and Waddock 2000; Hillman and Keim 2001; Margolis and Walsh 2003; Doh et al. 2010; Lo and Sheu 2007; Consolandi et al. 2009; Robin-son et al. 2011; Wagner 2010; Artich et al. 2010; Cheung 2011; Lourence et al. 2012). A third group of researchers found a negative relationship between CS and CFP (López et al. 2007).

[1] This is the treatment period for this study, as discussed in the Methods Chapter.

[2] The majority of firms in the sample have been practicing sustainability prior to 2005. The data showed they all started CS activities during the period of 2001-2004.

Researchers, who found no clear and direct relationship between CS and CFP, construed from their findings that the association is complex, and there are unobserved intervening influences that cannot be controlled and managed. For these reasons, Ullmann (1985) advocated that the existing theoretical presentations are insufficient to imply a direct clear relationship (Artiach et al. 2010).

For studies that found a positive association between CS and CFP, the research can be divided into three groups in terms of interpreting the reason for this positive relationship. First, some researchers indicated that the financial payback from adopting sustainable practices exceeds the costs of initial investment (McGuire et al. 1988; Barnett 2005). Another group of researchers based their interpretations on stakeholder theory which argues that investing in CS improves the financial performance by ideally managing stakeholders (Artiach et al. 2010). A third group argues that firms that invest in CS have greater resources and that they are more capable to adopt sustainability into operations and management. Having greater resources will ultimately be translated to higher financial performance (Alexander and Buchholz 1978; Waddock and Graves 1997; Clarkson et al. 2006; Artiach et al. 2010).

Finally, researchers who found out a negative relationship between CS and CFP argued that investing in corporate sustainability is costly (Alexander and Buchholz 1978; Becchetti et al. 2005). Those firms need to reallocate resources in order to meet sustainability standards such as adopting environmentally friendly practices, social and community development, employee training, improving working conditions, conducting promotions and making corporate donations (Artiach et al. 2010).

Researchers recommended that variation and ambiguity of previous studies in this area is likely due to application of diverse methodologies (Cochran and Wood 1984; Aupperle et al.

1985; Ullmann 1985; Pava and Krausz 1996; Barnett 2005). In Table 2-1, which summarizes previous studies that are the closest in nature and purpose to this study, it can be noticed that it is hard to find common ground among them, with different scope and methods. There is noticeable variation in the selected measures of CS and CFP, time periods examined and hypothesis tested.

López et al. (2007) and Lourenc et al. (2012) are the most closely related studies to this study as they based their studies on the Dow Jones Sustainability Index (DJSI) as well. López et al. (2007) examined the association between corporate performance and the adoption of corporate social responsibility (CSR) as a proxy for sustainable practices for two groups of 55 European firms during the period 1998-2004. Corporate performance was measured by the growth of profit before tax. The effect of CSR on profit before tax was estimated by regression analysis. On the other hand, Lourenc et al. (2012) studied CFP and its effects on the market value of equity for a sample of 600 Canadian and American firms from 2007 to 2010 using regression analysis.

Table 2-1. Summary of previous studies

Study	Waddock and Graves (1997)[3]	Berman et al. (1999)[3]	Graves and Waddock (2000)[3]	McWilliams and Siegel (2000)[3]
Year	1989-1991	1991-1996	1991-1997	1991-1996
Data	469 American companies belonging to Standard and Poor's 500 in 13 industries	81 American Fortune 500 companies in different industries	11 pairs of firms	524 companies
Financial Performance	ROE, ROA and ROS	ROA	ROE, ROA and ROS	ROE and ROA
Sample	Cross-sectional	Longitudinal/ panel	Longitudinal	Cross-sectional
Using DJSI	No	No	No	No
Account for Recession[4]	Not applicable	Not applicable	Not applicable	Not applicable
Method	OLS	Pooled times series model and two-step GLS	Trend analysis, T-tests	OLS
The detected Relationship	Positive	Positive	Positive	Neutral
Findings	Sustainable performance leads to better financial performance	Financial performance is positively affected with consumers and employees	Increasing positive relationship between financial performance and sustainable practices	The effect on financial performance changes as specifications of the model change

[3] (Garcia-Castro et al. 2010)

[4] Applicable when the study time frame covered 2008-2009

Table 2-1. Continued

Study	Hillman and Keim (2001)[3]	López et al. (2007)	Garcia-Castro et al. (2010)[3]	Artiach et al. (2010)
Year	1994, 1995, 1995	1998-2004	1991-2005	2002–2006
Sample	308 American Fortune 1000 and Standard and Poor's 500 companies belonging to different industries	Two groups of European firms: 55 firms included in the DJSI, and 55 European firms belonging to the DJGI	658 companies in KLD and Datastream	26 firms from the S&P 500 are included in the index every year for the sample period, whilst 81 firms are occasionally included
Financial Performance	MVA	Profit before tax	Tobin's Q, MVA, ROA,ROE	CSR (Dummy variable)
Data	Cross-sectional	Panel	Longitudinal/ Panel	Panel
Using DJSI	No	Yes	No	Yes
Account for Recession	Not applicable	Not applicable	Not applicable	Not applicable
Method	OLS	Regression analysis and hypotheses testing	OLS, fixed effect and random effects estimations	T-test and Wilcoxon-signed ranks test, the fixed effects model
The detected Relationship	Positive	Negative	Biased by unobserved firm-specific variables	Positive
Findings	The association between stakeholder management and shareholder value creation (MVA) is positive	Differences in performance exist between firms that belong to the DJSI and to the DJGI and these differences are related to CSR practices. A short-term negative impact on performance	Positive relationship between social performance and financial performance, but estimations were non-significant	Leading firms that are significantly larger have higher levels of growth and a higher return on equity than conventional firms

Table 2-1. Continued

Study	Cheung (2011)	Lourenc et al. (2012)	This study (2014)
Year	2002–2008	2007-2010	1999-2012
Sample	139 firms that were added to or deleted from the DJSI during the period of 2002–2008	A sample of 600 Canadian and American firms from 2007 until 2010	A sample of 493 firms in the U.S. during the period 1999 to 2012
Financial Performance	Stock return, risk and liquidity. Liquidity: measured by trading volume and proportional bid–ask spread	Market value of Equity (MVE)	(1/Tobin's q) and ROA
Data	Time series	Panel	Panel
Using DJSI	Yes	Yes	Yes
Account for Recession	No	No	Yes
Method	Event study methodology	OLS and Breusch-Pagan LM test	Propensity Score Matching Method and multi-period panel data FD and DID model
The detected Relationship	No clear relationship	Positive	Positive
Findings	No significant impact on stock return and risk. Liquidity deteriorates	There is association between Market value of Equity and CSP, this relationship is affected by the size and profitability of the firm	Positive association between CS and CFP. Firms' performance is sensitive to the level of CS applied. Recession has no influence on such associations

CHAPTER 3
METHODS

Sample Selection

To keep in line with the main objectives of this study, which is investigating the relation between CS and CFP over a longer period of time, and based on DJSI NA, we need to divide the sample into three groups of American firms. The first group is those firms that were always included in the index during the period 2005 to 2012, however, they should not have been listed in the index during the period of 1999-2000, since this is the baseline period of this study and we need to ensure the absence of the treatment as we will discuss in more detail in the Methodology chapter. The second are firms that were occasionally listed during the same period. In the second group, firms are added and removed at certain points since the index was established. These firms are referred to in this study as having a low level of corporate sustainability (CS). The last group represents firms that were never listed in the index as they have never satisfied its requirements. We rely on the S&P 500 to identify this group.

The data showed that 59 American firms the index tracks that lead the field in terms of sustainability by virtue of practicing sustainability for 8 years continuously. Based on the index, eleven companies out of the 59 have been investing in CS since 1999-2000, so these 11 firms cannot be included in this study due to their involvement in CS during the baseline period. The remaining 48 firms represent the first group. Another 84 firms are included in the second group which represents non-continuously sustainability practitioners.

Corporate financial performance data for a total sample of 493 firms in The United States of America during the period 1999 to 2012 is covered in this study. The period of 1999-2000 is the baseline as it is required by the applied methodology. The range of 1999-2000 cannot be expanded to cover more years since this would exclude more firms from the 48 firms that

constitute the first group. The lists of corporations were obtained from the DJSI which is the exclusive owner of such data and the financial data were retrieved from the COMPUSTAT Database. The COMPUSTAT Database belongs to Wharton Research Data Service, developed in 1993 by the Wharton School at the University of Pennsylvania. It has become a common tool for research by over 290 institutions around the world. The SAS and Minitab16 software were used for analyses of the data.

Variables and Measures

Dependent Variables

In order to measure the corporate financial performance, different researchers have used different indicators as shown in Table 2-1. Particularly, López et al. (2007) focused on analyzing the growth of profit before tax and growth in revenue. However, King and Lenox (2001) analyzed the financial performance by using Tobin's q, which is a measure of the market valuation of a firm relative to the replacement costs of tangible assets (Lindenberg and Ross 1981). It simply means the cash flow a firm will be able to generate by investing one more dollar in assets (King and Lenox 2001). An increase in Tobin's q reflects better expectations about future cash flows. Tobin's q can be calculated in various ways. We will be consistent with the recent studies by using a simplified measure of it. In this study, Tobin's q is calculated by dividing the sum of firm equity value, book value of long-term debt, and net current liabilities by the book value of total assets (King and Lenox 2001).

In order to double check the relationship under consideration in this study, we used both return on assets (*ROA*) and *Tobin's q* as the dependent variables. These two variables are ones of the most commonly used in the literature.

Independent Variables

A dummy variable for corporate sustainability investment (D_i) is introduced to the model, it represents the group to which a firm belongs (continuously adopting CS, non-continuously involved in CS, or never invests in CS). To account for the effect of the 2008-09 recession, we introduced a dummy variable (Rec_i), where Rec_i equals 1 for 2008 and 2009, and 0 otherwise. In addition, the overall market performance influences the detection of a possible relationship between CS and CFP. Good market conditions versus bad market conditions could strengthen or weaken the effect of sustainability on firms' performance. Consequently, the variable $Year_i$ is added to the model, where $Year_i$ ranges from 1999 to 2012.

Control Variables

So as to use firms with similar characteristics and to ensure the homogeneity of the three groups analyzed, we include a number of measures commonly employed in the analysis of financial performance as controls (King and Lenox 2011). Additionally, controlling for these variables guarantees that the change in the firm's corporate performance is explained only by being involved in sustainable practices. These measures include *firm size*, calculated by taking the log of total assets. The size of the firms is a vital factor that could positively affect financial performance. Larger corporations generally have greater access to resources which in turn may exaggerate their profitability in comparison to small-size firms. Second, *capital intensity* which is presented in the model as capital expenditures divided by sales. Capital intensity is defined as the amount of current real and fixed capital relative to other available production factors, such as labor. It is acknowledged among researchers that the utilization of machinery and equipment raises productivity of labor which in turn improves the overall performance (Jorgenson and Vu 2005). Third, *annual growth*, calculated as the percentage change in sales, noticeably impacts profitability. Fourth, *leverage ratio* is calculated as the ratio of debt to assets, and is used to

assess a firm's ability to meet its financial obligations when they become due[1]. The mix of debt and equity used by the firm can seriously affect its performance. Fifth, *research and development intensity* (*R&D intensity)* is added to the model and is obtained by dividing in-process research and development expenses by total assets. Researchers believe that investing in research and development brings new technologies that lead to an increase in net return in the long term. Finally, we considered the *industry sector* which is determined by 4-digit Standard Industrial Classification (SIC). The association between CS and CFP naturally differs among different industries. Researchers suggests that some industries are faster to absorb the benefits of CS than others, which has motivated us to go further in the analysis and classify the firms by industry sector in order to determine which industries are faster in absorbing the benefits of investing in CS. The classification is done after applying the PSM method. Based on the DJSI data, we determined that the firms constituting our sample groups belong to 15 different industry sectors, which were then grouped into 7 industry sectors based on the North American Industry Classification System[2]. These seven groups are Services, Information, Utilities, Financial, Mining, Retail Trade and Manufacturing. Note that we avoided absolute values; the entire data was scaled in an attempt to remove other characteristics of firms or industries that could affect financial performance aside from involvement in sustainability activities.

[1] Investopedia website, available at http://www.investopedia.com/terms/l/leverageratio.asp

[2] North American Industry Classification System is available at https://www.census.gov/cgi-bin/sssd/naics/naicsrch?chart=2012

CHAPTER 4
METHODOLOGY

Propensity Score Matching Method (PSM)

Rosenbaum and Rubin (1983a) have defined the propensity score as the probability of treatment assignment conditional on observed baseline covariates, so the covariates distribution between treated and untreated subjects are alike. The propensity score matching method can be applied in randomized and non- randomized studies. In non- randomized studies, the true propensity score is unknown but can be estimated using data from the study. The propensity score is most commonly obtained by applying a logistic regression model, in which the treatment group is regressed on characteristics of the baseline (Austin 2011).

This method forms matched sets of treatment and non-treatment groups who have similar characteristics, represented by obtaining similar values of the propensity score (Rosenbaum and Rubin 1983a and 1985). One of the advantages of using such an approach is that it ensures that the treatment group will not be confounded with either measured or unmeasured baseline characteristics. The second advantage is that once matched groups have been identified, the impact of the treatment can be directly analyzed by comparing the outcomes of treated and untreated subjects (Greenland, Pearl and Robins 1999).

For the above mentioned reasons, PSM is employed in this study to ensure that the grouping procedure of companies is balanced, and thus, the comparisons are valid.

In order to get the best matched groups of firms, we need to run the following probit (or logit) model for the pre-treatment period 1999-2000:

$\{Treatment=1\} = \Omega\,(f\,(Xi))$

$$\Pr\{D_i=1\} = \Omega\,(\textit{firm size} + \textit{capital intensity} + \textit{annual growth} + \textit{leverage ratio} + \textit{R\&D intensity}) \quad (4\text{-}1)$$

where Ω is the normal logistic and D_i represents the treatment group, so it equals 1 for firms that continuously practice CS. Other variables are taken as covariates in normal linear terms. We ran the model in equation (4-1) twice, first to get the best matched firms from the group of never invested in CS, and second to get a similar matched group from the firms occasionally investing in sustainability practices, in order to compare both of these groups to the treatment group. The results of the application of the PSM model assigns a probability score for each firm ranging from 0 to 1. The firms that were close in terms of covariates to the continuously listed firms get a probability close to 1 and these were chosen for comparison purposes.

Analysis of the Relation between CS and CFP

We use the Difference in Difference (DID) method to analyze the relationship between CS and CFP. The DID method is a technique used in econometrics that measures the effect of a treatment at a given period of time. It is often used to measure the change induced by a particular treatment or event (Abadie 2005). Generally, the DID equation is commonly expressed as follows:

$$Y_i = \beta_0 + \beta_1 \ D_i + \beta_2 \ T_i + \beta_3 \ D_i * T_i \ + \varepsilon_i \qquad (4\text{-}2)$$

where *Di* is the treatment, T_i is the treatment period, the interaction term represents the treatment status, β_3 is the DID estimator, which reflects the difference between the treatment group and the control, and ε_i is the error term. However, equation (4-2) is not sufficient to analyze our data, because we need to apply it along with the First Difference (FD) method. The FD method is an approach used to solve the problem of omitting relevant variables in panel data. It also removes time invariant omitted variables (V_i) using repeated observations over time, which can be expressed as the following.

$$Y_{it} = \beta_0 + \beta_1 X_{it} + V_i + \varepsilon_{it}, \; t=1999,\ldots\ldots,2012 \quad (4\text{-}3)$$

$$Y_{it-1} = \beta_0 + \beta_1 X_{it-1} + V_i + \varepsilon_{it-1}, \; t=2000,\ldots\ldots,2012 \quad (4\text{-}4)$$

where, X_{it} represents independent variables. Differencing both equations, gives:

$$\Delta Y_{it} = Y_{it} - Y_{it-1} = \beta_1 \Delta X_{it} + \Delta\varepsilon_{it}, \; t= 2000,\ldots\ldots,2012 \quad (4\text{-}5)$$

This latter equation cancels out the invariant unobserved effect V_i (Wooldridge and Jeffrey 2001). This method is advantageous to guarantee that the change in performance of firms is only a result of being involved in CS.

By combining the DID and FD methods, we get the two-period panel data FD and DID, but we re-formulated the later since we have multiple periods and we need to add several interaction terms in a way that satisfies our technical objectives. The multi-period panel data FD and DID model is discussed in detail in the following sections of this chapter.

The DID method has the same assumptions as Ordinary Least Squares (OLS) regression:

- Simple random sample ~ satisfied.
- Quantitative response, Y_i ~ satisfied since both *Tobin's q* and *ROA* are quantitative values.
- $\varepsilon \sim N(0, \sigma^2)$, error terms are independent and normally distributed with mean 0 and constant standard deviation σ for every combination of explanatory variables~ satisfied. This assumption is tested and Figure 4-1 shows the approximate normality of the residuals since it takes the shape of a standard bell curve.
- $Y \sim N(\mu_y, \sigma^2)$, where μ_y changes with every combination of explanatory variables, but σ is the same for all combinations~ satisfied and discussed in detail in the next chapter.

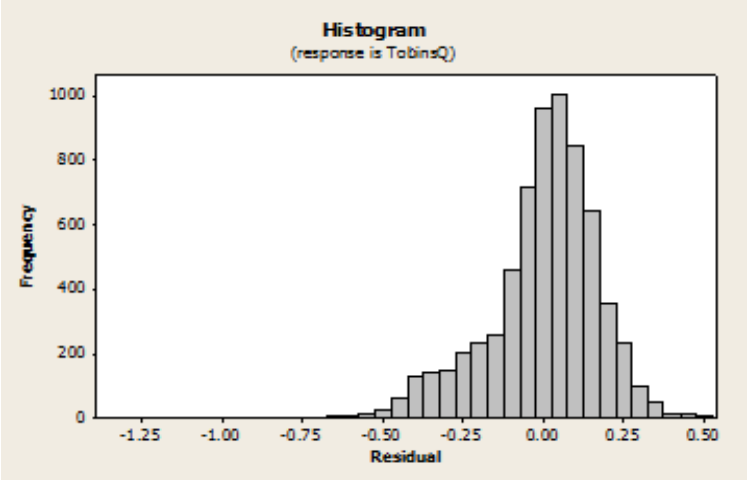

Figure 4-1. Histogram of residuals

Application of the Multi-Period Panel Data FD and DID Model: Model 1

The multi-period panel data FD and DID model can be expressed as the following.

$$Y_{it} = \beta_0 + \beta_1 D_{it} + \beta_2 T_{it} + \sum (\beta_i X_{it}) + V_i + \varepsilon_{it},\ t= 1999,\ldots..,2012 \quad (4\text{-}6)$$

$$Y_{it-1} = \beta_0 + \beta_1 D_{it-1} + \beta_2 T_{it-1} + \sum (\beta_i X_{it-1}) + V_i + \varepsilon_{it-1},\ t= 2000,\ldots..,2012 \quad (4\text{-}7)$$

Differencing both equations, gives:

$$\Delta Y_{it} = Y_{it} - Y_{it-1} = \beta_2 + \beta_1 \Delta D_{it} + \sum \Delta(\beta_i X_{it}) + \Delta\varepsilon_t,\ t= 2000,\ldots\ldots..,2012 \quad (4\text{-}8)$$

The latter equation cancels out the invariant unobserved effect V_i. The term T_{it} is a dummy for the time period that equals 1 for the treatment period 2005-12 and 0 otherwise. It does not vary across firms, and by applying the FD this term always gets the value of 0, except for year 2005 where it equals 1 (2005-2004 = 1 – 0 =1); which can be understood as (treatment period – control period = 1- 0 = 1). So, we will deal with it as with the case of a two-period model, where the intercept is replaced by a period effect β_2 (ΔT_{it} = 1 for all units), as shown in equation (4-8) above. The term ΔD_{it} varies across firms and over time, as either 0 or 1. If we designate A as the control group and B as the treatment group, then we can summarize it as $\Delta D_{i \in A} = 0$ and $\Delta D_{i \in B} = 1$. We notice in equation (4-8), the interaction term between the treatment and the treatment period $(\Delta D_{it} * \Delta T_{it})$ is dropped since ΔT_{it} equals 1, so it is the same as

ΔD_{it}. However, in this study, there is a need to include the interaction term since we have a gap of 4 years (2001-2004) between the control period (1999-2000) and the treatment period (2005-2012). Therefore, we should re-emphasize the treatment period after taking the first difference. Then, we can determine the DID estimator from equation (4-9), as shown in Table 4-1. The term $\sum \Delta(\beta_i X_{it})$ represents all control variables after taking the first difference. The equation in (4-9) is our reference model in for all the analysis.

$$\Delta Y_{it} = \beta_2 + \beta_1 \Delta D_{it} + \beta_3 \Delta D_{it} * T_{it} + \sum \Delta(\beta_i X_{it}) + \Delta\varepsilon_t,\ t= 2000,\ldots\ldots..,2012 \quad (4\text{-}9)$$

Table 4-1. Multi-period panel data FD and DID estimator

	Post-Treatment Period	Pre-Treatment Period	Difference
D_1 (treatment)	$\beta_{2+}\beta_1 + \beta_3 + \sum\beta_i$	$\beta_1 + \sum\beta_i$	$\beta_{2+}\beta_3$
D_3 (control)	$\beta_2 + \sum\beta_i$	$\sum\beta_i$	β_2
Difference			$\{\beta_3\}$

The objective of Model 1 is to detect the association between CS and CFP by comparing firms that invest continuously in CS and those which have never invested in CS, with the latter taken as the baseline. In addition, we will test the impact of the recession 2008-09 on this relationship. The dummy variable Rec_i and the interaction term of Rec_i and ΔD_i are added to the reference equation in (4-9), as shown in equation (4-10) below. The interaction term is needed because these variables may be interacting and the effect of Rec_i on the dependent variables will rely on whether the firm has CS or not. Additionally, we are interested in finding out by how much these always listed firms gain annually compared to those firms which have never been listed. Therefore, we add the variable $Year_i$ and the interaction term $Year_i * \Delta D_i$ to the reference model to address this question, as shown in equation (4-10) below. Finally, the interaction terms between each industry sector and ΔD_i are attached to the reference equation as well to achieve our fourth objective of determining which industries are faster in absorbing the benefits of CS.

Then, we apply standardized regression to equation in (4-10) in order to put all our coefficient estimators on an equal basis and therefore can compare them directly. In other words, we can use the beta coefficients as a measure of relative strength of the regressor variables. Standardization is attained by taking the difference of each variable from its mean and dividing by the standard deviation. Therefore, we can compare directly the performance of our three groups of firms (β_7) and the performance across different industries (β_{13} to β_{18}).

$$\begin{aligned}\Delta Y_{it} = {} & \beta_2 + \beta_1 \Delta D_{it} + \beta_3 \Delta D_{it}{*}T_{it} + \beta_4 Rec_{it} + \beta_5 Rec_{it}{*}\Delta D_{it} + \beta_6 Year_{it} + \\ & \beta_7 \ Year_{it}{*}\Delta D_{it} + \beta_8 \Delta firm\ size_{it} + \ \beta_9 \Delta capital\ intensity_{it} + \\ & \beta_{10} \Delta annual\ growth_{it} + \ \beta_{11} \Delta leverage\ ratio_{it} + \ \beta_{12} \Delta R\&D\ intensity_{it} + \\ & \beta_{13} Services_i{*}\Delta D_{it} + \beta_{14} Information_i{*}\Delta D_{it} + \beta_{15} Utilities_i{*}\Delta D_{it} + \\ & \beta_{16} Financial_i{*}\Delta D_{it} + \beta_{17} Mining_i{*}\Delta D_{it} + \beta_{18} \ Retails_i{*}\Delta D_{it} + \\ & \Delta\varepsilon_t,\ t= 2000,\ldots\ldots,2012\end{aligned} \qquad (4\text{-}10)$$

To answer our first concern in this study, we test the following hypothesis:

H1: There is a difference in financial performance between firms that continuously practice sustainability activities and those firms that have never invested in such practices and such difference persists during the recession's time. $B_3 + \beta_5 \neq 0$.

The interpretation of β_7 answers the first part of our third objective, by how much these always listed firms gain annually compared to those firms which have never been listed. The significance of the coefficient estimators β_{13} to β_{18} indicate which industries are more efficient in absorbing the benefits from CS, which addresses the first part of our fourth objective.

Application of the Multi-Period Panel Data FD and DID Model: Model 2

The objective of Model 2 is to test if there are differences in performance among corporations that invest in different levels of CS, which reflects how corporate performance is sensitive to the level of CS utilized by firms. In this model, we focus on firms that continuously invest in CS and firms that non-continuously invest in CS, with the latter taken as the baseline. Keeping all conditions the same as equation (4-10).

To answer our second objective, the following hypothesis will be tested:

H1: Corporate performance is sensitive to the level of CS invested by firms and such sensitivity persists during the recession. $B_3 + \beta_5 \neq 0$.

The interpretation of β_7 answers the second part of our third objective, i.e. by how much these always listed firms gain compared to those which are occasionally listed. Similarly, the significance of the coefficient estimators β_{13} to β_{18} answer the second part of our fourth objective, regarding which industries are more sensitive to the level of CS applied by firms.

CHAPTER 5
DATA CONSTRUCTION

Analysis of Residuals and Exposing Outliers

It is required to check the existence of outliers in the data, which may mislead final results. An outlying observation is an observation that is much different in relation to the observations in the sample. In addition, outliers are one of the sources of heteroskedasticity, a problem that is discussed later in this chapter.

Probability plot of residuals is one of the statistical tools used to expose outliers. Figure 5-1 shows that the data has six outliers, which are located beyond 2 and -2 standard deviations in the figure. Since the causes of these outliers in the data are unknown, it is not a wise decision to discard them immediately. We need to investigate their impacts on the study results, and then carefully deal with this issue.

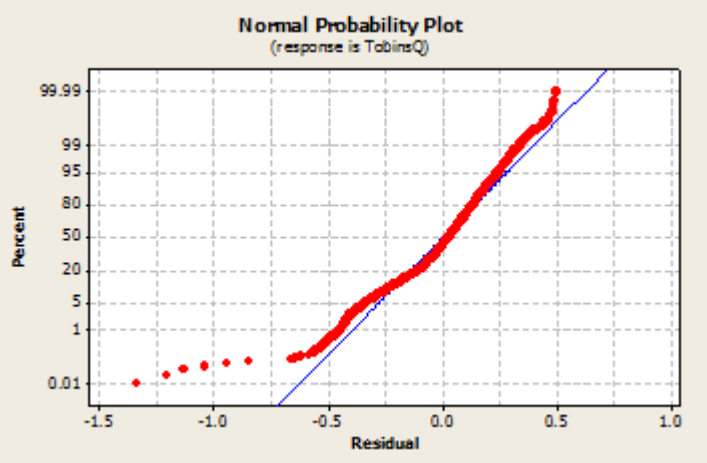

Figure 5-1. Probability plot of residuals from model1[1]

First, we ran the models with no action regarding the outliers as shown in Table 6-2, then, re-ran it after excluding the six outlying observations. The results confirm that the exclusion of outliers has no effect on the significance of estimators but it improves the goodness-of-fit of

[1] Probability plot of residuals from Model1 when *ROA* is the response exposed the same outliers since both *Tobin's q* and *ROA* are measures of return on asset. Model2 showed no outliers.

model1 by increasing the adjusted R-square to 23.29% in the case of *Tobin's q* and to 68.03% in the case of *ROA*. So, it was concluded that exclusion of outliers was not necessary since they did not lead to biased results.

Non-Linear Relationships and Multicolinearity

A scatterplot of each predictor variable against the dependent variables demonstrate that there is no special kind of relationship. From the Pearson correlation matrix in Table 5-1, it shows some indications of collinearity. Not surprisingly, the correlation between *Tobin's q* and *ROA* is statistically significant since both are means of measuring the return on assets. Furthermore, *Tobin's q* and *ROA* are correlated to *firm size, leverage ratio* and *R&D intensity*. Although the data suggest some level of collinearity, there were no pairwise correlations that exceeded 61% except for *capital intensity* and *annual growth* where it reaches 95%. The correlation between *capital intensity* and *annual grow*th is consistent with accounting literature. As we mentioned before, it is recognized that the utilization of machinery and equipment raises the productivity of labor which in turn stimulates the growth of the firm (Jorgenson and Vu 2005). To ensure reliability of the study results, we tested whether the existence of collinearity may cause bias. The results of the models that include either *capital intensity* or *annual growth* are completely identical to the models that include both, as shown in Table 6-2. This indicates that the threat of multicolinearity is limited and we should not omit any variables.

Table 5-1. Pearson correlation coefficients and probability values for model variables

Variable	Tobin'sq	ROA	Firm size	Capital intensity	Annual Growth	Leverage ratio
Tobin'sq	1	-	-	-	-	-
ROA	0.475	1	-	-	-	-
	(0.000)					
Firm size	0.608	0.455	1	-	-	-
	(0.000)	(0.000)				
Capital intensity	0.013	0.019	0.013	1	-	-
	(0.285)	(0.121)	(0.281)			
Annual growth	0.012	0.016	-0.012	0.991	1	-
	(0.311)	(0.192)	(0.008)	(0.000)		
Leverage ratio	0.158	0.178	0.033	0.019	0.020	1
	(0.000)	(0.000)	(0.008)	(0.117)	(0.103)	
R&D intensity	0.049	0.045	0.031	0.001	0.001	0.011
	(0.000)	(0.000)	(0.012)	(0.924)	(0.945)	(0.364)

Probability (p) values are given in parentheses.

Detecting the Problem of Autocorrelation and Heteroskedasticity

The assumptions of OLS and DID methods require the absence of autocorrelation and heteroskedasticity in the study data. Autocorrelation means the error from one observation depends on the error from other observations, which may create patterns among error terms. On the other hand, heteroskedasticity refers to the case where the variance of the disturbance term is not constant, which violates the equal-variance assumption of methods used in this study.

We ran the Durbin-Watson d test to detect autocorrelation. The results for the case of *Tobin's q* shows that neither positive nor negative autocorrelation are significant in the data (p value = 0.50 and 0.49, respectively). Similarly, the models with *ROA* as dependent variable show the absence of positive and negative autocorrelation with p value= 0.49 and 0.48, respectively, as shown in Table 6-2.

The presence of heteroskedasticity may lower the precision of the coefficient estimates. However, despite non-constant variance, estimators are still linear, unbiased and asymptotically normally distributed. By using White's General heteroskedasticity test as shown in Table 6-2, the null hypothesis that there is a constant variance is rejected when *Tobin's q* is the dependent variable (p value = 0.0003 for Model 1 and 0.0004 for Model 2). Figure 5-2 shows the absence of heteroskedasticity (constant variance). We can see that at smaller fitted values of dependent variables the residuals have more positive values and as the fitted values get larger, the spread of the residuals slopes down and become negative values. The variability of the residuals can be understood as those firms with lower levels of return on assets have predicted values lower than the actual ones, and the predicted values of firms with higher levels of return on assets are much higher than the actual ones. This creates a down sloping pattern of residuals.

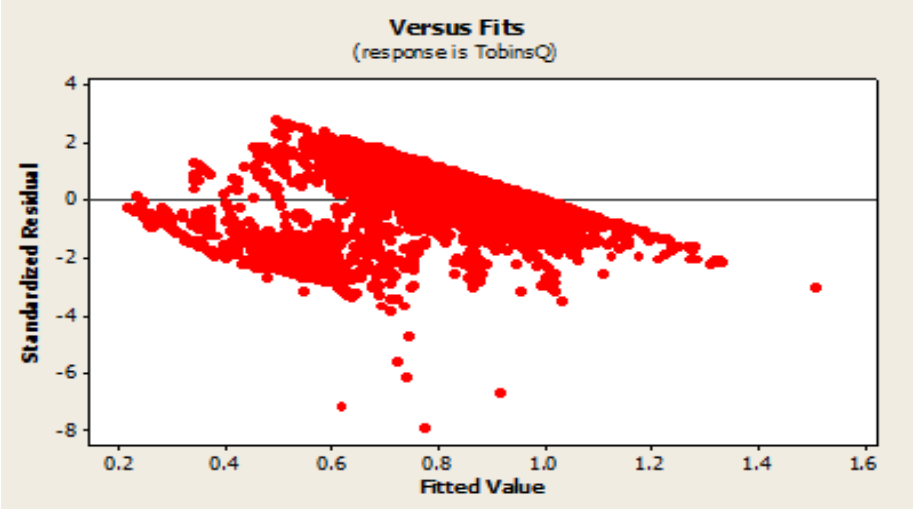

Figure 5-2. Fitted value of squared residuals for (Tobin's q)

To improve our analyses, we applied weighted regression which is one of the methods used to correct for non-constant variance. Since the data indicate that the dependent variable $(Tobin's\ q)^2$ changes with the variance of the residuals, we need to weight it in the regression.

[2] Heteroskedasticity test for *ROA* models was not significant at 10% level of significance, as shown in table 6-2.

Therefore, we calculated the reciprocal of *Tobin's q* (1/ *Tobin's q*) for the entire set of observations. Weighted regression works by weighting each observation based on the variability of its fitted value. In our case, we wanted to give observations with a different level of *Tobin's q* different weights in order to shrink their squared residuals. With the proper weight, this procedure minimizes the sum of weighted squared residuals to produce residuals with a constant variance (heteroskedasticity). In Table 6-2, we see that the non-constant variance in our data was resolved with p value = 0.054 for Model 1 and Model 2. Figure 5-3 demonstrates that the heteroskedasticity problem was clearly minimized after applying the weighted regression.

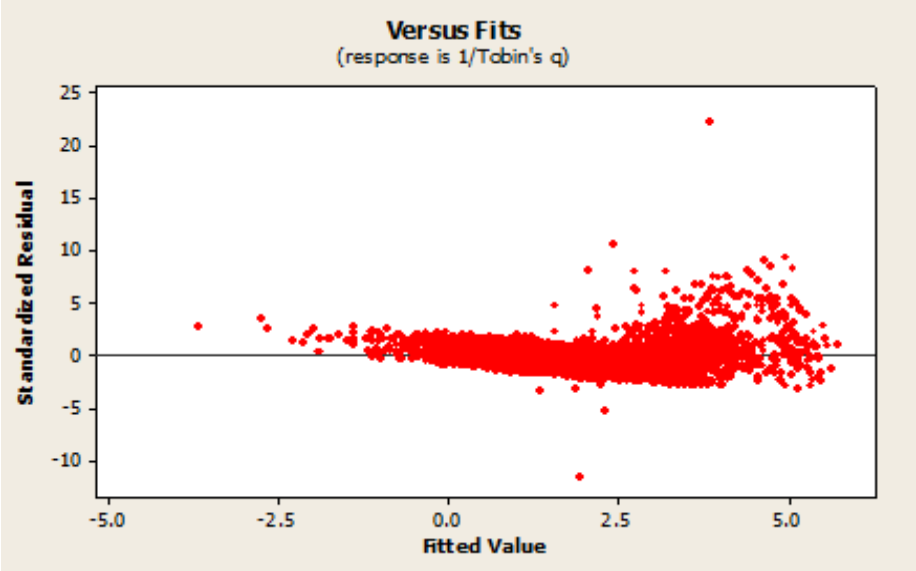

Figure 5-3. Fitted value of squared residuals for (1/Tobin's q)

It is important to emphasize the impact of violating the assumption of constant variance on the findings of this study. Ignoring the presence of heteroskedasticity led to a major misinterpretation of a negative relationship between CS and CFP, and also turning one variable to be statistically significant. It is clear then that such phenomenon can not only lower precision of the coefficient estimates, but completely shift the results. For this reason, we would

recommend that non-constant variance is expected to be one of the causes that have led to the inconsistency in the results of previous studies in this field.

CHAPTER 6
EMPIRICAL ANALYSIS AND RESULTS

Statistical Description

Table 6-1 presents the descriptive statistics for three sub-samples. The first section displays the statistics of DJSI continuously listed firms, the middle section shows the statistics of DJSI occasionally included firms, and the last section shows the firms that were never listed in DJSI. When comparing these three groups, we see that the mean and the median values for all variables are slightly greater for DJSI continuously listed firms compared to occasionally included firms and both continuously and occasionally listed have higher mean and median values compared to the never listed firms. These findings are consistent with Lourenc et al. (2012) who studied CFP and its effects on the market value of equity and Artiach et al. (2010) who analyzed the determinants of CFP. Both studies concluded that continuously listed corporations are significantly larger and have a higher return on equity (ROE) than non-continuously listed firms.

In addition, all three sub-samples show that the distributions of *capital intensity* and *annual growth* are highly skewed toward the right. In the case of continuously listed firms, the skewness values were 79.23 and 80.93 for *capital intensity* and *annual growth*, respectively. The same two variables had a higher and sharper distribution peak, which is presented as kurtosis values of 6367.98 and 6557.77, respectively, for continuously listed firms. At the same time, both *capital intensity* and *annual growth* have higher standard deviations for all sample groups, compared to other control variables.

Table 6-1. Descriptive statistics of the sampled firms

Variable	Mean	Median	Std Dev	Min	Max	Kurtosis	Skewness
			Continuously listed firms				
Tobin'sq	0.790	0.967	0.231	-0.608	1.000	2.738	-1.883
ROA	0.297	0.259	0.234	-0.669	1.630	1.602	1.129
Firmsize	4.015	3.981	0.663	1.458	6.380	0.837	0.270
Capital intensity	1.027	0.039	64.216	0.0001	5169.18	6382.81	79.233
Annual Growth	0.742	0.074	45.678	-1.000	3701.47	6557.77	80.931
Leverage Ratio	0.204	0.179	0.167	0	1.5108	5.158	1.447
R&D Intensity	0.001	0.001	0.012	-0.586	0.006	1102.5	-29.151
			Non-continuously listed firms				
Tobin'sq	0.788	0.883	0.232	-0.699	1.000	2.775	-1.823
ROA	0.292	0.252	0.229	-0.669	1.534	1.665	1.184
Firmsize	4.017	3.502	0.669	1.333	6.383	0.681	0.275
Capital intensity	1.020	0.029	64.582	0	5144.18	6367.98	79.213
Annual Growth	0.738	0.074	47.027	-1.001	3701.31	6557.17	81.003
Leverage Ratio	0.164	0.166	0.177	0	1.173	5.132	1.623
R&D Intensity	0.0009	0.0001	0.012	-0.666	0.005	1114.50	-29.374
			Never listed firms				
Tobin'sq	0.780	0.867	0.292	-0.409	1.000	2.723	-1.782
ROA	0.291	0.240	0.237	-0.658	1.501	1.274	1.027
Firmsize	4.016	3.518	0.703	1.444	6.000	0.379	0.298
Capital intensity	1.019	0.030	64.002	0	5160.05	6321.29	79.20
Annual Growth	0.731	0.071	45.002	-1.000	3600.21	6722.81	80.902
Leverage Ratio	0.128	0.129	0.204	0	1.444	5.364	1.426
R&D Intensity	-0.0002	0	0.013	-0.825	0.001	1101.17	-29.151

Results

The application of the Propensity Score Matching method (PSM) results in two sets of two groups each that are similar to the firms that are persistently listed in the index in terms of *firm size, capital intensity, annual growth, leverage ratio* and *R&D intensity*. The first is a subset of 48 firms from the group of firms that never practiced CS and the second is a subset of 48 firms from the group of occasionally listed firms. We will rely on these two subsets in the empirical analysis. Consequently, we expect most of the control variables to be statistically insignificant.

We can answer our first objective based on multiple regression analysis of model 1 with *(1/Tobin's q)* as the dependent variable and after the heteroskedasticity correcting procedure with results as shown in the second and third columns of Table 6-2. The result of our first hypothesis, H_0: $\beta_3+\beta_5=0$ is significantly rejected (p value= 0.012), where we can conclude that there is a significant difference in financial performance between firms that persistently practice CS for 8 years or more and those that have never done it. Importantly, we notice that the individual t-tests of these coefficients indicate that β_3 is statistically significant (p value= 0.009), but β_5 is statistically insignificant (p value= 0.819). Therefore, the total difference between the two groups is reflected in β_3 only and the effect of recession on the actual difference is negligible. We can conclude that the presence of recession neither enforced nor moderated the total difference of the effect of CS, and such difference persisted in the same magnitude during the recession of 2008-2009.

The negative[1] sign of β_3 indicates that sustainable companies outperform the non-sustainable companies and this difference persists in the same magnitude during recession times. It is important to understand from this study that managers can reap the avails of their investment

[1] Signs in the model reflect the relationship between the indicators and (*1/Tobin's q*), so negative sign means a positive association between the indicator and *Tobin's q*.

on CS within a period of 8 years[2]. Moreover, the coefficient of the term ΔD_{it} reflects the difference in performance between the two groups throughout the study period; it is not conditional to the treatment period for individual years (T_{it}). All findings are consistent when analyzing the variation on *ROA* instead of *1/Tobin's q*, as illustrated in the fourth and fifth columns of Table 6-2.

The second objective tests if there are differences in performance among corporations that invest in different levels of CS, which may reflect how corporate performance is sensitive to the level of CS invested, by focusing on firms continuously invest in CS and those that sometimes invest, with the latter treated as the baseline. The result of the second hypothesis $\beta_3+\beta_5=0$ supports our claim that the financial performance of firms is sensitive to the level of CS invested (p value = 0.027, see sixth and seventh columns of Table 2-6). The individual t-tests of these coefficients indicate that β_3 is statistically significant (p value= 0.031), however β_5 is statistically insignificant (p value= 0.721). Similarly, we can conclude here that existence of the 2008-09 recession didn't shift the sensitivity of firms' performance towards CS.

The negative[3] sign of β_3 indicates that continuously listed companies also outperformed the occasionally listed companies and this difference persisted in the same magnitude during recession times. In other words, the financial performance of firms is sensitive to the level of CS applied. This also supports our previous finding that managers could be motivated by such findings to prioritize the investment in CS. The regression analysis of model 2 with *ROA* as the dependent variable gave similar results as shown in the eighth and ninth columns of Table 6-2.

[2] Eight years: from 2005 to 2012.

[3] Signs in the model reflect the relationship between the indicators and (*1/Tobin's q*), so negative sign means a positive association between the indicator and *Tobin's q*.

The first part of our third objective aims to find out by how much the persistently listed firms gained compared to the firms that have never been listed. Based on the standardized coefficient estimator of the ΔD_{it}*$Year_{it}$ interaction variable, as shown in the second and fourth columns of Table 6-2, on average, continuously practicing CS firms realized a higher *Tobin's q* by 11.3% and a higher *ROA* by 7.1% compared to firms that never practiced CS, holding all other variables constant. The second part of the third objective examines by how much these persistently listed firms gained annually compared to those which were dropped off at from time to time. We can see in the sixth and eighth columns of Table 6-2, on average, the firms that were persistently involved in CS had a higher *Tobin's q* by 6% and a higher *ROA* by 3.1% compared to those firms occasionally investing in such practices, holding all other variables constant. The significant differences among the three groups of firms persisted across all times studied since 2000, which offers a promise for managers to capture the benefits of CS by efficiently utilizing available resources. In addition, the coefficient of the $Year_{it}$ variable reveals that the overall market performance was slightly increasing during the study period. Specifically, the general performance of the corporations constituting our sample groups grew annually by 3% to 6.4% on average since 2000.

The fourth objective of this study is to analyze the effect of CS among industries. First, our goal was to figure out which industries were faster in absorbing the benefits of investing in CS. The results of the empirical analysis in Table 6-2 (column 2 and 3) reveals that the *Utilities, Retail Trade, Information* and *Services* industries more greatly reflected the benefits of CS investment during the study period of 8 years. Firms in the *Utilities* industry can gain more than 12.4% on average as a result of persistently being involved in sustainable practices, compared to *Manufacturing* industry firms that invest at the same intenseness in such practices, holding all

other variable constant. Similarly, continuously-practicing CS firms in *Retail Trade, Information* and *Services* industries have a higher gain by 9.2%, 7.8% and 3%, respectively, comparing to continuously-practicing CS firms in *Manufacturing* . The analysis with *ROA* as the dependent variable supports all the above mentioned findings (see Table 6-2, columns 4 and 5).

Secondly, we can conclude that only *Retail Trade* and *Information* industries are sensitive to the level of CS applied by firms, as shown in Table 6-2 columns 6 and 7. In these two industries, it matters how intensive is the investment in CS by firms. In the case of comparing the *Retail Trade* industry to *Manufacturing*, firms that have CS over a period of 8 years can gain more than 8.8% on average compared to occasionally-listed firms, holding all other variables constant. The results are consistent when analyzing *ROA*, as shown in Table 6-2 columns 8 and 9.

In addition, the variables *firm size, capital intensity* and *annual growth* had no influence in all models. These three indicators met our expectations since firms groups are of similar levels for all control variables as a result of applying the PSM method. Whilst *R&D intensity* is significant at the10% probability level for the case of comparing continuously listed and never listed firms, it is not significant in the case of comparing continuously listed with non-continuously firms. This means that continuously listed firms invest significantly more in Research and Development practices compared to firms that never invest in CS, and such differences didn't exist between continuously and non-continuously listed firms, as we can see in Table 6-2. Notably, the *leverage ratio* explains some of the variation in the models, which means that there is a wide variance in the data such that the application of the PSM method did not completely correct for this predictor. This finding is consistent with previous literature; firms that are highly leveraged have a higher *Tobin's q* and *ROA*, holding all other variables constant.

Notably, the adjusted R-Squared of the *ROA* models were much higher than the adjusted R-Squared of *Tobin's q* models, which indicate that our independent variables are more efficient in explaining the variation in *ROA* during the study period. Additionally, the intercepts of the models represent two components, the first is the period effect β_2 as equation 4-10 symbolizes and the second is the average time invariant unobserved effect (average fixed effect) as the software used in this study always reports. All intercepts are statistically significant which implies the existence of period effects and average fixed effect in this study. It definitely reflects that the application of standardized multi-period panel data FD and DID methods is a preferred approach to analyze such data and handle the objectives of this study since the period effect is suggested by the DID method application and the fixed effect indicated by applying the FD method.

Table 6-2. Standardized parameter results of model 1 and model 2

	Model 1				Model 2			
Dep. Var.	(1/Tobin'sq)		(ROA)		(1/Tobin'sq)		(ROA)	
Predictor	Coeff.	P-value	Coeff.	P-value	Coeff.	P-value	Coeff.	P-value
Intercept	+.216	.000***	-.713	.047**	+.194	.000***	-.361	.091*
ΔD_{it}	-.0 32	.019**	+.018	.042**	-.078	.044**	+.025	.021**
$\Delta D_{it}*T_{it}$	-.087	.009***	+.099	.002***	-.062	.031**	+.031	.004***
Rec_{it}	+.0001	.807	-.001	.396	+.017	.943	-.002	.901
$\Delta D_{it}*Rec_{it}$	+.051	.819	-.004	.855	+.001	.721	-.003	.980
$Year_{it}$	-.064	.000***	+.030	.017**	-.061	.000**	+.037	.034**
$\Delta D_{it}*Year_{it}$	-.113	.000***	+.071	.021**	-.06	.000**	+.031	.027**
$\Delta Firmsize_{it}$	-.150	.371	+.118	.557	-.143	.844	+.863	.284
ΔCapital intensity$_{it}$	-.001	.758	+.0001	.881	-.001	.710	+.712	.787
ΔAnnual growth$_{it}$	-.001	.765	+.0002	.415	-.002	.719	+.569	.441
ΔLeverage ratio$_{it}$	-.301	.000***	+.241	.029**	-.277	.000***	+.938	.044**
ΔR&D intensity$_{it}$	-.402	.091*	+.518	.089*	-.285	.562	+.616	.888
$Services_{it}*\Delta D_{it}$	-.003	.077*	+.007	.027*	-.0001	.432	+.0006	.499
$Information_{it}*\Delta D_{it}$	-.078	.041**	+.031	.042**	-.011	.057 *	+.002	.071*
$Utilities_{it}*\Delta D_{it}$	-.124	.003***	+.112	.039**	-.095	.151	+.027	.601
$Financial_{it}*\Delta D_{it}$	-.002	.119	+.033	.442	-.001	.788	+.027	.699
$Mining_{it}*\Delta D_{it}$	-.0002	.121	+.0001	.142	-.013	.367	+.002	.109
$RetailTrade_{it}*\Delta D_{it}$	-.092	.000**	+.087	.012**	-.088	.032**	+.072	.011**
$B_3+\beta_5=0$		.012**		.011**		.027**		.001***
Adj R-Sq	23.07%		67.21%		22.88%		83.16%	
# of Obs.	24,960		24,951		24,960		24,051	
D-W Test		.50*		.49*		.49*		.48*
WhiteTest1		.000***		.058*		.000***		.058*
WhiteTest2		.054*		.058*		.054*		.058*

***, ** and * significance at the 0.01, 0.05 and 0.10 levels, respectively. Dep. Var. stands for Dependent Variable; Coeff. stands for Coefficient; # of Obs. is Number of Observation; D-W Test is Durbin-Watson Statistic of Autocorrelation; White's Test1 is the first heteroskedasticity test; White's Test2 is the heteroskedasticity test after correcting for heteroskedasticity. Dependent variables: *Tobin's q* is calculated by dividing the sum of firm equity value, book value of long-term debt, and net current liabilities by the book value of total assets; *ROA* is Return on Asset, calculated as Net Income/Total Assets. Independent variables: D_{it} is an indicator that equals 1 if the firm have been continuously listed in the DJSI during the sample period 2005-2012, and 0 if a firm has never been listed (baseline of model 1) or a firm is non-continuously listed (baseline of model 2) ; T_{it} is the treatment period (2005-12); Rec_{it} is the recession dummy variable, it equals 1 for 2008-2009; $Year_{it}$ ranges from 2000 to 2012; *Firm size* is the log of total assets; *Capital intensity* equals capital expenditures / sales; *annual growth* is the percentage change in sales; *Leverage ratio* is the ratio of debt to assets; *R&D intensity* equals in-process research and development expenses / total assets; Industry dummy variables: *Services, Information, Utilities, Financial, Mining, Retail Trade , Manufacturing* (baseline).

CHAPTER 7
FINDINGS SUMMARY AND CONCLUSION

Although, there have been several attempts to analyze the benefits of creating long term value for shareholders and stakeholders through CS activities, empirical evidence has been mixed. In fact, results could be influenced by factors like the study period length, time since firms started investing in CS, and the overall economic performance during the period of study. For these reasons, this research has considered these issues by covering a relatively longer time frame and accounting for defined economic conditions that dominated the selected period. The first objective of this study was to test whether there is a significant difference in financial performance between firms that continuously practice sustainability activities and those firms that never invest in such practices while accounting for the persistence of sustainability effects during the global recession of 2008-09. The second objective was to examine whether corporate performance is sensitive to the level of corporate sustainability (CS) activities by firms and if such sensitivity persisted during the 2008-09 recession. The third objective to find out by how much these persistently listed firms annually gain more comparing to the firms that have never been listed and measure and compared to firms which were dropped off at certain points. The fourth objective was to analyze the effect of CS among industries including which industries were faster in absorbing the benefits of investing in CS and testing the sensitivity of industries to the level of CS applied.

Importantly, we have constructed the dataset to detect any phenomena that may lower the precision of the coefficient estimates. Such phenomena are normally expected to be one of the causes leading to inconsistency in the results of previous studies in this field. Based on our sample, the existence of heteroskedasticity changed the sign of the DID estimator and turned the significance of one control variable. If this problem uncorrected, clearly it would have shifted the

findings. Data construction is one of the strengths of this study, which gives our results a higher level of confidence.

This study contributes to the literature by providing further support to the group of researchers who have reported a significant positive relationship between CS and CFP. We have proved the existence of a positive association by analyzing the variation in *ROA* and the reciprocal of *Tobin's q* statistic. Second, a period of eight years was found to be sufficient to reap the benefits of CS and completely cover the initial cost of investment in CS. This finding supports the explanations offered by McGuire et al. (1988) and Barnett (2005) regarding the positive relationship between CS and CFP. They believed that the association between CS and CFP becomes positive when the financial payback from adopting sustainable practices exceeds the costs of initial investment. Third, the financial performance of firms was sensitive to the level of CS applied; *Tobin's Q* and *ROA* were significantly greater for those firms always in DJSI since 2005. Fourth, the recession of 2008-09 didn't shift the total difference between CS and CFP. It is acknowledged that in recession times larger and smaller companies may suffer more relative to medium and large companies, and the majority of our sample is companies of medium size. Fifth, on average, continuously practicing CS firms realize a higher *Tobin's q* by 11.3% and a higher *ROA* by 7.1% compared to those that have never been practicing CS. In addition, on average, the firms that are persistently involved in CS have a higher *Tobin's q* by 6% and a higher *ROA* by 3.1% compared to those firms occasionally investing in such practices. The significant differences among the three groups of firms persisted across the time since 2000, which offers promise for managers to capture the benefits of CS based on their utilization of attainable resources. Sixth, empirical analysis revealed that the *Utilities, Retail Trade, Information* and *Services* industries realized greater benefits of CS investment during the study

period of 8 years. Firms belonging to the *Utilities* industry can gain about 12.4% greater returns on average as a result of persistent involvement in sustainable practices compared to firms in *Manufacturing* that invest at the same intensity in such practices. Moreover, we conclude that the *Retail Trade* and *Information* industries were most sensitive to the level of CS applied by firms. In the case of comparing Retail Trade to *Manufacturing*, firms with CS over a period of 8 years can gain up to 8.8% greater on average compared to occasionally-listed firms.

To summarize, this study found out that it really pays to be sustainable and it pays more for those persistently investing in CS. Such practice is proven to improve firms' financial performance. The increase in financial performance is in the favor of the firms themselves as well as investors, stakeholders and society. For example, one face of CS is establishing better work conditions for employees, which can positively impact their productivity. Companies can save on their expenses by cutting down the costs of recruitment and training of new employees as well. All of these factors result in high quality products and better prices, which works toward gaining committed and loyal consumers, and this is what stakeholder theory calls for. Some researchers like Artiach et al. (2010) based their interpretations of a positive relationship between CS and CFP on this theory, which argues that investing in CS improves the financial performance by ideally managing stakeholders.

It is worth mentioning that, although it is reported by The National Bureau of Economic Research that the duration of the recession was from 2008 to 2009, financial indicators still suggest that the U.S. economy is not fully recovered, which may be a limitation of this study. Future research efforts are expected to conduct more studies on this issue, and considering even longer time frames where then U.S. economy is expected to be fully recovered. In addition, research could broaden the scope and compare the effects of CS investment between developing

and developed countries. Questions like when does it pay to be sustainable and under what conditions do corporate sustainability (CS) efficiently work better could be interesting for other researchers.

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