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The Effect of Corporate Sustainability Reporting on Firm Valuation

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CLAREMONT McKENNA COLLEGE

**THE IMPACT OF CORPORATE SUSTAINABILITY REPORTING
ON FIRM VALUATION**

SUBMITTED TO

PROFESSOR MAFRED KEIL

AND

DEAN GREGORY HESS

BY

BRIAN BARTLETT

FOR

SENIOR THESIS

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Table of Contents

Acknowledgements	iv
Abstract	v
I. Introduction	6
II. Literature Review	
<i>II.i Introduction to CSR</i>	8
<i>II.ii Link Between CSR and Financial Performance</i>	9
<i>II.iii CSR and the Recession</i>	12
III. Data Description	
<i>III.i The Pacific Scoring Index (PSI)</i>	13
IV. Methodology & Results	
<i>IV.i Cross Section</i>	15
<i>IV.ii Panel Analysis</i>	17
<i>IV.iii Results</i>	18
V. Discussion	25
VI. Conclusion	28
References	32
Appendix	34

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Abstract

The topic of corporate sustainability reporting has seen rapid growth in the past couple of years as more firms are placing a greater emphasis on becoming sustainable. However, the true impact of sustainability reporting on firm value has been widely debated, often due to the nature of the qualitative data in sustainability reports. This thesis uses a normalized sustainability scoring system to examine the effects of sustainability reporting on firm value. In particular, this paper analyzes these effects during the Great Recession to note if there was any change in the effects on a year-by-year basis due to macroeconomic differences. This study finds that not only is superior corporate sustainability reporting positively correlated with increased firm value, but also that the degree of the impact greatly drops during the recession. These findings suggest that sustainability could be an advantageous business tool during stable economic times but not nearly as important in terms of increasing firm value during times of recession. Therefore, the results of this thesis have important practical uses and serve as a basis for analyzing the financial effects of corporate sustainability initiatives as this type of reporting becomes more prevalent in the future.

I. Introduction

“We strive to be a safety leader in our industry, a world-class operator, a good corporate citizen and a great employer. We are working to enhance safety and risk management, earn back trust and grow value.”

This quote came from the sustainability page of a company website. This company’s website also has statistics about what the firm is doing to plan for sustainable growth in the future and how they are changing to become more environmentally friendly. Additionally, this company has published statistics detailing various safety, environmental, and social performance indicators relative to their industry. Clearly, this is a firm that deeply cares about its environmental and social sustainability efforts and performance. One would assume that this company is a model of superior corporate sustainability reporting and performance and is looked upon favorably by stakeholders. In fact, this company is BP, famously known for being the main culprit of the Deepwater Horizon oil spill of 2010. This oil spill, which lasted for roughly three months, is widely considered the worst oil spill ever with roughly 4.1 million barrels of oil leaked into the Gulf of Mexico in eighty-seven days (Gosden, 2012). Since the oil spill has been cleaned up and BP has repeatedly apologized for the catastrophe, why do BP and other companies feel such a need to continually spend money on apology advertisements and publish corporate sustainability reports to the public? Clearly, companies feel the need to report their sustainability measures, possibly because these reports have an effect on firm value. The purpose of this thesis is to explain if environmental and social factors in corporate sustainability reports have any impact on firm value. More specifically, this thesis will analyze various companies from a wide range of industries during the Great Recession of 2007-2009 to analyze any potential impact on corporate sustainability measures’ influence on firm value during times

of recession. In order to get these reports into an equal and qualitative format, the companies in this study are ranked using the Pacific Scoring Index (PSI), a normalized scoring system of a firm's corporate sustainability performance. This thesis will now go into detail about the background of corporate sustainability reporting and outline the progression of this paper.

Corporate sustainability reporting, commonly abbreviated as CSR, involves firms publicly reporting about their environmental, social, and governance measures and their ability to deal with the related risks of these factors (Ballou, Heitger, and Landes, 2006). This type of reporting, which was virtually non-existent thirty years ago, has become a major factor in a company's public reports because internal and external stakeholders are increasingly demanding this information: "[...] meeting stakeholder expectations is as necessary a condition for sustainability as the need to achieve overall strategic business objectives. While maximizing shareholder value continues to be an overriding concern, companies will not be able to do that over the long term if they don't meet other key stakeholder interests" (Ballou, Heitger, and Landes, 2006; 1). However, companies may be unsure how the market will react to their corporate sustainability reporting. If the initiatives are favorable, this may theoretically boost firm value or stock price. On the other hand, some firms may be hesitant to release information because of a possible negative reaction to the firm by the market. This thesis will attempt to analyze any effects of better corporate sustainability practices on firm value. This paper proceeds as follows. A review of relevant literature, which goes into greater detail concerning the link between corporate sustainability reporting and firm value, immediately follows this section. An empirical study followed by results will come afterwards. A discussion of these results will follow the regressions. This paper will end with a conclusion that discusses how these results compare to other studies in the field and give takeaways from this study.

II. Literature Review

II.i Introduction to CSR

Corporate sustainability reports are publically released documents detailing the environmental, social, and governance performance of a company. Sustainability reporting began in the late 1980s, and has quickly become an important focus for companies from a wide range of industries (Global Reporting Initiative, 2012). From a financial performance perspective, corporations engage in sustainability in order to reduce costs for the future and help manage change, thus becoming a more sustainable and profitable business in the future. Additionally, it may be a requirement to release certain environmental information to satisfy local or federal laws regarding emissions or a similar matter. Companies most likely have other reasons to release these reports, such as building superior reputations and meeting informational needs of stakeholders, who are classified as anyone who is impacted by the company's actions.

Companies can report about sustainability initiatives using a variety of different methods because no U.S. law or regulation exists regarding the need to release a full sustainability report. The only federal regulations regarding environmental reporting stem from the Sarbanes-Oxley Act of 2002. According to Sarbanes-Oxley, environmental costs must be released in a report: "Sab-92 states that, with respect to contingent losses, companies should provide detailed disclosures regarding the facts and assumptions underlying the amounts of environmental liabilities" (McKenna Long & Aldridge, 2005). Firms must now quantify environmental liabilities if they represent an amount that is deemed material to their financial statements. If the environmental liability is not easily quantifiable, then a note must be attached detailing the nature of the environmental cost. Due to increased pressure from stakeholders to release environmental and social initiatives, firms are not only reporting on environmental costs but also

providing the public with an adequate representation of their sustainability initiatives and performance. Common frameworks that firms are using to report on their sustainability initiatives include the Global Reporting Initiative (GRI) and ISO 14000 frameworks. The GRI Sustainability Framework works in conjunction with the United Nations, which gives it credibility across the globe. Furthermore, it has grown into one of the most common frameworks (Global Reporting Initiative, 2012). The ISO 14000 is a set of standards that helps to address environmental management. It provides organizations with a framework to improve their environmental impact and performance in an attempt to lower costs and improve corporate image (ISO, 2012).

II.ii Link Between CSR and Financial Performance

The topic of corporate sustainability reporting/initiatives affecting financial performance has been a hotly debated topic for nearly thirty years. Early studies of the correlation between the two have yielded mixed results. Studies performed by Cochran and Wood (1984) found a positive correlation, while other studies, such as Aupperle and Pham (1989) found no correlation at all.

A positive relationship between corporate sustainability reporting and firm value may exist because firms that report on sustainability initiatives at a high quality may attract more investors and increase market value. However, due to the nature of regression analysis, it is difficult to imply causation between this relationship, which prompts questions about which aspect comes first. Preston and O'Bannon (1997) attempt to discover if social and financial performance is positively correlated, negatively correlated, or not correlated at all. Additionally, they wish to determine if a casual relationship behind these factors exists. This means that social

performance may drive financial performance, financial performance may influence social performance, or there is a synergistic relationship between the two. The theory that more closely relates to this thesis is defined as the stakeholder theory, which claims that favorable social performance influences positive financial performance because the firm is meeting more needs of the stakeholders, thus increasing transparency and firm value. In Preston and O'Bannon's empirical results, they discovered that there was not a single negative relationship between social and financial performance in large U.S. companies, which is consistent with the stakeholder theory. The strongest evidence indicated that social-financial performance is a positive synergy, meaning that available funds drive positive social performance and that positive social performance also drives financial performance (Preston and O'Bannon, 1997).

Waddock and Graves (1997) also argue that attention to corporate social performance builds effective and lasting relationships with stakeholder groups, which causes better overall financial performance. Financial performance is measured based on return on assets (ROA), return on equity (ROE), and return on sales. Waddock and Graves attempt to discover if "[...] there is a positive relationship between CSP and financial quality performance and whether slack resources and good management theory may be operating simultaneously" (Waddock and Graves, 1997; 2). The slack resources theory means that financially prosperous companies have available resources to invest in social sustainability initiatives, meaning that better financial performance is an indicator of better corporate social performance. After an empirical analysis, Waddock and Graves concluded that corporate social performance influences financial performance, and strong financial performance also drives increased corporate sustainability practices. Their concluding theory is in line with Preston and O'Bannon, stating that this

relationship is a virtuous cycle where firms perform well, increase corporate sustainability, and then perform even better.

However, other researchers have attempted to prove that corporate sustainability has no effect on the financial performance of a firm. Aupperle and Pham (1989) measured both market returns and accounting return ratios and discovered that there is no direct relationship between these initiatives and increased firm value. Instead, they claim that sustainability initiatives are an indirect factor with regards to financial performance, and there are other more direct factors that truly impact a firm's financials. The article claims that:

“Because a firm's financial performance is partly determined by its selection of corporate and business strategies, its organizational structure and culture, its reward systems and employee morale, as well as by its resources, capabilities, and environmental conditions and constraints, it is possible that a given social orientation may not clearly register a performance effect” (Aupperle and Pham, 1989; 2).

This theory concludes that it is ultimately things such as business management and strategy that influence financial performance and firm value, not corporate sustainability initiatives. Business management and strategy may promote better sustainability practices and witness increased financial performance, but these business strategies were the initial driver of financial performance. Aupperle and Pham reasoned that the other studies that showed a positive social-financial relationship failed to note that the true driver behind financial value of a company was the positive company culture/leadership, not the initiatives. However, after looking at their dependent variables, it becomes apparent that they were measuring financial performance using long-term ratios, such as long term ROA and long-term stock price. This may play a large factor in their findings because they fail to consider how sustainability initiative reporting may

influence a value such as stock price in the short term.

Oliver Salzmann (2005) presents a different view on measuring sustainability initiatives by looking at social, environmental, and governmental (ESG) factors to see how they affect financial performance and more importantly stock return. Salzmann looks at firms with high ESG scores and reasons that these firms will have excessive demand, which will lead to a higher stock price, claiming, ““Further, if there is excessive demand for stocks with high ESG scores, this could result in their stock price being inflated” (Salzmann, 2005; 2). Through empirical research, Salzmann concludes that a positive relationship exists between ESG and performance, however, the social aspect impacts financial performance much more than the government or environmental aspects. Additionally, Salzmann discovers that, “disaggregation shows that firms with higher environmental ratings have lower book-to-market ratios in line with these firms experiencing higher levels of market demand for their stocks” (Salzmann, 2005; 15). Therefore, Salzmann adds another element towards the debate about the effectiveness of corporate sustainability initiatives by analyzing these initiatives and book-to-market ratios.

II.iii CSR and the Recession

Because this paper focuses on how corporate sustainability initiatives influence firm value during the recession, it is important to see if companies still actively engage in CSR during the Great Recession. When profits are reduced, it would logically make sense that a company needs to engage in cost-cutting tactics, possibly causing corporate sustainability to be reduced or forgotten. An essay by Placier Klara attempted to solve this issue and discovered that corporate sustainability was reduced during periods of recession, but not at all close to levels that most critics believed. Klara mentions, “The economic crisis clearly has caused financial losses, and

this is obviously reflected in the field of social responsibility” (Klara, 2011; 14). Additionally, Klara states, “Even though businesses have been affected by the crisis in all three CSR areas, research has shown that the expectations of critics about the decline of CSR in a recession have not been fulfilled. It was rather the opposite; recession re-aimed CSR and demonstrated its social importance, as well as its potential to improve corporate competitiveness” (Klara, 2011; 14). According to this theory, it would make sense that CSR would be used in the Great Recession to improve firm value. Klara expands upon this theory, emphasizing that companies learned that the sustainability initiatives must be the most efficient in potentially increasing firm value due to tighter corporate sustainability budgets during the recession (Klara, 2011; 15). Therefore, I would expect to find that corporate sustainability initiatives and reporting during the most recent financial crisis would positively impact firm value.

For this study, I want to extend upon the findings that corporate sustainability initiatives impact financial performance during the Great Recession time period. While it can be argued that sustainability initiatives impact the financial value of a firm, it will be interesting to see if this same theory holds up in times of economic difficulty. Judging by Placier Klara’s theoretical research, it appears that these initiatives may have a positive effect on firm value similar to years of economic stability.

III. Data Description

III.i The Pacific Scoring Index (PSI)

For the purposes of environmental data collection, this thesis uses data from the Roberts Environmental Center at Claremont McKenna College. Every year, the Roberts Environmental Center, led by Professor Morhardt, conducts multiple corporate sustainability sector analyses

using the Pacific Scoring Index (PSI) scoring system. This system analyzes the quality of a firm's sustainability reporting by reviewing how much information the company released, their plans for the future, and performance relative to competitors in the industry. These reports use questionnaires to award points to companies for having certain levels of sustainability reporting. Two questionnaires, one with industry specific questions and one with general questions, are used to grade the corporate sustainability reports of companies. The overall PSI score is broken up into three parts, Environmental, Social, and Human Rights. Each part represents a percentage of the overall score, with Environmental and Social being the more heavily weighted categories and human rights being more lightly regarded. Each company in a sector report is graded and given a numerical score based on its Overall Report (Overall), Environmental Overall (EO), Environmental Intent (EI), Environmental Reporting (ER), Environmental Performance (EP), Social Overall (SO), Social Intent (SI), and finally Social Performance (SP). According to the Roberts Center, Intent measures, "the coverage and company's involvement in general environmental or social issues. The "Intent" topics are each worth 2 points; 1 point for a discussion of intentions, vision, or plans, and a 1 point for evidence of specific actions taken to implement them" (Roberts Environmental Center, 2012). This could be a specific environmental plan for the present and future or social standards the company is striving to achieve. Additionally, the environmental and social reporting scores measure "transparency in publicly discussing the company's dealing with issues independent of success in making improvements"(Roberts Environmental Center, 2012). For example, reporting could include pollution statistics and discussion of these statistics. "Performance" is scored based off improved performance from the previous year and performance compared to other firms in the same industry, normalized for revenue. For the purposes of this study, the Roberts

Environmental Center normalized all scores out of a total score of 100 for comparability across sectors. For example, when there is a score of 45.5, this indicates that the firm received 45.5% of the possible points available on their sustainability testing. This scoring system was chosen because it measures both qualitative and quantitative data on a point scoring system. Sample questionnaires are included in the appendix (Table 5).

IV. Methodology & Results

IV.i Cross Section

Because this thesis is focusing on the impact of the Great Recession on corporate sustainability and firm value, sustainability PSI scores from 2008 and 2009 are analyzed for ten various industries, from the Metals sector to the Pharmaceutical industry. The financial data for the companies being analyzed in this thesis were obtained from the Wharton Research Data Services (WRDS) COMPUSTAT database. The model to analyze any impact of corporate sustainability reporting on firm value uses a simplified version of the Linear Information Model, based off Ohlson (1995) and further developed by Crouse (2007):

$$MV_{it} = a_0 + a_1NI_{it} + a_2BV_{it} + a_3v_{it}$$

MV=market value= common shares outstanding (end of fiscal year)*closing stock price (end of fiscal year)

BV= book value (Total assets-Total liabilities)

NI= net income

v= corporate sustainability score, either social/environmental reporting (SR,ER),

social/environmental intent (SI,EI), or social/environmental performance (SP,EP), social/

environmental overall (SO,EO), or overall score

In theory, book value (BV) should have a coefficient of one because book value should move proportionally to market value. Book value is measured as total assets minus total liabilities, meaning it represents the total equity value of a firm. Net income is a company's net income before extraordinary items so that unusual items do not skew the results. The various corporate sustainability metrics are included as the other factor in this regression. My hypothesis is that book value, net income, and the sustainability metrics will be statistically significant in this regression, showing that increased sustainability reporting performance has a positive correlation with a higher market value. Corporate sustainability would need to be statistically significant and have a positive coefficient in 2008 in order to uphold Placier Klara's theory that corporate sustainability may serve as an important factor for firms to increase during times of recession.

The first regression analyzes the effects of corporate sustainability reporting on market value for 162 companies in 2008, the middle of the financial crisis. The ten sectors analyzed in this regression are shown in Table 1 below:

Table 1- Industries Analyzed

PSI Industry Sector Reports
Electronics and Semiconductors
Metals
Banks, Insurance, and Diversified Financials
Pharmaceuticals
Chemicals
Consumer Food, Food Production, and Beverages
Industrial and Farm Equipment
Forest and Paper Products
Motor Vehicles and Parts
Telecommunications, Network, and Peripherals

IV.ii Panel Analysis

The panel data analysis was conducted with the Roberts Environmental Center's PSI scores and the Wharton Research Data Services financial information for 62 companies. The data spanned across five years, from 2006 to 2010. The purpose of running a panel regression is to observe the impact of a firm's sustainability score on market value over time, more specifically the time period that dealt with the full economic effects of the Great Recession. The Roberts Environmental Center possessed sustainability scoring for this time period, but unfortunately a vast amount of the companies were not scored on a year-by-year basis. Upon discussing this issue with Elgeritte Adidjaja of the Roberts Environmental Center, this occurs because the company may not provide a sustainability report on an annual basis or the new report is not significantly different from the previous year. Rescoring usually happens when the company requests a rescore or the report is significantly different than before. Due to this, company scores for years that did not have data were lagged based on the previous year's score. For example, if a company received a score for 2009 but did not receive a score for 2010, the 2009 score was used for the 2010 year as well. Additionally, Ohlson's Linear Valuation Model (1995), which was later developed by Crouse (2007), was used for the basis of this regression as well. This regression added book value and net income together and placed it into one variable because the main purpose of the panel is to study the effect of sustainability initiatives on firm value. By adding the two together, Ohlson's model still holds true. A binary variable was created for each year that is interacted with overall score to analyze the yearly effects. Additionally, another binary variable was created for each industry and used as an interaction term with overall score to analyze the effects corporate sustainability reporting has on a particular sector. In order to have a model with entity (firm) fixed effects, the binary variable for

each individual company is included in the regression to control for the difference in inherent value for each firm. The equation for this regression is given below:

$$MV_{it} = a_0 + a_1 NIBV_{it} + a_2 (Industry_1 * v)_{it} + \dots + a_9 (Industry_7 * v)_{it} + a_{10} (Company_2)_{it} + \dots + a_{71} (Company_{62}) + a_{72} v_{it} + a_{73} (D_07 * v)_{it} + \dots + a_{76} (D_10 * v)_{it}$$

MV = market value

NIBV = Net Income + Book Value

Industry = binary variable for each industry

Company = binary variable for each company (Company 1 omitted)

D_07 & D_10 = binary variable for each year (2006 omitted)

v = Overall sustainability score

IV.iii Results

The sustainability metrics used in this study have a possibility of being highly correlated because they are all measuring similar aspects. Thus, a correlation matrix is necessary to determine the necessary nature of the regression. As shown in Table 2 below, the various sustainability measurements do appear to be highly correlated with one another. Not only are environmental measurements highly correlated with each other, but social measurements are highly correlated with environmental scores as well. For the purposes of this study, it is necessary to regress each sustainability measurement on the market value formula independently in order to avoid any possible error resulting from highly correlated independent variables.

Table 2- PSI Correlation Matrix

	EO	SO	SI	SR	SP	EI	ER	EP	Overall
EO	1.00								
SO	0.75	1.00							
SI	0.83	0.81	1.00						
SR	0.71	0.99	0.74	1.00					
SP	0.64	0.96	0.68	0.95	1.00				
EI	0.90	0.72	0.84	0.67	0.60	1.00			
ER	0.95	0.69	0.73	0.66	0.59	0.73	1.00		
EP	0.80	0.55	0.56	0.52	0.49	0.57	0.79	1.00	
Overall	0.81	0.88	0.79	0.86	0.82	0.77	0.74	0.62	1.00

The regression in Table 3 is a 2008 cross section analysis of all 162 companies.

Differences in industry are not taken into account or controlled for in this regression. The regression results show that book value and net income are both statistically significant at the 1% level in every regression.

Table 3-2008 Cross Section without controlling for industry

Independent Variables	dependent variable= Market Value (MV) (millions)					
	{1}	{2}	{3}	{4}	{5}	{6}
BV	0.63*** (7.29)	0.6*** (7.58)	0.59*** (7.55)	0.61*** (7.96)	0.57*** (6.61)	0.61*** (7.56)
NI	1.50*** (2.43)	1.46*** (2.72)	1.48*** (2.82)	1.39*** (2.57)	1.55*** (2.82)	1.53*** (2.77)
Overall	--	3.82*** (4.1)	--	--	--	--
EO	--	--	2.13* (1.6)	--	--	--
ER	--	--	--	--	--	4.03*** (3.58)
EI	--	--	--	--	2.2*** (3.72)	--
EP	--	--	--	4.45** (2.17)	--	--
SO	--	--	2.67** (2.16)	--	--	--
SP	--	--	--	3.12** (2.5)	--	--
R ²	0.5549	0.6116	0.6175	0.6254	0.5945	0.5969
SER	20637	19338	19253	19109	19760	19702

Note: t-stat in parenthesis; *** denotes 99% confidence, ** denotes 95% confidence, * denotes 90% confidence

Industry related factors could potentially play a major factor in the effects of corporate sustainability reporting on market value. Sustainability can have a large influence in some industries, such as the petroleum industry, where sustainability is highly important to stakeholders. With controls for each industry, it is now possible to see how each sustainability measurement impacts the market value of different types of companies. This regression was conducted based off Ohlson's model as well:

$$MV_{it} = a_0 + a_1NI_{it} + a_2BV_{it} + a_3(Industry_1 * v)_{it} + \dots + a_{12}(Industry_{10} * v)_{it}$$

Table 4-Industry Controlled 2008 Regression

Independent Variables	dependent variable= market value (MV) (in millions)		
	{1} Overall	{2} EO	{3} SO
BV	0.57*** (6.76)	0.57*** (6.91)	0.59*** (6.8)
NI	1.45*** (3.5)	1.4*** (3.07)	1.36*** (3.12)
Auto*v	6.68*** (2.92)	6.81*** (2.62)	5.78*** (2.97)
Banks*v	3.05* (1.43)	2.81 (1.04)	2.98* (1.54)
Industrial*v	1.35* (1.6)	0.82 (0.66)	1.74*** (2.37)
Chemicals*v	1.53** (2.08)	1.10 (1.23)	2.20*** (2.42)
Food/Beverage*v	3.84** (2.2)	4.62** (1.78)	3.68*** (2.45)
Electronics*v	1.50** (1.64)	1.16 (1.13)	1.76** (2.1)
Forest/Paper*v	0.63 (1.22)	-0.28 (0.43)	1.16** (2.09)
Metals*v	0.28 (0.37)	-0.52 (0.5)	0.69 (0.94)
Pharmaceutical*v	6.07*** (5.81)	7.74*** (4.56)	7.00*** (6.2)
Telecommunications*v	4.97** (2.27)	5.31** (1.89)	5.01*** (2.58)
R ²	0.6975	0.6785	0.6953
SER	17573	18118	17639

Note: t-stat in parenthesis; *** denotes 99% confidence, ** denotes 95% confidence, * denotes 90% confidence

The panel regression discussed in the methods section is listed below in Table 5. Two regressions were performed, one controlling for industry and another without these effects. The regression without industry effects was performed because the industry-controlled model had correlation issues with the overall sustainability score variable and the sector variable. As visible in the first regression, overall score appears to be insignificant. However, this is not the case, and is exhibited in the second regression.

Table 5-Panel Data

Independent Variables	Dependent variable = Market Value (MV) (in millions)	
	{1}	{2}
BVNI	0.54*** (4.34)	0.53*** (4.44)
Banks*v	9.48* (1.63)	-----
Chemicals*v	0.44 (0.09)	-----
Food*v	2.48 (0.18)	-----
Electronics*v	2.71 (0.5)	-----
Forest*v	14.46** (2.32)	-----
Metals*v	-0.7 (0.14)	-----
Pharmaceuticals*v	1.19 (0.22)	-----
v (Overall Sustainability Score)	4.25 (1.00)	6.09*** (3.78)
D_07*v	-1.12 (1.12)	-1.09 (1.11)
D_08*v	-5.92*** (5.79)	-5.73*** (6.02)
D_09*v	-4.28*** (4.02)	-4.09*** (4.16)
D_10*v	-4.43*** (4.22)	-4.27*** (4.41)
R ²	0.9	0.9
SER	19907	19725

Note: t-stat in parenthesis; *** denotes 99% confidence, ** denotes 95% confidence, * denotes 90% confidence

Additionally, it is important to perform tests to determine that the years are significantly different from 2008. F tests were conducted and validated the hypothesis that each year was different than the 2008 year. Results are visible in the appendix (Table 4).

V. Discussion

The 2008 cross section without controlling for industry in Table 3 shows that book value and net income are always statistically significant at the 99% confidence level, proving that Ohlson's model holds true. Furthermore, the coefficient on book value is roughly 0.6 in every regression, which is close to the theorized value of one for Ohlson's model. The fact that the coefficient is below one is probably due to the bear market in 2008 caused by the recession. Equation 2, which measures the impact the overall score PSI sustainability score has on market value, shows that the overall score is significant at the 99% confidence level. The interpretation of the overall coefficient states that for every 10 percent point increase in overall PSI score, market value increases by \$38 million, on average. This result reinforces the hypothesis that superior corporate sustainability reporting is related to higher market value. Additionally, the increase in R^2 of roughly 5% from Equation 1 to Equation 2 shows that Ohlson's model of firm valuation becomes a better predictor of market value with the addition of a variable measuring sustainability. Equation 3 breaks up the Overall score into the Overall Environmental score and Overall Social score, the two factors of Overall score, in order to determine which has the greater effect on market value. Environmental overall proves significant at the 90% confidence level and Social Overall is significant at the 95% confidence level. Both are clearly significant and have similar coefficients, showing that both facets of corporate sustainability reporting are important. The coefficient for Social Overall proves to be slightly higher than the coefficient of Environmental Overall, which coincides with Oliver Salzmann's (2005) hypothesis that social factors of the sustainability report have a greater impact on firm profitability than environmental factors. Upon looking at the statistically significant environmental and social performance metrics in Equation 4, it is clear that environmental performance has a greater effect on market

value of a firm than social performance. It also appears that when the other aspects of the overall environmental score are regressed separately due to correlation issues with other scoring variables, they are significant as well.

The industry controlled regression in Table 4 shows similar results on book value and net income, both of which are significant and book value has a coefficient of roughly 0.60. The coefficient on net income states that for every \$1 million increase in net income, market value increases \$1.45 million for Equation 1. Industries that are both significant at the 99% confidence level and have a large coefficient include the automobile, pharmaceutical, and telecommunications industries. The food and beverage industry is also significant at the 95% level and has a relatively high coefficient of 3.84. The fact that the automobile industry has the highest coefficient, with every percentage point increase in sustainability score increasing market value by \$6.68 million on average, is easily justifiable. Automobile companies should be extremely concerned with sustainability initiatives because public perception of corporate sustainability greatly impacts firms in this industry. Automobile firms are constantly being scrutinized for their sustainability efforts, which could potentially magnify the issue and lead to companies that are more concerned with sustainability to be perceived as better companies than those who are not as concerned. Another interesting industry to note is the Pharmaceuticals industry, which is also highly statistically significant and has a large coefficient. This is another industry in which it is extremely important to have a positive public image. Dr. Faiz Kermani explains, “the pharmaceutical industry is under constant scrutiny regarding the way it operates [...] Media coverage of the pharmaceutical industry’s activities has often been negative and whether they like it or not companies have to pay greater attention to their public image” (Kermani, 2005). Some industries where we expect to see a great impact of corporate

sustainability on market value, such as the forest and paper industry, appear statistically insignificant in this regression. This is most likely due to the fact that data was available for only seven forestry companies, possibly skewing the results. Other industries faced similar issues. In order to combat this issue, a panel was created which allowed for more data points to be analyzed and provide a more accurate model.

The purpose of the panel regression in Table 5 Equation 1 is to see the effects of the recession on certain years and analyze any possible industry effects. The model shows that the combined book value and net income variable is still highly significant, which helps show that Ohlson's model still holds true. Furthermore, the regression appears to be a good fit for the data, seeing as the model explains 90% of the variation in market value. Surprisingly, many of the industries are no longer statistically significant, which shows that over the course of the five years the impact of corporate sustainability on market value was not determined by differences in industries. The only industry where sustainability appears to be statistically significant at the 99% confidence level is the Forestry and Paper industry. This makes sense because this industry is heavily scrutinized for its sustainability initiatives based on their business practices of using natural resources to create revenues. The most interesting part of this regression appears to be the interaction term of year and overall score, which measures the effectiveness of overall sustainability on market value on a year-by-year basis. Because these determinants are binary variables, the variable "v" represents year 2006 when all the other terms for year drop out of the equation. A 2006 year variable is excluded to prevent issues with linear dependency. As seen in Equation 1, the variables for year do not always appear to be statistically significant. This is because of linear dependency issues with the sector interaction terms, which interacts with the "v" variable statistic. Thus, Equation 2 eliminates the industry interaction terms from the

equation, instead focusing on the year-to-year effects. When interpreting the coefficient for the effect of each year, it is important to add the “v” variable with the year and overall score interaction term for each year. This yields coefficients of 6.09, 5, 0.36, 2, and 1.82 for the years 2006, 2007, 2008, 2009, and 2010, respectively. Additionally, all of these terms are statistically significant at the 99% confidence level. For the year 2007, a ten percentage point increase in overall PSI sustainability score correlates with an increase in market value of \$5 million, on average. Each coefficient, which can be interpreted in this same manner, yields interesting results. The positive correlation between sustainability reporting and market value supports previous research that shows a positive link between superior corporate sustainability and increased firm value. Additionally, there is a slightly decrease in the effect of sustainability reporting in 2007 followed by a massive drop in 2008. In 2009 and 2010, there is a gradually but slow recovery in the effectiveness of corporate sustainability’s impact of market value. This decrease and gradual increase draws similar parallels to the Great Recession, which officially lasted from December 2007 to June 2009 (Rampell, 2010). Thus, during the recession, corporate sustainability reporting remained significant but the correlation it had with market value decreased dramatically. It is also interesting to note how there was very little difference between the coefficients for 2009 and 2010. This slow recovery in the magnitude of the coefficient also parallels the slow recovery characterized by the Great Recession.

VI. Conclusion

Although many firms place a heavy reliance on claiming that they possess effective corporate sustainability initiatives, the true added value of these initiatives has been debated for years. The purpose of this thesis is to look at firms from a wide range of sectors and determine if

any correlation between the level of corporate sustainability reporting and firm value, measured as market value, exists. Additionally, this thesis analyzes the effects of the Great Recession on corporate sustainability's impact on market value. In order to measure the effects on firm value, this thesis uses a modified version of the Ohlson Linear Information Valuation Model. This formula determines firm value as market value, and the components of market value are net income before extraordinary items, book value, and corporate sustainability level. Corporate sustainability level was determined by a standardized ranking system provided by the Roberts Environmental Center at Claremont McKenna College. The ranking system analyzes sustainability reports based on a wide array of factors, such as environmental/social intent, environmental/social reporting, and environmental/social performance. A cross section valuation study is conducted for 2008 and concludes that both the environmental and social aspects of sustainability reporting are significant and positively correlated with market value. An additional cross section regression controlled for industry and showed that corporate sustainability is a highly significant factor for market value in the pharmaceuticals industry and automobile industry. Due to the limitations of cross sectional data and the desire to test the effects the Great Recession had on corporate sustainability and firm value, a panel analysis is conducted for 2006-2010. This test not only controls for year, but also controls for industry and entity fixed effects of each individual company. This testing determines that industry does not play a large effect on the correlation between sustainability reporting and market value. However, the impact that corporate sustainability reports has on market value changes greatly on a year-by-year basis. During the prime year of the Great Recession, mainly 2008, corporate sustainability still maintained a slight positive correlation with market value but the magnitude of the correlation dropped dramatically. These results would indicate that firms would not be better

off trying to be more aggressive with their corporate sustainability efforts during times of recession. This contradicts Placier Klara's theory that firms should attempt to improve sustainability efforts during times of recession in an attempt to gain a competitive advantage over competitors.

This study has limitations due to the nature of the data. Because the Roberts Environmental Center only has 2008 data for roughly half of the sectors, sector data from 2009 for was used for many of the industries. When environmental scoring data was available for 2007 and 2009, an average of the two years' scores was taken and used as the 2008 score. Furthermore, this thesis will not look at every sector in the business market. A sector analysis of ten diverse industries will suffice as an accurate sample of the total population for the cross sectional work. Additionally, two outliers were taken out of the 2008 cross-section regression analysis in this study. These two companies, Johnson & Johnson and AT&T, both possess significantly higher market values than the other companies in this study. Such outliers greatly skew the OLS regression analysis. Lastly, while this ranking system is very methodical and direct, it does rely on discretion due to evaluating qualitative characteristics, such as plans for the future. One researcher may judge these plans more harshly than another.

The important takeaways of this thesis pertain to the positive correlation of corporate sustainability on firm value. It is important to note that this does not mean that superior sustainability reporting causes an increase in firm value. However, based on the positive correlation it is a reasonable assumption to conclude that sustainability reporting does not have negative effects on firm value. Another important aspect of this thesis is the effect of corporate sustainability reporting on firm value during times of recession. Considering the Great

Recession occurred recently, there has not been a large amount of research done pertaining to the effects the Recession had on corporate sustainability's impact on firm value.

In an attempt to expand upon this study, one could look at other financial measurements such as excess return and long-term ROE growth to judge further effects of effective sustainability reporting. Additionally, a study that looks at the release of sustainability reports and the immediate impact on stock price could help prove whether or not sustainability reports cause an immediate increase or decrease in firm value.

Generally, analyzing the effects that sustainability reporting has on firm value is a relatively new field that continues to grow rapidly due to the increased importance of corporate sustainability reporting. Considering stakeholders are placing a larger emphasis on these reports and the number of firms that release these reports is rapidly growing, these reports may have much greater effects on firm value in the future. This study should serve as a useful tool in examining the financial effects of sustainability reports and promoting the positive effects of sustainability reporting.

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Appendix

Table 1: Summary Statistics, 2008 Cross Section

Variable	Observations	Mean	Std. Dev.	Min	Max
MV	162	23161.56	30739.69	73.47	124660
EO	162	23.91	16.29	0	66.07
SO	162	41.04	18.05	4.28	77.36
SI	162	45.94	24.16	3.85	100
SR	162	43.16	19	3.77	80.58
SP	162	32.99	15.84	0	69.57
EI	162	49.33	29.28	0	100
ER	162	18.71	15.72	0	68.33
EP	162	8.1	10.4	0	40.91
O	162	38.06	19.31	0	84.3
Auto	162	6.79%			
Food	162	11.72%			
Electronics	162	11.70%			
Forest	162	3.70%			
Metals	162	8.64%			
Pharmaceuticals	162	11.72%			
Telecom	162	6.17%			
Chemicals	162	12.96%			
Industrial	162	13.58%			
Banks	162	12.96%			

Table 2: Summary Statistics, 2006-2010 Panel

Variable	Observations	Mean	Std. Dev.	Min	Max
O	310	46.13	14.57	2.79	74.48
EO	310	34.69	12.86	3.64	66.07
SO	310	47.37	15.5	4.1	76.47
SI	310	52.82	19.71	7.69	100
SR	310	50.09	16.64	1.45	83.77
SP	310	37.54	14.8	4.35	69.57
EI	310	61.97	22.74	1.92	100
ER	310	30.18	13.57	3.33	68.33
EP	310	15.71	10.46	2.08	45.45
MV	310	54018.8	56304.36	0	382421
Banks	310	27.00%			
Chemicals	310	21%			
Food	310	2%			
Electronics	310	16%			
Forest	310	6.50%			
Metals	310	5%			
Pharmaceuticals	310	17%			
Telcom	310	5%			

Table 3: Panel Data Analysis Full Regression

VARIABLES	(1) mkvalt	(2) mkvalt
bvni	0.539*** (0.124)	0.530*** (0.119)
banks_o	9.476 (5.825)	
chem_o	0.440 (4.728)	
food_o	2.447 (13.80)	
electronics_o	2.713 (5.404)	
forest_o	14.46** (6.231)	
metals_o	-0.697 (4.923)	
pharma_o	1.194 (5.317)	
_Icompany_2	-45,210** (22,536)	-46,462*** (8,010)
_Icompany_3	-56,154** (23,113)	-59,318*** (9,546)
_Icompany_4	-45,695* (24,432)	-55,310*** (6,952)
_Icompany_5	-51,170*** (8,728)	-51,504*** (7,975)
_Icompany_6	-13,539 (11,925)	-11,155 (9,742)
_Icompany_7	-52,964** (22,853)	-45,287*** (7,886)
_Icompany_8	-57,489** (22,290)	-58,172*** (8,387)
_Icompany_9	-97,570*** (29,400)	-57,273*** (12,726)
_Icompany_10	-102,096*** (32,360)	-54,672*** (13,963)
_Icompany_11	-22,794 (24,494)	-26,462*** (10,063)
_Icompany_12	-22,043 (26,194)	-27,681*** (10,563)
_Icompany_13	-57,536** (28,309)	-30,318* (15,447)
_Icompany_14	-31,463*** (8,855)	-32,057*** (8,176)
_Icompany_15	-53,619** (21,715)	-52,311*** (9,262)
_Icompany_16	-45,360 (47,232)	-1,405 (37,655)
_Icompany_17	39,334 (78,959)	46,913*** (9,961)
_Icompany_18	-64,364** (25,157)	-32,828*** (8,106)
_Icompany_19	-22,726 (24,786)	-24,350** (9,484)
_Icompany_20	-41,294* (24,786)	-44,503*** (9,484)

	(23,199)	(7,499)
_Icompany_21	-62,213***	-64,537***
	(23,061)	(9,645)
_Icompany_22	-56,812**	-56,526***
	(22,070)	(9,664)
_Icompany_23	-68,022***	-59,750***
	(24,009)	(8,858)
_Icompany_24	76,559	118,667***
	(52,542)	(44,929)
_Icompany_25	-50,589***	-49,196***
	(10,553)	(8,360)
_Icompany_26	34,185***	34,284***
	(6,886)	(6,515)
_Icompany_27	-92,852***	-59,623***
	(25,056)	(8,475)
_Icompany_28	-60,392***	-53,324***
	(22,303)	(8,257)
_Icompany_29	-1,131	41,091**
	(34,615)	(19,856)
_Icompany_30	-57,179**	-57,806***
	(22,272)	(8,590)
_Icompany_31	15,172	24,630**
	(27,940)	(10,696)
_Icompany_32	-129,951***	-57,207***
	(27,788)	(7,798)
_Icompany_33	79,519***	80,182***
	(8,596)	(7,960)
_Icompany_34	-55,416**	-30,509***
	(24,206)	(10,144)
_Icompany_35	-114,677***	-60,935***
	(25,020)	(8,793)
_Icompany_36	-53,094**	-52,525***
	(21,794)	(8,730)
_Icompany_37	10,835	10,989
	(10,448)	(10,131)
_Icompany_38	-60,912**	-28,240**
	(27,435)	(12,118)
_Icompany_39	-99,598***	-56,809***
	(28,516)	(9,614)
_Icompany_40	-55,888**	-56,020***
	(22,182)	(8,832)
_Icompany_41	-64,183**	-29,624***
	(25,909)	(7,700)
_Icompany_42	-54,785*	-58,034***
	(29,404)	(12,112)
_Icompany_43	-46,384*	-56,504***
	(24,239)	(7,278)
_Icompany_44	22,780**	23,550**
	(10,152)	(9,525)
_Icompany_45	-19,188	-23,293***
	(29,272)	(7,855)
_Icompany_46	-59,695**	-50,541***
	(25,165)	(6,919)
_Icompany_47	32,837***	33,589***
	(10,763)	(10,207)
_Icompany_48	-37,031*	-37,836***
	(22,336)	(8,069)
_Icompany_49	-38,543	-8,869

	(24,614)	(8,374)
_Icompany_50	-117,501***	-80,152***
	(34,981)	(21,745)
_Icompany_51	-58,314**	-48,845***
	(25,869)	(6,968)
_Icompany_52	-6,360	-6,469
	(10,050)	(9,618)
_Icompany_53	-53,978*	-8,519
	(31,980)	(13,830)
_Icompany_54	-62,136***	-53,848***
	(23,556)	(7,225)
_Icompany_55	-48,531**	-33,454**
	(24,086)	(13,267)
_Icompany_56	-53,179**	-44,273***
	(25,142)	(6,975)
_Icompany_57	-53,007**	-53,150***
	(21,441)	(9,646)
_Icompany_58	-135,807***	-61,201***
	(27,990)	(7,859)
_Icompany_59	-59,770**	-51,159***
	(24,339)	(7,585)
_Icompany_60	-49,503**	-42,297***
	(22,662)	(8,297)
_Icompany_61	-47,171*	-11,801
	(27,084)	(10,893)
_Icompany_62	-126,460***	-56,968***
	(27,580)	(8,176)
adjusted_overall	4.251	6.094***
	(4.259)	(1.613)
_IyeaXadu_2007	-1.119	-1.085
	(0.997)	(0.975)
_IyeaXadu_2008	-5.925***	-5.727***
	(1.023)	(0.951)
_IyeaXadu_2009	-4.276***	-4.093***
	(1.065)	(0.983)
_IyeaXadu_2010	-4.432***	-4.266***
	(1.049)	(0.968)
Constant	54,095**	49,383***
	(21,278)	(10,966)
Observations	310	310
R-squared	0.905	0.904
Robust standard errors in parentheses		
*** p<0.01, ** p<0.05, * p<0.1		

Table 4: F Test of Panel Data Years

	test	test	test
	2007=2008	2008=2009	2008=2010
F (1,242)	50.07	7.04	6.41
Prob>F	0	0.0085	0.012

