

# **The Relationship Between Equity Dependence and Environmental Performance**

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*How does a corporation's dependence on its shareholders affect the sustainability of its commitment to environmental performance? Although the literature has investigated how the financial markets respond to environmental and green initiatives, it has yet to examine the relationship between a firm's commitment to the environment and its dependence on the equity markets. In this research, we explore the relationship between equity dependence and environmental performance and find equity dependence is significantly related to corporations' environmental concerns but not their environmental strengths.*

## **INTRODUCTION**

Although the literature has investigated how the financial markets respond to corporate social responsibility (CSR) initiatives, to our knowledge, there has been limited research on how financial market perceptions affect CSR investments. Furthermore, even less research has been done on firms' CSR decisions when those firms are heavily dependent on the financial markets. In this research, we examine the theory and evidence for how a firm's equity dependence influences its environmental record. Given that environmental performance and "green" issues have become hot button topics in the age of global warming, how equity dependence influences a firm's environmental practices is an important piece of the puzzle.

Our focus on environmental performance instead of the more encompassing CSR measure facilitates the contribution of this paper in two important ways. First, there is empirical evidence that different categories of social responsibility have variable financial impact (see Berman, Wicks, Kotha and Jones, 1999). Second, as noted in the introduction, environmental and "green" issues are hot-button topics in an increasingly environmentally aware society. Especially as global warming and the health impacts of environmental problems have become more obvious, environmental performance has become an important piece of overall CSR performance.

Empirical evidence on the environmental/financial performance link is thin and inconclusive. For example, Lucas and Wilson (2008) claim a positive environmental/financial relationship for 1228 service firms. On the other hand, Berman Wicks, Kotha and Jones (1999) find, "[t]he natural environment failed to exhibit statistically significant impacts on firm financial performance." (p. 501). Our paper helps explain the underlying causes of the contrasting results.

## LITERATURE REVIEW

“In response to the surge of reported negative firm behaviors as well as the increased levels of sensitivity of customers, employees, and other stakeholders to social and environmental issues, more companies are making corporate social responsibility (CSR) an important strategic objective” (Wagner, Lutz, and Weitz, 2009, p. 77). Although some stakeholders may feel that management actions, such as those related to CSR, reflect the perceptions of various stakeholders, Zinkhan and Carlson (1995) point out that not all stakeholder groups will concurrently be pleased with management actions.

Building on the idea of asymmetric stakeholder responses to CSR initiatives, Davis and MacDonald (2010) suggest that the sustainability of such initiatives depends on how they are received by salient stakeholders. Salience, in this context, refers to the priority a firm gives a stakeholder and is derived primarily from a stakeholder’s power and urgency (Mitchell, Agle, and Wood, 1997). Power is defined as the ability or potential to apply a high level of direct economic reward or punishment, coercive or physical force, and/or positive or negative social influence. Stakeholder urgency exists when there is a pressing call for attention (Magness, 2007).

Given that organizations have finite resources in terms of time and money, they are unlikely to proactively address the concerns of all stakeholders all the time. Research on stakeholder salience indicates that corporations will pay more attention to stakeholders who control critical resources and have a sense of urgency in their claims (e.g., Agle et al. 1999). In our particular case, we assume that shareholder power, and especially shareholder urgency, increase as firms become more dependent on equity financing versus other financing mechanisms (such as internal funding from profitability). In practical terms, the stock market’s preference for short-term profitability over the long-term viability of their investments reduces firms’ incentives to invest in long-term assets like R&D, advertising/ branding, and CSR initiatives (Lahart, 2009).

The issue of shareholder salience is an important one for firms considering investments in CSR and environmental projects as there is a contentious relationship between CSR performance (and the environmental practices that are a big part of that equation) and financial metrics (especially those related to stock markets). On one hand, we have free market proselytizers that view the firm’s sole goal as maximizing profits so that socially responsible investments above a regulatory minimum simply burnish manager egos (Friedman, 1970). On the other hand, CSR true believers use the stakeholder theory detailed above to argue that CSR initiatives increase the trustworthiness of the firm with stakeholders and reduce agency costs that can lead to suboptimal investments. For example, CSR could help attract and keep better employees, brand firm outputs in a positive way with consumers, reduce operating costs by reducing agency costs with suppliers, and serve as a reservoir of goodwill that helps the firm weather downturns (Barnett, 2007).

The empirical evidence on these opposing views is inconsistent. Margolis and Walsh review 127 articles from 1972 to 2002 and find that “[a] simple compilation of the findings suggest a positive association, and certainly very little evidence of a negative association, between a company’s social performance and its financial performance”; however, they later admit, “[t]he imperfect nature of these studies makes research between the link between CSP [social performance] and CFP [financial performance] self-perpetuating: each successive study promises a definitive conclusion, while also revealing the inevitable inadequacies of empirically tackling the question” (Margolis and Walsh 2003, pp. 277-278). The ubiquitous practice of CSR investing also bolsters a positive CSR/financial link. However, a more cynical review of the literature is also fairly common: “[t]he result is that after more than 30 years of research, we cannot clearly conclude that whether a one-dollar investment in social initiatives returns more or less than one dollar in benefit to the shareholder” (Barnet, 2007, p. 794).

The impact of CSR on stock performance is seriously complicated by theories and evidence that the key direction of causation is from stock prices to investment (CSR included). Thus, higher stock returns lead to higher CSR initiatives since firms are less constrained financially. Baker, Stein and Wurgler (2003) argue that inefficient stock markets cut off firms from equity financing when their prices are irrationally low, which is especially troublesome for firms that don’t generate the internal or debt

financing to fund all positive net present value (NPV) projects—equity dependent firms. The relationship between investment and stock prices is therefore especially strong for these equity-dependent firms that have to placate a salient group of shareholders. An alternative explanation for the strong empirical relationship between equity dependence and investment found in Baker et al. (2003) is that markets are rational, but market imperfections related to debt overhang, information asymmetry and financial distress costs are the root causes; not over/under valuation of firm stock (Ovtchinnikov and McConnell, 2009).

Besides the problems inherent in using stock returns to measure financial performance, the CSR/financial performance link is also impacted by the long-term nature of a socially responsible investment such as environmental projects. Like R&D and corporate reputations, the payoff for these investments depends on a variety of factors and often the impact is cumulative. R&D is a good example: basic research might be good for the overall social good, but firms with an “absorptive capacity” (Cohen and Levinthal, 1990) honed by experience can use that to create a competitive advantage; they have a platform that allows them exploit new knowledge better than others. In the same way, CSR or environmental investment payoffs can build on themselves so that current returns depend on past investment. Thus, investment returns to CSR/environmental projects vary across time for individual firms (there is a life cycle for CSR acts) and cross-sectionally for all firms; which certainly complicates the econometric properties of the relationship.

Based on the above discussion, the main proposition explored by this manuscript is: Equity dependence and environmental performance are significantly and negatively related. That is, as equity dependence increases, firms invest less in projects that increase the environmental performance of the firm.

## RESEARCH METHODOLOGY

### Measuring Equity Dependence

According to Diamond (1991), a sensible measure of equity dependence would likely be negatively related to operating cash flow, debt capacity, and cash on hand while being positively related to proxies for growth opportunities actual leverage. Consistent with Diamond’s position, Kaplan and Zingales (1997), study the financial constraints faced by a sample of 49 low-dividend manufacturing firms using both objective and subjective criteria. Kaplan and Zingales (1997) classify firms into discrete categories of financial constraint and then use an ordered logit regression to relate their classifications to accounting variables. The resulting KZ index is offered as comprehensive measure of a firm's dependence on equity that has been used in a number of financial market studies (e.g., Lamont, Polk & Saá-Requejo, 2001). Firms with a high KZ index have high debt, low cash, and low dividends (Lamont, Polk, and Saá-Requejo, 2001). The five-variable version of the KZ index used is shown in Figure 1.

**FIGURE 1**  
**FOUR VARIABLE VERSION OF THE KZ INDEX**

$$KZ_{it} = -1.002CF_{it}/A_{it-1} - 39.368 DIV_{it}/A_{it} - 1.315C_{it}/A_{it-1} + 3.139 LEV_{it} + 0.283Q_{it}$$

where  $CF_{it}/A_{it-1}$  is cash flow over lagged assets;  $DIV_{it}/A_{it}$  is cash dividends over lagged assets;  $C_{it}/A_{it-1}$  is cash balances over assets;  $LEV_{it}$  is leverage; and  $Q$  is the market value of equity plus total assets minus the book value of equity all over total assets. All item measures are based on data provided by Standard and Poor’s Compustat database.

The KZ index has been used in numerous empirical tests of financial constraints. The most notable works, with respect to this research, are by Lamont, Polk, and Saá-Requejo (2001), Baker, Stein, and Wurgler (2003), and Ovtchinnikov and McConnell (2009). Lamont, Polk, and Saá-Requejo (2001), use the KZ index to test if firms face financial constraints that hamper their ability to invest. The authors conclude that there is a financial constraints factor, an identifiable independent common source of

economic shocks to firm value. The evidence suggests that financial constraints do affect firm value and that the severity of constraints varies over time.

Baker, Stein, and Wurgler (2003), find that among the firms most likely to be equity dependent, stock prices have a larger effect on investment than does cash flow. Furthermore, these authors suggest that this finding stands in contrast to the general belief that the effect of cash flow dominates that of Tobin's  $Q$  in investment equations.

Finally, Ovtchinnikov and McConnell (2009) use the KZ index to study the effects of financial constraints on a much larger sample of 91,957 firm-year observations, representing 10,732 unique firms. The authors show that higher KZ index firms exhibit an increased sensitivity of investment to stock prices and argue that these firms are more likely to suffer from debt overhang (high levels of debt that hinder a firm's borrowing ability) and information asymmetry problems. Because of high leverage, these firms are also more likely to encounter costly financial distress. It is thus plausible that these market imperfections will affect these firms' financing decisions as well as their investment decisions. Such imperfections will affect investment decisions in such a way that investments will appear to exhibit increased sensitivity to stock prices (even though they do not) (Ovtchinnikov and McConnell, 2009, p. 558)

*KZ Index robustness.* A particularly interesting finding of the Baker, Stein, and Wurgler (2003) study is that the KZ index is a robust measure of financial constraints. For example, although the original Kaplan and Zingales (1997) study was based on a relatively small sample of firms, Baker, Stein, and Wurgler (2003) achieve very similar results when the index is applied either to a subsample similar to that originally studied by Kaplan and Zingales—i.e., low-dividend manufacturing firms—or to its exact complement 985. Furthermore, Baker, Stein, and Wurgler (2003) find similar results when  $Q$  is dropped from the KZ index and the coefficients on the other four variables remain the same. That is, when the four-variable version of the KZ index was used on the original KZ sample, Baker, Stein, and Wurgler (2003) find that the coefficients on the other four variables are virtually identical whether or not  $Q$  is included in the regression. We use the four variable version of the KZ index in our analysis.

### **Measuring Environmental Performance**

In addition to measures of Financial Market Dependence, we require a measure of firms' environmental performance. The most prominent and comprehensive measure of corporate social performance (CSP) has been developed by the investment firm Kinder, Lydenberg, Domini, and Company (KLD) (Mitchel et al., 1997). KLD uses company surveys and secondary sources to obtain information on approximately three thousand companies. The company collects CSR data in terms of strengths and weakness over eight broad categories : i) *community*; ii) *corporate governance*; iii) *diversity*; iv) *employee relations*; v) *environment*; vi) *human rights*; vii) *product quality*; and viii) *controversial business issues*.

Following the approach of Hillman and Keim (2001), we use the KLD STATS database to construct three key measures of Environmental Performance: Environmental Concerns (EnvCons), Environmental Strengths (EnvStrs), and Net Environmental Performance (EnvNet). We restricted our analysis to the years 2000 to 2009. The variables included in the EnvCons and EnvStrs measures are presented in Table 1. The EnvNet measure is simply the result of subtracting EnvCons from EnvStrs. The seven stakeholder and social issues areas, as well as the strength and concern indicators by dimension, are listed in Table 1. Because the number of measures for the EnvStrs measure changed between 2000 and 2009, we sum the total strength indicators for each year and then divide by the number of indicators. For example, from 2000 to 2005 there were five indicators of environmental strengths but six indicators from 2006 to 2009. Although the number of indicators for the EnvCons measure did not change, we also scale that variable by the number of EnvCons indicators (i.e., seven).

**TABLE 1**  
**ENVIRONMENTAL PERFORMANCE MEASURES**

<b>Strengths</b>	<b>Concerns</b>
Beneficial Products & Services	Agricultural Chemicals
Alternative Fuels (Clean Energy)	Climate Change (added in 1999)
Management Systems (added 2006)	Hazardous Waste
Pollution Prevention	Ozone Depleting Chemicals
Recycling	Regulatory Problems
Other Strength	Substantial Emissions
	Other Concern

### **Control Variables**

Because size, performance, and industry have been suggested in previous articles to be factors that affect CSR and potentially environmental performance (e.g., Ullman, 1985; Mathur and Mathur, 2000; Udayasankar, 2007), each of these characteristics was operationalized as a control variable. We control for firm size by using sales. Our industry controls were based on the 13 industry classifications used in Waddock and Graves (1997). Industry was determined by the firm's 4-digit SIC and represented in the model by dummy variables. Finally, we control for firm performance differences by including measures of return on assets (ROA) and gross profit margin (GPM). Although debt/equity, total assets, and cash have also been used as control variables in previous research on social responsibility, we did not control for these variables because of their inclusion in the KZ index.

### **Analysis**

Table 2 lists the industries, SIC codes, and average industry Environmental Performance ratings (Env. Cons, Env. Strs., and Net Env.). The Banking and Finance related industries were omitted from the dataset based on previous research on the KZ index (see Baker, Stein, and Wurgler, 2003 and Ovtchinnikov and McConnell, 2009). Table 3 details descriptive statistics for all variables used in the

**TABLE 2**  
**INDUSTRIES IN THE SAMPLE**

<b>Industry</b>	<b>SIC</b>	<b>N</b>	<b>EnvCons</b>	<b>EnvStrs</b>	<b>NetEnv.</b>
Mining, Construction	1	260	0.072	0.020	-0.052
Food, textiles, apparel	2	120	0.037	0.037	0.001
Forest products, paper, publishing	3	112	0.048	0.064	0.016
Chemicals, Pharmaceuticals	4	354	0.057	0.038	-0.019
Refining, rubber, plastics	5	67	0.135	0.049	-0.087
Containers, steel, heavy mfg.	6	221	0.056	0.043	-0.013
Computers, autos, aerospace	7	719	0.023	0.035	0.012
Transportation	8	120	0.026	0.007	-0.019
Telephone and Utilities	9	291	0.100	0.043	-0.057
Wholesale, retail	10	411	0.013	0.010	-0.003
Hotel, entertainment	12	588	0.002	0.004	0.0023
Hospital Management	13	149	0.001	0.004	-0.009

study. We use regression analysis to explore the relationship between equity dependence and environmental performance. The first model uses Environmental Concerns (Env. Cons.) as the dependent variable, the second model uses Environmental Strengths (Env. Strs.), and the third model uses Net Environmental Performance (Net Env.). Equity dependence (KZ index) serves as the independent variable in each model. Furthermore, in each regression we control for firm performance (ROA, gross profit margin (GPM), firm size (sales), and industry. Following Baker, Stein, and Wurgler (2003) and Ovtchinnikov and McConnell (2009) all variables were Winsorized by industry using the first and 99<sup>th</sup> percentiles as cutoffs.

**TABLE 3**  
**DESCRIPTIVE STATISTICS**

Variable	N	Mean	S.E.
Environmental Cons	17388	0.0308	0.00078
Environmental Strengths	17388	0.0270	0.00065
Net Environmental	17388	-0.0110	0.00084
Total Sales	17388	3922.72M\$	21.22M\$
Gross Profit Margin	17388	35.14	0.098
Return on Assets	17388	2.33	0.019

## RESULTS

A total of 17,388 firm years and 3412 companies remained in the sample after companies missing either financial or environmental performance data were eliminated. As can be seen in Table II, there are considerable differences in the ratings among industries. The industry with the most environmental concerns is refining, rubber, and plastics while the forest products, paper, and publishing industry has the highest environmental strengths rating and highest net environmental performance. Telephone and Utilities has the lowest when environmental concerns are subtracted from environmental strengths. Note from Table II that most industries (9 out of 12) were rated below 0 on the overall CSP scoring and that only those industries not engaged in activities as likely to have significant CSP consequences (e.g., environmental impact or community, employee, and product-related issues) were rated positively on overall CSP. These descriptive results indicate the importance of controlling for industry in the assessment of the relationship between financial and environmental performance.

Table 4 provides the correlation matrices for the key variables. As expected, equity dependence (KZ index) is negatively correlated with sales. Equity dependence was not significantly correlated with gross profit margin (GPM) or return on assets (ROA). Of greater interest is the finding that equity dependence is negatively and significantly related to environmental concerns (EnvCons) but the relationship between equity dependence and environmental strengths (EnvStrs) is not significant. Finally, equity dependence and net environmental performance (NetEnv) are significantly correlated but the relationship is positive rather than negative. Note that the opposing signs for the KZ (equity dependence) correlations of EnvCon (negative) and EnvNet (positive) is a function of how the EnvNet variable is constructed (scaled strengths minus cons). Thus, a higher value for cons actually makes the net lower when they are subtracted out.

**TABLE 4**  
**CORRELATION MATRIX**

	<b>EnvCon</b>	<b>EnvStrs</b>	<b>EnvNet</b>	<b>KZ</b>	<b>Sales</b>	<b>GPM</b>	<b>ROA</b>
EnvCons	1.00	0.320**	-0.681**	-0.134**	0.268**	-0.122**	0.000**
EnvStrs		1.00	0.476**	-0.006	0.099**	-0.053**	0.018**
EnvNet			1.00	0.120**	-0.173**	0.073**	-0.014
KZ				1.00	-0.298**	-0.003	-0.009
Sales					1.00	-0.203	0.427**
GPM						1.00	0.244**
ROA							1.00

\* $p \leq 0.01$ , \*\* $p \leq 0.001$

Table 5 presents the results of the regression analysis using the three measures of environmental performance (EnvCons, EnvStrs, and NetEnv) as dependent variables and equity dependence (KZ index) as the independent variable while controlling for firm performance, size, and industry (industry controls are omitted from the table in the interest of space).

As can be seen (Table 5), each of the models is significant overall at the  $p < 0.001$  level. With respect to the control variables, ROA is significantly ( $p < 0.001$ ) and positively related to both environmental concerns (EnvCons) and environmental strengths (EnvStrs) but is not significantly related to net environmental performance (NetEnv). Gross profit margin (GPM) is not significantly related to environmental concerns or environmental strengths but is related to net environmental performance at the  $p < 0.01$  level. Firm size (sales) is significantly ( $p < 0.001$ ) and positively related to both environmental concerns and environmental strengths but negatively related to net environmental performance ( $p < 0.001$ ). Although not displayed in Table V, our results suggest a strong industry effect as seven of the twelve industry dummy variables were significant at the  $p < 0.001$ . Three of industry dummies were significant at the  $p < 0.01$  level.

In terms of the relationship between equity dependence and environmental performance, equity dependence (KZ) is negatively related ( $p < 0.001$ ) to environmental concerns (EnvCons) but positively related ( $p < 0.001$ ) to net environmental performance. Although equity dependence was not significantly related to environmental strengths the relationship was positive and approached significance at the  $p < 0.079$  level.

**TABLE 5**  
**REGRESSION ANALYSIS**

<i>Dependent variable: Env. Cons</i>	Std. $\beta$	Sig.
Equity Dependence (KZ)	-0.154**	0.000
Sales	0.350**	0.000
GPM	-0.008	0.338
ROA	0.036**	0.001
$R^2$	0.257	
Adj. $R^2$	0.256	
$F$	339.1**	0.000
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<i>Dependent variable: Env. Strengths</i>		
Equity Dependence (KZ)	-0.054	0.079
Sales	0.449**	0.000
GPM	0.042	0.150
ROA	0.131**	0.000
$R^2$	0.074	
Adj. $R^2$	0.073	
$F$	77.93**	
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<i>Dependent variable: Net Env. (EN)</i>		
Equity Dependence (KZ)	0.101**	0.001
Sales	-0.627**	0.000
GPM	0.009	0.751
ROA	0.033	0.147
$R^2$	0.109	
Adj. $R^2$	0.108	
$F$	119.65**	0.000

## DISCUSSION

Based on previous research, we posited equity dependent firms would invest less in environmental projects, in part because the payoffs are long-term and intangible in nature. But regression results show that net environmental scores increase with equity dependence. Breaking environmental records down into strengths and cons helps explain that dichotomy. Environmental cons drive the results; they are significantly negatively related to equity dependence, while environmental strengths have an insignificant relationship.

Based on our literature review, a tentative, yet plausible explanation for our findings is that equity markets are more willing to invest in environmental projects that reduce the uncertainty of their investment—and reducing environmental concerns (e.g., reducing hazardous waste, the use of ozone depleting chemicals, and avoiding regulatory problems) mitigates potential downside risk. On the other hand, investing in environmental strengths (e.g., use of alternative fuels, recycling, and producing

beneficial products and services) has the long-term and intangible benefits that are not favored by capital markets. Another way to look at it is that shareholders are willing to pay to reduce uncertainty, so that the market discipline provided by more salient shareholders is effective at disciplining environmental costs. But the benefits of increasing environmental strengths are hard to quantify and complicated by the associated information asymmetry, cumulative nature, and long-term horizon of that type of investment.

## CONCLUSION

We have known for many years that returns to CSR are contingent rather than universal (see Ullmann, 1985); however, much of the research on social responsibility and environmental performance fails to address the theoretical underpinnings for these differences (Rowley and Berman, 2000). We attempt to explain this heterogeneity by exploring the relationship between equity dependence and environmental performance. Based on the literature on stakeholder salience, social responsibility, and financial performance we propose a negative relationship between equity dependence and overall environmental performance. That is, as firms become more dependent on equity to finance investments, we expect increased shareholder salience and a growing emphasis on short-term returns to have a limiting effect on investments in environmental projects.

Our results show a significant relationship between equity dependence and environmental performance that is positive rather than negative. However, this relationship appears to be driven by a tendency to reduce environmental concerns as equity dependence increases. We suspect that the increasing salience of the equity markets encourages firms to reduce their environmental risk and uncertainty by investing in decreasing their environmental concerns rather than increasing their environmental strengths. Based on our results, we suggest that salient shareholders do affect firms' decisions related to environmental policy.

A primary finding of this research is that the relationship between equity dependence and environmental performance is complicated. Future research is encouraged in a number of related areas. For example, our finding of highly significant industry effects suggests that an exploration of the factors that cause the differential nature of the equity dependence – environmental performance relationship across industries would be fruitful. Additionally, we recommend that future research investigate the long-term nature of the relationship by incorporating lagged independent variables. Finally, environmental performance is just one component of social responsibility and corporate social performance. Future research should explore the relationship between equity dependence and other CSR related variables such as employee relations, diversity, and corporate governance.

## ACKNOWLEDGEMENTS

Financial support for this project was provided by the College of Business and Economics' Summer Research Grant program at Boise State University. We also thank RiskMetrics Group for access to the KLD Stats database.

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