

## **Does It Pay to Be Environmentally Responsible? Toxic Releases and Financial Performance**

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*Is a corporation's environmental responsibility consistent with its responsibility to maximize shareholder wealth? If environmentally sustainable behavior is a binding constraint on available strategies one would expect environmentally responsible firms to exhibit lower market values than corporations who are free to execute any strategies. But if there is a link between corporate environmental responsibility and shareholder wealth then one would expect environmentally responsible firms to have a higher market value. This study finds evidence of a positive relationship between financial performance as measured by Tobin's q and environmental performance as measured by the USEtox weighting system.*

### **INTRODUCTION**

Both finance academics and practitioners have come to accept the paradigm of the publicly traded corporation as an institution dedicated to the task of creating wealth for its shareholders (Friedman, 1970). Corporate managers create wealth by generating expectations of future cash flows for its owners. But corporations are essentially a set of privileges granted by the state. These privileges are granted because the process of generating cash flows provides goods, services, job opportunities, and tax revenues that benefit stakeholders other than the owners of the firm. While there are natural conflicts between these non-owner stakeholders and the owners, these conflicts do not lie at the core of the firms' existence. Financially successful firms generally provide valuable goods, services, job opportunities, and pay taxes. The broadest class of stakeholders, however, is the set of people who are affected by the environmental performance of the firm. This includes both of those whose health is directly affected by corporate behavior and those who value existing ecological state in which the firm operates. This study addresses the question of whether there is a general conflict between the financial performance and the environmental performance of publicly traded corporations.

Financial performance, however it is measured, is a positive quantity. In this paper we use Tobin's q as a measure of financial performance. Tobin's q is the ratio of the market value of the financial claims on the firm to the amount that the original claimants contributed to the firm's existence. A high Tobin's q identifies wealth creation and implies that a high level of risk adjusted cash flows are expected by the claimants. On the other hand, environmental performance is usually measured as a negative quantity. In this study we construct a measure of the firm's environmental performance using the recently developed

USETox weighting scheme to measure the toxicity of chemical releases into the air, water, and ground; the higher the index the lower the environmental performance.

If wealth creation is unrelated to legal toxic releases one would expect that the financial performance of a firm unconcerned with legal toxic releases would be equal to or greater than the financial performance of a firm that weighed the environmental impact of its strategic options. That is because the set of opportunities of the former must be greater than or equal to those of the latter. Indeed, Folger and Nutt (1975), Aupperle et. al. (1985), and Levy (1995) have argued this point. Mahapatra, (1984), Jaggi and Freedman (1992), Cordeiro and Sarkis (1997), McWilliams and Siegel (2000), and Wagner et. al. (2002) found empirical evidence to support this contention. Socially responsible mutual funds generally do not perform better and sometimes under-perform unconstrained funds (Ambec and Lanoie, 2007). On the other hand, Tobin's  $q$  is a function of expected future cash flows. A firm that is demonstrably weighing the environmental impact of its activities may generate expectations of greater risk adjusted cash flows than one that does not (de Villiers and van Staden, 2007). Such expectations may emanate from increased customer satisfaction, lower risk of cash flow disruption (Konar and Cohen, 2001; Cram and Koehler, 2000; Chan and Milne, 1999; Lanoie, 1998; White, 1996; Hamilton, 1995; Muoghalu, 1990; Spicer, 1978), superior employee retention (Gladwin, 1993; Ambec and Lanoie, 2008), and fewer wasted resources (Hart and Ahuja, 1996; Porter, 1991; Porter and van der Linde, 1995; Russo and Faults, 1997). Surveys of this considerable literature can be found in Ambec and Lanoie (2007), and Orlitzky et. al. (2003).

A number of studies have related financial performance directly to environmental performance using Tobin's  $q$  as a measure of financial performance. King and Lenox (2001) found evidence supporting the link between financial performance and environmental performance using a sample of 652 firms, aggregating toxic releases over a period of ten years. Ragothaman, et. al. (2008) studied air born releases of 100 firms and found that financial performance was positively linked to environmental performance. Konar and Cohen (2001), in a study who's methodology most closely precedes the present one's, found that Tobin's  $q$  was significantly lowered by poor environmental performance as measured by pounds of toxic releases.

It is obvious that a measure of equally weighted pounds of toxic releases does not generate a clear picture of the relative environmental damage from poor environmental behavior. At the time of the Konar and Cohen research there were a few weighting schemes such as EcoIndicator 99 (Toffel and Marshal 2004) but they were not comprehensive and often did not lend themselves to a complete portrait of a corporation's environmental profile. This study addresses the relative toxicity problem by employing the newly released USETox weighting scheme. USETox characterization factors are consensus based, include more chemicals, and account for the exposure pathways (air, water, ground). The Konar and Cohen sampling design begins with the companies of the S&P 500 index that reported toxic releases to the EPA. Our sampling design is the intersection of the entirety of the 49,136 useful release reports to the EPA in the year 2007 and all of the companies in the Compustat data base for which Tobin's  $q$  can be calculated. Thus, this study contributes to the literature by taking account the relative toxicity of each release and using the broadest possible cross section of observations as a sample.

## **METHODOLOGY**

If environmental responsibility is a binding constraint on the financial performance of the firm we would expect to see good financial performance associated with poor environmental performance or no relationship at all. If environmental responsibility improves risk-adjusted expectations of future cash flows we would expect to see the opposite. Thus, the relationship between financial and environmental performance lends itself to a two-tailed test on the coefficient  $\beta_2$  in the equation below.

**FIGURE 1  
THE EMPIRICAL TEST**

$$q = \beta_1 + \beta_2(EP) + \sum \beta_i(\text{control variables}) .$$

Tobin's q is calculated as (Market Value of Equity + Book Value of Debt) / Total Assets. This calculation is standard in the finance literature (Chung, K. and Pruitt S. 1994). Adjustment is made for amortization of goodwill. "EP" the environmental performance measure is given below.

**FIGURE 2  
ENVIRONMENTAL PERFORMANCE MEASURE**

$$EP = \frac{\sum_{ij} Q_{ij} * CF_{ij}}{Sales} ,$$

Where,

$Q_{ij}$  = Quantity (usually in pounds) of chemical "i" released into pathway "j".

$CF_{ij}$  = Characterization factor of chemical "i" released into pathway "j".

Sales = Total revenue for the year.

A significantly negative value for the coefficient  $\beta_2$  supports the contention that good environmental performance is associated with good financial performance. A significantly positive value supports the contention that environmental concerns impose a constraint on the set of the firm's strategic options.

**Data**

This study examines data from the toxic release reports in the Environmental Protection Agency's Toxic Release Inventory (TRI) data base, the characterization factors of the USETox model, and the financial reports of the Compustat data base.

Firms engaged in certain industries and are of a certain size must report the release of listed chemicals above a certain threshold to the EPA. The report is supposed to include the Dunn and Bradstreet number of the firm's ultimate parent company but in practice Dunn and Bradstreet numbers of subsidiary companies are often reported. In order to minimize any bias from such misreporting we use Dunn and Bradstreet, Lexis and Nexus Academic, and Internet search engines to identify the ultimate owner and the ultimate owner's ticker symbol (if any) of the firm generating each of the 49,136 toxic release reports for the year 2007. Any firm (including foreign firms) for which financial data are available in Compustat is included in the sample. Most reporting companies generated multiple release reports throughout the year. We are able to identify 1,074 unique companies that trade on a U.S. exchange, over-the-counter or on pink sheets. Of that set, 795 have at least some information in Compustat. The total number of firms for which both Tobin's q can be calculated and control variables are available numbers 563. These firms constitute the sample.

Work on the USETox model began in 2005 when the United Nations Environment Program – Society for Environmental Toxicology and Chemistry engaged the model developers of seven predecessor models to develop a consensus-based comprehensive model of chemical releases based on their life-cycle impact (Rosenbaum et. al. 2008). The life-cycle characterization factors are calculated according to the pathway of the release (i.e. land, water, or air). For human toxicity the unit of measure is the estimated relative increase in morbidity in the total human population per kilogram. The ecological impact is the potentially affected fraction of species per kilogram emitted.

At the time of this research the project had generated characterization factors for 1,243 individual organic chemicals and 18 inorganic chemical classes (accounting for differing valances across chemical compounds). EPA reporting requirements cover 593 individual chemicals and 30 chemical categories.

Individual chemicals are easily reconciled to the USETox characterization factors by CAS number but chemical categories (e.g. “Certain Glycol Ethers”) are characterized by a representative chemical within the class. The characterization factors for inorganic compounds in the TRI are adjusted by the atomic weight of the metal composing the reported chemical compound, taking account the valence of the toxic compound.

Both TRI and USETox keep track of release pathways. USETox characterization factors depend on whether the release is to natural land, agricultural land, urban air, rural air, freshwater or sea water. TRI pathway reporting requirements include air (point source or fugitive), surface water, underground injection, on-site land, or landfills. We use simple, constant averages to reconcile these differences.

The control variables are the natural log of the return on assets (LROA), the natural log of the firm’s total assets (LA), the growth rate in real assets (GA), and the growth in sales from the year 2006 to the year 2007 (GS). Table 1 provides descriptive statistics.

**TABLE 1  
DESCRIPTIVE STATISTICS**

	Minimum	Maximum	Mean	Std. Deviation
Tobin’s q	.6400	15.77	2.2120	1.27467
Revenue (\$1000)	6.80	375,376	14,082	38,943
Revenue Growth (%)	-59.49	506.19	14.66	35.83
Total Assets (\$1000)	11.33	2,187,631	20,139	1.03043E5
Return on Assets (%)	.01	33.47	7.24	4.84
Asset Growth (%)	-9.00	36.00	1.71	4.084
Human Tox ( <i>EP</i> )	.0014	4484,742.52	19,482.0059	222,447
Eco Tox ( <i>EP</i> )	1.5200	2.87E12	1.5087E10	1.30852E11

## RESULTS

Simple ordinary least squares regressions of EP onto Tobin’s q are reported in Table 2. The natural log of all the variables except asset growth and sales growth is used because the latter are negative for some firms. Three regressions are reported. The first reports the effects of chemical releases weighted by their affect on human health, the second is based on their affect on aquatic eco-systems and the third includes both weighting schemes. The first two regressions support the hypothesis that good environmental performance is associated with good financial performance. When estimated in separate equations the estimated coefficients on the (*EP*) measures are negative and significant consistent with the hypothesis that good environmental and good financial performance are associated with each other. Because the USETox characterization factors are estimated on a relative basis, the extent to which inferences can be drawn from these results is limited. If the characterization factors were interpreted as absolute references then these results would imply a mortality-performance relationship in the case of human toxicity. In the case of human toxicity weightings, a one percent increase in the morbidity in the human population per dollar of revenue implies a 0.16% decline in the Tobin’s q multiple. That implies that for a typical firm, reducing toxicity enough to reduce morbidity by one percent will add \$3.3 million to the market value of the firm. For eco toxicity, a one percent decline in the species affected per dollar of revenue is associated with a 0.13% decline in the Tobin’s q multiple, implying that a one percent decline would add \$2.62 million to the market value of the firm.

The third regression is consistent with the multicollinearity that might be expected. The actual chemicals affecting human and ecological health are the same in both weighting schemes. The difference

between the two variables is in the weighting schemes used to derive them. It is not surprising that the weightings schemes would be closely related to each other.

**TABLE 2**  
**REGRESSION RESULTS**

Constant	-0.62 (-0.767)***	0.128 (1.597)	0.000 (0.004)
ln ROA	0.279 (14.28)	0.28*** (15.069)	0.276*** (14.793)
ln T. Assets	0.021** (2.435)	0.008** (2.418)	0.020** (2.394)
ln Sales Growth	0.001*** (3.302)	0.001*** (3.067)	0.001*** (3.233)
ln Asset Growth	-0.407 (-1.333)	-0.431 (1.097)	-0.381 (-0.986)
ln Human Tox (EP)	-0.162*** (-4.587)		-0.004 (-0.708)
ln Eco Tox (EP)		-0.013*** (-4.370)	-0.009* (-1.783)
Adj R-Sq	32.50%	32.40%	32.10%
F	55.495***	55.177***	45.266***

The dependent variable is Tobin's q. Student t ratios are in parenthesis. \*\*\* significant at the 1% level, \*\* significant at the 5% level, \*significant at the 10% level. The coefficients of the environmental measures (EP) are negative and significant when estimated independently, consistent with a positive relationship between environmental and financial performance.

### Discussion of the Results

While it is clear that good environmental performance is associated with good financial performance the pathway of cause and effect is not clear. Well managed firms may possess both operational and chemical technology that is superior to poorly managed firms so that it is possible that good management generates both good financial performance and good environmental performance. This research does not address the issue of causality. But if environmental and financial performance are associated with each other by virtue of their common relationship to the underlying quality of management, one would expect that in the long run firms with poor environmental performance would fall victim to superior competition. It is likely but not certain that firms that reduce their toxic releases create wealth for their shareholders.

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