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Which Corporate Sustainability Activities are Associated with Greater Financial Payoffs?

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ABSTRACT
While many company managers and academic researchers have argued that businesses that develop a sustainability focus also may improve their financial performance, little information is known about whether firms' different types of sustainability activities are related to varying degrees of financial gain. This paper assesses the economic relationship between two types of sustainability activities – lower- and higher-order – derived from the sustainability value framework of Hart and Milstein (2003). Our analysis reveals that both types of sustainability activities are similarly associated with firms' financial performance in terms of direction and trend. However, the average level of financial benefits related to firms' higher-order sustainability activities (which develop new products and processes) is greater than the average level of financial benefits related to firms' lower-order sustainability activities (which modify existing products and processes). These findings offer initial evidence that companies that reach further by developing higher-order sustainability activities may reap greater financial benefits, while improving the natural environment to a greater degree. Copyright © 2012 John Wiley & Sons, Ltd and ERP Environment.

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Introduction

SINCE THE 1990S, SCHOLARS AND BUSINESS MANAGERS HAVE DEVOTED SIGNIFICANT ATTENTION TO DETERMINING whether firms' proactive environmental sustainability activities are related to profitability (e.g. Darnall, 2009; Darnall *et al.*, 2007; Hart and Ahuja, 1996; Klassen and McLaughlin, 1996; Lanoie *et al.*, 1998; Laplante and Lanoie, 1994; Russo and Fouts, 1997; Stanwick and Stanwick, 2000). Following the general framework developed by Hart and Milstein (2003), these sustainability behaviors can be classified into four broad categories: pollution prevention, product stewardship, clean technology and community focus. We refer to pollution prevention and product stewardship as lower-ordered sustainability activities, because Hart and Milstein (2003) suggest that both practices focus on developing incremental environmentally friendly process improvements for existing products and markets. By contrast, we consider clean technology and community focus to be higher-order

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sustainability activities, because Hart and Milstein (2003) note that both practices emphasize creating radically innovative green process improvements that lead to new products and novel market opportunities.

While prior studies assessing the link between firms' environmental and financial performance are well established, we know far less about what sorts of sustainability activity are associated with greater financial gain. Additionally, while the differential sustainability activities specified in the framework of Hart and Milstein (2003) are widely recognized, we lack empirical evidence regarding the extent to which lower- or higher-order sustainability activities are associated with firms' bottom lines. Such knowledge is important to scholarly literature, but also to business managers, since managers are more likely to adopt specific sustainability activities if they are to be associated with greater financial advantages (Margolis and Walsh, 2003).

This paper investigates the economic returns associated with the two types of sustainability activity derived from the framework of Hart and Milstein (2003). It examines which of these sustainability activities are correlated more strongly with firms' financial payoffs and whether there is a difference in the average level of financial benefits associated with the two. Our results suggest that both types of sustainability activity are associated with firms' financial performance. However, the financial benefits associated with firms' higher-order sustainability activities exceed the financial benefits related to firms' lower-order sustainability activities. These findings offer an important initial piece of information to managers about the conditions in which it pays for firms to be green. Moreover, they represent some of the first empirical findings suggesting that the various sustainability activities specified by Hart and Milstein (2003) are related to firm financial benefits in different ways.

Sustainability Activities and Firm Performance

Sustainability is defined as the ability of the current generation to meet its needs without compromising the ability of future generations to meet their own needs (WCED, 1987). Related to the firm, corporate sustainability is a business's capacity to reduce or eliminate its impact to the natural environment (Hart, 1995) while satisfying the needs of its existing (Delmas and Toffel, 2004) and future stakeholders (e.g. shareholders, employees, community groups, environmental nonprofits) (Dyllick and Hockerts, 2002). Companies can address stakeholder concerns by adopting a variety of sustainability activities. A sustainability activity is a project, program or initiative that is designed to meet stakeholder-related goals, and is integrated into day-to-day management decisions. Implementing these activities allows firms to effectively address shareholder pressures to increase short-term earnings, because economic activities are not sacrificed. However, firms that adopt sustainability activities also attend to the needs of existing and future stakeholders, because they simultaneously protect the environment and social integrity (Epstein, 2008).

Hart and Milstein (2003) developed an organizing framework that rationalizes many corporate sustainability activities in a business-oriented way by examining the strategic approaches firms could take to be more competitive. These authors suggest that firms' sustainable activities can be categorized based on whether they involve pollution prevention, product stewardship, clean technology or a community focus. Firms that implement activities in each of the four broad categories of sustainability can create shareholder value through positive financial performance (Hart and Milstein, 2003).

We elaborate on this general framework by considering firms day-to-day management decisions. This distinction is subtle, but important, since competitive firms acting strategically should not be reacting on a day-to-day basis to stakeholder whims. We refer to pollution prevention and product stewardship as lower-order sustainability activities, and suggest that clean technology and community focus are higher-order sustainability activities. We discuss these issues and their relationship with firms' financial performance below.

Lower-Order Sustainability Activities

Lower-order sustainability activities focus on improving the sustainability of companies' *existing* products and processes. These activities do so by encouraging the company's employees and managers to engage in pollution prevention. Pollution prevention involves the reduction or elimination of pollution at the source (source reduction) instead of at the end of the pipe or stack (Hart and Milstein, 2003). It occurs when raw materials, water, energy and other

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resources are used more efficiently, when less harmful substances are substituted for hazardous ones, and when toxic substances are eliminated from the production process (Nehrt, 1996). Firms often implement pollution prevention as an initial sustainability activity, since it is believed to create cost savings faster than other types of sustainability activity (Christmann, 2000; Kabongo and Boiral, 2011).

For instance, by switching from solvent-based coatings to water-based coatings, a company can improve the environment but also eliminate having to meet environmental approvals. As a consequence, this modification can speed up the time it takes to get a firm's product to market. Additionally, it reduces the firm's long-term liabilities related to hazardous waste disposal. However, pollution prevention can also reduce a firm's non-regulated environmental impacts and save money. Minnesota Mining and Minerals' (3M) energy conservation program is one example. Beginning in the year 2000, 3M challenged 150 company sites to reduce their annual energy consumption by 4 percent. The result for 3M has been a saving of more than $190 million (Darnall, 2008).

Undertaking pollution prevention can reduce a company's long-term legal obligation to clean up contamination of air, soil, or water due to the intentional and unintentional discharge of harmful substances. For companies that avoid creating pollution, many environmental regulations are no longer relevant to them. To the extent that companies can reduce their environmental impacts below regulatory thresholds and maintain them, they may no longer need to apply for costly operating permits or undergo expensive monitoring and reporting of specific environmental activities (Porter and van der Linde, 1995). Additionally, these companies can reduce the monetary and reputation risks associated with emission violations or the legal implications of non-compliance (Hart and Milstein, 2003). In some instances, companies may accrue a net financial gain from their pollution prevention activities. For instance, when Leff-Marvin's Cleaners, Inc., of Pittsburgh, PA, replaced its old dry-cleaning equipment with new cold-water-chilled closed-loop systems that recycle perchloroethylene (PERC), it no longer had to apply for a state environmental permit. The company's new equipment eliminated most of its regulated emissions and reduced its use of PERC from 200 gallons per month to 40 gallons per month (US Environmental Protection Agency, 2011). Leff-Marvin's realized a net savings and now has one less regulatory requirement, which also frees dedicated resources that would otherwise be allocated towards completing an additional environmental permit (US Environmental Protection Agency, 2011).

Other lower-order sustainability activities engage external stakeholders in a way that encourage firms to look beyond their operational boundaries to individuals and organizations who are involved in the life cycle of their existing products or processes. For instance, in developing 3M's product stewardship program, its Valley, NE, facility recognized an opportunity to reduce its supplier waste. By working with its supplier, shipments now incorporate reusable packaging. The modification has reduced shipping waste at this single 3M facility by eight tons in the first year (Minnesota Mining and Minerals, 2008).

By engaging external stakeholders, lower-order sustainability activities also can assist firms by avoiding the inheritance of environmental risks from less environmentally conscious suppliers. The global automotive industry is an example of one sector that is collectively considering the environmental attributes of its suppliers to avoid unnecessary environmental risks (Klassen and Whybark, 1999). US automakers require that their suppliers assess and continually improve their environmental performance. By reducing the risk of inheriting environmental problems, these companies are minimizing potential long-term environmental liabilities associated with their product inputs (Darnall *et al.*, 2008).

Higher-Order Sustainability Activities

Higher-order sustainability activities differ significantly from lower-order sustainability activities. Whereas lower-order sustainability practices lead to continuous *incremental* improvements in *existing* products, higher-order sustainability practices foster *radical* changes that are designed to unseat existing products and processes (Hart and Milstein, 2003) by developing products and processes for *new* markets. Such markets are characterized by their rapid pace of development (Hoskisson *et al.*, 2000), and are not well defined in terms of industry norms for production or customer preferences. Consequently, innovative firms can respond through a variety of novel product or equipment designs (Clark, 1985).

Companies that adopt higher-order sustainability activities embrace business models that disregard widely accepted industry routines and knowledge (Young and Tilley, 2006). They also invest in innovative clean technologies

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in an effort to preempt competitors, and, in some instances, restructure their industry. For instance, when developing its hybrid locomotive technology, General Electric (GE) aspired to do for the locomotive transportation market what Toyota did for the automobile market. By establishing itself as an early market entrant in hybrid locomotive technology, GE hoped to preempt its competitors and confirm itself as a market leader in this area (GE, 2007).

Such efforts often require that companies have strong relationships with their employees and managers in addition to their supply chain in order to discover innovative solutions that render existing products and processes obsolete. They also build partnerships with external nontraditional stakeholders such as environmental groups, consumer groups and other companies to acquire new competencies, knowledge and vision (London *et al.*, 2005). For example, Kraft Foods Inc. has partnered with the Rainforest Alliance and small coffee farmers in Central and South America to help train farmers in sustainable coffee production while paying them a fair wage. These efforts have benefited Kraft by securing a reliable source for 13 million pounds of sustainably grown coffee (Rainforest Alliance, 2006). Doing so has enabled the company to penetrate the burgeoning market for fair trade coffee. At the same time, the partnership has also enhanced the economic stability of rural farmers and improved their knowledge and use of sustainable farming practices.

Higher-order sustainability activities often have a broader focus, in that they emphasize not only environmental concerns but also issues affecting communities and human well-being. Such a perspective generally necessitates that firms focus on systems thinking for the strategic identification of value creation. Systems thinking requires that businesses comprehensively examine their operations and align them with the unmet needs of those in the local communities. These actions can create opportunities and growth over the long term (Hart and Milstein, 2003). As an example, DaimlerChrysler is exploring the new biotechnology market by using a community focus. It has partnered with NextEnergy to develop more economical means of producing soybean, corn, canola and switchgrass for the evolving biodiesel and/or ethanol fuel markets. In so doing, DaimlerChrysler is utilizing land that was once an industrial dump site to grow its crops. Since the site is located near an economically disadvantaged community, its productive use can benefit those living in the surrounding area by creating a safer and cleaner environment (PR Newswire, 2007).

In other instances, higher-order sustainability activities involve utilizing volunteerism and community involvement to better develop new products and processes, to find and serve new markets, and to solve long-standing business problems that simultaneously benefit communities (Hess *et al.*, 2002). For instance, Hindustan Unilever Limited (HUL) of Mumbai has implemented a program in which leadership trainees go through a rural stint and spend time working on numerous community volunteer projects that address the concerns of the rural populations in India (HUL, 2009). The program facilitates employee interaction with the rural customer, thereby bringing HUL managers closer to these individuals' social and economic challenges (HUL, 2009). In undertaking its program, HUL recognized that existing products often fall short of meeting the economic and social needs of the poor. As a consequence of the knowledge HUL gained from its volunteer activities, the company developed an environmentally friendly soap and shampoo bar. Affordably priced to meet the economic constraints of the poor, the product was created to benefit health and hygiene by reducing the transmission of diseases in poor communities (Hart and Sharma, 2004).

Which Sustainability Activities are Associated with Greater Performance?

In considering the relationship between the two broad types of sustainability activities (lower- and higher-order) and a firm's financial performance, our position is that the financial benefits associated with a firm's higher-order sustainability activities are more likely to exceed the financial benefits associated with its lower-order sustainability activities. Our rationale draws on the fact that lower-order sustainability activities, by design, emphasize the incremental improvement of companies' existing technologies and processes by eliminating excess waste in the production process. These activities reduce costs by way of enhanced efficiencies and risk avoidance associated with avoiding environmental non-compliances, supplier waste and long-term environmental liabilities. However, the marginal benefits of these activities are also limited, because they involve practices that are more easily replicated by competitors. For instance, to reduce virgin materials in product feedstock, companies may negotiate alternative contract agreements with suppliers. However, competitor companies can imitate these agreements with some ease. Similarly, firms that reuse their production materials can reduce their internal inefficiencies related to the

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manufacture of their existing products. However, significant knowledge about best environmental practices has been distributed widely among manufacturing firms. Additionally, governments worldwide have assembled information about best environmental practices and made them available publicly. Because of their replicability, the financial gains associated with undertaking lower-order sustainability activities are restricted to internal efficiency improvements and risk avoidance rather than the competitive advantage opportunities that can come from operating on the frontier of new product development.

By contrast, companies that utilize higher-order sustainability activities radically improve their production processes and develop products poised for new markets. Because of the focus on new product innovation, the financial gains that are associated with implementing these sustainability activities are restricted by not efficiency concerns and industry best practices, but rather their ability to reshape markets. This strategic approach is more likely to yield greater financial benefits for three reasons. The first reason relates to the fact that higher-order sustainability activities are more idiosyncratic, and require significant organizational commitment related to acquiring new skills and creatively destroying existing product portfolios (Hart and Milstein, 2003). To achieve this sort of commitment, firms must foster knowledge among their employees. Employee knowledge is a strong determinant of a firm's financial gain (Kogut and Zander, 1997; Markides and Williamson, 1997; Prahalad and Hamel, 1990). Because of the tacit nature of the knowledge and capabilities required to radically improve a firm's production processes and develop products for new market entry, firms that adopt higher-order sustainability activities are more likely to benefit financially than firms that develop lower-order sustainability activities.

The second reason why higher-order sustainability activities are more likely to be associated with greater financial performance relates to first-mover advantages. If successful, firms that undertake higher-order sustainability activities are more likely to be first-movers among competitors in their quest for new market innovations (Hart and Milstein, 2003). This advantage carries over into consumer and buyer markets, where firms that develop innovative green products can obtain greater visibility for their business practices. Doing so can position these companies as industry leaders, which can enable them to increase their market share. In addition to the revenue associated with the sale of innovative green products, greater visibility provides a stronger foundation for the creation of other intangible benefits (Porter and van der Linde, 1995). Enhanced organizational reputation is the third reason why we anticipate that the relationship between firms' financial performance and their higher-order sustainability activities is more likely to be stronger than for firms that undertake lower-order activities. Companies that develop a green reputation can enjoy stronger community support for the firm's day-to-day operations and development plans. They also have the potential for greater goodwill with environmental regulators (Darnall *et al.*, 2010). Each of these intangible benefits may improve a company's shareholder value (Hart and Milstein, 2003).

For all these reasons, we hypothesize that the correlation between a firm's financial benefits and its number of higher-order sustainability activities is stronger than the correlation between its financial benefits and its number of lower-order sustainability activities. Moreover, the average level of firms' financial gains associated with their higher-order sustainability activities will be higher than the gains associated with their lower-order sustainability activities.

Hypothesis 1. *The correlation between a firm's financial benefits and its number of higher-order sustainability activities is stronger than the correlation between its financial benefits and its number of lower-order sustainability activities.*

Hypothesis 2. *The mean level of financial benefits associated with a firm's higher-order sustainability activities is greater than the mean level of financial benefits related to its lower-order sustainability activities.*

Methods

To test our research hypotheses, we assessed firms identified in the Dow Jones Sustainability Index (DJSI). The DJSI is a 'best-in-class' index, which recognizes the cleanest firms in specific industries as opposed to identifying

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an industry's overall sustainability or distinguishing which industries are cleaner than others. All DJSI firms are large publicly traded companies that are recognized as being sustainability leaders (DJSI, 2008). To be included on the index, Dow Jones uses a variety of sustainability criteria, such as whether or not a company has a climate change strategy, the extent of a business's energy consumption, and information related to its corporate governance and human resources management. Firms that do not qualify for inclusion in the DJSI index are small companies, privately held businesses and large enterprises that may adopt sustainability activities but fail to report them in their external publications. These exclusions somewhat limit our ability to generalize the results of this study to a broader array of businesses. Nonetheless, the DJSI is one of the most comprehensive and globally recognized indices that track US firms' sustainability activities.

For our analysis, we relied on the most recent year the DJSI companies made its sustainability data publicly available – either 2006 or 2007. At that time, there was between an 18–24 month lag between when companies collected their sustainability data and when DJSI firms reported these data publically via their corporate sustainability reports. Data collection for this paper occurred between December 2008 and March 2009. As such, the sustainability reports were comparable to the DJSI data. By focusing on US manufacturing firms, we were able to ensure that our sample was subject to the same minimum federal environmental regulations. Within the US, Dow Jones included 51 companies on its list, and of these 48 were classified as manufacturing (NAICS 31–33) firms. These companies represent approximately 11% of all DJSI companies.

Dependent Variable

To examine our hypotheses, we utilized firms' reported value of financial benefits associated with their sustainability activities.[1] The data were extracted from firms' sustainability reports. Since the data were self-reported, firms may have a bias towards providing socially desirable information and withholding undesirable information. However, each of the publicly traded firms in our sample were required to disclose extensive financial information in their annual reports using generally accepted accounting principles, and provide independently audited financial statements to the US Securities and Exchange Commission. Therefore, while there may have been some variation in firms' estimation procedures related to their estimations of the monetary benefits of their sustainability activities, we anticipate that firms utilized their existing standards and conventions to collect these financial data.

Within their sustainability reports, firms described the financial benefits related to their sustainability efforts at the activity level. For each sustainability activity, we documented the value of its associated financial benefit. We then categorized each firm's respective benefit based on whether it was associated with a lower- and/or higher-order sustainability activity. If benefits were reported over a multiple year span, the average benefit per year was calculated. Since companies have numerous incentives to disclose high-quality information about their activities (Singhvi and Desai, 1971), in instances where firms did not report a financial benefit associated with a respective sustainability activity, we assumed that the actual value was $0.[2]

Financial benefit data were recorded for each firm at the activity level and summed to arrive at each firm's total benefits associated with its lower- and higher-order sustainability activities. Each firm therefore had the potential of having two financial benefit values. These two measures form our dependent variable.

Independent Variables

The independent variables were the sum of each firm's lower-ordered sustainability activities, and the sum of each firm's higher-ordered sustainability activities. To account for firms' different types of sustainability activity, we drew on information within companies' sustainability reports. Using the framework developed by Hart and Milstein

[1]In some instances, DJSI firms also reported their revenue related to the adoption of different sustainability activities. However, the data suffered from many missing values, and therefore could not be used in the analysis.

[2]In many instances where firms did not report a dollar value associated with a respective sustainability activity, some activities may have generated a financial benefit, but those benefits could not be quantified. This situation may be especially true for firms' higher-order sustainability activities since their benefits are likely to accrue over a longer period of time and involve intangible benefits, which are significantly more difficult to assess. By coding these activities as having a $0 benefit, there is a possibility that we have *underestimated* the overall benefits associated with firms' sustainability activities, and especially those that are classified as being higher-order.

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(2003), individual activities were assigned to one of four categories – pollution prevention, product stewardship, innovative technologies and community-focus – based on the following definitions.

- *Pollution prevention* relates to improving the internal environmental efficiency of a company's existing products and processes—that is, reducing waste from current operations—thereby reducing the amount of pollution generated at its source.
- *Product stewardship* extends beyond organizational boundaries to include the product's life cycle—from raw material access, through production processes, to product use and the disposal of spent products. It involves integrating the firm's value chain stakeholders, such as suppliers and customers, into business development, with the ultimate goal of reducing the firm's environmental impacts of existing products and processes.
- *Clean technology and innovation* refers to internal business innovations that 'leapfrog' widely accepted industry routines and knowledge. Such innovations depart from pollution prevention in that they extend beyond the company's existing products and services to the development of radically new products and business models.
- *Community focus* involves developing new products and business models that address the unmet needs of the economically disadvantaged, while presenting opportunities for firms to define a compelling trajectory for future growth. In some instances, such a strategy involves recognizing that existing products fall short of meeting the economic, social and environmental needs of the poor. In other instances, a community-focused strategy involves developing products for new markets in a way that simultaneously improves the conditions of the poor. To achieve these outcomes, firms with a community focus collaborate with external community stakeholders previously overlooked or ignored by firms (e.g. radical environmentalists, and the urban and rural poor), to help them steer towards radical innovation of new products and unconventional models for market growth.

Once our classification was completed, we randomly sampled 50 of firms' 633 sustainability activities and asked an independent reviewer to categorize them in an effort to increase the reliability of our classification. In 49 of 50 cases (98%) the categorization was consistent. We then classified firms' sustainability activities based on whether they met the definition of 'lower-ordered' or 'higher-ordered'.

We excluded several types of sustainability activity from the study that firms had reported in their sustainability reports. The first type relates to employee diversity programs, because their existence is driven primarily by equal opportunity laws rather than voluntary efforts. Second, we excluded activities associated with nuclear power generation, because nuclear power generation necessarily produces environmentally damaging wastes for which there are no technical solutions. Finally, we omitted philanthropic activities, since they do not change a company's internal production practices (Rondinelli and London, 2003) and therefore have little relationship to a business' products and processes.

Empirics

To empirically assess the association between firms' reported financial benefits and their total number of reported lower-order sustainability activities, we relied on Spearman's rank correlation. Similarly, we used Spearman's rank correlation to determine association between firms' reported financial benefits and their total number of higher-order sustainability activities. Spearman's rank correlation is a nonparametric measure of statistical association that does not make assumptions about the distribution of the variables of interest (Chen and Popovich, 2002). The resulting statistic, r_s, can have values between −1.00 and 1.00. If a correlation reliably differs from zero, it will be statistically significant, suggesting that the relationship between the two variables is not due to chance (Chen and Popovich, 2002). In general, variables with correlation coefficients of 0.10 are considered 'small' relationships, those of 0.30 are considered 'medium' relationships, and those of 0.50 are considered 'large' relationships (Cohen, 1988). To determine whether the correlation between firms' reported financial benefits and their lower- and higher-ordered sustainability activities differed statistically, we utilized a difference in correlations test described by Howell (2007) to assess whether the paired correlations were likely to represent a real difference in the population.

To examine Hypothesis 2, we began by calculating the financial benefits related to the sum of each firm's lower-order sustainability activities. For instance, if a firm implemented 10 lower-order activities, we summed the financial benefits associated across that suite. We also summed the firm's suite of higher-order sustainability activities.

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Similar values were then calculated for the remaining 47 firms. All firms' financial benefits related to their lower-order activities were then summed and divided by our sample size to arrive at firms' total average financial benefits. A similar procedure was performed for firms' higher-order activities. We utilized a dependent *t*-test for paired samples to determine whether firms' total average financial benefits differed across the two categories of sustainability activities. A dependent paired *t*-test compares the difference between two means (with different variances) within the same sample (Howell, 2007). This test is robust even if the distribution is skewed, as long as the sample size has at least 40 observations (Moore, 2004).

However, there is a possibility that a firm may derive more financial benefits from its sustainability activities simply because it adopts more of them. As such, we followed up this analysis by assessing each firm's average level of financial benefits per lower-ordered sustainability activity to determine whether it differed significantly from its average level of financial benefits per higher-ordered sustainability activity. For instance, if a firm implemented a suite of 10 lower-order activities, we calculated the mean level of financial benefits associated with that suite, before doing the same for the firm's higher-order activities. Similar values were then calculated for the remaining 47 firms. Firms' mean level of financial benefits associated with their sustainability activities were then summed, before arriving at a grand average of firms' financial benefits per lower-order and higher-order sustainability activities for the sample. We then used a dependent *t*-test to compare whether the average benefits associated with each firm's lower-ordered activities differed from the benefits related to their higher-ordered activities. One-tailed tests are reported for our mean comparisons, since Hypothesis 2 specifies direction (Moore, 2004).

Results

Figure 1 describes the 633 sustainability activities that US DJSI manufacturing firms undertook. More than half (53%) of all activities related to pollution prevention, and more than a quarter (28%) related to product stewardship. Lower-order sustainability activities therefore accounted for 81% of all sustainability activities in the sample. By contrast, only 19% of firms' activities (less than one in five) were classified as either clean technology (15%) or community focus (4%). Figure 1 provides examples of the types of sustainability activity that the firms in our sample implemented and how they were categorized. About 75% of all activities recorded for the study are included in Figure 2.

Table 1 includes descriptive statistics for our sample. Our unit of analysis is the firm, and the 48 firms in our sample implemented an average of 13 sustainability activities (both lower- and higher-order). Depending on the firm, this total average ranged from 1 to 44 activities. All 48 sample firms adopted lower-order activities, and 43

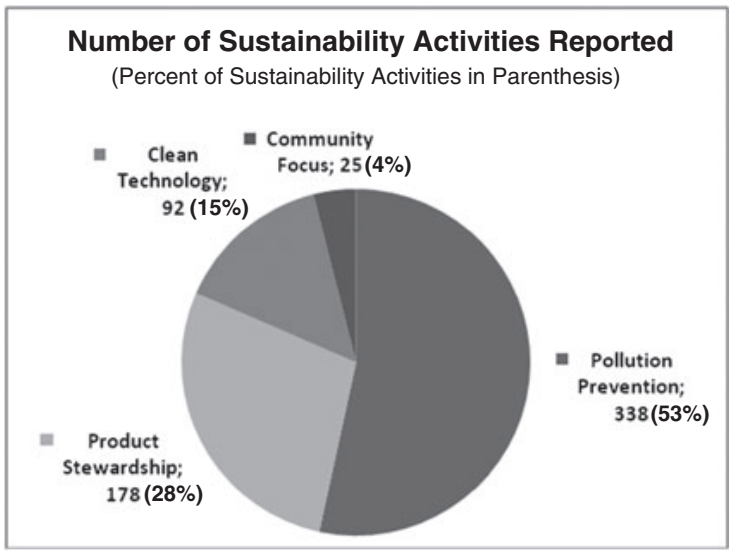

Figure 1. Firms' sustainability activities

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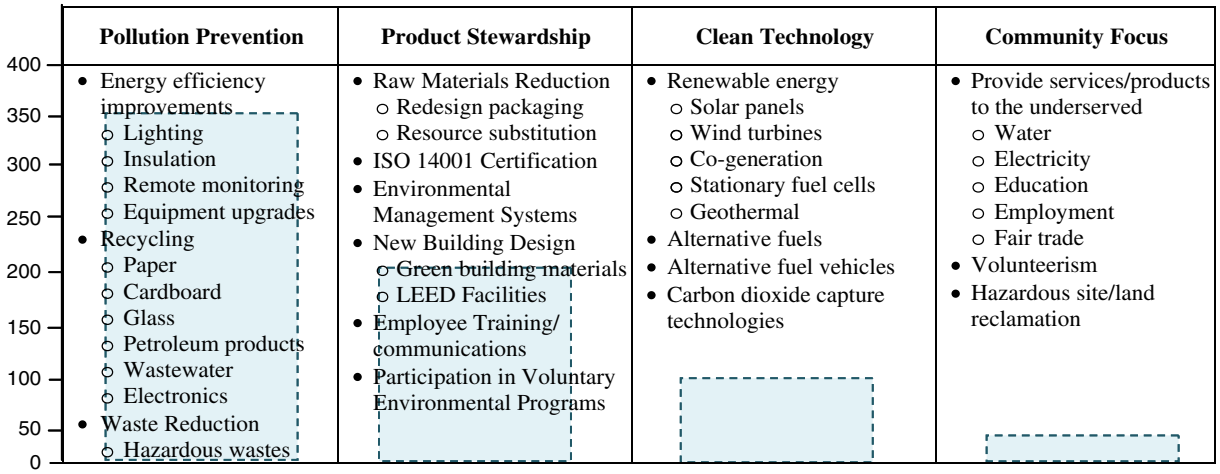

*Approximately 75 percent of all types of activities recorded in study are listed in table.

Figure 2. Reported financial benefits associated with firms' sustainability activities

Descriptive item	Mean	Standard deviation	Minimum value	Maximum value
Total number of sustainability activities per firm	13	9	1	44
Number of lower-order sustainability activities per firm	11	8	1	39
Number of higher-order sustainability activities per firm	2	3	0	19
Firms' total financial benefits across all activities*	$ 86	$ 647	$ 0	$2847
· Benefits related to the sum of each firm's lower-order activities	$ 69	$ 173	$ 0	$1197
· Benefits related to the sum of each firm's higher-order activities	$ 117	$ 240	$ 0	$1650
Firms' financial benefits per activity*				
· Benefits per lower-order activity	$ 3	$ 14	$ 0	$ 100
· Benefits per higher-order activity	$ 20	$ 71	$ 0	$ 413

Table 1. Descriptive statistics
*Monetary values are in millions.

(89.6%) of them also adopted higher-order activities. Firms' average monetary benefits associated with all their sustainability activities were $186 million, and total benefits ranged from $0 to $2847 million.

In examining which types of sustainability activity were more strongly associated with firms' financial gains, we found that 29.64% (0.2964; $p = 0.0408$, see Table 2) of the variability in firms' benefits was associated with the variability in the number of their lower-ordered sustainability activities. The associated *p*-value indicates that there was a 95.92% probability that this occurrence was not due to chance. With respect to firms' higher-order sustainability activities, 35.56% (0.3556; $p = 0.0131$) of the variability in firms' financial benefits was associated with the variability in the number of these sustainability activities. Moreover, the associated *p*-value indicates that there was a 98.69% probability that this occurrence was not due to coincidence. However, the difference in the correlation between the lower- and higher-order activities was 5.92%, and not significant statistically. As such, we did not find evidence in support of Hypothesis 1.

In performing our first dependent paired *t*-test, firms' mean benefits related to the sum of their lower-ordered activities were $69 million (see Table 3). By contrast, firms' benefits related to the sum of their higher-ordered activities were $117 million. Following the dependent paired *t*-test methodology, the mean and standard error of the difference between lower- and higher-order benefits were calculated. Dividing the mean difference ($48 million) by the difference in standard errors yielded a test statistic of 1.703, which was statistically significant at $p = 0.0475$ (df = 47). These findings indicate that the average benefits associated with each firm's higher-ordered sustainability activities differed significantly from the average benefits associated with their lower-ordered sustainability activities.

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Dependent variable – financial benefits	Independent variable	*n*	Spearman's rank correlation	*p*-value
Benefits related to the sum of each firm's lower-order activities	Number of lower-order sustainability activities	48	29.64%	0.0408
Benefits related to the sum of each firm's higher-order activities	Number of higher-order sustainability activities	48	35.56%	0.0131

Table 2. Firms' environmental activities and financial performance

Financial benefit measure	Mean	Difference	*t*	*p*-value
Benefits related to the sum of each firm's lower-order activities	$ 69			
Benefits related to the sum of each firm's higher-order activities	$ 117	$48	1.703	0.0475
Benefits per lower-order activity	$ 3			
Benefits per higher-order activity	$ 20	$18	1.940	0.0290

Table 3. Difference in firms' financial benefits related to their lower- and higher-order sustainability activities
*Monetary values are in millions; $n = 48$. Following Moore (2004), *p*-values relate to one-tailed dependent paired *t*-tests since Hypothesis 2 specifies direction.

Since firms that have numerous sustainability activities may generate more financial benefits by virtue of the number of projects they adopt, Table 3 also examines the benefits related to each individual activity. We compared each firm's difference in mean benefits per lower-ordered activity with their mean financial benefits per higher-ordered activity. Each firm's mean level of benefits reported per higher-ordered sustainability activity was $20 million. Similarly, each firm's mean value of benefits per lower-ordered sustainability activity was $3 million. The results of our dependent paired *t*-test indicated that the difference ($18 million) in the mean values was statistically significant at $p = 0.0290$ ($t = 1.940$; $df = 47$).

Figure 2 offers a graphical representation of our statistical findings. It plots (on a logarithmic scale) firms' numbers of lower- and higher-ordered sustainability activities by their reported benefits. The image illustrates that the general association between lower- and higher-order sustainability activities is quite similar, in that there appears to be a positive relationship with a similar upward trend. However, the benefits associated with each type of sustainability activity differ significantly in that the firms in this sample obtained a certain level of benefit with fewer higher-order sustainability activities. That is, firms that had $20 million of benefits associated with their sustainability activities might have implemented only one higher-order activity, while others might have implemented 6.7 lower-order sustainability activities.

Combined, these findings offer evidence that fails to support Hypothesis 1, which states that the correlation between firms' financial benefits and their number of higher-order sustainability activities is stronger than the correlation between firms' financial benefits and their number of lower-order sustainability activities. However, we do find evidence that the mean level of financial gains associated with each firm's higher-order sustainability activities is higher than the mean level of financial gains associated with their lower-order sustainability activities (Hypothesis 2). Therefore, while the two types of sustainability activity have similar associations with financial performance, the magnitude of this association appears to differ.

Discussion

In spite of the importance that the sustainability value framework of Hart and Milstein (2003) has had in the field of management strategy, as yet it has not been operationalized in terms of how firms' different types of sustainability

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activity are related to their financial performance. Additionally, while many scholars have suggested that there is an association between firms' adoption of lower- and higher-order sustainability activities and their financial performance, empirical support has been lacking. This study offers initial evidence for the notion that firms' sustainability activities of numerous sorts are related to their financial performance, and the strength of the association between financial performance and the number of lower- and higher-order activities they adopt is quite similar in terms of direction and trend. However, firms that adopt higher-order sustainability activities have a higher average level of financial benefit associated with undertaking these activities.

These findings are important for four reasons. First, from a managerial perspective, firms may elect to focus solely on developing lower-order sustainability activities. However, to achieve the same level of average financial benefits as associated with higher-order sustainability activities, they may need to implement more of them. A rationale for why the benefits associated with higher-order sustainability activities may be greater (an average of $18 million more per activity) might relate to the fact that these activities are designed to unseat existing products and processes and preempt competitors (Hart and Milstein, 2003). Such activities necessitate layers of embedded capabilities (Darnall and Edwards, 2006) and strong relationships with external stakeholders (London *et al.*, 2005), in addition to greater coordination among employees and managers. Firms that develop these capabilities must also foster or create knowledge among their employees. Since this sort of knowledge is related to a company's financial performance (Kogut and Zander, 1997; Markides and Williamson, 1997; Prahalad and Hamel, 1990), firms that are successful at their innovative efforts are positioned to be first-movers among competitors in their quest for new market innovations (Hart and Milstein, 2003). First-mover advantage can benefit firms by enhancing revenues with the sale of innovative green products, by improving their visibility and by increasing the intangible benefits related to their improved reputation with critical stakeholders.

Second, knowledge that higher-order sustainability activities are associated with greater financial gains is important because managers often struggle to determine to what extent they should implement sustainability activities within their companies. Because firms commonly believe that higher-order sustainability activities are more risky or costly to implement, managers may be less likely to adopt them. However, our results suggest that higher-order sustainability activities are associated with a higher average level of financial performance than lower-order sustainability activities. These results support strategic arguments about risk/reward relationships suggesting that risky higher-order activities are related to higher financial rewards. Understanding these distinctions may offer managers the needed support to reach further with respect to their companies' sustainability practices, especially for firms that are developing their long-term sustainability strategies. While our results may be skewed towards successful activities, since firms may be less likely to discuss failures in public forums (Singhvi and Desai, 1971), we expect that this reporting bias would apply systematically across all sorts of sustainability activities. As such, meaningful knowledge can still be gained by making empirical comparisons across lower- and higher-order sustainability activities.

The third contribution of this study is that it offers companies evidence of the merits of classifying their existing sustainability activities in a systematic way. Fewer than one in five sustainability activities that each firm implements are considered to be higher-order. Since DJSI firms are recognized as being sustainability leaders, we anticipate that fewer non-DJSI firms are adopting sustainability activities, especially those that are higher-order. By classifying their existing sustainability activities based on whether they are lower or higher-order, firms may develop a better understanding of their existing sustainability focus, which can allow them to make strategic adjustments that may benefit them to a greater degree over time.

The fourth contribution of this research relates to public policy. Many policy efforts, fashioned in the form of voluntary environmental programs (VEPs), are designed to encourage companies to pursue a proactive environmental strategy. In the US alone, there are more than 200 VEPs that operate at the federal level (Carmin *et al.*, 2003). However, most of these VEPs are designed to encourage firms to expand their lower-order sustainability practices, in large part because program managers fear that having more stringent program requirements may discourage additional participants in their programs (Darnall and Carmin, 2005). The results of our research suggest that a firm's higher-order sustainability practices are associated with greater financial returns. An opportunity therefore may exist for regulators to use VEPs to encourage more far-reaching sustainability practices among participant companies. Such VEPs may involve offering firms incentives to collaborate with other firms, nonprofits or government research laboratories with the goal of bolstering their innovative capacity to address issues related to clean technology development or poverty reduction. Additionally, regulators may also consider creating competitions to encourage greater development of higher-order sustainability activities.

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Related to future research, recent studies have suggested that companies typically choose to implement lower-order sustainability activities since they might be able to generate cost savings or revenue faster than other types of sustainability activity (Christmann, 2000), whereas higher-order sustainability activities may benefit firms over a longer time horizon (Hart, 2007). These studies and others (e.g. Hart and Ahuja, 1996) have suggested that there may be a potential lag in firms' financial benefits due to their sustainability efforts. Future research therefore would benefit from undertaking a more longitudinal analysis to examine how different types of sustainability activity are related to financial performance over time. Our expectation is that the financial benefits derived from higher-order sustainability activities might accrue at a greater and more sustained rate over time than those derived from lower-order sustainability activities because of their focus on new markets. If so, a more compelling case can be made for companies to develop far-reaching sustainability programs.

Similarly, prospective scholarship would benefit by examining the threshold in which adopting additional sustainability activities increases a firm's marginal costs. Such an assessment may be of particular interest to business managers in helping them to understand the extent to which they should pursue lower- or higher-order sustainability activities. Along the way we may find that there is a point of diminishing return on corporate sustainability activities that differs across industries. Finally, future work would benefit by improving upon this analysis in a way that accounts for other effects that might explain the relationship between firms' sustainability activities and their financial performance. Such an analysis would require access to a much larger dataset of firms to simultaneously control for firms' self-selection of their sustainability activities, and data related to control and instrumental variables. While collecting these sorts of data can be costly, the results of our analysis offer some initial justification for undertaking a broader study.

Conclusion

In sum, this research extends prior studies that examine the broader connections between sustainability activities and financial performance. It offers some of the first empirical evidence suggesting that the differential sustainability activities specified by Hart and Milstein (2003) are related to firms' financial performance in different ways. More specifically, we assess the extent to which sustainability activities involving incremental modifications (lower-order) and activities involving more significant modifications (higher-order) in product and process development are associated with similar financial gains. We reveal that lower- and higher-order sustainability activities are similarly associated with firms' financial performance in that they follow a similar direction and trend. However, the average level of financial benefits related to firms' higher-order sustainability activities is greater than the average level of financial benefits related to their lower-order sustainability activities. Our results suggest that companies that reach further by developing higher-order sustainability activities may be able to reap greater financial benefits, while improving the natural environment. These findings offer an important piece of information to managers and researchers about the possible conditions in which it might pay for firms to be green.

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