

COMPETITIVE STRATEGY,  
VOLUNTARY ENVIRONMENTAL DISCLOSURE  
STRATEGY, AND VOLUNTARY ENVIRONMENTAL  
DISCLOSURE QUALITY

By

QIANHUA LING

Bachelor of Science  
Beijing Technology and Business University  
Beijing, China  
1997

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By

Qianhua Ling

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DISCLOSURE QUALITY

Dissertation Approved:

Dr. Maryanne Mowen

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Dissertation Adviser

Dr. Gary Meek

---

Dr. Sandeep Nabar

---

Dr. Ramesh Rao

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Dr. A. Gordon Emslie

---

Dean of the Graduate College

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## CHAPTER I

### INTRODUCTION

In recent years, socially responsible investment has increased dramatically. Socially responsible investing is “an investment process that considers the social and environmental consequences of investments, both positive and negative, within the context of rigorous financial analysis” (Social Investment Forum 2006, 2). A survey of mutual funds, money managers, and institutional investors by the Social Investment Forum, Ltd. reports that in 2005 one out of every ten dollars under professional management in the U.S. was involved in socially responsible investing. Socially responsible investment assets equaled \$639 billion in 1995 and \$2.29 trillion in 2005, with a growth rate four percent faster than that of total assets under professional management (Social Investment Forum 2006).<sup>1</sup> The development suggests that there is a demand for social and environmental information on the part of investors.

Social investment managers consider voluntary environmental disclosures to be

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<sup>1</sup> The Social Investment Forum, Ltd. is a nonprofit association, promoting socially and environmentally responsible investing. In 1989, environmental groups and institutional investors represented by the Social Investment Forum, Ltd. set up the Coalition for Environmentally Responsible Economics (CERES) to promote environmentally responsible actions and environmental disclosure. CERES created the Valdez Principles (later changed the name to CERES Principles) that are used to direct corporate environmental conduct ([www.ceres.org](http://www.ceres.org)). In 2005, the Social Investment Forum, Ltd. has over 500 social investment practitioners and institutions, including financial advisers, analysts, portfolio managers, banks, mutual funds, foundations, community development organizations, researchers, and public educators. The report titled “2005 Report on Socially Responsible Investing Trends in the United States” was sponsored by 17 organizations that specialize in socially responsible investing. They are mutual funds, financial advisors, asset management corporations, and independent research agents. At the end of the report, there are lists of socially and environmentally screened funds, money managers providing social screening, institutions involved in social or environmental investing, and shareholder resolution proponents from 2003 to 2005 (Social Investment Forum 2006).

an important source of information about a firm's environmental performance (e.g., Calvert 2006). Social Investment Research Analyst Network (SIRAN), a network of 150 North American social investment analysts, emphasizes the importance of corporate social responsibility and sustainability reporting, which includes environmental information. Analysts believe that having either a separate section on the company website or an annual report about corporate social responsibility or sustainability, shows a commitment to environmental protection and reporting transparency (SIRAN 2006).

Environmental disclosure is "the set of information items that relate to a firm's past, current and future environmental management activities and performance" and "information about the past, current and future financial implications resulting from a firm's environmental management decisions or actions" (Berthelot et al. 2003 , 2).

Voluntary environmental disclosure (VED) is environmental disclosure not required by the Securities and Exchange Commission (SEC) or accounting standards. In the United States, more and more companies are voluntarily disclosing environmental information. Voluntary environmental and corporate responsibility reports have grown from 27 published in 1992 to 1,970 published in 2005 (CorporateRegister.com 2006). This upward trend suggests that reporting companies believe there are benefits to voluntarily disclosing environmental information.

These voluntary environmental reports, however, do not contain any standard set of information. Disclosures vary substantially in terms of content, information, and length. There are concerns that companies may use environmental publications primarily to enhance their public image (Beets and Souther 1999; Gorte 2005; Lydenberg 2005). This tactic, known as "greenwashing," is the use of environmental disclosure as

“exercises in public relations rather than environmental responsibility” (Beets and Souther 1999, 133). The term is also used in Wallis (1997), Newton and Harte (1997), and Greer and Bruno (1996) among other research.

Concern about the quality of VED makes it important to understand the factors influencing voluntary disclosure of environmental information and the quality of the disclosures. Drawing upon prior literature that relates disclosures to a company’s competitive position in the industry, this study hypothesizes that a company’s competitive strategy is an important factor in the VED decision, and also influences the quality of VED. The research question motivating this study is: Does VED relate to competitive strategy and actual environmental performance? To answer this question, this study has two objectives. The first is to determine whether a company’s competitive strategy guides its voluntary environmental disclosure decision. The second is to determine how competitive strategy impacts the association between voluntary environmental disclosure and actual environmental performance.

This study examines two competitive strategies. One is investment in brand image, and the other is investment in research and development (R&D). Using VED about 2004 environmental performance, this study finds that companies emphasizing investment in brand image tend to voluntarily provide more environmental information (but not necessarily regarding environmental performance) than companies that do not emphasize this strategy. Companies emphasizing investment in R&D tend to make more voluntary disclosures about environmental performance than companies that do not emphasize the strategy.

VED is of high quality if a positive relation exists between VED and environmental performance (Berthelot et al. 2003; Al-Tuwaijri et al. 2004). For companies that do not emphasize the two competitive strategies, more VED does not relate to good environmental performance. This is understandable because the proxies for environmental performance are the toxics management outcomes that will be eventually released by the U.S. Environmental Protection Agency (EPA). The information on toxics management is publicly available and comparable. To poor environmental performers, hiding the adverse news in other information or omitting the news could be the choice of disclosure decisions (i.e., “greenwashing”).

The two competitive strategies affect the association between VED and environmental performance differently. If the environmental performance proxy has implications for sustainability (e.g., percentage of toxics recycled), the association between VED and environmental performance is the same or more negative for companies emphasizing investment in brand image compared to other companies; but the association is more positive for companies emphasizing investment in R&D relative to other companies. If the environmental performance proxy has implications for environmental liabilities (e.g., percentage of toxics disposed of or otherwise released), more VED is less likely to relate to poor environmental performance for companies emphasizing investment in brand image relative to other companies; and more VED is the same or less likely to relate to poor environmental performance for companies emphasizing investment in R&D relative to other companies.

This study contributes to the literature in two ways. First, it contributes to the voluntary disclosure literature by testing the influence of competitive strategy on

voluntary environmental disclosure. Prior studies on factors that influence voluntary disclosure focused on factors such as competition, new issuance of securities, and public pressure (e.g., Gamble et al. 1995; Walden and Schwartz 1997; Harris 1998; Lang and Lundholm 2000). This study extends the literature by focusing on another important factor, the competitive strategy of a company, in the context of voluntary environmental disclosure. One prior study has called for attention to the impact of overall corporate strategy (Al-Tuwaijri et al. 2004, ACH), but it claims that overall corporate strategy cannot be observed. ACH thus only implicitly include the factor of corporate strategy in their research design. By contrast, this study identifies two specific competitive strategies and directly tests their influence on the voluntary environmental disclosure decision. Moreover, this study further investigates the strength of the association between VED and environmental performance under different competitive strategies. Finally, this study focuses on voluntary environmental disclosures, whereas ACH examine environmental disclosures in 10Ks that contain mandatory information (Clarkson et al. 2006). The results of this study indicate the need for future studies to incorporate competitive strategy into the determinants of voluntary disclosure decisions.

The second contribution of this study is that it presents a new perspective on examining the reliability of environmental disclosures. In the environmental disclosure literature, VED is considered reliable if the disclosures are helpful to estimate actual environmental performance; and prior research has reported inconsistent results on it (Berthelot et al. 2003; Al-Tuwaijri et al. 2004; Clarkson et al. 2006). This study contributes to the literature by providing evidence that different competitive strategies lead to varied VED strategies, which result in varied VED quality. The findings of this

study should be of interest to investors, because investors may not be able to get timely environmental performance data or afford the cost to collect environmental performance data, and have to rely on companies' self-reported information.<sup>2</sup> The results from this study may help investors identify one condition under which voluntarily disclosed environmental information is a useful indicator of environmental performance and its financial implications.

This study focuses on the chemical industry because prior studies identify it as a highly polluting industry. In addition, the chemical industry has more companies with environmental performance information and competitive strategy data than those in other industries. Focusing on a single industry controls for unknown factors that may affect VED and vary systematically across industries. The limitation of doing so is that the conclusions may not be generalizable to companies in other industries.

The remainder of the paper is organized as follows. Chapter II reviews prior literature. Chapter III presents the hypotheses. Chapter IV discusses research design and sample selection. Chapter V reports descriptive statistics and the results of hypothesis testing. The last chapter concludes the paper.

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<sup>2</sup> The problem of having timely environmental performance data may be shown by the fact that the toxic releases information in 2004 was released on April 12, 2006 by the EPA, which is a 1.5 year lag. The EPA is aware of the timing problem and tries to accelerate the whole process. Around October 2006, it released an early version of 2005 toxic releases data, but allowed facilities to keep revising their reports until spring 2007.

The cost of collecting environmental performance data may be high for several reasons. First, environmental performance covers a lot of areas such as energy, water, waste, and biodiversity. It is difficult to summarize all performance by one measure. Second, companies apply different indices in the same environmental area. Third, even measures for toxics management activities are comparable in U.S., they are at the facility level and it is very time-consuming to pull all facilities together to get the performance of the parent company.

## CHAPTER II

### REVIEW OF LITERATURE

#### **2.1 Voluntary Disclosure Strategies**

Dye (2001, 184) states that “any entity contemplating making a disclosure will disclose information that is favorable to the entity, and will not disclose information unfavorable to the entity.” “Favorable” here indicates impressing shareholders positively, protecting jobs from hostile takeover, increasing stock prices and so on (Revsine 1991; Healy and Palepu 2001). To achieve favorable results, some companies may misrepresent information, while others will provide accurate information to reduce information asymmetry.

Revsine (1991) proposes a selective misrepresentation hypothesis, suggesting that managers use disclosures to manipulate investors’ perceptions. Many findings support this aspect of disclosure. For instance, listed firms offer more reasons and causes for corporate events or performance than do unlisted firms. Firms selectively direct public focus so that positive effects will be reinforced and negative effects will be corrected or supplanted (Aerts 2005). Regardless of performance, companies emphasize positive outcomes. They attribute good news to their own actions and bad news to external factors (Clatworthy and Jones 2003).

Specific company narratives are used to manage impressions. For example, as earnings decline, firms may shift disclosures from long-term forecasts to short-term



forecasts (Miller 2002). This practice allows firms to focus on current positive news and avoid discussion of possible long-term decline. The market apparently does not see through the change in the forecast time horizon and does not adjust its expectations. Schrand and Walther (2000) find that firms separate a prior-period nonrecurring gain from the sale of property, plant and equipment but hide a loss so that they can show a maximum increase (or a minimum decrease) in current earnings. Surprisingly, investors do not verify the prior period information but use the benchmark provided in the earnings announcement to evaluate current earnings. These studies imply that companies try to manage investors' perceptions. Moreover, evidence shows that investors have limited memory and information processing power, so the manipulation attempts could be successful (e.g., Hobson and Kachelmeier 2005; Krische 2005; Hirshleifer and Teoh 2003).

Prior studies also show that companies use voluntary disclosure to provide the market with useful information. The main effect of this type of voluntary disclosure is reduced information asymmetry (e.g., Welker 1995; Botosan 1997; Verrecchia 2001). Recent studies providing similar evidence include Brown et al. (2004), who use the information embedded in the daily trading orders to capture the degree of information asymmetry. They find that increasing the number of conference calls (voluntary disclosure) leads to lower probability of private information-based trading in the subsequent quarter. They also find that the effect on information asymmetry does not exist for a one-time conference call. Guo et al. (2004) study the initial public offering prospectuses of biotech companies. They report that detailed disclosures about products are linked to lower bid-ask spread, lower return volatility and higher quoted depth, where

bid-ask spread, return volatility, and quoted depth are proxies for information asymmetry. Francis et al. (2005) examine whether the finding of reduced information asymmetry can be generalized to countries other than the United States. They find that even though legal and financial systems may differ among countries in the sample, the negative association between voluntary disclosure scores and cost of capital still holds.

In summary, the literature on voluntary disclosure suggests that voluntary disclosure provides both useful and misleading information to investors. When processing this type of information, investors may need additional help in discriminating useful information from noise. This study explores an approach to supporting investors in the context of VED.

## **2.2 Environmental Disclosure**

### **2.2.1 Environmental disclosure strategies**

Research on environmental disclosure has focused primarily on information in annual reports and 10Ks, which are a mix of mandatory and voluntary disclosure (Clarkson et al. 2006). One stream of this literature shows that companies choose the types of environmental information in an attempt at impression management. For instance, 15 out of 18 firms identified as a “Potentially Responsible Party” under the Superfund Act do not disclose the fact; even though 80 percent of them have above-average disclosure scores (Fekrat et al. 1996). Companies also disclose more environmental information when they experience a loss or when regulatory challenges are intense. Furthermore, companies tend to select positive examples of firm actions while reframing or ignoring negative actions (Neu et al. 1998). A study finds that in the

environmental section of annual reports, Finnish companies disclose a higher proportion of known positive events than the proportion of known negative events (Niskanen and Nieminen 2001). These types of environmental disclosure behaviors may fall into the category of “greenwashing”. The practice tries to paint an environmentally friendly image for a firm, and it passes on little verifiable information about actual environmental performance (Beets and Souther 1999).

Another stream of literature has established that environmental liabilities and environmental expenditure affect investors’ judgments regarding a company’s profitability potential, and the knowledge of environmental performance facilitates the estimation of financial implications from environmental activities (Barth and McNichols 1994; Clarkson et al. 2004; Cormier and Magnan 1997; Hughes 2000). Evidence shows that some companies provide such useful information in their annual reports and/or 10Ks (Belkaoui 1976; Barth et al. 1997; Li and McConomy 1999).

### **2.2.2 Value relevance of environmental disclosure**

Prior studies report that environmental disclosure is associated with firm stock performance.<sup>3</sup> Anderson and Frankle (1980) compare the portfolio return of socially disclosing firms with the portfolio return of non-socially disclosing firms from July 1972 to June 1973. The types of social disclosures they discuss include several areas; the most common area is environmental controls. They report that investors pay a premium for firms making social disclosures once the disclosures are released in the annual reports.

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<sup>3</sup> Most studies find that environmental disclosure has a positive effect on stock price (e.g., Anderson and Frankle (1980); Freedman and Stagliano (1991); Blacconiere and Patten (1994); Patten and Nance (1998); Magness (2002); Patten and Trompeter (2003)). An exception is Richardson and Welker (2001), which finds the more the social disclosure the higher the cost of capital. This relation is especially obvious for less profitable companies.

They also find that investors reward firms with a prior history of disclosure more than firms new in making social disclosures.

Further support for this finding is reported by Blacconiere and Patten (1994), who document a negative market return for chemical firms after Union Carbide's chemical leak accident in Bhopal, India in 1984. The researchers note that firms with relatively extensive environmental disclosure prior to the accident suffered less negative market reaction than firms with limited environmental disclosure. A further examination of chemical firms' reactions to the Bhopal accident found that chemical firms disclosing more environmental information in their 10Ks before the accident had a smaller amount of negative discretionary accruals after the event (Patten and Trompeter 2003). An investigation of the Exxon Valdez oil spill reported positive abnormal returns for U.S. petroleum and refining companies due to potential price increases for crude oil, wholesale gasoline and retail gasoline after the accident. The market response, however, was moderated by less extensive environmental disclosure prior to the event (Patten and Nance 1998). These studies suggest that having a commitment to environmental disclosure is recognized by investors after bad environmental news.

### **2.2.3 Reliability of environmental disclosure**

Studies on environmental disclosure define reliability as whether the disclosures are helpful in estimating actual environmental performance. Early studies suggest that environmental disclosure may have no relationship with environmental performance (Ingram and Frazier 1980; Wiseman 1982; Freedman and Wasley 1990; Fekrat et al. 1996). In these studies, disclosure scores were generated using a content analysis and environmental performance was the rating issued by the Council on Economic Priorities

(CEP). Using similar measures, Hughes et al. (2001) find that poor environmental performers have higher environmental disclosure scores than firms with good or mixed performance. However, the extent of disclosure could not differentiate actual environmental performance.

Patten (2002) uses a relatively large sample (131 firms), adjusts toxics release by revenue, and controls for firm size and industry. He finds a negative association between environmental disclosure and environmental performance. Similarly, Bewley and Li (2000) find that firms with high pollution propensity (i.e., poor environmental performance) tend to disclose more general environmental information.

More recently, Al-Tuwaijri et al. (2004) show that firms with less pollution are more likely to disclose pollution-related information. Clarkson et al. (2006) contend that the disclosures in Al-Tuwaijri et al. (2004) are largely mandatory. Clarkson et al. (2006) study voluntary disclosures and find that firms with good environmental performance are inclined to disclose environmental information. The conclusion is the same regardless of whether the disclosure measure is content based or is a simple dichotomous variable.

This study most closely relates to Clarkson et al. (2006) in that both papers examine VED and use toxic-related data as a proxy for environmental performance. However, the two studies are motivated differently. Clarkson et al. (2006) focus on the signaling effects of disclosure, while this study examines the influence of competitive strategy on disclosure.

In summary, literature on environmental disclosure generally finds that the disclosure is value relevant. But prior studies report inconsistent results on the relation between environmental disclosure and environmental performance. Therefore, the

reliability of environmental disclosure is questionable (Berthelot et al. 2003). The problem of reliability may be partly explained by the nature of environmental disclosure in annual reports and 10Ks, which is a mix of mandatory and voluntary disclosure. On the one hand, poor environmental performers may be reluctant to disclose environmental information, but are required to disclose it under SEC regulations and accounting standards. On the other hand, good environmental performers may want to publicize their achievements but the disclosure is not required by regulation. This study proposes that VED provides an opportunity to examine whether environmental disclosure could be a good indicator of environmental performance. Specifically, this study identifies when VED is more likely to be greenwashing, and when VED is more likely to be informative.

### **2.3 Determinants of Voluntary Disclosure**

Previous research suggests that factors such as equity issuance affect managers' disclosure decisions. In a study of companies issuing seasoned securities, Lang and Lundholm (2000) find that these companies make more disclosures during the six months leading to the offering than during the six months starting a year ago, and disclose more information than do non-issuing companies over the same time period.

In the environmental disclosure area, studies such as Barth et al. (1997) find that firms frequently accessing capital markets are more likely to disclose environmental information. Studies also report that large firms, firms in high-polluting industries, and firms facing risk of new stringent environmental laws tend to disclose more environmental information (Patten 1992; Li et al. 1997; Walden and Schwartz 1997; Neu et al. 1998; Bewley and Li 2000; Cormier and Magnan 2003). Public pressure and media

coverage pertaining to corporate environmental activities may encourage or discourage firms to make environmental disclosure (Gamble et al. 1995; Li et al. 1997; Brown and Deegan 1998; Neu et al. 1998).

Prior literature on corporate disclosure has examined the effects of different factors on disclosure behaviors, but tends to ignore the influence of internal factors, such as a company's competitive strategy, on disclosure decisions (e.g., Ullmann 1985; Patten 1991; Gamble et al. 1995). One reason for this lack may be the difficulty in identifying and measuring internal factors. Al-Tuwaijri et al. (2004) tried to include overall corporate strategy in their investigation of interactions among environmental performance, economic performance, and environmental disclosure. They argue that corporate strategy is "unobservable" so they set up a simultaneous equation system to capture the impact of corporate strategy on environmental performance, economic performance, and environmental disclosure. They find that economic performance does not determine environmental performance. That is, the cost of environmental responsibility is not as a big problem as generally believed. However, good environmental performance positively affects economic performance. They also report that good environmental performers tend to disclose quantitative pollution-related environmental information.

## CHAPTER III

### HYPOTHESES

This study proposes that competitive strategy plays an important role in the voluntary environmental disclosure decision. Competitive strategy, an overall plan enabling a company to “establish a profitable and sustainable position” in the industry (Porter 1985), is designed to guide all activities and decisions within a company. One activity guided by competitive strategy is disclosure management. How disclosures are managed can affect a company’s competitive position in the industry (Ozbilgin and Penno 2005), because proprietary costs can be incurred by disclosures (Verrecchia 1983; Darrough and Stoughton 1990; Wagenhofer 1990; Feltham and Xie 1992; Newman and Sansing 1993; Darrough 1993; Gigler 1994; Hayes and Lundholm 1996; Li et al. 1997; Price 1999; Guo et al. 2004). These proprietary costs occur when competitors respond to a company’s disclosure decision by undertaking actions that adversely affect the disclosing company’s future cash flows (Wagenhofer 1990).

Even with a general knowledge of factors causing competitive disadvantage, it is difficult for a company to predict competitors’ reaction to a particular disclosure (Elliott and Jacobson 1994; Guo et al. 2004). For example, the announcement of a green technology may encourage competitors to strive to catch up, but it may also persuade competitors to give up the area because the disclosing company is much advanced in development. Disclosures then are likely to be managed in a way that they are consistent



with the company's competitive strategy.<sup>4</sup> When proprietary costs are incurred, it is easier for managers to justify the decision if the disclosure was aligned with the company's competitive strategy than if it was not.

This study examines whether voluntary environmental disclosure is a function of competitive strategy. The two competitive strategies examined here are: (1) investment in brand image, and (2) investment in research and development (R&D). These two strategies are chosen because they are main competitive strategies emphasized by companies and they are observable based on public data. Data for other strategies (such as simpler product designs and more flexible delivery) are not available.

Companies emphasizing one of the two strategies are believed to have a tendency to publish more voluntary environmental information. For companies emphasizing the strategy of investment in brand image, voluntary environmental disclosure provides an opportunity to build brand image and/or corporate image (Varadarajan 1992; Hoeffler and Keller 2002). Evidence shows that many companies incorporate environmental issues into marketing activities (Menon and Menon 1997; Handelman and Arnold 1999). The purpose is to attract environmentally conscious investors and consumers (Belkaoui 1976; Menon and Menon 1997; Banerjee et al. 2003). Green marketing has helped companies achieve competitive advantage in the product market (Hart 1995; Mohr and Webb 2005).

Companies with a high level of R&D investment are apt to make voluntary disclosures (Lhuillery 2006). Via disclosure, companies deliver the message that they are competent and worth working with (Muller and Penin 2006). In addition, revealing

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<sup>4</sup> Based on interviews, Gibbins et al. (1990) suggest that corporate strategy plays a role in disclosure decisions. Corporate strategy here refers to plans regarding markets a company chooses to enter and exchanges a company decides to list on. Gibbins et al. (1990) also note that internal politics is involved in disclosure decisions.

knowledge from R&D may lead to related innovation from other companies that will increase the popularity of disclosing company's products and technology (De Fraja 1993; Katz and Shapiro 1994). In general, firms sharing knowledge enjoy higher innovation productivity (Lhuillery 2006). Prior literature also suggests that companies emphasizing the strategy of investment in R&D are more likely to work on technologies and production processes that may improve environmental performance (Hasseldine et al. 2005). These companies have environmental information to communicate to investors and competitors. Therefore, the first set of hypotheses stated in the alternative form is:

H1a: Companies emphasizing a strategy of investment in brand image are likely to voluntarily disclose more environmental information than companies that do not emphasize this strategy.

H1b: Companies emphasizing a strategy of investment in research and development are likely to voluntarily disclose more environmental information than companies that do not emphasize this strategy.

The attempts to align disclosure with competitive strategy imply that companies would manage disclosed information with respect to content, redundancy, format and so on. As a result, the quality of information is affected. Prior studies suggest that companies want to manipulate investors' perceptions (e.g., Revsine 1991; Schrand and Walther 2000). This point of view is adopted in the environmental disclosure area, where the primary purpose of VED is to build a high-profile image (e.g., Fekrat et al. 1996; Patten 2002). As responding to environmental concerns could be part of marketing practice (Menon and Menon 1997; Handelman and Arnold 1999) and green marketing is a subset of information disclosure strategies (Prakash 2002), this study proposes that companies emphasizing the strategy of investment in brand image are more likely to use

voluntary environmental disclosure as a public relations tool, namely, greenwashing. As a result, extensive voluntary environmental disclosure is less likely to be linked to good environmental performance.

In contrast, previous research shows that companies offer useful information to reduce information asymmetry between managers and investors (e.g., Botosan 1997; Brown et al. 2004). In the environmental disclosure field, some companies release information such as environmental liabilities, expenditure, and performance to the public (Belkaoui 1976; Blacconiere and Patten 1994; Barth et al. 1997; Li and McConomy 1999). Given that research and development facilitates investment in environmentally friendly technology and products (Hasseldine et al. 2005), companies emphasizing the strategy of investment in R&D are likely to have environment-related achievements to communicate. Consistent with the rigor involved in undertaking research and development, companies emphasizing the strategy of investment in R&D are more likely to have VED as an indicator of environmental performance than companies that do not emphasize the strategy (Lev 1992). Therefore, extensive disclosure from these companies should strongly relate to good environmental performance. The second set of hypotheses is stated below in the alternative form:

H2a: The association between voluntary environmental disclosure and environmental performance is weaker for companies that emphasize a strategy of investment in brand image relative to companies that do not.

H2b: The association between voluntary environmental disclosure and environmental performance is stronger for companies that emphasize a strategy of investment in research and development relative to companies that do not.

## CHAPTER IV

### RESEARCH DESIGN AND SAMPLE SELECTION

#### 4.1 Competitive Strategy and Voluntary Environmental Disclosure (H1)

The first set of hypotheses predicts that competitive strategy is related to voluntary environmental disclosure. The discussions in Chapter III and prior literature suggest that a company's VED decision is a function of the company's competitive strategy, litigation risk, capital demand, leverage, size, other voluntary disclosures, and environmental performance. Therefore, the theoretical framework of this test is:

$$\begin{aligned} \text{Voluntary Environmental Disclosure} \\ = f(\text{competitive strategy, litigation risk, capital demand, leverage, size,} \\ \text{other voluntary disclosure, and environmental performance}) \end{aligned}$$

The dependent variable, voluntary environmental disclosure (*VEnvDisc*), refers to the attributes of disclosures such as the extent of disclosure. The independent variable of interest is competitive strategy (*Image* or *Technology*). Other variables serve as control variables. They are defined later in this section.

The empirical model testing H1 is presented below:

$$\begin{aligned} VEnvDisc = \beta_0 + \beta_1 Image + \beta_2 Technology + \beta_3 LitgRisk + \beta_4 CapDema \\ + \beta_5 Leverage + \beta_6 Size + \beta_7 OthDisc + \beta_8 EnvPerf + \epsilon \end{aligned} \quad (1)$$

#### **4.1.1 Voluntary environmental disclosure**

This study obtains voluntary environmental disclosure information from (1) the database of the CorporateRegister.com, and (2) a search of company websites for a separate section of environmental information.<sup>5</sup> The inclusion of website disclosure responds to the trend of putting non-financial, non-audited information on the internet, especially for social and environmental information (Xiao et al. 2002). For U.S. companies, stand-alone environmental reports or similar reports and environmental information on the company website are considered voluntary disclosures. Both stand-alone reports and environmental disclosures in a separate section of company website are important means to communicate to investors (SIRAN 2006).

One objective of this study is to examine whether competitive strategy affects the relationship between actual environmental performance and voluntary disclosure about it. In this study, environmental performance is measured by the outcome of toxics management. The data available at the time of this study was for 2004. Therefore, the voluntary environmental disclosure is the first environmental or similar report (hereafter, environmental report) discussing 2004 performance. However, if a company published environmental reports annually till 2004, skipped the report in 2005, but published again in 2006 for previous years' performance, this case is coded as no voluntary environmental disclosure for 2004 environmental performance.

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<sup>5</sup> CorporateRegister.com is the most comprehensive database of corporate non-financial (environment/social/sustainability/CSR) reports in the world. It was established by Next Step Consulting in 1998. The database is supported by leading organizations in the field of Corporate Social Responsibility and Socially Responsible Investment. The reports can be traced back to 1990. As of Apr. 18, 2006, the website has 11,067 reports from 3,175 different companies across 111 countries.

This study adopts the disclosure checklist in Clarkson et al. (2006) as the coding scheme. The checklist is derived from the Sustainability Reporting Guidelines 2002 published by the Global Reporting Initiative (GRI). In line with sustainable development, the Guidelines emphasize disclosures of economic, environmental, and social performance, which facilitate the decision-making of both reporting organizations and stakeholders. The goal of GRI is to have this disclosure framework accepted around the world. Therefore, completeness and comparability are given careful consideration in the development of the Guidelines. The disclosure checklist stemming from the Guidelines is broad enough to cover existing disclosure practices.

As shown in Appendix A, the coding list has 95 items. Each item is coded as 1 if it is present and 0 if it is absent. This checklist classifies voluntary environmental information into two sets – “Hard” and “Soft” disclosures. The “hard” set places emphasis on objective environmental information. It contains 79 items, grouped under four classifications, *A1* – *A4*. The “hard” classifications address: governance mechanisms for environmental control (*A1*), the credibility of environmental disclosure (*A2*), actual environmental performance (*A3*), and environment-related financial information (*A4*). The presence of items in the “hard” set is indicative of good environmental citizenship.

A company can accumulate points in the actual environmental performance group, *A3*, by providing information in ten environmental areas (e.g., energy use, water use, and toxics releases). See Appendix A for more detail. Disclosures about each area are evaluated in terms of the presence of 2004 performance, comparison with benchmarks (peer performance, previous performance, or performance target), and degree of detail (normalized or disaggregated). The rationale is that comparison and

details help investors to assess company environmental effort and possible environmental liabilities. Accordingly, the maximum score for an environmental area is six. The highest possible score for A3 is 60 and is obtained if the ten areas are discussed thoroughly.

Here is an example of the coding. Johnson & Johnson presented its water use graphically. The graph showed that the water consumption was 10.9 million cubic meters in 2004, 12.3 in 2003, 13.0 in 2002, and 13.1 in 2001. This disclosure is awarded one point for reporting the consumption in 2004, and another point for the historical data for trend analysis. The consumption was indexed to sales (cubic meters/\$1,000 sales). It was 0.23, 0.29, 0.36, and 0.40 m<sup>3</sup> per thousand dollars of sales for 2004 back to 2001, respectively. The disclosure is awarded one more point for the normalization. In addition, Johnson & Johnson set a goal of cumulative water use avoidance of ten percent from 2001 to 2005. By the end of 2004, the cumulative avoidance was 12.1 percent. This adds another point to the disclosure for comparison with the target. In total, Johnson & Johnson gets four points for its disclosure on water use. In contrast, The Dow Chemical Company scores only one point for its disclosure in this area. It described verbally the types of water included in the measure, but did not report usage by type. The information provided was the total water usage of 2,037 million cubic meters in 2004.

“Soft” disclosures include general environmental statements, captured by 16 items, each coded as one point. They are vision and strategy claims (A5), environmental overviews (A6), and environmental initiatives (A7). Compared to “hard” set disclosures, these items are based on internal claims, evaluations and judgments. While “soft” disclosures may be well true, they lack the corroboration provided by hard data. They are also useful for a “greenwashing” strategy (Clarkson et al. 2006).

In summary, the highest possible score for “hard” disclosures is 79, and for “soft” disclosures is 16. Thus, the total possible score is 95. The dependent variable in model (1), *VEnvDisc*, is one of the four disclosure scores - *Total*, *Hard*, *Soft*, or *A3*.

#### **4.1.2 Competitive strategies**

The independent variables of interest are proxies for the two competitive strategies. This study calculates the ratio of advertising expenditure to sales for the year prior to VED. It also calculates the ratio of R&D expenditure to sales for the three years prior to VED, and then takes the average of the three ratios. An emphasis on investment in brand image (*Image*) is recognized when the advertising ratio is in the top one third of the industry. Recognition of an emphasis on investment in R&D (*Technology*) applies a similar rule. Companies with a R&D ratio in the top one third of the industry emphasize investment in R&D. An alternative way to define which competitive strategy is emphasized within a company is discussed later in sensitivity analyses.

R&D expenditure and sales information are obtained from COMPUSTAT. The attempt to get advertising information first turns to COMPUSTAT. But only 27 out of 74 chemical companies have the information. Advertising information is then obtained from “Advertising Ratios & Budgets” by Schonfeld & Associates (2005). Schonfeld & Associates, Inc., a business information researcher and seller since 1977, estimates company advertising spending using time series model, industry model, and constant ratio model. These estimates have already captured the advertising spending pattern of each company. Therefore, the ratio of advertising expenditure to sales is not an average like the final ratio of R&D to sales.



The advertising data are used with caution. First, there is a potential upward bias for big companies. Scaling advertising expenditures by sales accommodates this issue. Second, for companies without sufficient historical reporting, the accuracy of advertising estimates relies on the similarity between the company and other companies in the same industry. This may reduce the variation of the advertising ratio, making it work against the hypotheses of this study. This issue makes the results more convincing.

As predicted by the first set of hypotheses, the coefficients  $\beta_1$  and  $\beta_2$  should be significantly positive. A positive association between the competitive strategy proxy and the VED proxy indicates that companies with the tendency to emphasize either one of the strategies are likely to voluntarily disclose more environmental information than companies that do not emphasize the strategy.

#### **4.1.3 Control variables**

Based on prior research, several other variables are included in model (1) to control for factors expected to affect voluntary environmental disclosure. The control variables are litigation risk (*LitgRisk*), capital demand (*CapDema*), leverage (*Leverage*), company size (*Size*), other voluntary disclosures (*OthDisc*), and actual environmental performance (*EnvPerf*). The source of environmental performance information is discussed in the next section. Financial information is retrieved from COMPUSTAT. The number of news items released is counted from the website of each company.

In environmental disclosure literature, litigation risk refers to the probability of being sued or being penalized due to poor environmental performance. Companies facing risk of legal actions are more likely to disclose environmental information (Gamble et al.

1995; Walden and Schwartz 1997; Al-Tuwaijri et al. 2004). Litigation risk, *LitgRisk*, is the total production-related toxics (in pounds) adjusted by the company's total sales revenue (in thousand). This adjustment controls for the production process that determines pollution generation (Al-Tuwaijri et al. 2004). A review of voluntary environmental disclosure studies reveals that normalizing environmental performance by sales is very common. Though Clarkson et al. (2006) use it as one of two environmental performance measures, they conclude that this measure and the percentage of toxics recycled measure capture complementary information.

Prior literature also suggests that companies are inclined to voluntarily disclose extensive information if they anticipate accessing the capital market (Baiman and Verrecchia 1996; Lang and Lundholm 2000). This tendency could be extended to voluntary disclosure of environmental information. Similar to the proxy for industry dependence on external financing in Rajan and Zingales (1998), this study measures capital demand, *CapDema*, as 1 minus the ratio of cash flow from operations to capital expenditures. Greater value of *CapDema* means greater reliance on external capital. A positive association is expected between *VEnvDisc* and *CapDema*.

Different reasons have been offered for including *Leverage* in environmental disclosure research. Some argue that environmental disclosure may reveal proprietary information and costs may be incurred because of that. Financially healthy companies have a good chance to absorb this cost (Cormier and Magnan 1999; Cormier and Magnan 2003). Others maintain that debtholders are concerned about environmental liabilities when debt is relatively high, and that managers in these companies tend to satisfy this

demand for information (Clarkson et al. 2006). This study measures *Leverage* as the ratio of total debt to total assets. The sign of *Leverage* is not clear.

The control variable *Size* is included because large companies are more likely to voluntarily disclose environmental information due to visibility and political exposure (Cowen et al. 1987; Patten 1992; Hackston and Milne 1996; Bewley and Li 2000; Patten 2002; Cormier and Magnan 2003). *Size* is defined as the nature logarithm of total assets. *Size* and *VEnvDisc* are expected to be positively related.

To separate the impact of competitive strategy on VED, this study further controls for other factors that may influence voluntary disclosure decisions made by each company. Other voluntary disclosures, *OthDisc*, are measured as the number of news items released in the year of VED shown on the company website. *VEnvDisc* and *OthDisc* are expected to move in the same direction, provided that companies hold a consistent voluntary disclosure policy.

This model also includes environmental performance as an independent variable. Prior research reports that companies with poor environmental performance tend to disclose more environmental information, especially in less environmentally sensitive industries (Patten 2002). Prior literature also finds that companies with good environmental performance tend to disclose more environmental information in order to signal their quality (Al-Tuwaijri et al. 2004). The conflicting results may be due to the fact that the disclosures in these studies are a mix of mandatory and voluntary disclosure in annual reports and 10Ks. As there are concerns for “greenwashing”, this study posits that poor performers present no less voluntary environmental disclosures than good performers. The specific measures are defined in the next section.

## 4.2 Competitive Strategy, Voluntary Environmental Disclosure Strategy, and Actual Environmental Performance (H2)

The second set of hypotheses suggests that VED strategy is consistent with the competitive strategy. More specifically, the greenwashing strategy follows the investment in brand image strategy, whereas the strategy of informing investors follows the investment in R&D strategy. Different VED strategies lead to environmental disclosures with varying quality. Disclosure under the greenwashing strategy is expected to have a weak relation to the actual environmental performance. Disclosure under the strategy of informing investors is anticipated to be strongly linked to the actual environmental performance. The model is specified as follows:

$$\begin{aligned} VEnvDisc = & \beta_0 + \beta_1 Image + \beta_2 Technology + \beta_3 EnvPerf \\ & + \beta_4 EnvPerf * Image + \beta_5 EnvPerf * Technology + \beta_6 LitgRisk \\ & + \beta_7 CapDema + \beta_8 Leverage + \beta_9 Size + \beta_{10} OthDisc + \varepsilon \end{aligned} \quad (2)$$

### 4.2.1 Environmental performance

The Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA) authorized the U.S. Environmental Protection Agency (EPA) to collect toxics release and transfer information. This Toxics Release Inventory (TRI) program began in 1987 and expanded later under the Pollution Prevention Act of 1990. With two decades of development, the TRI program provides the most comparable information available regarding environmental performance.

The Pollution Prevention Act of 1990 mandates that companies report additional information on toxics management and source reduction practices to the EPA. Total production-related toxics are recycled, treated, combusted for energy recovery, or

disposed of or otherwise released. Recycling recovers toxics for reuse. Treating is to destroy toxic chemicals by processes. Combusting is to burn toxics to recover energy. Disposing or releasing is to send toxics to underground injection wells, landfills, and other media. Of all these management approaches, recycling is the best in terms of environmental protection and resource conservation. When environmental contamination is the concern, recycling, treating, and combusting are all desired management activities, while disposing or releasing is less desirable.

The ratios of toxic waste recycled to total production-related toxics (*Recycled*), toxic waste treated to total production-related toxics (*Treated*), and toxic waste for energy recovery to total production-related toxics (*Combusted*) represent competing toxics management methods. Higher ratio values indicate better environmental performance. The ratio of toxic waste disposed of or otherwise released to total production-related toxics (*Disposed*) equals one minus the total of *Recycled*, *Treated*, and *Combusted*. As opposed to the three previous ratios, lower values of *Disposed* are better.

This study uses *Recycled* and *Disposed* as proxies for environmental performance. Toxics recycled reflect the spirit of good environmental performance, i.e., pollution minimization, resource conservation, and waste reduction (Al-Tuwaijri et al. 2004). With future profitability information embedded, *Recycled* has implications for sustainability. Toxics disposed of or otherwise released partly determine the extent of environmental contamination. Consequently, *Disposed* has implications for environmental liabilities. Other variables in the model are defined as those in section 4.1.

When the performance variable is *Recycled*, the second set of hypotheses predicts  $\beta_4$  to have a negative sign, but  $\beta_5$  to have a positive sign. When the performance

variable is *Disposed*,  $\beta_4$  is to be positive while  $\beta_5$  is to be negative. If the results are consistent with the predictions, it means that the disclosures are less useful if they are from companies emphasizing investment in brand image compared to those from other companies. The disclosures are more likely to be helpful to estimate actual environmental performance if they are from companies emphasizing investment in R&D relative to those from other companies.

### **4.3 Sample Selection**

This study starts with all non-federal chemical facilities that report toxics management activities to the U.S. EPA. The EPA database includes 3,556 facilities, whose Standard Industrial Classification (SIC) codes begin with 28. Among them, 559 facilities reported either an amount of zero or that the amount of toxics did not reach the reporting threshold for 2004. The remaining 2,997 facilities belong to 231 U.S. public companies and some foreign companies. The foreign companies are dropped because they are subject to different sets of regulation. Also excluded are 111 U.S. companies whose primary business is not in the chemical industry, since their production structure may not be comparable to that of chemical companies. Remaining are 120 U.S. public chemical companies (two-digit SIC = 28: chemicals & allied products). The sample size further decreases due to the lack of: advertising information (15 companies), research and development information (6 companies), or both (25 companies). The final sample includes 74 observations, which are listed in Appendix B.

## CHAPTER V

### ANALYSES

#### 5.1 Descriptive Statistics

Table 1 presents descriptive statistics for the variables in this study. Panel A reports the VED scores for the 45 companies that make disclosures. It shows that among companies providing VED, the disclosures vary substantially. The *Total* disclosure scores range from 1 to 59, and the median (mean) score is 17 (19.8). This result is comparable to the median (mean) of 17 (18.95) for 41 chemical companies in Clarkson et al. (2006). The variation in *Total* mostly comes from *Hard* disclosures. The standard deviation of *Hard* disclosures is 14.023, while the standard deviation of *Soft* disclosures is 2.791. Examining the four groups within the *Hard* set suggests that the main contributor to the variation is *A3* (environmental performance). Its standard deviation is 11.115. Panel B in Table 1 reports VED scores for the full sample. The median (mean) drops from 17 (19.8) to 3.5 (12.054) for *Total*, from 12 (14.8) to 1.5 (8.973) for *Hard*, from 5 (5.1) to 2 (3.081) for *Soft*, and from 5 (9.7) to 0 (5.878) for *A3*.

Panel C reports descriptive statistics for other variables. The competitive strategy measures are *Image* and *Technology*. They are defined based on the advertising-sales ratio (*Advertising*) and R&D-sales ratio (*R&D*). The median advertising expenditure of the sample is 1.3 percent of sales revenue. The mean expenditure is 2.9 percent of sales

revenue. Sample firms spent more on R&D than advertising. The median R&D expenditure is 3 percent of sales revenue, and the mean is 6.4 percent of sales revenue. As defined in section 4.1.2, *Image* and *Technology* are dummy variables. They have the same median of 0 and mean of 0.338.

The sample firms face different litigation risks due to environmental performance. The median (mean) of *LitgRisk* is 0.947 (11.506) pounds of toxics per thousand dollars of sales. The median (mean) of *CapDema* is -1.618 (-1.776), indicating that these sample firms generate enough internal cash to finance their capital expenditures. Consequently, the debt to asset ratio, *Leverage*, has a relatively low median (mean) of 0.253 (0.298). The natural logarithm of total assets, *Size*, has a median (mean) of 8.020 (7.907). The median (mean) number of voluntary news items released, *OthDisc*, is 30 (45.892) in the VED year.

The management of production-related toxics is also reported. Based on the medians (means), 5.3 percent (22 percent) of the production-related toxics are recycled and 4.3 percent (16.3 percent) are disposed of or otherwise released. These numbers suggest that sample firms still have a lot to do to catch up with the national level of 36.5 percent for recycling, the best management method in terms of environmental protection and resource conservation.

Table 2 presents the correlation matrix for the independent variables. The two competitive strategy measures, *Image* and *Technology*, are positively correlated, and their correlation is moderate. Except the correlation between *Size* and *OthDisc*, the rest correlation coefficients show that the independent variables are not highly correlated, suggesting low possibility of multicollinearity.



## 5.2 Hypothesis Testing

### 5.2.1 Results for H1

Table 3 presents the results of hypothesis testing. Panel A uses *Recycled* as the proxy for environmental performance. The dependent variables are different *VEnvDisc* measures, as labeled on the top of each section. Panel A shows that the coefficient on *Image* is positive and significant when the dependent variable is *Total*, *Hard*, or *A3* (environmental performance). The results provide support to Hypothesis 1a that companies emphasizing investment in brand image are likely to voluntarily publish more environmental information than companies that do not emphasize this strategy.

Hypothesis 1b predicts that companies emphasizing investment in R&D are likely to voluntarily disclose more environmental information than companies that do not emphasize this strategy. When *Soft* or *Total* is the dependent variable, the coefficient on *Technology* is not statistically significant, suggesting that companies emphasizing investment in R&D are unlikely to provide more “soft” environmental information and environmental information in general. However, when *A3* or *Hard* is the dependent variable, the coefficient on *Technology* is significantly positive, indicating these companies tend to provide more environmental performance information and information that shows long-term commitment to environmental protection.

Among other variables, *CapDema*, *Size*, and *OthDisc* are significantly positive. A positive coefficient on *CapDema* suggests that companies relying on external funds disclose more environmental information than companies generating enough internal cash for capital expenditure. Large firms are under relatively more public pressure than

small firms are. They voluntarily disclose more environmental information. Also note that companies have a consistent voluntary disclosure policy, as evidenced by positive coefficients on *OthDisc*. If companies tend to voluntarily disclose news such as product development and management forecasts, they also tend to voluntarily disclose environment-related issues.

The *LitgRisk* variable has no significant association with *VEnvDisc* measures. This suggests that in the chemical industry, litigation risk due to poor environmental performance does not encourage VED. Two conflicting expectations exist with respect to the relationship between *Leverage* and *VEnvDisc*. One predicts a negative association, arguing that financially healthy companies are able to absorb proprietary costs related to VED. The other expects a positive association, stating that companies try to satisfy creditors' desire to assess future environmental liabilities. The non-significance of *Leverage* does not support either of these explanations. The coefficients on the environmental performance proxy, *Recycled*, are not significant. It seems the performance in recycling is not related to VED.

The results are basically the same in Panel B, where *Disposed* is the environmental performance measure. One exception is that *Technology* is not significantly associated with *Hard* but still positively related to *A3* in this Panel. The other exception is that *Disposed* is negatively related to *Hard*. Companies releasing a small amount of toxics to the environment are likely to voluntarily disclose more environmental information demonstrating long-term commitments. Since *Disposed* has implications for environmental liabilities, companies seem to be cautious in this regard.

### 5.2.2 Results for H2

Table 4 presents the association between VED and actual environmental performance under the influence of competitive strategy. Panel A reports the results when *Recycled* is the environmental performance proxy. The coefficient of *Recycled* is not significant, suggesting there is no association between VED and environmental performance for companies that do not emphasize the two strategies. When the two competitive strategies are involved, the relationship between VED and environmental performance is altered. The signs of the interaction terms *Recycled\*Image* are significantly negative. This indicates that the relationship between VED and environmental performance is more negative for companies emphasizing investment in brand image compared to other companies. The VED of these companies is more likely to associate with poor environmental performance. In contrast, the signs of the interaction terms *Recycled\*Technology* are significantly positive. The VED of companies emphasizing investment in R&D is more likely to associate with good environmental performance compared to other companies, consistent with the comment of a “reliable” indicator by Berthelot et al. (2003). The association between VED and environmental performance is weaker for companies emphasizing investment in brand image, and is stronger for companies emphasizing investment in R&D.

Panel B of this table uses *Disposed* as the proxy for environmental performance. *Disposed* measures the proportion of toxics sent to underground injection wells, landfills, and other media. A smaller value of *Disposed* indicates better performance. *Disposed* is positively related to *Soft*, suggesting that more “soft” environmental information relates to poor environmental performance for companies without an emphasis on *Image* or

*Technology*. The interaction terms *Disposed \*Image* are negatively related to VED scores, and the interaction terms *Disposed\*Technology* are insignificant. The two competitive strategies have different impacts on the association between VED and environmental performance.

### **5.3 Sensitivity Tests**

This section presents the results of additional tests. The new tests investigate whether the results in section 5.2 are sensitive to changes in measurement methods and econometric specifications. Details are presented below.

#### **5.3.1 Variations of *Image* and *Technology* based on advertising ratio and R&D ratio, respectively**

Table 5 and Table 6 classify companies with an advertising-to-sales ratio above the industry median as companies emphasizing investment in brand image. They also categorize companies with a R&D-to-sales ratio above the industry median as companies emphasizing investment in R&D. Table 5 shows that companies emphasizing investment in brand image are likely to offer more VED, both “hard” and “soft” environmental information, than companies that do not emphasize this strategy. Companies emphasizing investment in R&D have a tendency to provide more environmental performance information. In Table 6, the results about the influence of competitive strategy on the association between VED and environmental performance are similar to what Table 4 has reported. When *Recycled* is the environmental performance proxy, its coefficient is not significant; the coefficient of *Recycled\*Image* is negative; and the coefficient of *Recycled\*Technology* is generally positive. The coefficient of *Disposed* is positive when

*Soft* is the dependent variable. The coefficient of *Disposed\*Image* is negative. The coefficient of *Disposed\*Technology* is not significant.

Table 7 and Table 8 report the hypothesis testing results using advertising ratio and R&D ratio directly. A high advertising ratio indicates an emphasis on the strategy of investment in brand image. Similarly, a high R&D ratio indicates an emphasis on the strategy of investment in R&D. Table 7 shows that companies emphasizing investment in brand image are likely to make more VED. Companies emphasizing investment in R&D are likely to provide more environmental performance information (i.e., *A3*). In this table, VED scores have no association with *Recycled*, but negative links are between *Hard* and *Disposed* and between *A3* and *Disposed*.

Table 8 suggests that the association between VED score and environmental performance is affected by competitive strategy. Panel A shows that *Total* and *Recycled* are negatively associated. So are *Soft* and *Recycled*. They suggest for companies with no advertising or R&D expenditure, more VED are related to poor environmental performance. The coefficients are not significant for *Recycled\*Image*, indicating companies emphasizing investment in brand image do not significantly change the negative association between VED and environmental performance. The coefficients are significantly positive for *Recycled\*Technology*, suggesting companies emphasizing investment in R&D are more likely to correct the general negative association. In other words, their VED have a tendency to relate to good environmental performance. Panel B present similar results to those reported in Table 4.

The next two tables present the results when all variables are ranked in the ascending order. Regarding the competitive strategy measures, *Image* is the rank of

*Advertising* within the industry, and *Technology* is the rank of *R&D* within the industry. Table 9 reports that companies emphasizing investment in brand image are likely to provide more environmental performance information or “hard” environmental information in general. Companies emphasizing investment in R&D are unlikely to provide more environmental information than companies that do not emphasize this strategy. Table 10 reports the association between VED and environmental performance under the influence of competitive strategy. Panel A shows that VED measures, *Total*, *Hard*, and *Soft*, are not significantly related to *Recycled*, but *A3* and *Recycled* are negatively related. Variable *Recycled\*Image* associates with none of the VED measures, whereas *Recycled\*Technology* positively relates to all the VED measures. Panel B shows that the coefficients on *Disposed* and the interaction terms are not significant.

### **5.3.2 Considering the tension between the two competitive strategies within a company**

Whether a company emphasizes a competitive strategy or not depends on its position in the industry in terms of advertising spending or R&D expenditure. The tendency of emphasizing a competitive strategy increases with the value of advertising spending or R&D expenditure. The above tests have defined “emphasizing a competitive strategy” in this way. The tests below adopt another way to define it:

- Compute the ratio of advertising expenditure to sales for the year prior to VED;
- Calculate the ratio of R&D expenditure to sales for the three years prior to VED and then take the average of the three ratios;
- Subtract the advertising ratio from the final R&D ratio for each company;

- Sort the differences of the ratios in a descending order;
- If the value falls in the lower one third range, it means the strategy of investment in brand image dominates the strategy of investment in R&D. The proxy for investment in brand image, *Image*, equals 1, and 0 otherwise;
- If the value falls in the upper one third range, it indicates the opposite that the strategy of investment in R&D prevails. The proxy for investment in R&D, *Technology*, equals 1, and 0 otherwise.

This approach intends to capture the tension between the two competitive strategies within a company and the industry norm. As H2a and H2b predict, the two competitive strategies lead to different association between VED and environmental performance. A company's VED should reflect the impacts of both strategies, but the overall association between VED and environmental performance should be salient for the dominant strategy. For example, Eli Lilly and Company has an advertising ratio of 5 percent, and its R&D ratio is 20.4 percent on average. They are all ranked in the top one third of the industry. So both competitive strategies are important to the company. As investment in R&D is likely to dominate investment in brand image, the association between VED and environmental performance could be affected more by the strategy of investment in R&D.

The testing results are presented in Tables 11 and 12. Table 11 suggests that companies emphasizing investment in brand image are likely to make more "soft" environmental disclosures such as general environmental statements than other companies. Companies emphasizing investment in R&D are likely to voluntarily disclose more environmental information in total. The information disclosed is primarily "hard"

information showing their long-term commitments to improving environmental performance. These companies also make significantly more voluntary environmental disclosures about their actual environmental performance. In this table, VED is not related to *Recycled*. But *Hard* is negatively related to *Disposed*.

In Panel A of Table 12, *Recycled* is negatively related to *Total*, *Hard*, and *Soft*. For companies that do not emphasize the two competitive strategies, more VED relates to poor environmental performance. This indicates that VED is to enhance public relations, supporting the claim of “greenwashing”. Two more independent variables of interest are the interaction terms. The results show for companies emphasizing investment in brand image, the association between their VED and environmental performance is not significantly different from that of companies without an emphasis on the two strategies. In contrast, the signs of the interaction term *Recycled\*Technology* are positive. It suggests that companies emphasizing investment in R&D are more inclined to correct the negative association than other companies. Panel A suggests that different competitive strategies have different effects on the association between VED and environmental performance.

Panel B of this table uses *Disposed* as the proxy for environmental performance. The coefficients of *Disposed* are significantly positive, indicating again more VED are related to poor environmental performance. However, both interaction terms are negatively related to VED. Therefore, this undesirable relation is weaker for companies emphasizing either one of the strategies. One explanation is that the public is sensitive to *Disposed*; hence, when these companies make VED, they consider their performance on disposing toxics.



This study has also tried the Tobit models since the dependent variables are greater than or equal to zero. The results are presented in Table 13 and Table 14. As reported above, companies emphasizing investment in brand image are likely to voluntarily disclose more “soft” environmental information than companies that do not emphasize the strategy. Companies emphasizing investment in R&D are likely to voluntarily disclose more detailed environmental performance information, “hard” environmental information, and environmental information in total. In the examination of competitive strategy’s effects on the association between VED and environmental performance, interaction terms *Recycled\*Image* are not significant, whereas interaction terms *Recycled\*Technology* are significantly positive. In Panel B of Table 14, only *Total* and *Soft* are negatively associated with *Disposed\*Image*, while all VED proxies are negatively connected with *Disposed\*Technology*.

So far the hypothesis testing has included both stand-alone environmental reports and environmental disclosures on company websites. The publication dates of stand-alone environmental reports were accurately determined; these dates were prior to the EPA release of the toxics data. When the disclosures on the company websites were coded, many websites had not updated information for 2005 performance. If they had, the VED scores were discounted to reflect disclosures made when only 2004 environmental performance information was available. However, the coding was conducted after the 2004 TRI data were released by the EPA. At that time 2005 environmental performance information might be available within companies. It is difficult to determine whether the VED about 2004 performance was put on the company website because companies wanted to show 2005 performance, or it was already there when only the 2004

performance data were available. If the former happens, the VED measures may be positively biased because of the inclusion of website disclosures. To accommodate this concern, website disclosures are treated as no disclosure. The results are basically the same after the change. The exception is that companies emphasizing investment in brand image are now unlikely to disclose more “soft” environmental information than companies that do not emphasize this strategy. Detailed information is presented in Tables 15 and 16.

Logit models are used when the VED score *Total* is re-defined as a dummy variable, which equals 1 if *Total* is greater than zero, and 0 otherwise. The dummy variable specification of *Total* leads to a loss of information. In the tests of H1a and H1b, Table 17 reports that none of the competitive strategy measures are positive, neither is *OthDisc*. *LitgRisk* is positively significant in Panel A but not in Panel B. Regarding the rest variables, *CapDema* and *Size* remain positive, and *Leverage* is still not significant. A negative association is reported between the decision of VED and *Recycled*. It means that offering VED relates to poor environmental performance. But the decision of VED does not significantly relate to *Disposed*. Table 18 reports the testing results of H2a and H2b. The coefficient of *Recycled* is negative. The interaction term *Recycled\*Image* is not significant, while the interaction term *Recycled\*Technology* is positive. When *Disposed* is the environmental performance measure, none of the three variables, *Disposed*, *Disposed\*Image*, and *Disposed\*Technology*, are significant.

### **5.3.3 Variations of environmental performance measures**

Production-related toxics are recycled, treated, combusted, or disposed of. In this section, the toxics amount managed by each method is divided by sales revenue for size-

adjustment. Mathematically, these measures are the components of the environmental litigation risk measure *LitgRisk*. To avoid the problem of multicollinearity, the variable *LitgRisk* is dropped in the tests below.

Tables 19 and 20 use these new environmental performance measures and the competitive strategy measures defined in section 4.1.2. Each table includes four panels, corresponding to the four management methods, recycling, treating, combusting, and disposing of. Table 19 shows that companies emphasizing either one of the two competitive strategies tend to disclose more environmental performance information, and “hard” environmental information. Companies emphasizing investment in brand image also tend to disclose more environmental information in total than companies that do not emphasize the strategy. More “soft” environmental disclosures are related to poor environmental performance measured by *Recycled* or good environmental performance measured by *Combusted*.

Panel A of Table 20 reports a negative association between *Soft* and *Recycled*, but no association between other VED measures and *Recycled*. Across all VED measures, the association between VED and environmental performance is more negative for companies emphasizing investment in brand image compared to other companies; the association is more positive for companies emphasizing investment in R&D compared to other companies. Panel B shows that the coefficients on environmental performance measure *Treated* are not significant. The association between VED and environmental performance represented by *Treated* is more positive for companies emphasizing either one of the competitive strategies relative to other companies. Panel C has *Combusted* as the environmental performance measure. The coefficients of this variable are not

significant. But the association between VED and environmental performance has a slight tendency to move in the negative direction under the strategy of investment in brand image. Panel D uses *Disposed* as the environmental performance proxy. The coefficients of this variable are negative, indicating more VED relates to good environmental performance shown by *Disposed*. This association is not significantly different for companies emphasizing investment in brand image, but is weaker for companies emphasizing investment in R&D.

Tables 21 and 22 take the new environmental performance measures and the competitive strategy measures defined in section 5.3.2. Table 21 reports that companies emphasizing investment in brand image are likely to make more “soft” environmental disclosures than companies that do not emphasize this strategy. Companies emphasizing investment in R&D are likely to make more environmental disclosures driven by “hard” environmental information, especially environmental performance information.

Panel A of Table 22 reports when *soft* is the dependent variable, the coefficient of *Recycled* is negative. The coefficients are not significant when other VED scores are used. But the association between *A3* and *Recycled* is more positive under the strategy of investment in brand image. Panel B reports that more VED associates with poor environmental performance measured by *Treated* for companies not emphasizing the two competitive strategies. The association is not significantly different for companies emphasizing investment in brand image, whereas the association is ameliorated for companies emphasizing investment in R&D. When *Combusted* is used as the environmental performance proxy in Panel C, more *A3* relates to poor environmental performance for other companies. Compared to this association, the association between

VED and environmental performance is more positive for companies emphasizing investment in R&D but not for companies emphasizing investment in brand image. Panel D shows that the coefficients of *Disposed* are negative. The association between VED and environmental performance is not significantly different for companies emphasizing either one of the competitive strategies relative to other companies.

Recycling, treating, and combusting toxics alleviate the extent of environmental contamination. Hence, these three methods are considered desirable management methods. A new environmental performance measure, *Desired*, is constructed by adding together the scaled *Recycled*, *Treated*, and *Combusted* defined above. High values of *Desired* indicate good environmental performance. The competitive strategy measures in Tables 23 and 24 follow the definitions in section 4.1.2. Table 23 reports that companies emphasizing either one of the competitive strategies have a propensity to disclose more environmental information. Table 24 shows that VED and environmental performance are not significantly related for companies without an emphasis on *Image* or *Technology*. This relation is not significantly different for companies emphasizing investment in brand image. The relation, however, is significantly more positive for companies emphasizing investment in R&D.

The competitive strategy measures in Tables 25 and 26 are changed to the definitions developed in section 5.3.2. Table 25 shows that companies emphasizing investment in brand image tend to focus on “soft” environmental information. Companies emphasizing investment in R&D tend to report on environmental performance information, “hard” environmental information, and environmental information in total. Table 26 has VED associates with poor environmental performance for companies with

no emphasis on the two competitive strategies. This association is not significantly changed for companies emphasizing investment in brand image, but it moves in the positive direction for companies emphasizing investment in R&D.

#### **5.3.4 Including a fixed effect for pharmaceutical companies**

The final sample of this study contains 74 chemical companies. Among them, 18 are pharmaceutical companies (SIC = 2834). To examine whether the results are driven by this group of companies, this study adds a dummy variable, *Pharmaceutical*, to the models. This variable equals 1 if a company's SIC code is 2834, and 0 otherwise. Tables 27 and 28 take the competitive strategy measures defined in section 4.1.2. The results are basically the same as those reported in Tables 3 and 4. Tables 29 and 30 use the competitive strategy measures defined in section 5.3.2. Their results are basically the same as those reported in Tables 11 and 12.

#### **5.4 Summary**

Several themes emerge from the analyses in this Chapter. First, companies emphasizing investment in brand image are likely to provide more environmental information than companies that do not emphasize this strategy. Companies emphasizing investment in R&D tend to provide more environmental performance information than companies that do not emphasize this strategy.

Second, different competitive strategies affect the association between VED and environmental performance differently. Some companies emphasize investment in brand image. If the environmental performance measure has implications for sustainability (e.g., *Recycled*), the association between VED and environmental performance is the

same or more negative for these companies relative to other companies. If the environmental performance measure has implications for environmental liabilities (e.g., *Disposed*), the association between VED and environmental performance is adjusted, so VED is less likely to relate to poor environmental performance.

Third, for companies emphasizing investment in R&D, the tendency of VED to be linked to poor environmental performance is ameliorated. In other words, the association between VED and environmental performance is stronger for these R&D companies than for other companies. This association is also stronger if the environmental performance measure has implications for sustainability than if the environmental performance measure has implications for environmental liabilities.

## CHAPTER VI

### CONCLUSION

The overall objective of this study is to further our understanding of voluntary disclosure decisions. In the context of voluntary environmental disclosure, this study investigates whether a company's competitive strategy affects its VED decision, and also influences the quality of disclosed environmental information. This investigation is important, given the rapid growth in socially responsible investment.

This study contributes to the voluntary disclosure literature by testing whether competitive strategy affects company disclosure policy. Prior studies have identified many factors influencing disclosure decisions but competitive strategy has been ignored by them. This study finds that a company's competitive strategy affect its voluntary environmental disclosure. Companies emphasizing investment in brand image are likely to voluntarily disclose more environmental information than companies that do not emphasize the strategy. Companies emphasizing investment in R&D in general also tend to voluntarily provide more environmental information than companies that do not emphasize the strategy. Their disclosures focus on environmental performance. This study also finds that VED positively relate to other voluntary disclosures made by the company. It suggests that companies may have consistent voluntary disclosure policies that are also influenced by competitive strategy. Future research should consider including competitive strategy as a determinant of voluntary disclosure decisions.



This study investigates specific competitive strategies. It addresses the problem that may be caused by using a general competitive strategy variable such as industry competition intensity. As shown by the results, different competitive strategies have different effects on VED strategy. If a general competitive strategy variable is used, the effect of competitive strategy on disclosures may appear unstable.

Investigating specific competitive strategies further provides insight into the conflicting relation between VED and environmental performance. The results of this study indicate that for companies that do not emphasize the two competitive strategies, more VED do not relate to good environmental performance, leading to concerns of “greenwashing”. When the environmental performance measure has implications for sustainability, the association between VED and environmental performance is not stronger for companies emphasizing investment in brand image relative to other companies. This association, however, is significantly stronger for companies emphasizing investment in R&D relative to other companies. When the environmental performance measure has implications for environmental liabilities, the association between VED and environmental performance is stronger for companies emphasizing investment in brand image, and is the same or stronger for companies emphasizing investment in R&D, compared to other companies.

These findings suggest that competitive strategy is a signal of the quality of disclosed environmental information. Investors can use a company’s competitive strategy as a heuristic measure to estimate the company’s environmental performance and the financial implications of the performance. This method should save investors time and costs in collecting actual environmental performance data.

The results in this study are limited by features of the data and the methodology. First, this study examines only the chemical industry and the sample size is relatively small. It is not clear whether the findings could be generalized to other industries. However, focusing on one industry controls for unknown factors that may affect voluntary disclosure decisions and vary from industry to industry, making the tests of competitive strategy powerful. Second, research on voluntary disclosures is usually charged with subjectivity in coding. The VED scores in this study may contain measurement errors for this reason. This study uses a disclosure checklist to help control measurement errors. The scores are comparable to those in a study using the same checklist. Third, environmental performance is measured by toxics management outcomes, and performance in other environmental areas may also affect VED. This study follows the literature to use TRI information, because performance in other areas is difficult to evaluate. Also because of this, its influence on VED may not be comparable to that of toxics management information. Toxics management information is reported under the TRI program, and the EPA has managed the program for 20 years. The information is publicly accessible and of high quality.

Future research could develop new environmental performance measures that capture performance in multiple environmental areas, and then examine the relation between VED and environmental performance. Industries other than the chemical industry could also be examined. It may be that additional data and/or harder disclosure measures become available. This would enable a closer look at the relationship among competitive strategy, voluntary environmental disclosure, and environmental performance. Finally, future studies could examine whether investors assign different

values to different quality of environmental disclosures. The results may suggest whether there would be a demand for regulatory guidance on environmental reporting and reporting assurance service.

## TABLES

**TABLE 1**  
**Descriptive Statistics**

**Panel A: Descriptive Statistics for 45 Disclosure Scores**

<u>Variable</u>	<u>N</u>	<u>Mean</u>	<u>Std. Dev.</u>	<u>Min</u>	<u>Q1</u>	<u>Median</u>	<u>Q3</u>	<u>Max</u>
Total	45	19.8	16.375	1	5	17	30	59
Hard	45	14.8	14.023	0	2	12	23	50
Soft	45	5.1	2.791	1	3	5	7	11
A3	45	9.7	11.115	0	0	5	16	40
A1	45	1.9	1.498	0	1	2	3	5
A2	45	2.5	1.938	0	1	2	4	7
A4	45	0.6	0.908	0	0	0	1	3
A5	45	2.7	1.408	0	2	3	4	6
A6	45	0.6	0.747	0	0	0	1	3
A7	45	1.7	1.286	0	1	2	3	4

**Panel B: Descriptive Statistics for 74 Disclosure Scores**

<u>Variable</u>	<u>N</u>	<u>Mean</u>	<u>Std. Dev.</u>	<u>Min</u>	<u>Q1</u>	<u>Median</u>	<u>Q3</u>	<u>Max</u>
Total	74	12.054	16.017	0	0	3.5	24	59
Hard	74	8.973	13.081	0	0	1.5	18	50
Soft	74	3.081	3.301	0	0	2	5	11
A3	74	5.878	9.851	0	0	0	11	40

**Panel C: Descriptive Statistics for Other Variables**

<u>Variable</u>	<u>N</u>	<u>Mean</u>	<u>Std. Dev.</u>	<u>Min</u>	<u>Q1</u>	<u>Median</u>	<u>Q3</u>	<u>Max</u>
Advertising	74	0.029	0.045	0.000	0.002	0.013	0.038	0.251
R&D	74	0.064	0.073	0.000	0.016	0.030	0.096	0.321
Image	74	0.338	0.476	0.000	0.000	0.000	1.000	1.000
Technology	74	0.338	0.476	0.000	0.000	0.000	1.000	1.000
LitgRisk	74	11.506	26.013	0.000	0.190	0.947	9.170	146.752
CapDema	74	-1.776	2.797	-8.749	-3.249	-1.618	-0.480	11.069
Leverage	74	0.298	0.206	0.000	0.183	0.253	0.396	1.363
Size	74	7.907	1.802	2.350	7.000	8.020	9.050	11.675
OthDisc	74	45.892	34.623	3.000	20.000	30.000	70.000	139.000
Recycled	74	0.220	0.305	0.000	0.000	0.053	0.371	0.997
Disposed	74	0.163	0.275	0.000	0.018	0.043	0.153	1.000

*Total:* the total score for VED, based on the disclosure coding scheme in the Appendix; equals “Hard” plus “Soft”;

*Hard:* sum of VED scores for sections A1, A2, A3, and A4 of the disclosure coding scheme;

*(continued on next page)*

**TABLE 1 (Continued)**

<i>Soft:</i>	sum of VED scores for sections A5, A6, and A7 of the disclosure coding scheme;
<i>A1:</i>	score for VED regarding governance structure and management systems;
<i>A2:</i>	score for VED regarding the credibility of information;
<i>A3:</i>	score for VED regarding actual environmental performance;
<i>A4:</i>	score for VED regarding environmental spending;
<i>A5:</i>	score for VED regarding environmental vision and strategy claims;
<i>A6:</i>	score for VED regarding environmental profile;
<i>A7:</i>	score for VED regarding environmental initiatives;
<i>Advertising:</i>	estimated advertising expenditure prior to the year of VED divided by the sales revenue of the same year; the advertising expenditure is estimated using time-series model, industry model, and constant ratio model by Schonfeld & Associates, Inc.;
<i>R&amp;D:</i>	first measured by the ratio of R&D to sales revenue for the three years prior to the year of VED, and then averaged for the three values;
<i>Image:</i>	equals 1 if the ratio of advertising to sales for the year prior to VED is in the top one third of the industry, and 0 otherwise;
<i>Technology:</i>	equals 1 if the average of the yearly ratio of R&D to sales over the three years preceding the year of VED is in the top one third of the industry, and 0 otherwise;

*(continued on next page)*

### TABLE 1 (Continued)

<i>LitgRisk:</i>	total production-related toxics (in pounds) adjusted by the company's total sales revenue (in thousand);
<i>CapDema:</i>	1 minus the ratio of cash flow from operations to capital expenditures;
<i>Leverage:</i>	the ratio of total debt to total assets;
<i>Size:</i>	the nature logarithm of the total assets;
<i>OthDisc:</i>	the number of news released in the year of VED on the company website;
<i>Recycled:</i>	the ratios of toxic waste recycled to total production-related toxics for 2004;
<i>Disposed:</i>	the ratio of toxic waste disposed of or otherwise released to total production-related toxics for 2004.

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**TABLE 2**  
**Correlations between Independent Variables**

<u>Variable</u>	<u>Image</u>	<u>Technology</u>	<u>LitgRisk</u>	<u>CapDema</u>	<u>Leverage</u>	<u>Size</u>	<u>OthDisc</u>	<u>Recycled</u>	<u>Disposed</u>
<i>Image</i>		0.336	-0.299	-0.233	-0.039	0.059	0.085	-0.119	0.149
		0.0035	0.0098	0.0455	0.7442	0.6171	0.4741	0.3117	0.2037
<i>Technology</i>	0.336		-0.202	-0.170	-0.372	0.112	0.176	-0.187	-0.060
	0.0035		0.0850	0.1484	0.0011	0.3435	0.1339	0.1109	0.6092
<i>LitgRisk</i>	-0.493	-0.346		0.349	0.026	-0.174	-0.103	0.332	-0.165
	0.0000	0.0025		0.0023	0.8290	0.1381	0.3805	0.0038	0.1589
<i>CapDema</i>	-0.280	-0.244	0.189		0.147	-0.442	-0.200	0.094	-0.069
	0.0156	0.0361	0.1076		0.2129	0.0001	0.0883	0.4272	0.5584
<i>Leverage</i>	-0.134	-0.418	0.182	0.055		-0.037	-0.137	-0.036	0.149
	0.2535	0.0002	0.1212	0.6422		0.7569	0.2460	0.7589	0.2039
<i>Size</i>	0.023	0.132	-0.004	-0.328	-0.084		0.679	-0.030	-0.117
	0.8431	0.2631	0.9743	0.0044	0.4784		0.0001	0.8026	0.3199
<i>OthDisc</i>	0.093	0.187	0.085	-0.258	-0.087	0.703		-0.144	-0.179
	0.4307	0.1100	0.4701	0.0268	0.4600	0.0001		0.2198	0.1281
<i>Recycled</i>	-0.242	-0.270	0.420	0.099	0.105	0.197	0.029		-0.250
	0.0378	0.0201	0.0002	0.3994	0.3724	0.0933	0.8093		0.0319
<i>Disposed</i>	-0.092	-0.271	-0.142	-0.008	0.181	-0.147	-0.074	-0.106	
	0.4341	0.0196	0.2271	0.9488	0.1224	0.2112	0.5316	0.3680	

Pearson correlations above the diagonal and Spearman correlations below the diagonal; p-values are under the correlation coefficients.

Variables are defined in Table 1.



**TABLE 3**  
**The Effect of Competitive Strategy on VED Behavior – Determining *Image* and *Technology* Using the Top One Third of Advertising Ratio and R&D Ratio, Respectively**

**Panel A: Recycled**

<u>Variable</u>		<u>Total</u>		<u>Hard</u>		<u>Soft</u>		<u>A3</u>	
		<u>Coef.</u>		<u>Coef.</u>		<u>Coef.</u>		<u>Coef.</u>	
<i>Intercept</i>	?	-29.846	***	-25.319	***	-4.527	***	-19.852	***
		-5.203		-5.384		-3.513		-5.321	
<i>Image</i>	(+)	3.986	*	3.767	**	0.219		3.190	**
		1.437		1.697		0.347		1.768	
<i>Technology</i>	(+)	2.792		2.939	*	-0.146		3.634	**
		1.066		1.393		-0.235		2.030	
<i>LitgRisk</i>	(+)	0.001		0.002		-0.001		-0.002	
		0.048		0.096		-0.084		-0.090	
<i>CapDema</i>	(+)	1.558	***	1.207	***	0.351	***	0.794	***
		3.394		3.369		2.903		2.787	
<i>Leverage</i>	?	-1.309		-0.883		-0.426		0.841	
		-0.176		-0.159		-0.208		0.205	
<i>Size</i>	(+)	4.149	***	3.293	***	0.855	***	2.377	***
		4.704		4.642		4.101		4.284	
<i>OthDisc</i>	(+)	0.217	***	0.181	***	0.036	***	0.123	***
		5.110		5.112		3.599		4.027	
<i>Recycled</i>	(-/0)	0.260		0.744		-0.484		1.253	
		0.083		0.306		-0.541		0.634	
Adj. R <sup>2</sup>		0.659		0.674		0.473		0.617	
N		74		74		74		74	

*(continued on next page)*

TABLE 3 (Continued)

Panel B: Disposed

<u>Variable</u>		<u>Total</u>		<u>Hard</u>		<u>Soft</u>		<u>A3</u>	
		<u>Coef.</u>		<u>Coef.</u>		<u>Coef.</u>		<u>Coef.</u>	
<i>Intercept</i>	?	-28.697	***	-24.245	***	-4.452	***	-19.112	***
		-5.192		-5.391		-3.409		-5.268	
<i>Image</i>	(+)	4.453	*	4.220	**	0.234		3.526	**
		1.628		1.915		0.372		1.945	
<i>Technology</i>	(+)	2.528		2.639		-0.111		3.351	**
		0.977		1.273		-0.181		1.909	
<i>LitgRisk</i>	(+)	-0.006		-0.002		-0.003		-0.002	
		-0.222		-0.126		-0.408		-0.120	
<i>CapDema</i>	(+)	1.516	***	1.170	***	0.346	***	0.772	***
		3.506		3.536		2.799		2.898	
<i>Leverage</i>	?	-0.497		-0.235		-0.262		1.124	
		-0.075		-0.049		-0.130		0.314	
<i>Size</i>	(+)	4.092	***	3.260	***	0.832	***	2.383	***
		4.778		4.766		4.013		4.456	
<i>OthDisc</i>	(+)	0.210	***	0.173	***	0.037	***	0.116	***
		4.995		4.937		3.792		3.840	
<i>Disposed</i>	(+/-)	-5.336		-4.924	**	-0.413		-3.302	
		-1.559		-1.958		-0.364		-1.618	
Adj. R <sup>2</sup>		0.667		0.685		0.473		0.624	
N		74		74		74		74	

(continued on next page)

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**TABLE 3 (Continued)**

\*, \*\*, \*\*\* significant at 10 percent, 5 percent, and 1 percent, respectively, in a one-tailed test if a directional prediction is made and a two-tailed test otherwise;

t-statistics are under the coefficient estimates; based on robust standard errors;

Dependent variables are VED scores on top of each model;

A company's competitive strategy is determined by the following procedure:

- Using the advertising expenditure provided by Schonfeld & Associates, Inc. calculate the ratio of advertising expenditure to sales prior to the year of VED;
- Calculate the average of the yearly ratio of R&D expenditure to sales over the three years preceding the year of VED;

*Image:* equals 1 if the advertising ratio is in the top one third of the industry and 0 otherwise;

*Technology:* equals 1 if the R&D ratio is in the top one third of the industry and 0 otherwise;

Other variables are defined in Table 1.

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**TABLE 4**  
**The Effect of Competitive Strategy on the Association between VED and Environmental Performance – Determining *Image* and *Technology* Using the Top One Third of Advertising Ratio and R&D Ratio, Respectively**

**Panel A: Recycled**

<u>Variable</u>		<u>Total</u>		<u>Hard</u>		<u>Soft</u>		<u>A3</u>	
		<u>Coef.</u>		<u>Coef.</u>		<u>Coef.</u>		<u>Coef.</u>	
<i>Intercept</i>	?	-27.550	***	-23.656	***	-3.893	***	-18.709	***
		-4.839		-5.022		-3.034		-4.897	
<i>Image</i>	(+)	5.109	**	4.650	**	0.459		4.010	**
		1.795		2.021		0.717		2.172	
<i>Technology</i>	(+)	-0.663		0.369		-1.031		1.660	
		-0.228		0.154		-1.523		0.843	
<i>Recycled</i>	(-/0)	-3.745		-2.105		-1.640		-0.552	
		-0.957		-0.705		-1.271		-0.239	
<i>Recycled*Image</i>	(-)	-10.074	**	-7.907	**	-2.168	*	-7.286	**
		-1.855		-1.836		-1.562		-1.905	
<i>Recycled*Technology</i>	(+)	28.058	***	20.988	***	7.070	***	16.461	***
		3.297		2.965		3.995		2.567	
<i>LitgRisk</i>	(+)	0.014		0.011		0.003		0.004	
		0.444		0.461		0.302		0.200	
<i>CapDema</i>	(+)	1.724	***	1.331	***	0.394	***	0.888	***
		4.052		3.958		3.555		3.239	
<i>Leverage</i>	?	-6.793		-4.954		-1.838		-2.264	
		-0.896		-0.860		-0.892		-0.523	
<i>Size</i>	(+)	4.360	***	3.454	***	0.906	***	2.512	***
		5.127		5.011		4.565		4.561	
<i>OthDisc</i>	(+)	0.192	***	0.162	***	0.030	***	0.108	***
		4.454		4.425		3.094		3.459	
Adj. R <sup>2</sup>		0.683		0.693		0.509		0.637	
N		74		74		74		74	

*(continued on next page)*

**TABLE 4 (Continued)**

**Panel B: Disposed**

<u>Variable</u>		<u>Total</u>		<u>Hard</u>		<u>Soft</u>		<u>A3</u>	
		<u>Coef.</u>		<u>Coef.</u>		<u>Coef.</u>		<u>Coef.</u>	
<i>Intercept</i>	?	-30.111	***	-25.240	***	-4.871	***	-19.969	***
		-5.511		-5.598		-3.955		-5.461	
<i>Image</i>	(+)	6.778	**	5.842	**	0.936	*	4.915	***
		2.231		2.365		1.398		2.469	
<i>Technology</i>	(+)	3.161		3.115	*	0.046		3.780	**
		1.131		1.389		0.070		2.024	
<i>Disposed</i>	(+/0)	4.066		1.740		2.326	*	2.465	
		1.046		0.552		1.524		0.961	
<i>Disposed*Image</i>	(+)	-18.089	***	-12.619	**	-5.470	***	-10.796	**
		-2.418		-2.074		-2.640		-2.037	
<i>Disposed*Technology</i>	(-)	2.445		1.402		1.043		1.008	
		0.356		0.258		0.604		0.212	
<i>LitgRisk</i>	(+)	0.006		0.006		0.000		0.005	
		0.217		0.287		0.000		0.324	
<i>CapDema</i>	(+)	1.537	***	1.179	***	0.357	***	0.777	***
		3.940		3.848		3.249		3.191	
<i>Leverage</i>	?	3.373		2.478		0.895		3.453	
		0.539		0.521		0.514		0.943	
<i>Size</i>	(+)	3.916	***	3.134	***	0.783	***	2.273	***
		4.550		4.535		3.887		4.190	
<i>OthDisc</i>	(+)	0.220	***	0.180	***	0.040	***	0.122	***
		5.418		5.268		4.285		4.164	
Adj. R <sup>2</sup>		0.677		0.690		0.499		0.633	
N		74		74		74		74	

(continued on next page)

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**TABLE 4 (Continued)**

\*, \*\*, \*\*\* significant at 10 percent, 5 percent, and 1 percent, respectively, in a one-tailed test if a directional prediction is made and a two-tailed test otherwise;

t-statistics are under the coefficient estimates; based on robust standard errors;

Dependent variables are VED scores on top of each model;

A company's competitive strategy is determined by the following procedure:

- Using the advertising expenditure provided by Schonfeld & Associates, Inc. calculate the ratio of advertising expenditure to sales prior to the year of VED;
- Calculate the average of the yearly ratio of R&D expenditure to sales over the three years preceding the year of VED;

*Image:* equals 1 if the advertising ratio is in the top one third of the industry and 0 otherwise;

*Technology:* equals 1 if the R&D ratio is in the top one third of the industry and 0 otherwise;

Other variables are defined in Table 1.

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**TABLE 5**

**The Effect of Competitive Strategy on VED Behavior – Determining *Image* and *Technology* Using the Median of Advertising Ratio and R&D Ratio, Respectively**

**Panel A: Recycled**

<u>Variable</u>		<u>Total</u>		<u>Hard</u>		<u>Soft</u>		<u>A3</u>	
		<u>Coef.</u>		<u>Coef.</u>		<u>Coef.</u>		<u>Coef.</u>	
<i>Intercept</i>	?	-30.855	***	-25.992	***	-4.862	***	-20.120	***
		-5.779		-5.849		-4.129		-5.620	
<i>Image</i>	(+)	6.621	***	5.478	***	1.142	**	4.985	***
		3.078		3.181		2.057		3.519	
<i>Technology</i>	(+)	1.639		1.952		-0.313		1.913	*
		0.687		1.036		-0.503		1.291	
<i>LitgRisk</i>	(+)	-0.005		-0.004		-0.001		-0.008	
		-0.194		-0.221		-0.075		-0.486	
<i>CapDema</i>	(+)	1.615	***	1.245	***	0.370	***	0.829	***
		3.989		3.948		3.272		3.304	
<i>Leverage</i>	?	-4.012		-3.132		-0.881		-1.872	
		-0.595		-0.634		-0.454		-0.551	
<i>Size</i>	(+)	4.093	***	3.237	***	0.856	***	2.334	***
		5.000		4.849		4.491		4.509	
<i>OthDisc</i>	(+)	0.225	***	0.187	***	0.038	***	0.129	***
		5.712		5.532		3.837		4.356	
<i>Recycled</i>	(-/0)	0.964		1.245		-0.281		1.501	
		0.302		0.502		-0.323		0.756	
Adj. R <sup>2</sup>		0.686		0.696		0.502		0.638	
N		74		74		74		74	

(continued on next page)

**TABLE 5 (Continued)**

**Panel B: Disposed**

<u>Variable</u>		<u>Total</u>		<u>Hard</u>		<u>Soft</u>		<u>A3</u>	
		<u>Coef.</u>		<u>Coef.</u>		<u>Coef.</u>		<u>Coef.</u>	
<i>Intercept</i>	?	-29.924	***	-25.109	***	-4.816	***	-19.534	***
		-5.784		-5.860		-3.962		-5.547	
<i>Image</i>	(+)	6.447	***	5.298	***	1.149	**	4.832	***
		2.979		3.060		2.079		3.421	
<i>Technology</i>	(+)	1.810		2.106		-0.297		1.999	*
		0.769		1.136		-0.484		1.372	
<i>LitgRisk</i>	(+)	-0.008		-0.006		-0.002		-0.007	
		-0.381		-0.358		-0.293		-0.434	
<i>CapDema</i>	(+)	1.574	***	1.206	***	0.367	***	0.806	***
		4.073		4.075		3.101		3.354	
<i>Leverage</i>	?	-3.094		-2.307		-0.788		-1.423	
		-0.518		-0.538		-0.416		-0.474	
<i>Size</i>	(+)	4.065	***	3.223	***	0.842	***	2.350	***
		5.038		4.926		4.378		4.594	
<i>OthDisc</i>	(+)	0.218	***	0.180	***	0.038	***	0.123	***
		5.435		5.222		4.046		4.062	
<i>Disposed</i>	(+0)	-4.255		-4.005	**	-0.250		-2.579	
		-1.283		-1.737		-0.207		-1.430	
Adj. R <sup>2</sup>		0.691		0.702		0.502		0.641	
N		74		74		74		74	

(continued on next page)



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**TABLE 5 (Continued)**

\*, \*\*, \*\*\* significant at 10 percent, 5 percent, and 1 percent, respectively, in a one-tailed test if a directional prediction is made and a two-tailed test otherwise;

t-statistics are under the coefficient estimates; based on robust standard errors;

Dependent variables are VED scores on top of each model;

A company's competitive strategy is determined by the following procedure:

- Using the advertising expenditure provided by Schonfeld & Associates, Inc. calculate the ratio of advertising expenditure to sales prior to the year of VED;
- Calculate the average of the yearly ratio of R&D expenditure to sales over the three years preceding the year of VED;

*Image:* equals 1 if the advertising ratio is above the industry median and 0 otherwise;

*Technology:* equals 1 if the R&D ratio is above the industry median and 0 otherwise;

Other variables are defined in Table 1.

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**TABLE 6**

**The Effect of Competitive Strategy on the Association between VED and Environmental Performance Behavior – Determining *Image* and *Technology* Using the Median of Advertising Ratio and R&D Ratio, Respectively**

**Panel A: Recycled**

<b>Variable</b>		<b>Total</b>		<b>Hard</b>		<b>Soft</b>		<b>A3</b>	
		<b>Coef.</b>		<b>Coef.</b>		<b>Coef.</b>		<b>Coef.</b>	
<i>Intercept</i>	?	-30.602	***	-26.053	***	-4.549	***	-20.290	***
		-5.417		-5.528		-3.574		-5.319	
<i>Image</i>	(+)	7.769	***	6.381	***	1.388	**	5.666	***
		3.193		3.231		2.292		3.490	
<i>Technology</i>	(+)	0.093		0.969		-0.876		1.281	
		0.034		0.436		-1.281		0.728	
<i>Recycled</i>	(-/0)	0.229		1.258		-1.029		1.793	
		0.053		0.367		-0.736		0.656	
<i>Recycled*Image</i>	(-)	-9.680	*	-7.362	*	-2.318	*	-5.447	*
		-1.472		-1.429		-1.352		-1.293	
<i>Recycled*Technology</i>	(+)	11.173	*	7.320	*	3.853	**	4.836	
		1.613		1.334		2.186		1.076	
<i>LitgRisk</i>	(+)	-0.002		-0.004		0.002		-0.009	
		-0.095		-0.217		0.195		-0.539	
<i>CapDema</i>	(+)	1.622	***	1.247	***	0.374	***	0.829	***
		3.935		3.869		3.377		3.238	
<i>Leverage</i>	?	-5.489		-4.032		-1.457		-2.429	
		-0.781		-0.772		-0.736		-0.664	
<i>Size</i>	(+)	4.162	***	3.296	***	0.866	***	2.381	***
		5.149		4.987		4.666		4.629	
<i>OthDisc</i>	(+)	0.222	***	0.185	***	0.037	***	0.128	***
		5.626		5.488		3.689		4.326	
Adj. R <sup>2</sup>		0.686		0.693		0.510		0.633	
N		74		74		74		74	

(continued on next page)

**TABLE 6 (Continued)**

**Panel B: Disposed**

<u>Variable</u>		<u>Total</u>		<u>Hard</u>		<u>Soft</u>		<u>A3</u>	
		<u>Coef.</u>		<u>Coef.</u>		<u>Coef.</u>		<u>Coef.</u>	
<i>Intercept</i>	?	-31.032	***	-25.825	***	-5.207	***	-20.080	***
		-6.262		-6.151		-4.874		-5.759	
<i>Image</i>	(+)	8.613	***	6.702	***	1.911	***	5.991	***
		3.594		3.492		3.183		3.912	
<i>Technology</i>	(+)	1.083		1.643		-0.560		1.807	
		0.414		0.792		-0.882		1.114	
<i>Disposed</i>	(+0)	2.431		0.369		2.062	*	2.032	
		0.631		0.114		1.629		0.732	
<i>Disposed*Image</i>	(+)	-17.218	***	-11.172	***	-6.047	***	-9.497	***
		-3.654		-2.982		-3.485		-2.910	
<i>Disposed*Technology</i>	(-)	6.577		4.202		2.375		1.923	
		1.380		1.137		1.430		0.651	
<i>LitgRisk</i>	(+)	-0.008		-0.006		-0.002		-0.005	
		-0.375		-0.342		-0.315		-0.307	
<i>CapDema</i>	(+)	1.657	***	1.260	***	0.398	***	0.816	***
		4.918		4.561		4.164		3.566	
<i>Leverage</i>	?	-0.295		-0.493		0.198		0.052	
		-0.057		-0.126		0.136		0.019	
<i>Size</i>	(+)	3.925	***	3.131	***	0.794	***	2.246	***
		4.892		4.767		4.417		4.382	
<i>OthDisc</i>	(+)	0.233	***	0.190	***	0.043	***	0.131	***
		5.920		5.476		5.235		4.283	
Adj. R <sup>2</sup>		0.707		0.708		0.561		0.649	
N		74		74		74		74	

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**TABLE 6 (Continued)**

\*, \*\*, \*\*\* significant at 10 percent, 5 percent, and 1 percent, respectively, in a one-tailed test if a directional prediction is made and a two-tailed test otherwise;

t-statistics are under the coefficient estimates; based on robust standard errors;

Dependent variables are VED scores on top of each model;

A company's competitive strategy is determined by the following procedure:

- Using the advertising expenditure provided by Schonfeld & Associates, Inc. calculate the ratio of advertising expenditure to sales prior to the year of VED;
- Calculate the average of the yearly ratio of R&D expenditure to sales over the three years preceding the year of VED;

*Image:* equals 1 if the advertising ratio is above the industry median and 0 otherwise;

*Technology:* equals 1 if the R&D ratio is above the industry median and 0 otherwise;

Other variables are defined in Table 1.

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**TABLE 7**  
**The Effect of Competitive Strategy on VED Behavior – Letting *Image* and *Technology***  
**Equal the Advertising Ratio and the R&D Ratio, Respectively**

**Panel A: Recycled**

<u>Variable</u>		<u>Total</u>		<u>Hard</u>		<u>Soft</u>		<u>A3</u>	
		<u>Coef.</u>		<u>Coef.</u>		<u>Coef.</u>		<u>Coef.</u>	
<i>Intercept</i>	?	-28.440	***	-24.058	***	-4.382	***	-18.544	***
		-4.901		-5.103		-3.369		-4.992	
<i>Image</i>	(+)	59.261	***	50.727	***	8.534	*	43.489	***
		2.411		2.663		1.415		3.016	
<i>Technology</i>	(+)	8.342		13.607		-5.264		17.617	*
		0.464		0.922		-1.372		1.526	
<i>LitgRisk</i>	(+)	0.002		0.003		-0.001		0.000	
		0.061		0.137		-0.148		0.002	
<i>CapDema</i>	(+)	1.330	***	0.993	***	0.336	***	0.600	**
		2.980		2.866		2.875		2.190	
<i>Leverage</i>	?	-4.267		-3.040		-1.228		-1.159	
		-0.568		-0.542		-0.594		-0.282	
<i>Size</i>	(+)	3.910	***	3.038	***	0.872	***	2.124	***
		4.690		4.491		4.423		4.006	
<i>OthDisc</i>	(+)	0.233	***	0.196	***	0.037	***	0.137	***
		5.547		5.447		3.992		4.333	
<i>Recycled</i>	(-/0)	1.430		1.771		-0.341		2.014	
		0.462		0.749		-0.374		1.046	
Adj. R <sup>2</sup>		0.664		0.676		0.494		0.612	
N		74		74		74		74	

(continued on next page)

**TABLE 7 (Continued)**

**Panel B: Disposed**

<u>Variable</u>		<u>Total</u>		<u>Hard</u>		<u>Soft</u>		<u>A3</u>	
		<u>Coef.</u>		<u>Coef.</u>		<u>Coef.</u>		<u>Coef.</u>	
<i>Intercept</i>	?	-27.105	***	-22.860	***	-4.245	***	-17.740	***
		-4.761		-4.958		-3.197		-4.821	
<i>Image</i>	(+)	61.473	***	52.166	***	9.308	**	43.530	***
		2.846		3.120		1.677		3.337	
<i>Technology</i>	(+)	5.775		11.187		-5.412		15.799	*
		0.315		0.740		-1.443		1.332	
<i>LitgRisk</i>	(+)	-0.002		0.001		-0.003		0.001	
		-0.102		0.053		-0.462		0.095	
<i>CapDema</i>	(+)	1.278	***	0.951	***	0.328	***	0.576	**
		2.978		2.909		2.701		2.229	
<i>Leverage</i>	?	-3.767		-2.657		-1.110		-1.014	
		-0.569		-0.555		-0.556		-0.288	
<i>Size</i>	(+)	3.895	***	3.045	***	0.851	***	2.161	***
		4.691		4.542		4.274		4.111	
<i>OthDisc</i>	(+)	0.224	***	0.187	***	0.037	***	0.129	***
		5.320		5.181		4.075		4.060	
<i>Disposed</i>	(+/0)	-5.380		-4.761	**	-0.619		-3.081	**
		-1.628		-2.011		-0.545		-1.685	
Adj. R <sup>2</sup>		0.672		0.684		0.496		0.616	
N		74		74		74		74	

(continued on next page)

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**TABLE 7 (Continued)**

\*, \*\*, \*\*\* significant at 10 percent, 5 percent, and 1 percent, respectively, in a one-tailed test if a directional prediction is made and a two-tailed test otherwise;

t-statistics are under the coefficient estimates; based on robust standard errors;

Dependent variables are VED scores on top of each model;

Competitive strategy measures:

*Image:* Using the advertising expenditure provided by Schonfeld & Associates, Inc. calculate the ratio of advertising expenditure to sales prior to the year of VED;

*Technology:* Calculate the average of the yearly ratio of R&D expenditure to sales over the three years preceding the year of VED;

Other variables are defined in Table 1.

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**TABLE 8**

**The Effect of Competitive Strategy on the Association between VED and Environmental Performance  
– Letting *Image* and *Technology* Equal the Advertising Ratio and the R&D Ratio, Respectively**

**Panel A: Recycled**

<u>Variable</u>		<u>Total</u> <u>Coef.</u>		<u>Hard</u> <u>Coef.</u>		<u>Soft</u> <u>Coef.</u>		<u>A3</u> <u>Coef.</u>	
<i>Intercept</i>	?	-26.983	***	-23.009	***	-3.974	***	-17.821	***
		-4.728		-4.922		-3.190		-4.813	
<i>Image</i>	(+)	58.982	***	50.972	***	8.010	*	44.318	***
		2.750		3.036		1.491		3.371	
<i>Technology</i>	(+)	-8.980		1.251		-10.231	***	9.265	
		-0.478		0.078		-2.888		0.729	
<i>Recycled</i>	(-/0)	-6.420	*	-3.982		-2.438	*	-2.105	
		-1.393		-1.171		-1.573		-0.807	
<i>Recycled*Image</i>	(-)	38.887		45.219		-6.332		56.715	
		0.193		0.300		-0.108		0.457	
<i>Recycled*Technology</i>	(+)	111.256	**	76.559	*	34.697	***	47.566	
		1.732		1.463		2.458		1.060	
<i>LitgRisk</i>	(+)	0.018		0.015		0.003		0.009	
		0.556		0.623		0.265		0.449	
<i>CapDema</i>	(+)	1.575	***	1.170	***	0.405	***	0.721	***
		4.005		3.761		3.990		2.892	
<i>Leverage</i>	?	-8.975		-6.392		-2.583		-3.416	
		-1.177		-1.109		-1.246		-0.812	
<i>Size</i>	(+)	4.241	***	3.275	***	0.967	***	2.283	***
		4.833		4.571		4.877		4.070	
<i>OthDisc</i>	(+)	0.213	***	0.181	***	0.032	***	0.127	***
		4.858		4.779		3.447		3.840	
Adj. R <sup>2</sup>		0.675		0.683		0.520		0.614	
N		74		74		74		74	

(continued on next page)



**TABLE 8 (Continued)**

**Panel B: Disposed**

<u>Variable</u>		<u>Total</u>		<u>Hard</u>		<u>Soft</u>		<u>A3</u>	
		<u>Coef.</u>		<u>Coef.</u>		<u>Coef.</u>		<u>Coef.</u>	
<i>Intercept</i>	?	-34.139	***	-27.845	***	-6.294	***	-21.568	***
		-5.836		-5.662		-5.133		-5.353	
<i>Image</i>	(+)	123.882	***	96.732	***	27.150	***	77.759	***
		3.778		3.541		4.155		3.452	
<i>Technology</i>	(+)	10.088		13.807		-3.719		17.810	*
		0.569		0.938		-1.042		1.524	
<i>Disposed</i>	(+0)	6.007	*	2.710		3.297	**	2.655	
		1.578		0.877		2.225		1.168	
<i>Disposed*Image</i>	(+)	-260.219	***	-184.097	***	-76.122	***	-141.388	***
		-3.520		-2.959		-4.430		-2.781	
<i>Disposed*Technology</i>	(-)	-0.795		8.585		-9.380		6.628	
		-0.020		0.284		-0.856		0.257	
<i>LitgRisk</i>	(+)	0.003		0.004		-0.001		0.004	
		0.106		0.201		-0.145		0.228	
<i>CapDema</i>	(+)	1.801	***	1.337	***	0.464	***	0.873	***
		5.129		4.725		4.774		3.734	
<i>Leverage</i>	?	6.567		4.633		1.934		4.585	
		1.017		0.907		1.145		1.171	
<i>Size</i>	(+)	4.207	***	3.279	***	0.928	***	2.341	***
		5.049		4.807		5.003		4.309	
<i>OthDisc</i>	(+)	0.230	***	0.190	***	0.039	***	0.132	***
		5.953		5.645		4.802		4.415	
Adj. R <sup>2</sup>		0.704		0.707		0.566		0.638	
N		74		74		74		74	

(continued on next page)

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**TABLE 8 (Continued)**

\*, \*\*, \*\*\* significant at 10 percent, 5 percent, and 1 percent, respectively, in a one-tailed test if a directional prediction is made and a two-tailed test otherwise;

t-statistics are under the coefficient estimates; based on robust standard errors;

Dependent variables are VED scores on top of each model;

Competitive strategy measures:

*Image:* Using the advertising expenditure provided by Schonfeld & Associates, Inc. calculate the ratio of advertising expenditure to sales prior to the year of VED;

*Technology:* Calculate the average of the yearly ratio of R&D expenditure to sales over the three years preceding the year of VED;

Other variables are defined in Table 1.

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**TABLE 9**  
**The Effect of Competitive Strategy on VED Behavior – All Variables Ranked**

**Panel A: Recycled**

<b>Variable</b>		<b>Total</b>		<b>Hard</b>		<b>Soft</b>		<b>A3</b>	
		<b>Coef.</b>		<b>Coef.</b>		<b>Coef.</b>		<b>Coef.</b>	
<i>Intercept</i>	?	-12.380		-15.441	**	-4.735		-13.937	**
		-1.459		-2.030		-0.496		-2.314	
<i>Image</i>	(+)	0.102		0.109	*	0.105		0.143	**
		1.162		1.322		1.067		2.012	
<i>Technology</i>	(+)	0.033		0.054		-0.043		0.081	
		0.314		0.531		-0.398		0.933	
<i>LitgRisk</i>	(+)	0.162	*	0.191	**	0.086		0.095	*
		1.519		1.971		0.680		1.358	
<i>CapDema</i>	(+)	0.226	***	0.246	***	0.220	***	0.211	***
		2.861		3.449		2.596		3.365	
<i>Leverage</i>	?	0.019		0.004		0.013		0.030	
		0.223		0.049		0.146		0.419	
<i>Size</i>	(+)	0.641	***	0.603	***	0.619	***	0.528	***
		5.515		5.623		5.085		5.828	
<i>OthDisc</i>	(+)	0.152		0.173	*	0.118		0.227	***
		1.174		1.442		0.839		2.489	
<i>Recycled</i>	(-/0)	-0.004		0.030		0.007		0.056	
		-0.039		0.333		0.064		0.850	
Adj. R <sup>2</sup>		0.531		0.553		0.422		0.607	
N		74		74		74		74	

*(continued on next page)*

**TABLE 9 (Continued)**

**Panel B: Disposed**

<u>Variable</u>		<u>Total</u>		<u>Hard</u>		<u>Soft</u>		<u>A3</u>	
		<u>Coef.</u>		<u>Coef.</u>		<u>Coef.</u>		<u>Coef.</u>	
<i>Intercept</i>	?	-18.771	*	-18.541	*	-11.017		-16.613	**
		-1.851		-1.972		-0.996		-2.240	
<i>Image</i>	(+)	0.118		0.116	*	0.121		0.147	**
		1.284		1.329		1.200		2.033	
<i>Technology</i>	(+)	0.060		0.068		-0.016		0.094	
		0.572		0.667		-0.146		1.114	
<i>LitgRisk</i>	(+)	0.191		0.220	**	0.120		0.134	**
		1.970		2.452		1.096		1.867	
<i>CapDema</i>	(+)	0.236	***	0.254	***	0.231	***	0.221	***
		3.000		3.541		2.675		3.377	
<i>Leverage</i>	?	0.010		-0.001		0.004		0.025	
		0.112		-0.011		0.047		0.345	
<i>Size</i>	(+)	0.658	***	0.627	***	0.641	***	0.563	***
		6.503		6.420		5.976		7.351	
<i>OthDisc</i>	(+)	0.140		0.157	*	0.102		0.204	***
		1.165		1.372		0.776		2.440	
<i>Disposed</i>	(+/-)	0.089		0.053		0.090		0.055	
		1.141		0.711		1.086		0.809	
Adj. R <sup>2</sup>		0.539		0.555		0.430		0.608	
N		74		74		74		74	

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**TABLE 9 (Continued)**

\*, \*\*, \*\*\* significant at 10 percent, 5 percent, and 1 percent, respectively, in a one-tailed test if a directional prediction is made and a two-tailed test otherwise;

t-statistics are under the coefficient estimates; based on robust standard errors;

Dependent variables are VED scores on top of each model;

Competitive strategy measures:

*Image*: Rank of *Advertising* within the industry; *Advertising* is defined in Table 1;

*Technology*: Rank of *R&D* within the industry; *R&D* is defined in Table 1;

Other variables are ranks of corresponding variables defined in Table 1.

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**TABLE 10**

**The Effect of Competitive Strategy on the Association between VED and Environmental Performance – All Variables Ranked**

**Panel A: Recycled**

<u>Variable</u>		<u>Total</u> <u>Coef.</u>		<u>Hard</u> <u>Coef.</u>		<u>Soft</u> <u>Coef.</u>		<u>A3</u> <u>Coef.</u>	
<i>Intercept</i>	?	-0.106		-6.310		9.515		-4.137	
		-0.008		-0.567		0.685		-0.534	
<i>Image</i>	(+)	0.202		0.212		0.161		0.161	
		1.091		1.219		0.823		1.119	
<i>Technology</i>	(+)	-0.312	**	-0.230		-0.383	**	-0.133	
		-1.712		-1.286		-2.027		-0.913	
<i>Recycled</i>	(-/0)	-0.260		-0.163		-0.287		-0.144	*
		-1.089		-0.759		-1.110		-1.355	
<i>Recycled*Image</i>	(-)	-0.003		-0.003		-0.002		-0.001	
		-0.622		-0.660		-0.346		-0.194	
<i>Recycled*Technology</i>	(+)	0.010	**	0.008	**	0.010	**	0.006	**
		2.280		1.969		2.022		1.835	
<i>LitgRisk</i>	(+)	0.194	**	0.219	**	0.116		0.113	*
		1.858		2.286		0.948		1.665	
<i>CapDema</i>	(+)	0.229	***	0.248	***	0.225	***	0.215	***
		3.011		3.533		2.767		3.498	
<i>Leverage</i>	?	-0.019		-0.025		-0.029		0.001	
		-0.247		-0.315		-0.324		0.013	
<i>Size</i>	(+)	0.638	***	0.604	***	0.609	***	0.519	***
		5.875		5.901		5.384		5.793	
<i>OthDisc</i>	(+)	0.096		0.125		0.066		0.196	**
		0.849		1.146		0.530		2.278	
Adj. R <sup>2</sup>		0.556		0.567		0.443		0.614	
N		74		74		74		74	

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**TABLE 10 (Continued)**

**Panel B: Disposed**

<u>Variable</u>		<u>Total</u>		<u>Hard</u>		<u>Soft</u>		<u>A3</u>	
		<u>Coef.</u>		<u>Coef.</u>		<u>Coef.</u>		<u>Coef.</u>	
<i>Intercept</i>	?	-22.358	*	-21.029	*	-15.468		-18.261	**
		-1.796		-1.806		-1.163		-2.029	
<i>Image</i>	(+)	0.214	*	0.203	*	0.285	**	0.122	
		1.346		1.315		1.689		0.900	
<i>Technology</i>	(+)	0.049		0.044		-0.067		0.147	
		0.248		0.238		-0.328		0.883	
<i>Disposed</i>	(+/0)	0.183		0.122		0.215		0.087	
		1.007		0.717		1.107		0.661	
<i>Disposed*Image</i>	(+)	-0.003		-0.002		-0.004		0.001	
		-0.734		-0.705		-1.138		0.251	
<i>Disposed*Technology</i>	(-)	0.000		0.001		0.001		-0.001	
		0.059		0.160		0.311		-0.391	
<i>LitgRisk</i>	(+)	0.187	**	0.213	**	0.105		0.147	**
		1.928		2.380		0.938		1.938	
<i>CapDema</i>	(+)	0.238	***	0.258	***	0.239	***	0.214	***
		3.042		3.561		2.787		3.169	
<i>Leverage</i>	?	0.011		-0.001		0.003		0.030	
		0.124		-0.015		0.034		0.411	
<i>Size</i>	(+)	0.658	***	0.627	***	0.641	***	0.563	***
		6.487		6.436		5.968		7.327	
<i>OthDisc</i>	(+)	0.142		0.160	*	0.109		0.200	**
		1.176		1.395		0.837		2.310	
Adj. R <sup>2</sup>		0.528		0.544		0.423		0.596	
N		74		74		74		74	

(continued on next page)

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**TABLE 10 (Continued)**

\*, \*\*, \*\*\* significant at 10 percent, 5 percent, and 1 percent, respectively, in a one-tailed test if a directional prediction is made and a two-tailed test otherwise;

t-statistics are under the coefficient estimates; based on robust standard errors;

Dependent variables are VED scores on top of each model;

Competitive strategy measures:

*Image*: Rank of *Advertising* within the industry; *Advertising* is defined in Table 1;

*Technology*: Rank of *R&D* within the industry; *R&D* is defined in Table 1;

Other variables are ranks of corresponding variables defined in Table 1.

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**TABLE 11**  
**The Effect of Competitive Strategy on VED Behavior – Considering the Tension**  
**between the Two Competitive Strategies within a Company**

**Panel A: Recycled**

<u>Variable</u>		<u>Total</u>		<u>Hard</u>		<u>Soft</u>		<u>A3</u>	
		<u>Coef.</u>		<u>Coef.</u>		<u>Coef.</u>		<u>Coef.</u>	
<i>Intercept</i>	?	-27.942	***	-23.098	***	-4.843	***	-17.581	***
		-4.691		-4.674		-3.850		-4.414	
<i>Image</i>	(+)	2.603		1.658		0.944	*	1.544	
		1.026		0.810		1.475		0.946	
<i>Technology</i>	(+)	4.234	*	4.124	**	0.110		4.606	***
		1.626		1.928		0.168		2.599	
<i>LitgRisk</i>	(+)	-0.013		-0.012		-0.001		-0.014	
		-0.461		-0.562		-0.098		-0.782	
<i>CapDema</i>	(+)	1.400	***	1.042	***	0.358	***	0.631	***
		3.349		3.197		3.144		2.433	
<i>Leverage</i>	?	-2.606		-1.577		-1.030		0.048	
		-0.390		-0.317		-0.535		0.014	
<i>Size</i>	(+)	3.873	***	3.002	***	0.871	***	2.078	***
		4.128		3.932		4.121		3.470	
<i>OthDisc</i>	(+)	0.226	***	0.189	***	0.037	***	0.131	***
		5.110		5.015		3.735		4.052	
<i>Recycled</i>	(-/0)	0.822		1.164		-0.342		1.595	
		0.267		0.482		-0.397		0.815	
Adj. R <sup>2</sup>		0.645		0.653		0.488		0.586	
N		74		74		74		74	

*(continued on next page)*

TABLE 11 (Continued)

Panel B: Disposed

<u>Variable</u>		<u>Total</u> <u>Coef.</u>		<u>Hard</u> <u>Coef.</u>		<u>Soft</u> <u>Coef.</u>		<u>A3</u> <u>Coef.</u>	
<i>Intercept</i>	?	-26.858	***	-22.081	***	-4.777	***	-16.892	***
		-4.610		-4.583		-3.766		-4.338	
<i>Image</i>	(+)	2.472		1.501		0.970	*	1.368	
		0.984		0.751		1.502		0.866	
<i>Technology</i>	(+)	4.076	*	3.926	**	0.150		4.370	***
		1.581		1.866		0.232		2.525	
<i>LitgRisk</i>	(+)	-0.018		-0.015		-0.003		-0.013	
		-0.721		-0.781		-0.357		-0.784	
<i>CapDema</i>	(+)	1.359	***	1.006	***	0.353	***	0.611	***
		3.382		3.261		3.004		2.469	
<i>Leverage</i>	?	-1.841		-0.923		-0.918		0.355	
		-0.305		-0.209		-0.486		0.112	
<i>Size</i>	(+)	3.839	***	2.987	***	0.853	***	2.101	***
		4.174		4.004		4.051		3.595	
<i>OthDisc</i>	(+)	0.220	***	0.183	***	0.037	***	0.125	***
		4.998		4.845		3.898		3.848	
<i>Disposed</i>	(+/-)	-4.399		-4.064	**	-0.334		-2.613	
		-1.483		-1.952		-0.305		-1.619	
Adj. R <sup>2</sup>		0.650		0.659		0.488		0.589	
N		74		74		74		74	

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**TABLE 11 (Continued)**

\*, \*\*, \*\*\* significant at 10 percent, 5 percent, and 1 percent, respectively, in a one-tailed test if a directional prediction is made and a two-tailed test otherwise;

t-statistics are under the coefficient estimates; based on robust standard errors;

Dependent variables are VED scores on top of each model;

A company's competitive strategy is determined by the following procedure:

- Using the advertising expenditure provided by Schonfeld & Associates, Inc. calculate the ratio of advertising expenditure to sales prior to the year of VED;
- Calculate the average of the yearly ratio of R&D expenditure to sales over the three years preceding the year of VED;
- Subtract the advertising-sales ratio from the R&D-sales ratio;
- Sort the differences in a descending order;

*Image*: equals 1 if the difference is in the lower one third of the industry and 0 otherwise;

*Technology*: equals 1 if the difference is in the upper one third of the industry and 0 otherwise;

Other variables are defined in Table 1.

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**TABLE 12**

**The Effect of Competitive Strategy on the Association between VED and Environmental Performance –  
Considering the Tension between the Two Competitive Strategies within a Company**

**Panel A: Recycled**

<u>Variable</u>		<u>Total</u> <u>Coef.</u>		<u>Hard</u> <u>Coef.</u>		<u>Soft</u> <u>Coef.</u>		<u>A3</u> <u>Coef.</u>	
<i>Intercept</i>	?	-26.651	***	-22.094	***	-4.558	***	-16.687	***
		-4.760		-4.703		-3.876		-4.329	
<i>Image</i>	(+)	1.355		0.839		0.516		1.231	
		0.445		0.340		0.692		0.646	
<i>Technology</i>	(+)	-0.019		1.020		-1.039		2.412	
		-0.006		0.393		-1.365		1.106	
<i>Recycled</i>	(-/0)	-9.139	**	-5.985	*	-3.154	***	-3.108	
		-1.970		-1.635		-2.567		-1.168	
<i>Recycled*Image</i>	(-)	6.060		3.950		2.109		1.414	
		0.991		0.827		1.087		0.396	
<i>Recycled*Technology</i>	(+)	27.946	***	20.546	***	7.400	***	14.964	**
		3.038		2.637		4.049		2.175	
<i>LitgRisk</i>	(+)	0.019		0.011		0.008		0.001	
		0.658		0.478		1.012		0.078	
<i>CapDema</i>	(+)	1.671	***	1.244	***	0.427	***	0.785	***
		4.384		4.061		4.256		3.091	
<i>Leverage</i>	?	-7.965		-5.571		-2.394		-3.020	
		-1.205		-1.086		-1.330		-0.797	
<i>Size</i>	(+)	4.406	***	3.382	***	1.024	***	2.319	***
		4.682		4.398		4.772		3.807	
<i>OthDisc</i>	(+)	0.194	***	0.166	***	0.028	***	0.115	***
		4.001		3.998		2.729		3.312	
Adj. R <sup>2</sup>		0.671		0.673		0.533		0.603	
N		74		74		74		74	

(continued on next page)

TABLE 12 (Continued)

Panel B: Disposed

<u>Variable</u>		<u>Total</u> <u>Coef.</u>		<u>Hard</u> <u>Coef.</u>		<u>Soft</u> <u>Coef.</u>		<u>A3</u> <u>Coef.</u>	
<i>Intercept</i>	?	-30.302	***	-24.467	***	-5.836	***	-18.544	***
		-5.256		-5.082		-4.700		-4.677	
<i>Image</i>	(+)	4.835	**	3.135	*	1.700	**	2.486	*
		1.710		1.411		2.284		1.418	
<i>Technology</i>	(+)	6.102	**	5.361	**	0.741		5.475	***
		2.114		2.247		1.097		2.812	
<i>Disposed</i>	(+/-)	9.425	**	5.603	**	3.822	*	4.399	**
		2.027		1.678		1.616		1.674	
<i>Disposed*Image</i>	(+)	-18.946	***	-13.121	***	-5.826	**	-9.068	***
		-3.230		-3.192		-2.052		-2.695	
<i>Disposed*Technology</i>	(-)	-16.228	***	-11.523	**	-4.705	**	-8.964	***
		-2.821		-2.609		-1.968		-2.387	
<i>LitgRisk</i>	(+)	-0.012		-0.011		-0.001		-0.009	
		-0.475		-0.540		-0.155		-0.528	
<i>CapDema</i>	(+)	1.488	***	1.091	***	0.397	***	0.653	***
		3.974		3.667		3.816		2.676	
<i>Leverage</i>	?	-0.252		0.189		-0.441		1.166	
		-0.044		0.044		-0.256		0.366	
<i>Size</i>	(+)	3.997	***	3.092	***	0.905	***	2.160	***
		4.478		4.252		4.450		3.756	
<i>OthDisc</i>	(+)	0.225	***	0.186	***	0.039	***	0.127	***
		5.308		5.097		4.173		4.044	
Adj. R <sup>2</sup>		0.657		0.662		0.511		0.588	
N		74		74		74		74	

(continued on next page)

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**TABLE 12 (Continued)**

\*, \*\*, \*\*\* significant at 10 percent, 5 percent, and 1 percent, respectively, in a one-tailed test if a directional prediction is made and a two-tailed test otherwise;

t-statistics are under the coefficient estimates; based on robust standard errors;

Dependent variables are VED scores on top of each model;

*Image* and *Technology* are defined in Table 11;

Other variables are defined in Table 1.

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**TABLE 13**  
**The Effect of Competitive Strategy on VED Behavior – Considering the Tension**  
**between the Two Competitive Strategies within a Company (Tobit Model)**

**Panel A: Recycled**

<u>Variable</u>		<u>Total</u>		<u>Hard</u>		<u>Soft</u>		<u>A3</u>	
		<u>Coef.</u>		<u>Coef.</u>		<u>Coef.</u>		<u>Coef.</u>	
<i>Intercept</i>	?	-27.942	***	-23.098	***	-4.843	***	-17.581	***
		-4.741		-4.853		-3.322		-4.491	
<i>Image</i>	(+)	2.603		1.658		0.944	*	1.544	
		0.978		0.772		1.434		0.874	
<i>Technology</i>	(+)	4.234	*	4.124	**	0.110		4.606	***
		1.534		1.850		0.161		2.512	
<i>LitgRisk</i>	(+)	-0.013		-0.012		-0.001		-0.014	
		-0.278		-0.322		-0.074		-0.452	
<i>CapDema</i>	(+)	1.400	***	1.042	***	0.358	***	0.631	**
		3.093		2.852		3.193		2.101	
<i>Leverage</i>	?	-2.606		-1.577		-1.030		0.048	
		-0.455		-0.341		-0.726		0.013	
<i>Size</i>	(+)	3.873	***	3.002	***	0.871	***	2.078	***
		4.291		4.118		3.901		3.466	
<i>OthDisc</i>	(+)	0.226	***	0.189	***	0.037	***	0.131	***
		5.231		5.422		3.447		4.553	
<i>Recycled</i>	(-/0)	0.822		1.164		-0.342		1.595	
		0.217		0.381		-0.365		0.635	
Log Likelihood		-267.155		-251.340		-163.786		-236.876	
N		74		74		74		74	

*(continued on next page)*

**TABLE 13 (Continued)**

**Panel B: Disposed**

<u>Variable</u>		<u>Total</u> <u>Coef.</u>		<u>Hard</u> <u>Coef.</u>		<u>Soft</u> <u>Coef.</u>		<u>A3</u> <u>Coef.</u>	
<i>Intercept</i>	?	-26.858	***	-22.081	***	-4.777	***	-16.892	***
		-4.536		-4.626		-3.235		-4.277	
<i>Image</i>	(+)	2.472		1.501		0.970	*	1.368	
		0.943		0.711		1.485		0.783	
<i>Technology</i>	(+)	4.076	*	3.926	**	0.150		4.370	***
		1.512		1.807		0.223		2.430	
<i>LitgRisk</i>	(+)	-0.018		-0.015		-0.003		-0.013	
		-0.401		-0.424		-0.238		-0.437	
<i>CapDema</i>	(+)	1.359	***	1.006	***	0.353	***	0.611	**
		3.015		2.770		3.140		2.035	
<i>Leverage</i>	?	-1.841		-0.923		-0.918		0.355	
		-0.322		-0.200		-0.643		0.093	
<i>Size</i>	(+)	3.839	***	2.987	***	0.853	***	2.101	***
		4.337		4.186		3.862		3.559	
<i>OthDisc</i>	(+)	0.220	***	0.183	***	0.037	***	0.125	***
		5.199		5.357		3.533		4.417	
<i>Disposed</i>	(+/0)	-4.399		-4.064		-0.334		-2.613	
		-1.108		-1.270		-0.338		-0.987	
Log Likelihood		-266.569		-250.614		-163.796		-236.593	
N		74		74		74		74	

(continued on next page)



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**TABLE 13 (Continued)**

\*, \*\*, \*\*\* significant at 10 percent, 5 percent, and 1 percent, respectively, in a one-tailed test if a directional prediction is made and a two-tailed test otherwise;

Chi-squared statistics are under the coefficient estimates;

Dependent variables are VED scores on top of each model;

*Image* and *Technology* are defined in Table 11;

Other variables are defined in Table 1.

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**TABLE 14**

**The Effect of Competitive Strategy on the Association between VED and Environmental Performance –  
Considering the Tension between the Two Competitive Strategies within a Company (Tobit Model)**

**Panel A: Recycled**

<u>Variable</u>		<u>Total</u> <u>Coef.</u>		<u>Hard</u> <u>Coef.</u>		<u>Soft</u> <u>Coef.</u>		<u>A3</u> <u>Coef.</u>	
<i>Intercept</i>	?	-26.651	***	-22.094	***	-4.558	***	-16.687	***
		-4.713		-4.794		-3.281		-4.368	
<i>Image</i>	(+)	1.355		0.839		0.516		1.231	
		0.451		0.342		0.699		0.606	
<i>Technology</i>	(+)	-0.019		1.020		-1.039		2.412	
		-0.006		0.410		-1.385		1.169	
<i>Recycled</i>	(-/0)	-9.139	*	-5.985		-3.154	**	-3.108	
		-1.539		-1.236		-2.161		-0.774	
<i>Recycled*Image</i>	(-)	6.060		3.950		2.109		1.414	
		0.721		0.576		1.021		0.249	
<i>Recycled*Technology</i>	(+)	27.946	***	20.546	***	7.400	***	14.964	**
		2.872		2.591		3.096		2.276	
<i>LitgRisk</i>	(+)	0.019		0.011		0.008		0.001	
		0.417		0.295		0.719		0.049	
<i>CapDema</i>	(+)	1.671	***	1.244	***	0.427	***	0.785	***
		3.806		3.476		3.959		2.647	
<i>Leverage</i>	?	-7.965		-5.571		-2.394	*	-3.020	
		-1.384		-1.187		-1.693		-0.777	
<i>Size</i>	(+)	4.406	***	3.382	***	1.024	***	2.319	***
		4.886		4.601		4.624		3.806	
<i>OthDisc</i>	(+)	0.194	***	0.166	***	0.028	***	0.115	***
		4.479		4.705		2.622		3.935	
Log Likelihood		-263.131		-247.997		-159.247		-234.108	
N		74		74		74		74	

(continued on next page)

**TABLE 14 (Continued)**

**Panel B: Disposed**

<u>Variable</u>		<u>Total</u> <u>Coef.</u>		<u>Hard</u> <u>Coef.</u>		<u>Soft</u> <u>Coef.</u>		<u>A3</u> <u>Coef.</u>	
<i>Intercept</i>	?	-30.302	***	-24.467	***	-5.836	***	-18.544	***
		-5.009		-4.985		-3.918		-4.546	
<i>Image</i>	(+)	4.835	**	3.135	*	1.700	***	2.486	*
		1.693		1.353		2.417		1.291	
<i>Technology</i>	(+)	6.102	**	5.361	**	0.741		5.475	***
		2.108		2.283		1.040		2.805	
<i>Disposed</i>	(+/-)	9.425		5.603		3.822	**	4.399	
		1.178		0.863		1.940		0.815	
<i>Disposed*Image</i>	(+)	-18.946	**	-13.121		-5.826	***	-9.068	
		-1.890		-1.613		-2.360		-1.341	
<i>Disposed*Technology</i>	(-)	-16.228	*	-11.523	*	-4.705	**	-8.964	*
		-1.592		-1.393		-1.874		-1.304	
<i>LitgRisk</i>	(+)	-0.012		-0.011		-0.001		-0.009	
		-0.269		-0.302		-0.100		-0.301	
<i>CapDema</i>	(+)	1.488	***	1.091	***	0.397	***	0.653	**
		3.143		2.840		3.408		2.047	
<i>Leverage</i>	?	-0.252		0.189		-0.441		1.166	
		-0.045		0.041		-0.318		0.307	
<i>Size</i>	(+)	3.997	***	3.092	***	0.905	***	2.160	***
		4.550		4.338		4.183		3.646	
<i>OthDisc</i>	(+)	0.225	***	0.186	***	0.039	***	0.127	***
		5.425		5.538		3.784		4.560	
Log Likelihood		-264.655		-249.188		-160.940		-235.505	
N		74		74		74		74	

(continued on next page)

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**TABLE 14 (Continued)**

\*, \*\*, \*\*\* significant at 10 percent, 5 percent, and 1 percent, respectively, in a one-tailed test if a directional prediction is made and a two-tailed test otherwise;

Chi-squared statistics are under the coefficient estimates;

Dependent variables are VED scores on top of each model;

*Image* and *Technology* are defined in Table 11;

Other variables are defined in Table 1.

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**TABLE 15**  
**The Effect of Competitive Strategy on VED Behavior – Considering the Tension**  
**between the Two Competitive Strategies within a Company and with Website**  
**Disclosure Scores Set to Zero**

<b>Panel A: Recycled</b>									
<b>Variable</b>		<b>Total</b>		<b>Hard</b>		<b>Soft</b>		<b>A3</b>	
		<b>Coef.</b>		<b>Coef.</b>		<b>Coef.</b>		<b>Coef.</b>	
<i>Intercept</i>	?	-27.123	***	-22.161	***	-4.962	***	-16.589	***
		-4.126		-4.172		-3.646		-4.065	
<i>Image</i>	(+)	0.040		0.014		0.026		0.701	
		0.014		0.006		0.037		0.428	
<i>Technology</i>	(+)	5.287	**	4.655	**	0.632		4.593	***
		1.829		1.989		0.974		2.450	
<i>LitgRisk</i>	(+)	-0.021		-0.017		-0.004		-0.011	
		-0.686		-0.707		-0.576		-0.577	
<i>CapDema</i>	(+)	0.902	**	0.746	**	0.155	*	0.497	**
		2.160		2.271		1.619		1.934	
<i>Leverage</i>	?	4.464		3.085		1.379		2.746	
		0.681		0.630		0.793		0.794	
<i>Size</i>	(+)	2.972	***	2.412	***	0.560	***	1.689	***
		3.023		3.098		2.554		2.912	
<i>OthDisc</i>	(+)	0.254	***	0.205	***	0.049	***	0.143	***
		5.244		5.107		4.619		4.373	
<i>Recycled</i>	(-/0)	1.954		1.768		0.186		2.048	
		0.588		0.686		0.238		1.030	
Adj. R <sup>2</sup>		0.595		0.610		0.470		0.570	
N		74		74		74		74	

*(continued on next page)*

TABLE 15 (Continued)

Panel B: Disposed

<u>Variable</u>		<u>Total</u> <u>Coef.</u>		<u>Hard</u> <u>Coef.</u>		<u>Soft</u> <u>Coef.</u>		<u>A3</u> <u>Coef.</u>	
<i>Intercept</i>	?	-25.497	***	-20.966	***	-4.531	***	-15.813	***
		-4.019		-4.075		-3.484		-3.997	
<i>Image</i>	(+)	-0.219		-0.205		-0.014		0.481	
		-0.078		-0.094		-0.020		0.309	
<i>Technology</i>	(+)	4.959	**	4.372	**	0.587		4.296	***
		1.788		1.944		0.943		2.382	
<i>LitgRisk</i>	(+)	-0.026		-0.019		-0.007		-0.009	
		-0.943		-0.882		-1.073		-0.514	
<i>CapDema</i>	(+)	0.844	**	0.706	**	0.138	*	0.475	**
		2.174		2.302		1.542		1.977	
<i>Leverage</i>	?	5.492		3.785		1.707		3.050	
		0.965		0.890		1.109		1.016	
<i>Size</i>	(+)	2.952	***	2.411	***	0.541	***	1.726	***
		3.090		3.160		2.598		3.038	
<i>OthDisc</i>	(+)	0.243	***	0.196	***	0.047	***	0.136	***
		4.997		4.829		4.492		4.063	
<i>Disposed</i>	(+/-)	-6.479	***	-4.705	**	-1.774	***	-2.901	**
		-2.465		-2.338		-2.659		-1.810	
Adj. R <sup>2</sup>		0.606		0.619		0.490		0.573	
N		74		74		74		74	

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**TABLE 15 (Continued)**

\*, \*\*, \*\*\* significant at 10 percent, 5 percent, and 1 percent, respectively, in a one-tailed test if a directional prediction is made and a two-tailed test otherwise;

t-statistics are under the coefficient estimates; based on robust standard errors;

Dependent variables are VED scores on top of each model;

*Image* and *Technology* are defined in Table 11;

Other variables are defined in Table 1.

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**TABLE 16**

**The Effect of Competitive Strategy on the Association between VED and Environmental Performance – Considering the Tension between the Two Competitive Strategies within a Company and with Website Disclosure Scores Set to Zero**

**Panel A: Recycled**

<u>Variable</u>		<u>Total</u> <u>Coef.</u>		<u>Hard</u> <u>Coef.</u>		<u>Soft</u> <u>Coef.</u>		<u>A3</u> <u>Coef.</u>	
<i>Intercept</i>	?	-26.423	***	-21.638	***	-4.785	***	-16.092	***
		-4.146		-4.182		-3.671		-4.013	
<i>Image</i>	(+)	-0.872		-0.719		-0.154		0.313	
		-0.241		-0.258		-0.173		0.158	
<i>Technology</i>	(+)	2.655		2.620		0.035		3.081	*
		0.763		0.918		0.046		1.347	
<i>Recycled</i>	(-/0)	-4.396		-3.178		-1.218		-1.421	
		-0.840		-0.784		-0.950		-0.508	
<i>Recycled*Image</i>	(-)	4.481		3.605		0.876		1.867	
		0.651		0.676		0.534		0.516	
<i>Recycled*Technology</i>	(+)	17.058	*	13.148	*	3.911	*	10.030	*
		1.516		1.448		1.667		1.359	
<i>LitgRisk</i>	(+)	-0.001		-0.001		0.000		0.001	
		-0.035		-0.048		0.010		0.031	
<i>CapDema</i>	(+)	1.064	***	0.870	***	0.193	***	0.595	***
		2.576		2.703		1.975		2.371	
<i>Leverage</i>	?	1.278		0.645		0.632		0.789	
		0.181		0.120		0.347		0.207	
<i>Size</i>	(+)	3.317	***	2.681	***	0.636	***	1.873	***
		3.209		3.290		2.716		3.092	
<i>OthDisc</i>	(+)	0.234	***	0.189	***	0.045	***	0.132	***
		4.453		4.340		3.992		3.755	
Adj. R <sup>2</sup>		0.595		0.610		0.469		0.570	
N		74		74		74		74	

(continued on next page)



**TABLE 16 (Continued)**

**Panel B: Disposed**

<u>Variable</u>		<u>Total</u> <u>Coef.</u>		<u>Hard</u> <u>Coef.</u>		<u>Soft</u> <u>Coef.</u>		<u>A3</u> <u>Coef.</u>	
<i>Intercept</i>	?	-28.418	***	-23.298	***	-5.120	***	-17.761	***
		-4.382		-4.443		-3.756		-4.367	
<i>Image</i>	(+)	1.813		1.406		0.407		1.824	
		0.552		0.562		0.483		1.022	
<i>Technology</i>	(+)	6.434	**	5.650	**	0.785		5.388	***
		2.047		2.214		1.111		2.664	
<i>Disposed</i>	(+/-)	4.552		4.386	*	0.166		4.766	**
		1.113		1.337		0.181		1.920	
<i>Disposed*Image</i>	(+)	-16.104	***	-12.844	***	-3.260	**	-10.726	***
		-2.648		-2.782		-2.028		-3.064	
<i>Disposed*Technology</i>	(-)	-11.615	**	-10.153	**	-1.462	*	-8.705	**
		-2.155		-2.292		-1.301		-2.346	
<i>LitgRisk</i>	(+)	-0.023		-0.016		-0.007		-0.006	
		-0.798		-0.701		-1.070		-0.332	
<i>CapDema</i>	(+)	0.990	***	0.808	***	0.182	**	0.557	**
		2.504		2.598		1.996		2.337	
<i>Leverage</i>	?	6.750		4.826		1.924		3.930	
		1.222		1.164		1.284		1.343	
<i>Size</i>	(+)	3.116	***	2.529	***	0.587	***	1.821	***
		3.282		3.355		2.779		3.247	
<i>OthDisc</i>	(+)	0.246	***	0.199	***	0.047	***	0.138	***
		5.184		5.030		4.558		4.267	
Adj. R <sup>2</sup>		0.605		0.618		0.485		0.575	
N		74		74		74		74	

(continued on next page)

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**TABLE 16 (Continued)**

\*, \*\*, \*\*\* significant at 10 percent, 5 percent, and 1 percent, respectively, in a one-tailed test if a directional prediction is made and a two-tailed test otherwise;

t-statistics are under the coefficient estimates; based on robust standard errors;

Dependent variables are VED scores on top of each model;

*Image* and *Technology* are defined in Table 11;

Other variables are defined in Table 1.

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**Table 17**  
**The Effect of Competitive Strategy on VED Behavior – Considering the Tension between the Two Competitive Strategies within a Company (Logit Model)**

Dependent Variable: *Total*

Panel A: Recycled				Panel B: Disposed			
<u>Variable</u>		<u>Coef.</u>		<u>Variable</u>		<u>Coef.</u>	
<i>Intercept</i>	?	-7.030	***	<i>Intercept</i>	?	-6.568	***
		10.640				10.458	
<i>Image</i>	(+)	0.540		<i>Image</i>	(+)	0.682	
		0.453				0.826	
<i>Technology</i>	(+)	-0.931		<i>Technology</i>	(+)	-0.201	
		1.043				0.061	
<i>LitgRisk</i>	(+)	0.022	*	<i>LitgRisk</i>	(+)	0.013	
		2.213				0.850	
<i>CapDema</i>	(+)	0.354	***	<i>CapDema</i>	(+)	0.297	**
		5.730				4.676	
<i>Leverage</i>	?	-2.076		<i>Leverage</i>	?	-0.958	
		1.346				0.363	
<i>Size</i>	(+)	1.103	***	<i>Size</i>	(+)	0.877	***
		9.873				9.145	
<i>OthDisc</i>	(+)	0.014		<i>OthDisc</i>	(+)	0.020	
		0.663				1.462	
<i>Recycled</i>	(-/0)	-2.483	**	<i>Disposed</i>	(-/0)	-0.110	
		3.565				0.011	
Likelihood Ratio		35.784		Likelihood Ratio		31.671	
N		74		N		74	

(continued on next page)

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**Table 17 (Continued)**

\*, \*\*, \*\*\* significant at 10 percent, 5 percent, and 1 percent, respectively, in a one-tailed test if a directional prediction is made and a two-tailed test otherwise;

Chi-squared statistics are under the coefficient estimates;

Dependent variable *Total*: equals 1 if *Total* defined in Table 1 is greater than zero, and 0 otherwise;

*Image* and *Technology* are defined in Table 11;

Other variables are defined in Table 1.

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**TABLE 18**  
**The Effect of Competitive Strategy on the Association between VED and Environmental Performance Behavior – Considering the Tension between the Two Competitive Strategies within a Company (Logit Model)**

Dependent Variable: <i>Total</i>							
Panel A: Recycled				Panel B: Disposed			
<u>Variable</u>		<u>Coef.</u>		<u>Variable</u>		<u>Coef.</u>	
<i>Intercept</i>	?	-7.022	***	<i>Intercept</i>	?	-7.199	***
		10.202				10.763	
<i>Image</i>	(+)	0.083		<i>Image</i>	(+)	1.016	
		0.007				1.431	
<i>Technology</i>	(+)	-1.787	**	<i>Technology</i>	(+)	0.110	
		2.824				0.015	
<i>Recycled</i>	(-/0)	-4.644	**	<i>Disposed</i>	(+/0)	1.614	
		5.129				0.618	
<i>Recycled*Image</i>	(-/0)	2.359		<i>Disposed*Image</i>	(+/0)	-2.394	
		0.806				0.845	
<i>Recycled*Technology</i>	(+)	8.157	**	<i>Disposed*Technology</i>	(-)	-2.144	
		4.558				0.554	
<i>LitgRisk</i>	(+)	0.032	**	<i>LitgRisk</i>	(+)	0.014	
		3.436				0.971	
<i>CapDema</i>	(+)	0.396	***	<i>CapDema</i>	(+)	0.316	**
		6.759				4.539	
<i>Leverage</i>	?	-2.853		<i>Leverage</i>	?	-0.697	
		2.499				0.193	
<i>Size</i>	(+)	1.217	***	<i>Size</i>	(+)	0.913	***
		11.656				9.290	
<i>OthDisc</i>	(+)	0.012		<i>OthDisc</i>	(+)	0.022	*
		0.404				1.662	
Likelihood Ratio		39.946		Likelihood Ratio		32.603	
N		74		N		74	

*(continued on next page)*

**Table 18 (Continued)**

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\*, \*\*, \*\*\* significant at 10 percent, 5 percent, and 1 percent, respectively, in a one-tailed test if a directional prediction is made and a two-tailed test otherwise;

Chi-squared statistics are under the coefficient estimates;

Dependent variable *Total*: equals 1 if *Total* defined in Table 1 is greater than zero, and 0 otherwise;

*Image* and *Technology* are defined in Table 11;

Other variables are defined in Table 1.

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**TABLE 19**  
**The Effect of Competitive Strategy on VED Behavior – Adjusting Toxics Amount by Sales for Each Management Method and Determining *Image* and *Technology* Using the Top One Third of Advertising Ratio and R&D Ratio, Respectively**

Panel A: Recycled		<u>Total</u>		<u>Hard</u>		<u>Soft</u>		<u>A3</u>	
<u>Variable</u>		<u>Coef.</u>		<u>Coef.</u>		<u>Coef.</u>		<u>Coef.</u>	
<i>Intercept</i>	?	-29.600	***	-25.142	***	-4.457	***	-19.765	***
		-5.086		-5.286		-3.418		-5.233	
<i>Image</i>	(+)	3.918	*	3.739	**	0.179		3.220	**
		1.416		1.698		0.279		1.802	
<i>Technology</i>	(+)	2.668		2.816	*	-0.148		3.491	**
		1.027		1.347		-0.242		1.989	
<i>CapDema</i>	(+)	1.584	***	1.226	***	0.358	***	0.804	***
		3.610		3.581		3.108		2.972	
<i>Leverage</i>	?	-1.460		-1.085		-0.375		0.576	
		-0.194		-0.193		-0.182		0.140	
<i>Size</i>	(+)	4.163	***	3.320	***	0.843	***	2.422	***
		4.752		4.708		4.103		4.429	
<i>OthDisc</i>	(+)	0.216	***	0.179	***	0.037	***	0.120	***
		5.185		5.136		3.733		4.005	
<i>Recycled</i>	(-/0)	-0.015		-0.002		-0.013	**	0.002	
		-0.670		-0.118		-2.183		0.145	
Adj. R <sup>2</sup>		0.664		0.679		0.485		0.622	
N		74		74		74		74	

*(continued on next page)*

**TABLE 19 (Continued)**

**Panel B: Treated**

<u>Variable</u>		<u>Total</u>		<u>Hard</u>		<u>Soft</u>		<u>A3</u>	
		<u>Coef.</u>		<u>Coef.</u>		<u>Coef.</u>		<u>Coef.</u>	
<i>Intercept</i>	?	-30.327	***	-25.490	***	-4.837	***	-19.746	***
		-5.256		-5.338		-3.868		-5.156	
<i>Image</i>	(+)	4.295	*	3.936	**	0.359		3.217	**
		1.549		1.772		0.570		1.775	
<i>Technology</i>	(+)	2.847		2.885	*	-0.038		3.480	**
		1.113		1.402		-0.062		2.014	
<i>CapDema</i>	(+)	1.526	***	1.200	***	0.326	***	0.806	***
		3.363		3.355		2.839		2.834	
<i>Leverage</i>	?	-1.373		-1.069		-0.304		0.564	
		-0.186		-0.193		-0.154		0.137	
<i>Size</i>	(+)	4.181	***	3.333	***	0.848	***	2.423	***
		4.835		4.759		4.251		4.445	
<i>OthDisc</i>	(+)	0.213	***	0.177	***	0.036	***	0.120	***
		5.152		5.086		3.711		3.961	
<i>Treated</i>	(-/0)	0.081		0.047		0.034		0.001	
		0.499		0.398		0.646		0.013	
Adj. R <sup>2</sup>		0.665		0.679		0.483		0.622	
N		74		74		74		74	

(continued on next page)



**TABLE 19 (Continued)**

**Panel C: Combusted**

<u>Variable</u>		<u>Total</u>		<u>Hard</u>		<u>Soft</u>		<u>A3</u>	
		<u>Coef.</u>		<u>Coef.</u>		<u>Coef.</u>		<u>Coef.</u>	
<i>Intercept</i>	?	-30.714	***	-25.672	***	-5.043	***	-20.018	***
		-5.213		-5.271		-4.048		-5.082	
<i>Image</i>	(+)	4.244	*	3.893	**	0.351		3.293	**
		1.539		1.771		0.553		1.845	
<i>Technology</i>	(+)	2.590		2.742	*	-0.152		3.431	**
		0.996		1.303		-0.254		1.937	
<i>CapDema</i>	(+)	1.456	***	1.164	***	0.292	***	0.774	***
		3.123		3.109		2.650		2.559	
<i>Leverage</i>	?	-1.061		-0.902		-0.159		0.659	
		-0.144		-0.163		-0.081		0.161	
<i>Size</i>	(+)	4.212	***	3.349	***	0.864	***	2.439	***
		4.823		4.735		4.326		4.413	
<i>OthDisc</i>	(+)	0.214	***	0.178	***	0.036	***	0.119	***
		5.238		5.145		3.799		3.980	
<i>Combusted</i>	(-/0)	0.128		0.069		0.059	**	0.038	
		1.120		0.720		2.034		0.434	
Adj. R <sup>2</sup>		0.667		0.680		0.492		0.622	
N		74		74		74		74	

(continued on next page)

**TABLE 19 (Continued)**

**Panel D: Disposed**

<u>Variable</u>		<u>Total</u>		<u>Hard</u>		<u>Soft</u>		<u>A3</u>	
		<u>Coef.</u>		<u>Coef.</u>		<u>Coef.</u>		<u>Coef.</u>	
<i>Intercept</i>	?	-29.610	***	-25.052	***	-4.558	***	-19.647	***
		-5.094		-5.257		-3.502		-5.177	
<i>Image</i>	(+)	3.834	*	3.651	*	0.183		3.136	**
		1.381		1.653		0.285		1.757	
<i>Technology</i>	(+)	2.650		2.758	*	-0.108		3.424	**
		1.022		1.322		-0.177		1.947	
<i>CapDema</i>	(+)	1.584	***	1.236	***	0.348	***	0.817	***
		3.636		3.623		3.036		3.004	
<i>Leverage</i>	?	-1.509		-1.163		-0.346		0.494	
		-0.200		-0.206		-0.169		0.119	
<i>Size</i>	(+)	4.174	***	3.331	***	0.843	***	2.432	***
		4.754		4.704		4.094		4.423	
<i>OthDisc</i>	(+)	0.216	***	0.179	***	0.037	***	0.120	***
		5.229		5.143		3.841		3.990	
<i>Disposed</i>	(+/-)	-0.195		-0.136		-0.059		-0.107	
		-1.257		-1.085		-1.343		-0.827	
Adj. R <sup>2</sup>		0.665		0.679		0.481		0.622	
N		74		74		74		74	

(continued on next page)

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**TABLE 19 (Continued)**

\*, \*\*, \*\*\* significant at 10 percent, 5 percent, and 1 percent, respectively, in a one-tailed test if a directional prediction is made and a two-tailed test otherwise;

t-statistics are under the coefficient estimates; based on robust standard errors;

Dependent variables are VED scores on top of each model;

*Recycled:* the amount of toxic waste recycled in 2004 adjusted by the sales revenue of 2004;

*Treated:* the amount of toxic waste treated in 2004 adjusted by the sales revenue of 2004;

*Combusted:* the amount of toxic waste combusted for energy recovery in 2004 adjusted by the sales revenue of 2004;

*Disposed:* the amount of toxic waste disposed of or otherwise released in 2004 adjusted by the sales revenue of 2004;

*Image* and *Technology* are defined in Table 3;

Other variables are defined in Table 1.

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TABLE 20

The Effect of Competitive Strategy on the Association between VED and Environmental Performance – Adjusting Toxics Amount by Sales for Each Management Method and Determining *Image* and *Technology* Using the Top One Third of Advertising Ratio and R&D Ratio, Respectively

## Panel A: Recycled

<u>Variable</u>		<u>Total</u>		<u>Hard</u>		<u>Soft</u>		<u>A3</u>	
		<u>Coef.</u>		<u>Coef.</u>		<u>Coef.</u>		<u>Coef.</u>	
<i>Intercept</i>	?	-29.654	***	-25.167	***	-4.486	***	-19.770	***
		-5.171		-5.365		-3.468		-5.312	
<i>Image</i>	(+)	5.350	**	4.834	**	0.516		4.237	***
		1.847		2.108		0.755		2.416	
<i>Technology</i>	(+)	0.144		0.784		-0.641		1.494	
		0.048		0.325		-0.870		0.797	
<i>Recycled</i>	(-/0)	-0.021		-0.007		-0.014	***	-0.003	
		-0.950		-0.388		-2.409		-0.168	
<i>Recycled*Image</i>	(-)	-4.765	**	-3.514	**	-1.251	***	-3.117	**
		-2.241		-2.047		-2.607		-1.830	
<i>Recycled*Technology</i>	(+)	14.837	**	12.103	**	2.734	**	12.064	**
		2.244		2.165		1.939		1.932	
<i>CapDema</i>	(+)	1.764	***	1.376	***	0.388	***	0.957	***
		4.104		4.143		3.252		3.860	
<i>Leverage</i>	?	-4.991		-3.932		-1.060		-2.226	
		-0.627		-0.661		-0.482		-0.513	
<i>Size</i>	(+)	4.475	***	3.567	***	0.908	***	2.660	***
		5.053		5.009		4.284		4.862	
<i>OthDisc</i>	(+)	0.195	***	0.163	***	0.032	***	0.105	***
		4.589		4.558		3.157		3.514	
Adj. R <sup>2</sup>		0.669		0.683		0.484		0.634	
N		74		74		74		74	

(continued on next page)

**TABLE 20 (Continued)**

**Panel B: Treated**

<u>Variable</u>		<u>Total</u>		<u>Hard</u>		<u>Soft</u>		<u>A3</u>	
		<u>Coef.</u>		<u>Coef.</u>		<u>Coef.</u>		<u>Coef.</u>	
<i>Intercept</i>	?	-31.453	***	-26.021	***	-5.431	***	-20.091	***
		-5.545		-5.603		-4.333		-5.339	
<i>Image</i>	(+)	2.899		2.558		0.341		2.124	
		1.009		1.125		0.516		1.173	
<i>Technology</i>	(+)	1.012		1.487		-0.475		2.426	*
		0.360		0.666		-0.718		1.344	
<i>Treated</i>	(-/0)	-0.020		-0.020		-0.001		-0.048	
		-0.117		-0.155		-0.010		-0.477	
<i>Treated*Image</i>	(-)	6.099	**	6.129	***	-0.030		4.879	**
		1.973		2.452		-0.048		2.334	
<i>Treated*Technology</i>	(+)	0.544	**	0.358	*	0.185	***	0.261	*
		1.988		1.626		2.684		1.304	
<i>CapDema</i>	(+)	1.176	***	0.936	***	0.239	**	0.608	**
		2.509		2.527		2.050		1.982	
<i>Leverage</i>	?	-0.162		-0.290		0.128		1.127	
		-0.024		-0.057		0.067		0.301	
<i>Size</i>	(+)	4.383	***	3.471	***	0.911	***	2.525	***
		5.143		5.065		4.549		4.750	
<i>OthDisc</i>	(+)	0.195	***	0.160	***	0.036	***	0.106	***
		4.990		4.952		3.708		3.728	
Adj. R <sup>2</sup>		0.676		0.696		0.485		0.639	
N		74		74		74		74	

(continued on next page)

TABLE 20 (Continued)

Panel C: Combusted

<u>Variable</u>		<u>Total</u>		<u>Hard</u>		<u>Soft</u>		<u>A3</u>	
		<u>Coef.</u>		<u>Coef.</u>		<u>Coef.</u>		<u>Coef.</u>	
<i>Intercept</i>	?	-31.742	***	-26.486	***	-5.255	***	-20.362	***
		-5.114		-5.151		-4.152		-4.961	
<i>Image</i>	(+)	4.513	*	4.272	**	0.241		3.708	**
		1.506		1.788		0.355		1.903	
<i>Technology</i>	(+)	2.120		2.435		-0.315		3.403	**
		0.768		1.093		-0.496		1.859	
<i>Combusted</i>	(-/0)	0.034		0.031		0.004		0.078	
		0.132		0.135		0.062		0.355	
<i>Combusted*Image</i>	(-)	-1.327		-1.463		0.136		-1.249	*
		-0.938		-1.296		0.430		-1.464	
<i>Combusted*Technology</i>	(+)	0.171		0.085		0.086		-0.042	
		0.547		0.315		1.287		-0.167	
<i>CapDema</i>	(+)	1.331	***	1.083	***	0.248	***	0.768	**
		2.596		2.606		2.091		2.264	
<i>Leverage</i>	?	-0.121		-0.195		0.074		0.899	
		-0.016		-0.034		0.037		0.208	
<i>Size</i>	(+)	4.325	***	3.439	***	0.886	***	2.479	***
		4.819		4.715		4.425		4.385	
<i>OthDisc</i>	(+)	0.212	***	0.175	***	0.037	***	0.117	***
		5.135		5.028		3.860		3.862	
Adj. R <sup>2</sup>		0.658		0.672		0.481		0.614	
N		74		74		74		74	

(continued on next page)

**TABLE 20 (Continued)**

**Panel D: Disposed**

<u>Variable</u>		<u>Total</u>		<u>Hard</u>		<u>Soft</u>		<u>A3</u>	
		<u>Coef.</u>		<u>Coef.</u>		<u>Coef.</u>		<u>Coef.</u>	
<i>Intercept</i>	?	-29.657	***	-25.115	***	-4.543	***	-20.121	***
		-4.970		-5.125		-3.432		-5.115	
<i>Image</i>	(+)	5.134	**	4.702	**	0.432		4.077	**
		1.682		1.951		0.605		2.112	
<i>Technology</i>	(+)	1.162		1.548		-0.386		2.214	
		0.413		0.687		-0.579		1.190	
<i>Disposed</i>	(+/-)	-0.286	**	-0.211	**	-0.075	**	-0.200	**
		-2.116		-1.988		-1.744		-2.260	
<i>Disposed*Image</i>	(+)	-10.920		-8.657		-2.263		-4.814	
		-1.255		-1.161		-1.395		-0.837	
<i>Disposed*Technology</i>	(-)	3.289	***	2.705	***	0.585		3.217	***
		2.687		3.008		1.401		4.319	
<i>CapDema</i>	(+)	1.572	***	1.227	***	0.344	***	0.834	***
		3.636		3.621		2.995		3.157	
<i>Leverage</i>	?	-2.142		-1.669		-0.474		0.147	
		-0.277		-0.287		-0.228		0.034	
<i>Size</i>	(+)	4.235	***	3.384	***	0.851	***	2.543	***
		4.796		4.743		4.121		4.632	
<i>OthDisc</i>	(+)	0.211	***	0.175	***	0.037	***	0.114	***
		5.118		5.028		3.742		3.880	
Adj. R <sup>2</sup>		0.664		0.679		0.473		0.632	
N		74		74		74		74	

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**TABLE 20 (Continued)**

\*, \*\*, \*\*\* significant at 10 percent, 5 percent, and 1 percent, respectively, in a one-tailed test if a directional prediction is made and a two-tailed test otherwise;

t-statistics are under the coefficient estimates; based on robust standard errors;

Dependent variables are VED scores on top of each model;

*Recycled:* the amount of toxic waste recycled in 2004 adjusted by the sales revenue of 2004;

*Treated:* the amount of toxic waste treated in 2004 adjusted by the sales revenue of 2004;

*Combusted:* the amount of toxic waste combusted for energy recovery in 2004 adjusted by the sales revenue of 2004;

*Disposed:* the amount of toxic waste disposed of or otherwise released in 2004 adjusted by the sales revenue of 2004;

*Image and Technology* are defined in Table 3;

Other variables are defined in Table 1.

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**TABLE 21**  
**The Effect of Competitive Strategy on VED Behavior – Adjusting Toxics**  
**Amount by Sales for Each Management Method and Considering the Tension**  
**between the Two Competitive Strategies within a Company**

**Panel A: Recycled**

<b>Variable</b>		<b>Total</b>		<b>Hard</b>		<b>Soft</b>		<b>A3</b>	
		<b>Coef.</b>		<b>Coef.</b>		<b>Coef.</b>		<b>Coef.</b>	
<i>Intercept</i>	?	-27.944	***	-23.165	***	-4.779	***	-17.700	***
		-4.698		-4.701		-3.773		-4.465	
<i>Image</i>	(+)	2.456		1.560		0.897	*	1.455	
		0.960		0.758		1.390		0.900	
<i>Technology</i>	(+)	4.074	*	4.008	**	0.066		4.493	***
		1.564		1.871		0.103		2.546	
<i>CapDema</i>	(+)	1.395	***	1.030	***	0.365	***	0.613	***
		3.593		3.400		3.433		2.547	
<i>Leverage</i>	?	-2.669		-1.686		-0.983		-0.110	
		-0.399		-0.341		-0.508		-0.032	
<i>Size</i>	(+)	3.912	***	3.048	***	0.864	***	2.138	***
		4.211		4.014		4.199		3.602	
<i>OthDisc</i>	(+)	0.224	***	0.187	***	0.037	***	0.127	***
		5.164		5.009		3.879		3.978	
<i>Recycled</i>	(-/0)	-0.016		-0.006		-0.011	**	-0.001	
		-0.731		-0.316		-1.682		-0.039	
Adj. R <sup>2</sup>		0.650		0.657		0.499		0.589	
N		74		74		74		74	

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**TABLE 21 (Continued)**

**Panel B: Treated**

<u>Variable</u>		<u>Total</u>		<u>Hard</u>		<u>Soft</u>		<u>A3</u>	
		<u>Coef.</u>		<u>Coef.</u>		<u>Coef.</u>		<u>Coef.</u>	
<i>Intercept</i>	?	-27.991	***	-22.993	***	-4.998	***	-17.321	***
		-4.737		-4.708		-3.997		-4.433	
<i>Image</i>	(+)	2.624		1.651		0.973	*	1.527	
		1.059		0.833		1.537		0.987	
<i>Technology</i>	(+)	4.190	*	3.975	**	0.215		4.348	***
		1.653		1.919		0.340		2.559	
<i>CapDema</i>	(+)	1.395	***	1.060	***	0.335	***	0.672	***
		3.261		3.155		3.035		2.536	
<i>Leverage</i>	?	-2.688		-1.741		-0.947		-0.209	
		-0.398		-0.343		-0.509		-0.057	
<i>Size</i>	(+)	3.900	***	3.042	***	0.858	***	2.134	***
		4.216		4.033		4.174		3.646	
<i>OthDisc</i>	(+)	0.226	***	0.189	***	0.037	***	0.130	***
		5.230		5.061		3.912		4.051	
<i>Treated</i>	(-/0)	-0.033		-0.053		0.021		-0.086	
		-0.206		-0.456		0.420		-0.933	
Adj. R <sup>2</sup>		0.650		0.658		0.497		0.593	
N		74		74		74		74	

(continued on next page)

TABLE 21 (Continued)

Panel C: Combusted

<u>Variable</u>		<u>Total</u>		<u>Hard</u>		<u>Soft</u>		<u>A3</u>	
		<u>Coef.</u>		<u>Coef.</u>		<u>Coef.</u>		<u>Coef.</u>	
<i>Intercept</i>	?	-28.580	***	-23.355	***	-5.224	***	-17.677	***
		-4.755		-4.675		-4.262		-4.368	
<i>Image</i>	(+)	2.490		1.580		0.910	*	1.468	
		0.991		0.786		1.435		0.936	
<i>Technology</i>	(+)	4.165	*	4.046	**	0.119		4.505	***
		1.647		1.934		0.198		2.601	
<i>CapDema</i>	(+)	1.306	***	1.004	***	0.302	***	0.616	**
		3.056		2.922		2.947		2.217	
<i>Leverage</i>	?	-2.374		-1.603		-0.770		-0.129	
		-0.360		-0.322		-0.423		-0.036	
<i>Size</i>	(+)	3.926	***	3.051	***	0.875	***	2.135	***
		4.234		4.017		4.350		3.589	
<i>OthDisc</i>	(+)	0.224	***	0.187	***	0.037	***	0.128	***
		5.199		5.013		3.948		3.965	
<i>Combusted</i>	(-/0)	0.069		0.019		0.050		-0.005	
		0.563		0.189		1.593		-0.053	
Adj. R <sup>2</sup>		0.650		0.657		0.504		0.589	
N		74		74		74		74	

(continued on next page)

TABLE 21 (Continued)

Panel D: Disposed

<u>Variable</u>		<u>Total</u>		<u>Hard</u>		<u>Soft</u>		<u>A3</u>	
		<u>Coef.</u>		<u>Coef.</u>		<u>Coef.</u>		<u>Coef.</u>	
<i>Intercept</i>	?	-27.951	***	-23.079	***	-4.872	***	-17.578	***
		-4.730		-4.722		-3.822		-4.473	
<i>Image</i>	(+)	2.397		1.443		0.954	*	1.321	
		0.954		0.717		1.485		0.837	
<i>Technology</i>	(+)	3.977	*	3.845	**	0.132		4.312	***
		1.558		1.839		0.207		2.489	
<i>CapDema</i>	(+)	1.408	***	1.052	***	0.356	***	0.637	***
		3.630		3.459		3.378		2.616	
<i>Leverage</i>	?	-2.745		-1.758		-0.987		-0.176	
		-0.409		-0.353		-0.513		-0.050	
<i>Size</i>	(+)	3.937	***	3.074	***	0.863	***	2.162	***
		4.226		4.040		4.146		3.638	
<i>OthDisc</i>	(+)	0.224	***	0.187	***	0.038	***	0.127	***
		5.181		4.991		3.965		3.943	
<i>Disposed</i>	(+/-)	-0.280		-0.232		-0.048		-0.194	
		-1.596		-1.581		-1.002		-1.389	
Adj. R <sup>2</sup>		0.651		0.659		0.496		0.592	
N		74		74		74		74	

(continued on next page)

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**TABLE 21 (Continued)**

\*, \*\*, \*\*\* significant at 10 percent, 5 percent, and 1 percent, respectively, in a one-tailed test if a directional prediction is made and a two-tailed test otherwise;

t-statistics are under the coefficient estimates; based on robust standard errors;

Dependent variables are VED scores on top of each model;

*Recycled:* the amount of toxic waste recycled in 2004 adjusted by the sales revenue of 2004;

*Treated:* the amount of toxic waste treated in 2004 adjusted by the sales revenue of 2004;

*Combusted:* the amount of toxic waste combusted for energy recovery in 2004 adjusted by the sales revenue of 2004;

*Disposed:* the amount of toxic waste disposed of or otherwise released in 2004 adjusted by the sales revenue of 2004;

*Image and Technology* are defined in Table 11;

Other variables are defined in Table 1.

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**TABLE 22**

**The Effect of Competitive Strategy on the Association between VED and Environmental Performance – Adjusting Toxics Amount by Sales for Each Management Method and Considering the Tension between the Two Competitive Strategies within a Company**

**Panel A: Recycled**

<u>Variable</u>		<u>Total</u>		<u>Hard</u>		<u>Soft</u>		<u>A3</u>	
		<u>Coef.</u>		<u>Coef.</u>		<u>Coef.</u>		<u>Coef.</u>	
<i>Intercept</i>	?	-28.786	***	-24.027	***	-4.759	***	-18.487	***
		-4.488		-4.509		-3.570		-4.320	
<i>Image</i>	(+)	2.084		1.162		0.922	*	1.093	
		0.749		0.522		1.332		0.637	
<i>Technology</i>	(+)	2.968		3.048		-0.081		3.600	**
		0.994		1.238		-0.112		1.802	
<i>Recycled</i>	(-/0)	-0.028		-0.017		-0.011	**	-0.011	
		-1.286		-0.989		-1.710		-0.737	
<i>Recycled*Image</i>	(-)	0.129		0.129		-0.001		0.118	**
		1.235		1.527		-0.023		1.735	
<i>Recycled*Technology</i>	(+)	6.271		5.325		0.946		4.972	
		0.985		1.012		0.676		0.867	
<i>CapDema</i>	(+)	1.468	***	1.090	***	0.378	***	0.669	***
		3.629		3.460		3.408		2.637	
<i>Leverage</i>	?	-3.617		-2.430		-1.187		-0.813	
		-0.506		-0.453		-0.579		-0.209	
<i>Size</i>	(+)	4.139	***	3.264	***	0.875	***	2.336	***
		4.156		4.010		3.992		3.645	
<i>OthDisc</i>	(+)	0.215	***	0.178	***	0.036	***	0.120	***
		4.764		4.613		3.683		3.641	
Adj. R <sup>2</sup>		0.644		0.652		0.485		0.586	
N		74		74		74		74	

(continued on next page)

TABLE 22 (Continued)

Panel B: Treated

<u>Variable</u>		<u>Total</u>		<u>Hard</u>		<u>Soft</u>		<u>A3</u>	
		<u>Coef.</u>		<u>Coef.</u>		<u>Coef.</u>		<u>Coef.</u>	
<i>Intercept</i>	?	-28.005	***	-23.048	***	-4.958	***	-17.055	***
		-4.665		-4.674		-3.778		-4.301	
<i>Image</i>	(+)	1.130		0.662		0.468		0.614	
		0.399		0.295		0.636		0.362	
<i>Technology</i>	(+)	2.441		2.776		-0.335		3.528	**
		0.854		1.189		-0.496		1.901	
<i>Treated</i>	(-/0)	-0.294	*	-0.229	*	-0.065		-0.232	**
		-1.658		-1.645		-1.267		-1.995	
<i>Treated*Image</i>	(-)	0.369		0.243		0.126		0.234	
		1.093		0.941		1.243		1.108	
<i>Treated*Technology</i>	(+)	0.485	*	0.335	*	0.150	**	0.209	
		1.613		1.453		1.811		0.988	
<i>CapDema</i>	(+)	1.360	***	1.029	***	0.331	***	0.697	**
		3.055		2.855		3.032		2.351	
<i>Leverage</i>	?	-2.895		-1.836		-1.060		-0.599	
		-0.450		-0.373		-0.617		-0.169	
<i>Size</i>	(+)	4.018	***	3.125	***	0.893	***	2.180	***
		4.334		4.134		4.337		3.701	
<i>OthDisc</i>	(+)	0.230	***	0.191	***	0.039	***	0.133	***
		5.412		5.159		4.299		4.104	
Adj. R <sup>2</sup>		0.646		0.652		0.499		0.585	
N		74		74		74		74	

(continued on next page)

TABLE 22 (Continued)

Panel C: Combusted

<u>Variable</u>		<u>Total</u> <u>Coef.</u>		<u>Hard</u> <u>Coef.</u>		<u>Soft</u> <u>Coef.</u>		<u>A3</u> <u>Coef.</u>	
<i>Intercept</i>	?	-29.157 ***		-23.557 ***		-5.600 ***		-17.146 ***	
		-4.805		-4.660		-4.546		-4.256	
<i>Image</i>	(+)	1.766		0.917		0.850		0.647	
		0.637		0.415		1.198		0.380	
<i>Technology</i>	(+)	2.940		3.116 *		-0.176		3.814 **	
		1.075		1.382		-0.272		2.059	
<i>Combusted</i>	(-/0)	-0.435		-0.393		-0.042		-0.394 *	
		-0.988		-1.164		-0.323		-1.519	
<i>Combusted*Image</i>	(-)	0.419		0.384		0.036		0.473	
		0.763		0.874		0.230		1.282	
<i>Combusted*Technology</i>	(+)	0.608 *		0.476 *		0.132		0.396 *	
		1.344		1.363		1.023		1.473	
<i>CapDema</i>	(+)	1.207 ***		0.951 ***		0.255 **		0.643 **	
		2.722		2.684		2.291		2.262	
<i>Leverage</i>	?	-1.611		-1.151		-0.459		-0.159	
		-0.242		-0.229		-0.250		-0.045	
<i>Size</i>	(+)	4.045 ***		3.123 ***		0.922 ***		2.135 ***	
		4.359		4.086		4.698		3.595	
<i>OthDisc</i>	(+)	0.227 ***		0.190 ***		0.037 ***		0.131 ***	
		5.267		5.036		4.135		3.982	
Adj. R <sup>2</sup>		0.644		0.650		0.496		0.582	
N		74		74		74		74	

(continued on next page)



TABLE 22 (Continued)

Panel D: Disposed

<u>Variable</u>		<u>Total</u> <u>Coef.</u>		<u>Hard</u> <u>Coef.</u>		<u>Soft</u> <u>Coef.</u>		<u>A3</u> <u>Coef.</u>	
<i>Intercept</i>	?	-27.881	***	-23.022	***	-4.859	***	-17.557	***
		-4.728		-4.715		-3.842		-4.433	
<i>Image</i>	(+)	2.904		1.869		1.035	*	1.635	
		1.037		0.841		1.429		0.956	
<i>Technology</i>	(+)	3.758	*	3.645	*	0.113		4.004	**
		1.368		1.607		0.173		2.172	
<i>Disposed</i>	(+/-)	-0.272	**	-0.227	**	-0.045		-0.209	**
		-1.885		-1.949		-0.937		-2.221	
<i>Disposed*Image</i>	(+)	-1.078		-0.910		-0.168		-0.709	
		-0.634		-0.592		-0.459		-0.488	
<i>Disposed*Technology</i>	(-)	0.736		0.661		0.075		0.932	
		0.463		0.515		0.202		0.565	
<i>CapDema</i>	(+)	1.381	***	1.029	***	0.352	***	0.619	***
		3.616		3.441		3.354		2.614	
<i>Leverage</i>	?	-2.468		-1.523		-0.945		0.021	
		-0.360		-0.300		-0.482		0.006	
<i>Size</i>	(+)	3.909	***	3.051	***	0.858	***	2.154	***
		4.201		4.010		4.146		3.606	
<i>OthDisc</i>	(+)	0.225	***	0.187	***	0.038	***	0.127	***
		5.171		4.975		3.952		3.923	
Adj. R <sup>2</sup>		0.642		0.650		0.481		0.582	
N		74		74		74		74	

(continued on next page)

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**TABLE 22 (Continued)**

\*, \*\*, \*\*\* significant at 10 percent, 5 percent, and 1 percent, respectively, in a one-tailed test if a directional prediction is made and a two-tailed test otherwise;

t-statistics are under the coefficient estimates; based on robust standard errors;

Dependent variables are VED scores on top of each model;

*Recycled:* the amount of toxic waste recycled in 2004 adjusted by the sales revenue of 2004;

*Treated:* the amount of toxic waste treated in 2004 adjusted by the sales revenue of 2004;

*Combusted:* the amount of toxic waste combusted for energy recovery in 2004 adjusted by the sales revenue of 2004;

*Disposed:* the amount of toxic waste disposed of or otherwise released in 2004 adjusted by the sales revenue of 2004;

*Image and Technology* are defined in Table 11;

Other variables are defined in Table 1.

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**TABLE 23**  
**The Effect of Competitive Strategy on VED Behavior – Adding Together the Scaled  
 Toxics Amount Managed by the Three Desirable Methods and Determining *Image*  
 and *Technology* Using the Top One Third of Advertising Ratio and R&D Ratio,  
 Respectively**

<u>Variable</u>		<u>Total</u>		<u>Hard</u>		<u>Soft</u>		<u>A3</u>	
		<u>Coef.</u>		<u>Coef.</u>		<u>Coef.</u>		<u>Coef.</u>	
<i>Intercept</i>	?	-29.898	***	-25.349	***	-4.549	***	-19.856	***
		-5.210		-5.370		-3.522		-5.254	
<i>Image</i>	(+)	4.018	*	3.815	**	0.203		3.256	**
		1.459		1.735		0.320		1.824	
<i>Technology</i>	(+)	2.775		2.865	*	-0.090		3.503	**
		1.077		1.385		-0.146		2.018	
<i>CapDema</i>	(+)	1.553	***	1.205	***	0.348	***	0.795	***
		3.379		3.352		2.868		2.787	
<i>Leverage</i>	?	-1.345		-1.019		-0.325		0.599	
		-0.180		-0.183		-0.158		0.147	
<i>Size</i>	(+)	4.160	***	3.322	***	0.837	***	2.425	***
		4.787		4.739		4.103		4.451	
<i>OthDisc</i>	(+)	0.216	***	0.179	***	0.037	***	0.120	***
		5.268		5.189		3.850		4.024	
<i>Desired</i>	(-/0)	0.005		0.007		-0.002		0.005	
		0.161		0.315		-0.251		0.255	
Adj. R <sup>2</sup>		0.664		0.679		0.479		0.622	
N		74		74		74		74	

*(continued on next page)*

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**TABLE 23 (Continued)**

\*, \*\*, \*\*\* significant at 10 percent, 5 percent, and 1 percent, respectively, in a one-tailed test if a directional prediction is made and a two-tailed test otherwise;

t-statistics are under the coefficient estimates; based on robust standard errors;

Dependent variables are VED scores on top of each model;

*Desired:* the amount of toxic waste recycled, treated, and combusted for energy recovery in 2004 adjusted by the sales revenue of 2004;

*Image* and *Technology* are defined in Table 3;

Other variables are defined in Table 1.

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**TABLE 24**  
**The Effect of Competitive Strategy on the Association between VED and Environmental Performance – Adding Together the Scaled Toxics Amount Managed by the Three Desirable Methods and Determining *Image* and *Technology* Using the Top One Third of Advertising Ratio and R&D Ratio, Respectively**

<u>Variable</u>		<u>Total</u>		<u>Hard</u>		<u>Soft</u>		<u>A3</u>	
		<u>Coef.</u>		<u>Coef.</u>		<u>Coef.</u>		<u>Coef.</u>	
<i>Intercept</i>	?	-31.279	***	-25.951	***	-5.327	***	-20.051	***
		-5.099		-5.169		-4.009		-4.987	
<i>Image</i>	(+)	3.823		3.499	*	0.324		3.003	*
		1.172		1.354		0.437		1.468	
<i>Technology</i>	(+)	1.971		2.446		-0.475		3.323	**
		0.711		1.091		-0.753		1.800	
<i>Desired</i>	(-/0)	-0.006		0.001		-0.007		0.002	
		-0.240		0.042		-0.965		0.090	
<i>Desired*Image</i>	(-)	0.390		0.508		-0.118		0.386	
		0.251		0.366		-0.367		0.367	
<i>Desired*Technology</i>	(+)	0.151	**	0.082		0.069	***	0.037	
		1.773		1.156		3.791		0.620	
<i>CapDema</i>	(+)	1.338	***	1.092	***	0.246	**	0.746	**
		2.667		2.717		2.006		2.268	
<i>Leverage</i>	?	-0.461		-0.600		0.140		0.757	
		-0.063		-0.109		0.069		0.186	
<i>Size</i>	(+)	4.285	***	3.374	***	0.912	***	2.439	***
		4.718		4.593		4.433		4.276	
<i>OthDisc</i>	(+)	0.214	***	0.178	***	0.036	***	0.120	***
		5.211		5.125		3.838		3.986	
Adj. R <sup>2</sup>		0.659		0.672		0.486		0.612	
N		74		74		74		74	

*(continued on next page)*

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**TABLE 24 (Continued)**

\*, \*\*, \*\*\* significant at 10 percent, 5 percent, and 1 percent, respectively, in a one-tailed test if a directional prediction is made and a two-tailed test otherwise;

t-statistics are under the coefficient estimates; based on robust standard errors;

Dependent variables are VED scores on top of each model;

*Desired:* the amount of toxic waste recycled, treated, and combusted for energy recovery in 2004 adjusted by the sales revenue of 2004;

*Image and Technology* are defined in Table 3;

Other variables are defined in Table 1.

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**TABLE 25**  
**The Effect of Competitive Strategy on VED Behavior – Adding Together the Scaled Toxics Amount Managed by the Three Desirable Methods and Considering the Tension between the Two Competitive Strategies within a Company**

<b>Variable</b>		<b>Total Coef.</b>		<b>Hard Coef.</b>		<b>Soft Coef.</b>		<b>A3 Coef.</b>	
<i>Intercept</i>	?	-27.948	***	-23.085	***	-4.863	***	-17.541	***
		-4.697		-4.675		-3.834		-4.401	
<i>Image</i>	(+)	2.546		1.568		0.977	*	1.414	
		1.004		0.772		1.511		0.885	
<i>Technology</i>	(+)	4.154	*	3.996	**	0.158		4.418	***
		1.614		1.897		0.245		2.549	
<i>CapDema</i>	(+)	1.397	***	1.042	***	0.355	***	0.634	***
		3.333		3.176		3.130		2.436	
<i>Leverage</i>	?	-2.703		-1.721		-0.982		-0.156	
		-0.404		-0.346		-0.510		-0.045	
<i>Size</i>	(+)	3.903	***	3.046	***	0.857	***	2.139	***
		4.205		4.017		4.142		3.612	
<i>OthDisc</i>	(+)	0.225	***	0.187	***	0.038	***	0.127	***
		5.206		5.018		3.967		3.966	
<i>Desired</i>	(-/0)	-0.008		-0.007		-0.002		-0.007	
		-0.299		-0.302		-0.205		-0.407	
Adj. R <sup>2</sup>		0.650		0.657		0.495		0.590	
N		74		74		74		74	

*(continued on next page)*

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**TABLE 25 (Continued)**

\*, \*\*, \*\*\* significant at 10 percent, 5 percent, and 1 percent, respectively, in a one-tailed test if a directional prediction is made and a two-tailed test otherwise;

t-statistics are under the coefficient estimates; based on robust standard errors;

Dependent variables are VED scores on top of each model;

*Desired:* the amount of toxic waste recycled, treated, and combusted for energy recovery in 2004 adjusted by the sales revenue of 2004;

*Image* and *Technology* are defined in Table 11;

Other variables are defined in Table 1.

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**TABLE 26**  
**The Effect of Competitive Strategy on the Association between VED and Environmental Performance – Adding Together the Scaled Toxics Amount Managed by the Three Desirable Methods and Considering the Tension between the Two Competitive Strategies within a Company**

<u>Variable</u>		<u>Total</u>		<u>Hard</u>		<u>Soft</u>		<u>A3</u>	
		<u>Coef.</u>		<u>Coef.</u>		<u>Coef.</u>		<u>Coef.</u>	
<i>Intercept</i>	?	-29.329	***	-23.855	***	-5.474	***	-17.801	***
		-4.795		-4.687		-4.396		-4.333	
<i>Image</i>	(+)	1.336		0.723		0.612		0.701	
		0.459		0.310		0.842		0.393	
<i>Technology</i>	(+)	3.107		3.387	*	-0.281		4.151	**
		1.123		1.478		-0.430		2.219	
<i>Desired</i>	(-/0)	-0.031	*	-0.022	*	-0.010	*	-0.018	
		-1.487		-1.310		-1.452		-1.286	
<i>Desired*Image</i>	(-)	0.091		0.067		0.024		0.064	
		0.838		0.740		0.863		0.800	
<i>Desired*Technology</i>	(+)	0.132	*	0.073		0.059	***	0.022	
		1.637		1.105		3.148		0.407	
<i>CapDema</i>	(+)	1.263	***	0.979	***	0.284	***	0.642	**
		2.749		2.651		2.504		2.162	
<i>Leverage</i>	?	-1.928		-1.340		-0.588		-0.156	
		-0.297		-0.273		-0.328		-0.045	
<i>Size</i>	(+)	4.110	***	3.173	***	0.937	***	2.212	***
		4.347		4.094		4.590		3.641	
<i>OthDisc</i>	(+)	0.220	***	0.184	***	0.036	***	0.125	***
		5.049		4.888		3.796		3.849	
Adj. R <sup>2</sup>		0.644		0.650		0.498		0.580	
N		74		74		74		74	

*(continued on next page)*

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**TABLE 26 (Continued)**

\*, \*\*, \*\*\* significant at 10 percent, 5 percent, and 1 percent, respectively, in a one-tailed test if a directional prediction is made and a two-tailed test otherwise;

t-statistics are under the coefficient estimates; based on robust standard errors;

Dependent variables are VED scores on top of each model;

*Desired:* the amount of toxic waste recycled, treated, and combusted for energy recovery in 2004 adjusted by the sales revenue of 2004;

*Image* and *Technology* are defined in Table 11;

Other variables are defined in Table 1.

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**TABLE 27**  
**The Effect of Competitive Strategy on VED Behavior – Including a Fixed Effect for Pharmaceutical Companies and Determining *Image* and *Technology* based on the Top One Third of Advertising Ratio and R&D Ratio, Respectively**

<b>Panel A: Recycled</b>		<b>Total</b>		<b>Hard</b>		<b>Soft</b>		<b>A3</b>	
<b>Variable</b>		<b>Coef.</b>		<b>Coef.</b>		<b>Coef.</b>		<b>Coef.</b>	
<i>Intercept</i>	?	-29.761	***	-25.213	***	-4.548	***	-19.760	***
		-5.314		-5.579		-3.499		-5.574	
<i>Image</i>	(+)	3.529		3.201	*	0.329		2.698	*
		1.234		1.432		0.481		1.474	
<i>Technology</i>	(+)	2.127		2.114		0.013		2.917	*
		0.752		0.916		0.021		1.522	
<i>LitgRisk</i>	(+)	0.002		0.003		-0.001		-0.001	
		0.079		0.147		-0.110		-0.035	
<i>CapDema</i>	(+)	1.552	***	1.200	***	0.353	***	0.787	***
		3.333		3.295		2.939		2.741	
<i>Leverage</i>	?	-1.061		-0.575		-0.486		1.109	
		-0.142		-0.104		-0.233		0.273	
<i>Size</i>	(+)	4.141	***	3.283	***	0.857	***	2.369	***
		4.750		4.738		4.093		4.429	
<i>OthDisc</i>	(+)	0.215	***	0.178	***	0.037	***	0.121	***
		5.090		5.096		3.686		4.001	
<i>Recycled</i>	(-/0)	-0.016		0.402		-0.418		0.956	
		-0.005		0.169		-0.477		0.510	
<i>Pharmaceutical</i>	?	1.610		1.996		-0.386		1.735	
		0.515		0.789		-0.582		0.812	
Adj. R <sup>2</sup>		0.655		0.672		0.467		0.615	
N		74		74		74		74	

*(continued on next page)*

TABLE 27 (Continued)

Panel B: Disposed

<u>Variable</u>		<u>Total</u> <u>Coef.</u>		<u>Hard</u> <u>Coef.</u>		<u>Soft</u> <u>Coef.</u>		<u>A3</u> <u>Coef.</u>	
<i>Intercept</i>	?	-28.595	***	-24.119	***	-4.476	***	-19.000	***
		-5.322		-5.637		-3.398		-5.606	
<i>Image</i>	(+)	3.948	*	3.591	*	0.357		2.965	*
		1.403		1.618		0.532		1.605	
<i>Technology</i>	(+)	1.830		1.772		0.059		2.576	*
		0.635		0.756		0.092		1.333	
<i>LitgRisk</i>	(+)	-0.006		-0.003		-0.003		-0.002	
		-0.229		-0.140		-0.404		-0.135	
<i>CapDema</i>	(+)	1.508	***	1.160	***	0.348	***	0.763	***
		3.438		3.458		2.828		2.850	
<i>Leverage</i>	?	-0.153		0.193		-0.346		1.507	
		-0.023		0.040		-0.168		0.425	
<i>Size</i>	(+)	4.071	***	3.234	***	0.837	***	2.360	***
		4.807		4.848		4.006		4.588	
<i>OthDisc</i>	(+)	0.209	***	0.172	***	0.037	***	0.115	***
		4.949		4.889		3.887		3.786	
<i>Disposed</i>	(+/0)	-5.411		-5.017	**	-0.394		-3.385	
		-1.558		-1.951		-0.348		-1.600	
<i>Pharmaceutical</i>	?	1.759		2.188		-0.429		1.954	
		0.548		0.844		-0.628		0.887	
Adj. R <sup>2</sup>		0.663		0.683		0.466		0.623	
N		74		74		74		74	

(continued on next page)

**TABLE 27 (Continued)**

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\*, \*\*, \*\*\* significant at 10 percent, 5 percent, and 1 percent, respectively, in a one-tailed test if a directional prediction is made and a two-tailed test otherwise;

t-statistics are under the coefficient estimates; based on robust standard errors;

Dependent variables are VED scores on top of each model;

*Pharmaceutical:* equals 1 if the SIC code of a company is 2834, and 0 otherwise;

*Image* and *Technology* are defined in Table 3;

Other variables are defined in Table 1.

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TABLE 28

The Effect of Competitive Strategy on the Association between VED and Environmental Performance – Including a Fixed Effect for Pharmaceutical Companies and Determining *Image* and *Technology* based on the Top One Third of Advertising Ratio and R&D Ratio, Respectively

## Panel A: Recycled

<u>Variable</u>		<u>Total</u>		<u>Hard</u>		<u>Soft</u>		<u>A3</u>	
		<u>Coef.</u>		<u>Coef.</u>		<u>Coef.</u>		<u>Coef.</u>	
<i>Intercept</i>	?	-27.036	***	-23.161	***	-3.876	***	-18.302	***
		5.373		4.369		1.274		3.505	
<i>Image</i>	(+)	4.069	*	3.646	*	0.423		3.184	**
		2.932		2.321		0.686		1.840	
<i>Technology</i>	(+)	-2.588		-1.490		-1.098		0.132	
		3.250		2.657		0.758		2.262	
<i>Recycled</i>	(-/0)	-5.024		-3.339		-1.685		-1.568	
		3.927		2.906		1.341		2.141	
<i>Recycled*Image</i>	(-)	-10.427	**	-8.247	**	-2.180	*	-7.566	**
		5.192		4.092		1.376		3.514	
<i>Recycled*Technology</i>	(+)	30.749	***	23.585	***	7.164	***	18.598	***
		8.003		6.563		1.843		5.934	
<i>LitgRisk</i>	(+)	0.018		0.015		0.003		0.007	
		0.032		0.024		0.010		0.020	
<i>CapDema</i>	(+)	1.728	***	1.334	***	0.394	***	0.891	***
		0.431		0.340		0.111		0.278	
<i>Leverage</i>	?	-6.783		-4.945		-1.838		-2.256	
		7.384		5.559		2.055		4.166	
<i>Size</i>	(+)	4.357	***	3.451	***	0.906	***	2.509	***
		0.819		0.655		0.198		0.518	
<i>OthDisc</i>	(+)	0.185	***	0.155	***	0.030	***	0.102	***
		0.044		0.037		0.010		0.032	
<i>Pharmaceutical</i>	?	3.798		3.665		0.133		3.015	
		2.814		2.273		0.622		1.955	
Adj. R <sup>2</sup>		0.684		0.697		0.502		0.642	
N		74		74		74		74	

TABLE 28 (Continued)

Panel B: Disposed

Variable		Total		Hard		Soft		A3	
		Coef.		Coef.		Coef.		Coef.	
<i>Intercept</i>	?	-30.026	***	-25.149	***	-4.877	***	-19.888	***
		5.171		4.164		1.241		3.296	
<i>Image</i>	(+)	6.087	**	5.103	**	0.984	*	4.259	**
		3.056		2.443		0.693		2.023	
<i>Technology</i>	(+)	2.195		2.083		0.113		2.862	*
		3.036		2.447		0.678		1.969	
<i>Disposed</i>	(+/0)	4.538		2.245		2.293	*	2.914	
		4.029		3.285		1.543		2.674	
<i>Disposed*Image</i>	(+)	-18.735	***	-13.310	**	-5.425	***	-11.410	**
		7.789		6.340		2.106		5.564	
<i>Disposed*Technology</i>	(-)	1.804		0.717		1.087		0.400	
		7.014		5.595		1.715		5.138	
<i>LitgRisk</i>	(+)	0.007		0.007		0.000		0.006	
		0.028		0.021		0.008		0.017	
<i>CapDema</i>	(+)	1.512	***	1.153	***	0.359	***	0.753	***
		0.402		0.313		0.111		0.244	
<i>Leverage</i>	?	4.071		3.224		0.847		4.116	
		6.363		4.775		1.803		3.641	
<i>Size</i>	(+)	3.869	***	3.084	***	0.786	***	2.228	***
		0.846		0.668		0.204		0.515	
<i>OthDisc</i>	(+)	0.218	***	0.178	***	0.040	***	0.120	***
		0.040		0.034		0.009		0.029	
<i>Pharmaceutical</i>	?	2.700		2.887		-0.187		2.564	
		3.334		2.691		0.721		2.267	
Adj. R <sup>2</sup>		0.675		0.691		0.491		0.635	
N		74		74		74		74	

(continued on next page)

**TABLE 28 (Continued)**

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\*, \*\*, \*\*\* significant at 10 percent, 5 percent, and 1 percent, respectively, in a one-tailed test if a directional prediction is made and a two-tailed test otherwise;

t-statistics are under the coefficient estimates; based on robust standard errors;

Dependent variables are VED scores on top of each model;

*Pharmaceutical:* equals 1 if the SIC code of a company is 2834, and 0 otherwise;

*Image* and *Technology* are defined in Table 3;

Other variables are defined in Table 1.

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**TABLE 29**  
**The Effect of Competitive Strategy on VED Behavior – Including a Fixed Effect for Pharmaceutical Companies and Considering the Tension between the Two Competitive Strategies within a Company**

<b>Panel A: Recycled</b>		<b>Total</b>		<b>Hard</b>		<b>Soft</b>		<b>A3</b>	
<b>Variable</b>		<b>Coef.</b>		<b>Coef.</b>		<b>Coef.</b>		<b>Coef.</b>	
<i>Intercept</i>	?	-28.820	***	-23.999	***	-4.822	***	-18.385	***
		-5.102		-5.205		-3.768		-4.992	
<i>Image</i>	(+)	2.501		1.554		0.947	*	1.451	
		1.003		0.780		1.475		0.921	
<i>Technology</i>	(+)	2.367		2.212		0.156		2.900	*
		0.841		0.979		0.219		1.587	
<i>LitgRisk</i>	(+)	-0.006		-0.005		-0.001		-0.007	
		-0.205		-0.221		-0.118		-0.416	
<i>CapDema</i>	(+)	1.454	***	1.098	***	0.356	***	0.681	***
		3.320		3.186		3.170		2.505	
<i>Leverage</i>	?	-2.013		-0.969		-1.044		0.590	
		-0.288		-0.186		-0.537		0.161	
<i>Size</i>	(+)	3.984	***	3.116	***	0.868	***	2.180	***
		4.411		4.298		4.114		3.909	
<i>OthDisc</i>	(+)	0.219	***	0.182	***	0.037	***	0.124	***
		5.001		4.942		3.762		3.951	
<i>Recycled</i>	(-/0)	0.094		0.419		-0.324		0.930	
		0.030		0.171		-0.379		0.498	
<i>Pharmaceutical</i>	?	3.908		4.003		-0.095		3.572	*
		1.326		1.652		-0.154		1.755	
Adj. R <sup>2</sup>		0.648		0.660		0.480		0.598	
N		74		74		74		74	

*(continued on next page)*

**TABLE 29 (Continued)**

**Panel B: Disposed**

<u>Variable</u>		<u>Total</u> <u>Coef.</u>		<u>Hard</u> <u>Coef.</u>		<u>Soft</u> <u>Coef.</u>		<u>A3</u> <u>Coef.</u>	
<i>Intercept</i>	?	-27.734 ***		-22.981 ***		-4.753 ***		-17.698 ***	
		-5.055		-5.173		-3.701		-5.000	
<i>Image</i>	(+)	2.427		1.455		0.972 *		1.327	
		0.971		0.738		1.504		0.860	
<i>Technology</i>	(+)	2.183		1.981		0.203		2.629 *	
		0.771		0.875		0.288		1.439	
<i>LitgRisk</i>	(+)	-0.014		-0.011		-0.003		-0.009	
		-0.542		-0.556		-0.374		-0.561	
<i>CapDema</i>	(+)	1.410 ***		1.058 ***		0.351 ***		0.658 ***	
		3.382		3.287		3.043		2.556	
<i>Leverage</i>	?	-1.029		-0.089		-0.940		1.102	
		-0.165		-0.020		-0.490		0.337	
<i>Size</i>	(+)	3.922 ***		3.072 ***		0.850 ***		2.177 ***	
		4.471		4.395		4.047		4.039	
<i>OthDisc</i>	(+)	0.213 ***		0.176 ***		0.037 ***		0.118 ***	
		4.896		4.774		3.939		3.744	
<i>Disposed</i>	(+/-)	-4.784		-4.461 **		-0.324		-2.967	
		-1.500		-1.928		-0.295		-1.569	
<i>Pharmaceutical</i>	?	4.162		4.278 *		-0.116		3.829 *	
		1.399		1.747		-0.185		1.851	
Adj. R <sup>2</sup>		0.654		0.669		0.480		0.604	
N		74		74		74		74	

(continued on next page)

**TABLE 29 (Continued)**

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\*, \*\*, \*\*\* significant at 10 percent, 5 percent, and 1 percent, respectively, in a one-tailed test if a directional prediction is made and a two-tailed test otherwise;

t-statistics are under the coefficient estimates; based on robust standard errors;

Dependent variables are VED scores on top of each model;

*Pharmaceutical:* equals 1 if the SIC code of a company is 2834, and 0 otherwise;

*Image* and *Technology* are defined in Table 11;

Other variables are defined in Table 1.

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TABLE 30

The Effect of Competitive Strategy on the Association between VED and Environmental Performance – Including a Fixed Effect for Pharmaceutical Companies and Considering the Tension between the Two Competitive Strategies within a Company

## Panel A: Recycled

<u>Variable</u>		<u>Total</u> <u>Coef.</u>		<u>Hard</u> <u>Coef.</u>		<u>Soft</u> <u>Coef.</u>		<u>A3</u> <u>Coef.</u>	
<i>Intercept</i>	?	-27.699	***	-23.087	***	-4.612	***	-17.544	***
		-5.447		-5.497		-3.963		-5.142	
<i>Image</i>	(+)	1.156		0.650		0.506		1.068	
		0.384		0.268		0.679		0.573	
<i>Technology</i>	(+)	-3.131		-1.930		-1.201		-0.136	
		-0.962		-0.732		-1.399		-0.060	
<i>Recycled</i>	(-/0)	-11.154	**	-7.895	**	-3.259	***	-4.757	**
		-2.352		-2.123		-2.581		-1.758	
<i>Recycled*Image</i>	(-)	6.297		4.175		2.122		1.608	
		1.051		0.922		1.087		0.499	
<i>Recycled*Technology</i>	(+)	31.145	***	23.578	***	7.567	***	17.583	***
		3.862		3.550		4.086		3.029	
<i>LitgRisk</i>	(+)	0.032		0.023		0.009		0.012	
		1.051		0.968		1.067		0.616	
<i>CapDema</i>	(+)	1.781	***	1.348	***	0.433	***	0.875	***
		4.519		4.259		4.258		3.283	
<i>Leverage</i>	?	-7.787		-5.402		-2.385		-2.874	
		-1.171		-1.053		-1.318		-0.762	
<i>Size</i>	(+)	4.614	***	3.579	***	1.035	***	2.489	***
		5.230		5.027		4.861		4.416	
<i>OthDisc</i>	(+)	0.180	***	0.153	***	0.027	***	0.104	***
		3.737		3.757		2.608		3.009	
<i>Pharmaceutical</i>	?	5.541	**	5.253	**	0.289		4.537	**
		2.048		2.360		0.494		2.329	
Adj. R <sup>2</sup>		0.683		0.690		0.527		0.627	
N		74		74		74		74	

(continued on next page)

**TABLE 30 (Continued)**

**Panel B: Disposed**

<u>Variable</u>		<u>Total</u> <u>Coef.</u>		<u>Hard</u> <u>Coef.</u>		<u>Soft</u> <u>Coef.</u>		<u>A3</u> <u>Coef.</u>	
<i>Intercept</i>	?	-31.318	***	-25.493	***	-5.825	***	-19.458	***
		-5.624		-5.562		-4.643		-5.207	
<i>Image</i>	(+)	4.839	**	3.139	*	1.700	**	2.490	*
		1.712		1.424		2.285		1.450	
<i>Technology</i>	(+)	4.198	*	3.438	*	0.760		3.762	**
		1.415		1.438		1.062		1.992	
<i>Disposed</i>	(+/-)	9.521	**	5.700	**	3.821	*	4.486	**
		2.089		1.752		1.615		1.788	
<i>Disposed*Image</i>	(+)	-19.405	***	-13.584	***	-5.821	**	-9.481	***
		-3.236		-3.234		-2.051		-2.785	
<i>Disposed*Technology</i>	(-)	-17.141	***	-12.445	***	-4.696	**	-9.786	***
		-2.933		-2.761		-1.955		-2.450	
<i>LitgRisk</i>	(+)	-0.007		-0.006		-0.001		-0.005	
		-0.269		-0.284		-0.162		-0.267	
<i>CapDema</i>	(+)	1.536	***	1.140	***	0.397	***	0.697	***
		3.944		3.690		3.855		2.810	
<i>Leverage</i>	?	0.671		1.122		-0.450		1.997	
		0.112		0.252		-0.257		0.608	
<i>Size</i>	(+)	4.081	***	3.177	***	0.904	***	2.236	***
		4.765		4.627		4.461		4.188	
<i>OthDisc</i>	(+)	0.218	***	0.179	***	0.039	***	0.121	***
		5.204		5.039		4.201		3.953	
<i>Pharmaceutical</i>	?	4.425		4.469	*	-0.045		3.982	*
		1.555		1.890		-0.076		1.952	
Adj. R <sup>2</sup>		0.663		0.674		0.503		0.605	

(continued on next page)

**TABLE 30 (Continued)**

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\*, \*\*, \*\*\* significant at 10 percent, 5 percent, and 1 percent, respectively, in a one-tailed test if a directional prediction is made and a two-tailed test otherwise;

t-statistics are under the coefficient estimates; based on robust standard errors;

Dependent variables are VED scores on top of each model;

*Pharmaceutical:* equals 1 if the SIC code of a company is 2834, and 0 otherwise;

*Image* and *Technology* are defined in Table 11;

Other variables are defined in Table 1.

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## APPENDIX A

### The Disclosure Checklist of Voluntary Environmental Disclosure

Source: Clarkson et al. (2006)

#### **HARD DISCLOSURE ITEMS**

#### **Map to GRI**

##### ***A1) Governance Structure and Management Systems (max score is 6)***

- |  |            |
|--|------------|
| 1. Existence of a Department for pollution control and/or management positions for env. management (0-1)     | 3.1        |
| 2. Existence of an Environmental and/or a Public Issues Committee in the board (0-1)                         | 3.1        |
| 3. Existence of terms and conditions applicable to suppliers and/or customers regarding env. practices (0-1) |            |
| 4. Stakeholder involvement in setting corporate environmental policies (0-1)                                 | 1.1, 3.10  |
| 5. Implementation of ISO14001 at the plant and/or firm level (0-1)   | 3.14, 3.20 |
| 6. Executive compensation is linked to environmental performance (0-1)                                       | 3.5        |

##### ***A2) Credibility (max score is 10)***

- |  |               |
|--|---------------|
| 1. Adoption of GRI sustainability reporting guidelines or provision of a CERES report (0-1)  | 3.14          |
| 2. Independent verification/assurance about environmental information disclosed in the EP report/Web.(0-1)                                 |               |
| 3. Periodic independent verifications/audits on environmental performance and/or systems (0-1)   | 3.19, 2.20,21 |
| 4. Certification of environmental programs by independent agencies (0-1)   | 3.2           |
| 5. Product Certification with respect to environmental impact (0-1)  | 3.16          |
| 6. External Environmental Performance Awards and/or inclusion in a Sustainability Index (0-1)  |               |
| 7. Stakeholder involvement in the environmental disclosure process (0-1)   | 1.1, 3.10     |
| 8. Participation in voluntary environmental initiatives endorsed by EPA or Department of Energy (0-1)                                      | 3.15          |
| 9. Participation in industry specific associations/initiatives to improve environmental practices (0-1)                                    | 3.15          |
| 10. Participation in other environmental organizations/assoc. to improve environmental practices (if not awarded under 8 or 9 above) (0-1) | 3.15          |

**A3) Environmental Performance Indicators (EPI) (max score is 60)\***

1. EPI on energy use and/or energy efficiency (0-6)	EN3,4,17
2. EPI on water use and/or water use efficiency (0-6)	EN5
3. EPI on green house gas emissions (0-6)	EN8
4. EPI on other air emissions (0-6)	EN9,10
5. EPI on TRI (land, water, air) (0-6)	EN11
6. EPI on other discharges, releases and/or spills (not TRI) (0-6)	EN12,13
7. EPI on waste generation and/or management (recycling, re-use, reducing, treatment and disposal) (0-6)	EN11
8. EPI on land and resources use, biodiversity and conservation (0-6)	EN6,7
9. EPI on environmental impacts of products and services (0-6)	EN14
10. EPI on compliance performance (e.g. exceedances, reportable incidents) (0-6)	EN16

**A4) Environmental Spending (max score is 3)**

1. Summary of dollar savings arising from environment initiatives to the company (0-1)	
2. Amount spent on technologies, R&D and/or innovations to enhance environmental performance and/or efficiency (0-1)	EN35
3. Amount spent on fines related to environmental issues (0-1)	EN16

**NOTE: \* The scoring scale of environmental performance data is from 0 to 6. A point is awarded for each of the following items:**

- 1) Performance data is presented
- 2) Performance data is presented relative to peers/rivals or industry
- 3) Performance data is presented relative to previous periods (trend analysis)
- 4) Performance data is presented relative to targets
- 5) Performance data is presented both in absolute and normalized form
- 6) Performance data is presented at disaggregate level (i.e. plant, business unit, geographic segment).



**SOFT DISCLOSURE ITEMS****Map to GRI*****A5) Vision and Strategy Claims (max score is 6)***

- |   |               |
|---|---------------|
| 1. CEO statement on environmental performance in letter to shareholders and/or stakeholders (0-1)               |               |
| 2. A statement of corporate environmental policy, values and principles, environ. codes of conduct (0-1)        | 1.1, 1.2, 3.7 |
| 3. A statement about formal management systems regarding environmental risk and performance (0-1)               | 3.19          |
| 4. A statement that the firm undertakes periodic reviews and evaluations of its environmental performance (0-1) | 3.19          |
| 5. A statement of measurable goals in terms of future environmental performance (if not awarded under A3) (0-1) | 1.1           |
| 6. A statement about specific environmental innovations and/or new technologies (0-1)                           | 1.1           |

***A6) Environmental Profile (max score is 4)***

- |  |      |
|--|------|
| 1. A statement about the firm's compliance (or lack thereof) with specific environmental standards (0-1) | GN 8 |
| 2. An overview of environmental impact of the industry (0-1)   | GN 8 |
| 3. An overview of how the business operations and/or products and services impact the environment. (0-1) | GN 8 |
| 4. An overview of corporate environmental performance relative to industry peers (0-1)                   | GN 8 |

***A7) Environmental Initiatives (max score is 6)***

- |  |           |
|--|-----------|
| 1. A substantive description of employee training in environmental management and operations (0-1)       | 3.19      |
| 2. Existence of response plans in case of environmental accidents (0-1)                                  |           |
| 3. Internal Environmental Awards (0-1)   |           |
| 4. Internal Environmental Audits (0-1)   | 3.19 3.20 |
| 5. Internal certification of environmental programs (0-1)  | 3.19      |
| 6. Community involvement and/or donations related to environ. (if not awarded under A1.4 or A2.7 ) (0-1) | SO1, EC10 |

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The "Map to GRI" column refers to the corresponding section in the Sustainability Reporting Guidelines 2002 published by the Global Reporting Initiative (GRI).

## APPENDIX B

### The List of Sample Chemical Companies

<b><u>No.</u></b>	<b><u>Company Names</u></b>
1	ABBOTT LABORATORIES
2	AIR PRODUCTS AND CHEMICALS INC.
3	ALBEMARLE CORP.
4	ALPHARMA INC.
5	AMERICAN VANGUARD CORP.
6	ANIKA THERAPEUTICS INC.
7	BARR PHARMACEUTICALS INC.
8	BIOGEN IDEC INC.
9	BIOSITE INC.
10	BRISTOL-MYERS SQUIBB CO.
11	CALGON CARBON CORP.
12	CELANESE CORP.
13	CHIRON CORP.
14	CHURCH & DWIGHT CO. INC.
15	CLOROX CO.
16	COLGATE-PALMOLIVE CO.
17	CYTEC INDUSTRIES INC.
18	DOW CHEMICAL CO.
19	DU PONT (E I) DE NEMOURS
20	EASTMAN CHEMICAL CO.
21	ECOLAB INC.
22	ELI LILLY & CO.
23	ENGELHARD CORP.
24	ENZON PHARMACEUTICALS INC.
25	EQUISTAR CHEMICALS LP
26	ESTEE LAUDER INC.
27	GENZYME CORP.
28	HERCULES INC.
29	HEXCEL CORP.
30	HOSPIRA INC.
31	HUNTSMAN CORP.
32	INTEGRATED BIOPHARMA INC.
33	INTERNATIONAL FLAVORS & FRAGRANCES INC.
34	INVITROGEN CORP.
35	JOHNSON & JOHNSON
36	JOHNSONDIVERSEY INC.
37	KING PHARMACEUTICALS INC.
38	KOPPERS INC.
39	LSB INDUSTRIES INC.
40	LYONDELL CHEMICAL CO.
41	MACDERMID INC.
42	MERCK & CO INC.
43	MINERALS TECHNOLOGIES INC.
44	MONSANTO CO.
45	NALCO HOLDING CO.

46 NEWMARKET CORP.  
47 NOVEN PHARMACEUTICALS INC.  
48 OMNOVA SOLUTIONS INC.  
49 PERRIGO CO.  
50 PFIZER INC.  
51 POLYONE CORP.  
52 PPG INDUSTRIES INC.  
53 PRAXAIR INC.  
54 PROCTER & GAMBLE CO.  
55 REVLON INC.  
56 ROHM & HAAS CO.  
57 RPM INTERNATIONAL INC.  
58 SCHERING-PLOUGH CORP.  
59 SCOTTS MIRACLE-GRO CO.  
60 SENSIENT TECHNOLOGIES.  
61 SHERWIN-WILLIAMS CO.  
62 SIGMA-ALDRICH CORP.  
63 SMITH INTERNATIONAL INC.  
64 SOLUTIA INC.  
65 STEPAN CO.  
66 SYNTHETECH INC.  
67 US ENRICHMENT CORP. (USEC)  
68 VALSPAR CORP.  
69 VERASUN ENERGY CORP.  
70 VIRBAC CORP.  
71 W.R. GRACE & CO.  
72 WATSON PHARMACEUTICALS INC.  
73 WELLMAN INC.  
74 WYETH

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VITA

Qianhua Ling

Candidate for the Degree of

Doctor of Philosophy

Thesis: COMPETITIVE STRATEGY, VOLUNTARY ENVIRONMENTAL  
DISCLOSURE STRATEGY, AND VOLUNTARY ENVIRONMENTAL  
DISCLOSURE QUALITY

Major Field: Business Administration – Accounting

Biographical:

Education: Completed the requirements for the Doctor of Philosophy degree at Oklahoma State University, Stillwater, Oklahoma in July 2007; received the Bachelor of Science degree in Accounting from Beijing Technology and Business University, Beijing, China in July 1997.

Experience: Lecturer, Principles of Managerial Accounting, Oklahoma State University, 2003-2007 (with Spring 2004 off); Research Assistant and Graduate Assistant, Oklahoma State University, Stillwater, Oklahoma, 2001-2003 and Spring 2004; Senior Accountant and Project Manager, Beijing Ericsson Communication Systems Co. Ltd., Beijing, China, 1998-2001; Accountant and Financial Assistant, Occidental Eastern Inc. (A subsidiary of Occidental Oil and Gas Corp.), Beijing, China, 1997-1998.

Professional Memberships: American Accounting Association; Chinese Institute of Certified Public Accountants (CPA).

Name: Qianhua Ling

Date of Degree: July, 2007

Institution: Oklahoma State University

Location: Stillwater, Oklahoma

Title of Study: COMPETITIVE STRATEGY, VOLUNTARY ENVIRONMENTAL  
DISCLOSURE STRATEGY, AND VOLUNTARY ENVIRONMENTAL  
DISCLOSURE QUALITY

Pages in Study: 154

Candidate for the Degree of Doctor of Philosophy

Major Field: Business Administration – Accounting

Scope and Method of Study: Concerns exist that companies make voluntary environmental disclosures (VED) primarily to enhance their public image. In response to the concerns, this study examines whether a company's competitive strategy is an important factor in the VED decision, and also in the quality of VED. This study focuses on a highly polluting industry, the chemical industry, and adopts various measurement methods and econometric specifications for the examination.

Findings and Conclusions: Using VED about 2004 environmental performance, this study finds that companies emphasizing investment in brand image are likely to voluntarily provide more environmental information than companies that do not emphasize this strategy. Companies emphasizing investment in R&D are likely to make more voluntary disclosures about actual environmental performance than companies that do not emphasize the strategy.

This study also finds that company competitive strategies affect the association between VED and environmental performance differently. If the environmental performance measure has implications for sustainability, the association between VED and environmental performance is the same or more negative for companies emphasizing investment in brand image relative to other companies. If the environmental performance measure has implications for environmental liabilities, the association between VED and environmental performance is adjusted, so these companies' VED are less likely to relate to poor environmental performance. For companies emphasizing investment in R&D, the tendency of VED to be linked to poor environmental performance is ameliorated. The association between VED and environmental performance is stronger for R&D companies compared to other companies. This association is also stronger if the environmental performance measure has implications for sustainability than if the environmental performance measure has implications for environmental liabilities.

ADVISER'S APPROVAL: Dr. Maryanne Mowen

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