

Does It Pay to Be Green? Financial Benefits of Environmental Labeling among Chinese Firms, 2000–2005

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ABSTRACT Drawing on economic, sociological, and strategic perspectives, we use data of a large sample of 936 Chinese manufacturing firms in the period from 2000 to 2005 to examine how environmental labeling may affect a firm's financial performance. We argue that reducing information asymmetry, increasing legitimacy, and differentiating strategically through environmental labeling may prompt customers to patronize the firm, thereby enhancing firm performance. However, not all firms benefit equally; environmental labeling conveys fewer benefits for larger firms and for firms listed in a stock market, because they are less threatened by information asymmetry or insufficient organizational legitimacy. Our findings suggest that environmental labeling has generally limited influence on financial performance, but for small and unlisted firms, environmental labeling increases sales.

KEYWORDS China, economic performance, environmental labeling, green management, sustainability

INTRODUCTION

Humanity is increasingly threatened by environmental degradation, evidenced by resource depletion, such as deforestation, overfishing, water scarcity, global warming, air pollution, and the extinction of escalating numbers of species. Business firms contribute heavily to environmental problems and, thus, face growing pressure to be more environmentally friendly in their production processes. In the past two decades, to encourage firms to pursue environmentally responsible behaviors, many countries and regions have launched environmental labeling programs, for example, Germany's 'Blue Angel', Japan's 'Eco-Mark', Sweden's 'Environmental Choice', Nordic countries' 'Swan', and the European Union's 'Ecoflower'. These programs require third-party verifications, which award labels based on certain environmental standards, typically by assessing the product's entire life cycle, including production, use, and disposal. A labeled product must demonstrate that it is more environmentally friendly than similarly unlabeled products (Zhao & Xia, 1999).

Despite the increasing popularity of environmental labeling programs worldwide, little research has examined whether voluntary certification of environmental labeling brings any advantage to a firm, such as increased sales or stronger financial performance. Studies on environmental labeling typically focus on assessing its effects on purchasing behaviors (e.g., Bjørner, Hansen, & Russell, 2004) or on motivations for seeking certifications (Shen & Qin, 2011). Theoretical accounts and empirical evidence are lacking on whether firms benefit financially from obtaining environmental labels for their products. The current study aims to fill this gap in the literature.

Despite a dearth of empirical evidence about the financial consequences of environmental labeling, there are many studies on the question of how environmental initiatives generally affect financial performance. Theoretical accounts are contradictory regarding financial outcomes of various environmental initiatives. Some scholars argue that environmental initiatives can provide long-term benefits by reducing long-term costs, decreasing liability exposure, increasing efficiency, enhancing stakeholder relations, and improving public image (e.g., Hart, 1995; Hoffman, 1997). However, others argue that environmental initiatives represent a trade-off between social benefits and increased operating costs (e.g., Friedman, 1970; Walley & Whitehead, 1994). The empirical evidence is also mixed. Some studies found that environmental initiatives positively affect financial performance (e.g., Freeman & Evan, 1990; Wahba, 2007), while others found null or negative relationships (e.g., González-Benito & González-Benito, 2005; Link & Naveh, 2006).

Several factors might explain the contradictory results. First, unique environmental initiatives may affect financial performance differently. For example, process-oriented, internally focused environmental initiatives do not undergo third-party verification processes, so consumers may not know about the initiatives. In contrast, externally oriented environmental initiatives require third-party verification and certification, the information that customers and other external stakeholders can see on product labels. Thus, environmental initiatives may significantly differ in their effects on financial performance, depending on their visibility.

Second, environmental initiatives affect aspects of financial performance differently. For example, in a sample of Malaysian firms, ISO 14000 positively affected return on equity (ROE) but not sales or capitalization (Nga, 2009). In a sample of Egyptian firms, ISO 14001 and Tobin's q showed a positive relationship (Wahba, 2007). In general, research has accumulated too little evidence to allow consistent conclusions on the financial consequences of different environmental initiatives.

Third, prior research has insufficiently examined the boundary conditions under which environmental initiatives affect financial performance (Sharma & Starik, 2002). One exception is a study of the wine industry, which found that if customers perceive lower quality in wines labeled environmentally friendly, they tend to be less willing to pay more for labeled wines (Delmas & Grant, 2014).

In general, prior research on environmental initiatives and financial performance is fragmented, suggesting the need for more research on how specific environmental initiatives may affect different aspects of financial performance. In this study, we examine specifically how environmental labeling, a type of environmental initiative, may affect firms financially. Drawing on economic, sociological, and strategic perspectives, we argue that environmental labeling may benefit firms financially, because it reduces information asymmetry, increases a firm's legitimacy with its stakeholders, potentially reduces costs, or differentiates a firm from its competitors. However, not all firms benefit equally from environmental labeling. Firms that suffer more information asymmetry with stakeholders or firms with less legitimacy have more to gain from environmental labeling, because environmental labeling can potentially help them reduce information asymmetry and enhance legitimacy. Smaller firms and unlisted firms (i.e., firms that are not listed in a stock market) tend to have more information asymmetry and less legitimacy with stakeholders; therefore, they might potentially benefit more from environmental labeling.

For our empirical context, we chose China, where the past three decades of rapid economic growth have created environmental problems that significantly threaten public health. The Chinese government launched its environmental labeling program in 1993 to encourage Chinese firms to institute environmentally responsible practices. However, as mentioned, research has not yet shown whether certifying products through environmental labeling programs affects financial performance. Because the Chinese environmental labeling program is very similar to programs elsewhere, the results of this study are applicable to similar environmental labeling programs in other countries.

China's Environmental Labeling Program

In 1993, the State Environmental Protection Administration of China (SEPA) launched China's environmental labeling program, a voluntary third-party certification system based on the labeling procedures developed by the Organization for Economic Cooperation and Development Countries (OECD), adapted to China's economic and social situations. The China Certification Committee for Environmental Labeling (CCEL) was established in 1994 to manage the program under the direction of the China State Bureau of Technology Supervision (CSBTS) and SEPA (Zhao & Xia, 1999). At the end of 2002, the China Environmental United Center (CEC), supervised by the CCEL, was created as the *only* environmental labeling body to carry out China's environmental labeling certification.

China's environmental labeling program uses the life cycle approach popular with various labeling programs worldwide (USEPA, 1998). The life cycle approach examines a product's life cycle, beginning with its initial raw materials and following its production, use, and disposal. To obtain certification, products must meet set quality, safety, and hygiene standards, and firms must meet national standards for pollutant discharges for their particular industry. Technical experts conduct

on-site inspections to examine the product and production processes based on established procedures and standards. Authorized testing institutions test product samples before the CEC's technical committee assesses whether to issue labels. Once awarded a label for a product, the company signs a three-year licensing agreement with the CEC. The agreement grants the use of the CEC's seal of approval, conditioned on continued environmental compliance through annual or biannual inspections performed by the local environmental protection agency.

The CEC collects fees from the applicants for the application process, site inspection, product testing, and product approval. In addition, the awardees pay licensing fees for using the label. The fees are calculated based on product sales, the nature of the product, and firm size. Such an approach makes it possible for small firms to apply for labels (USEPA, 1998).

By 2010, 1,600 companies with more than 30,000 products were certified for environmental labeling. The total production value of those labeled products has reached more than RMB 100 billion *yuan* (about US\$15.4 billion) (Wu, 2010). Certified product categories generally include those that are in international environmental agreements and those devoted to enhancing renewable energy and recycling, improving environmental quality in regions or in homes, protecting human health, and saving resources and energy. Specific product categories include, for example, textiles, furniture, detergents, electronics, automobiles, refrigerators, paper products, plant fiber products, packaging products, chemical products, construction materials, and degradable materials.^[1] Although some of the products are industrial goods for business-to-business markets, others are products for business-to-consumer markets. Therefore, labeling affects all customers, including individual consumers and procurement departments of companies and government agencies.

Since 2003, the CCEL has signed agreements for mutual recognition of labels with certifiers in Japan, Germany, Australia, New Zealand, and South Korea, illustrating that the Chinese labeling program is gaining increasing credibility in international markets. Although some may still question the credibility of the Chinese environmental labeling program compared with programs in other countries, in the Chinese context, where product information is scarce and credible independent rating agencies are few, some information is better than none.

China's environmental labeling program shares the same purposes as other worldwide environmental labeling programs: to raise public awareness of environmental protection and encourage individual and institutional customers to buy earth-friendly products. The program encourages firms to adopt clean technologies in manufacturing products that are closely related to human health (Bjørner et al., 2004). Although environmental labels apparently affect purchasing choices (Huang, Zhang, & Deng, 2006), it is essential to understand whether environmental labeling positively affects firms' financial performance, because that will directly affect their motivation to apply for labels and, thereby, will affect the success of the labeling program.

Table 1. Categories of environmental initiatives

| | <i>Third-party certification</i> | <i>No third-party certification</i> |
|---------------|----------------------------------|---|
| Process based | ISO 14000 series | EMS, pollution control, recycling and waste reduction, remanufacturing, and environmental design |
| Product based | Environmental labeling | 'No animal test' label '100% natural' label |

THEORETICAL BACKGROUND AND HYPOTHESES

Prior research of the impact of environmental initiatives on financial performance yielded mixed results (see the Appendix for a summary of these studies). We distinguish various environmental initiatives based on two dimensions: process-based vs. product-based initiatives and third-party certification vs. no third-party certification. For example, environmental labeling is a product-based environmental initiative that requires third-party certification. The environmental management system (EMS), an integrated system comprising organizational structures, processes, practices, and resources required to reduce environmental influence (Nga, 2009), is a process-based initiative that does not necessarily require third-party certification. Such initiatives may also include, for example, a recycling and waste reduction program. An example of process-based initiatives that require third-party certification is the ISO 14000 series, introduced by the International Organization for Standardization (ISO) to establish the basic structural elements of an EMS (Melnyk, Sroufe, & Calantone, 2003). An example of product-based initiative with no requirement of third-party certification might be a product that uses all natural ingredients. Table 1 illustrates these different initiatives with examples.

The most widely studied environmental initiatives are EMSs and the ISO 14000 series of standards. Three studies explored the relationship between EMSs and firm performance and found either positive or no effects. A study of 262 hotels in Spain showed that EMS adoption positively impacted profitability and occupancy rate (Gil, Jiménez, & Lorente, 2001). A positive link also was found between EMS adoption and perceived corporate performance of 1,222 American manufacturing firms (Melnyk et al., 2003). However, another study of U.S. firms showed no relationship between EMS adoption and financial performance (Watson, Klingenberg, Polito, & Geurts, 2004).

Empirical evidence also provides mixed findings regarding the effects of the ISO 14000 series of standards on financial performance. Some studies found a positive link between ISO 14000 and perceived economic performance (Ann, Zailani, & Wahid, 2006), ROE (Nga, 2009), and Tobin's q (Wahba, 2007), while others found no effect on gross profit margin (Link & Naveh, 2006) or sales and capitalization (Nga, 2009). Other process-based environmental initiatives that do not require third-party verification include pollution control initiatives, recycling,

waste reduction, remanufacturing, or environmental design initiatives. Positive relationships are generally found between these environmental initiatives and financial performance (e.g., Chien & Peng, 2012; Christmann, 2000; Hart & Ahuja, 1996; Montabon, Sroufe, & Narasimhan, 2007; Nehrt, 1996). Our literature review found only one study linking environmental labeling and financial performance (Delmas & Grant, 2014).

Drawing on economic, sociological, and strategic perspectives, we explore whether and when firms may benefit financially from environmental labeling with a sample of Chinese manufacturing firms. We view these three perspectives as complementary mechanisms through which environmental labeling may bring positive returns to firms.

The Main Effect of Environmental Labeling on Financial Performance

There are at least three reasons why environmental labeling may benefit firms financially: reducing information asymmetry between firms and buyers, enhancing firms' legitimacy, and providing strategic advantage through reduced costs or product differentiation.

First, from an economic perspective, environmental labeling may benefit firms through the reduction of information asymmetry. Theories on economics of information explain that buyers spend considerable time and effort in finding sellers who offer the lowest prices (Stigler, 1961). Information about quality is harder to find than data about prices, so buyers might expend even greater search costs to find the highest quality products (Nelson, 1970) and be more interested in information about quality than about prices (Andrews, 1992). Although researching, examining, or consuming products can reveal the quality information of some products, the quality of others may be less easily discerned. Such goods are called *credence goods* (Caswell & Mojdzuska, 1996). For example, consumers cannot easily test milk for protein levels or test toys for lead, which creates significant information asymmetry between sellers and buyers.

Environmental labeling transforms credence attributes to search attributes (Caswell, 1998). Labeling is a simple way for firms to convey complex environmental information indicating that the product is more environmentally friendly than similar unlabeled products, that it meets primary concerns of quality and safety standards, and that it is less hazardous and more energy efficient (Bjørner et al., 2004). By encountering reduced search costs, buyers should prefer labeled products to unlabeled products and even be willing to pay more for them (Bjørner et al., 2004; Nelson, 1970; Shen & Saijo, 2009). If consumers are willing to pay more for labeled products, environmental labeling and the firm's subsequent financial performance should be positively related.

Second, environmental labeling may also benefit firms financially by enhancing their legitimacy. Organizational legitimacy can be defined as the generalized perception that an organization's actions are desirable and appropriate within

a social system (Suchman, 1995). One central element of organizational legitimacy is that the organization meets expectations of social norms and rules. An organization's legitimacy is essential for its survival and operations if it is to continually draw resources from the social system (Dowling & Pfeffer, 1975).

To achieve legitimacy, organizations typically adapt their goals, outputs, and operations to correspond with these social norms and rules (Dowling & Pfeffer, 1975; Parsons, 1956). Environmental labeling can enhance organizational legitimacy, because it is a prevailing norm and even moral obligation for goods and services to be produced less destructively (Donaldson & Dunfee, 1994). In other words, stakeholders expect legitimate firms to be environmentally responsible. By certifying through environmental labeling, firms may effectively signal their environmental commitment and enhance their stakeholder relationships (Jiang & Bansal, 2003). Good stakeholder relationships can serve as valuable, rare, inimitable, and nonsubstitutable resources, which help well-performing firms to sustain their long-term financial advantages and help poor-performing firms overcome their disadvantages rapidly (Choi & Wang, 2009). By demonstrating social concerns, a firm could enhance its reputation, charge higher prices, and enjoy better financial performance (Fombrun & Shanley, 1990). A sample of 100 publicly listed US manufacturing firms in heavily polluting sectors showed that corporate environmental legitimacy reduced unsystematic stock market risks (Bansal & Clelland, 2004).

A third benefit of environmental labeling is that it may serve as a strategic tool for cost reduction and product differentiation. The process of certifying for environmental labeling may force firms to transform their manufacturing processes to reduce waste and pollution and to increase efficiency (Hart & Ahuja, 1996; Porter & van der Linde, 1995). It may also reduce production costs by eliminating costly materials, reducing unnecessary packaging, or simplifying designs (Porter & van der Linde, 1995). It is less expensive to reduce emissions during the manufacturing process than to use pollution control equipment to treat pollution after it is created (Hart & Ahuja, 1996). For example, Ciba-Geigy's dyestuff plant in New Jersey changed its production process by (1) replacing iron with a chemical conversion agent that did not produce solid iron sludge and (2) eliminating the release of potentially toxic product into the wastewater stream. These two changes boosted yield by 40% and also eliminated waste, for an annual cost savings of \$740,000 (Dorfman, Muir, & Miller, 1992). Green design also conveyed benefits more than 10 times greater than the additional costs of building green in a sample of 33 green buildings (Kats, 2003; for more examples, see Porter & van der Linde, 1995).

Environmental labeling allows firms to market their products using environmental consciousness as a point of differentiation and unique brand identity (Rivera, 2002). For example, Natura, a Brazilian firm founded in 1969, manufactures high-end cosmetics, fragrances, and personal hygiene products using all-natural ingredients, carbon-neutral operations, and recycled packages.

Natura successfully uses environmental and social responsibility in its strategy and operations as its brand appeal.

Environmental labeling has a positive relationship with premium prices. A study of Nordic Swan environmental labeling effects from 1997 to 2001 showed that consumers willingly paid 13% to 18% more for labeled toilet paper and detergents (Bjørner et al., 2004). Customers were willing to pay premium prices for environmentally friendly products not only because they viewed the firms that provided the products as socially responsible but also because they perceived the products to be safer and more beneficial to human health. In China, governments and other organizations are increasingly using environmentally friendly products. The CEC website, for example, reports that the Chinese government strongly urges government agencies to purchase environmental-labeled products. Based on the above discussion, we hypothesize:

Hypothesis 1: Environmental labeling will positively impact a firm's financial performance.

The Moderating Role of Firm Size and Public Listing Status

Environmental labeling may not benefit all firms equally. Firms that suffer more information asymmetry with stakeholders or firms with less legitimacy potentially will have more to gain from environmental labeling. Two important firm characteristics – firm size and public listing status – may alter the relationship between environmental labeling and financial performance. Firm size is one of the most important contingency variables moderating the relationship between strategy and performance (Hofer, 1975; Smith, Guthrie, & Chen, 1989). Smaller firms should have more to gain from environmental labeling, because smaller firms suffer more information asymmetry problems and are less legitimate than larger firms. Large firms are more visible. They have well-established, well-known brand names (Jiang & Bansal, 2003; Etzion, 2007); products that reach many customers; and more marketing resources to advertise their product features, including environmental characteristics. In addition, larger size signals quality, success, and legitimacy. Potential customers typically trust well-known brands from larger firms with established track records compared with unknown brands from smaller firms.

Smaller firms, in contrast, suffer from 'liability of smallness'. Their products are less known and less visible, their customer base is smaller, and they lack marketing resources. Thus, environmental labeling, as a tool for reducing information asymmetry and gaining trust, should have a stronger positive effect for smaller firms. Hence, we hypothesize:

Hypothesis 2: Environmental labeling and financial performance will have a stronger positive relationship for smaller than for larger firms.

Most studies on the relationship between environmental initiatives and financial performance focus on publicly listed firms in developed countries (e.g., Konar

& Cohen, 2001). We know little about how environmental initiatives may affect firms with other ownership status, such as unlisted firms, especially from emerging markets. Unlisted firms, however, should benefit more from environmental labeling, because they face more information asymmetry and are arguably less legitimate than publicly listed firms.

Listed firms are subject to greater public scrutiny. They are legally required to regularly reveal their activities, operations, and financial performance, often through standardized reporting mandates, such as annual reports. Industry analysts and the press also carefully monitor listed firms' activities, because investors want and need the information (Bushman, Piotroski, & Smith, 2004; Piotroski & Wong, 2011). Consumers can easily find information related to listed firms through various Internet sites and the popular media. Unlisted firms, in contrast, are not legally obligated to disclose information about their operations and practices, which affect only a few private owners rather than many shareholders. Thus, unlisted firms tend to attract less industry analysis and press interest and have more information asymmetry with potential customers and other stakeholders.

In addition, listed firms have successful track records that partially led to their stock market listing. For example, in China, regulations require firms to meet certain criteria before applying for initial public offering (IPO) status. They must be profitable for three consecutive years, they must have formalized governance structures, and they must meet financial reporting and auditing requirements. In addition, unsuccessful firms may be unable to pursue IPO status, because potential investors may be unwilling to invest in a company that has not shown sustained financial performance. Stakeholders, therefore, may perceive that a publicly listed firm is more successful and legitimate than an unlisted firm. Hence, unlisted firms may benefit more from environmental labeling that can reduce information asymmetry and enhance their organizational legitimacy:

Hypothesis 3: Environmental labeling and financial performance will have a stronger positive relationship for unlisted than for listed firms.

METHOD

Sample and Procedure

The data for this study came from a database of Chinese industrial firms published by the All-China Federation of Industry and Commerce, the China Private Economy Association, and the Chinese National Statistical Bureau. The database includes firm survey and firm financial statements. Only firms with annual sales volumes larger than RMB 5 million *juan* (about US\$625,000 using the March 2006 exchange rate) were included in the initial survey. The sampled firms are representative in terms of ownership (i.e., state-owned, foreign-owned, and domestic private firms) and firm size. The firm survey was conducted in March

2006 in 12 major cities: Changchun, Dandong, Chifeng, Beijing, Shijiazhuang, Xi'an, Zibo, Chongqing, Shiyao, Wujiang, Hangzhou, and Shunde. About 100 to 140 surveys were gathered in each city. Trained research assistants filled out the survey questions based on their interviews with general managers about corporate social responsibility practices and performance. The survey was matched with the National Statistics Bureau's industrial enterprise database, which contains information for the sampled firms, such as industry, ownership type, financial statements from 2000 to 2005, and additional objective operational information, including wages, taxes, profits, sales revenue, total fixed assets, and employment size.

The original database contains 1,268 firms, evenly spread throughout China's coastal, central, and western regions and belonging to 37 industries at the two-digit industry code level, as defined by the State Statistical Bureau. We included only firms in the manufacturing sector and excluded those in mining and water/gas/electric power, as environmental labeling applied mainly to the manufacturing sector during this period. In addition, to examine the effects of environmental labeling over time, we retained only sample firms that reported operational information for at least two consecutive years. Therefore, the valid sample we used to test the hypotheses contained 936 firms, with 2,749 firm-year observations, representing 29 industries at the two-digit industry code level. Table 2 shows the number of firms certified for environmental labeling for each of the 29 industries in 2005. In 2005, sampled firms averaged 708 workers, 76.82% were small-to-medium enterprises with fewer than 500 employees, 67.95% were domestic private firms, 8.87% were state-owned enterprises (SOEs), 12.71% were foreign-invested enterprises (FIEs), and about 10.47% were Hong Kong/Macaw/Taiwan-invested enterprises (HMTs). The ownership and size distribution of the 936 manufacturing firms for this study are comparable to the original sample of 1,268 firms in all industries.

Measures

Dependent variables. We measured the financial performance of Firm i at year t with three indicators: sales, profit, and return on sales (ROS). We took the natural logarithm of a firm's sales revenue (in RMB 1,000 *yuan*) because of the overdispersion of this variable. We transformed the value of profit according to the following formula to deal with negative profits for some cases:

$$\text{Profit}_{it}^* = \ln [\text{Profit}_{it} + (|C| + 1)],$$

where Profit_{it} represents the net profit of Firm i at year t and C equals the largest negative value of Profit_{it} (Wang, Guthrie, & Xiao, 2012). The ROS was calculated as the net income divided by sales revenue at year t .

Independent variable. The questionnaire asked respondents whether the firm was certified for environmental labeling and, if so, what year that occurred. We coded

Table 2. The number of firms with environmentally labeled product(s) in 2005 by industry

| <i>Industry Code</i> | <i>Industry Name</i> | <i># of Firms Not Labeled</i> | <i># of Firms Labeled</i> | <i>Total # of Firms</i> | <i>% of Labeled Firms</i> |
|----------------------|--|-------------------------------|---------------------------|-------------------------|---------------------------|
| 13 | Processing of food from agricultural products | 43 | 10 | 53 | 18.87% |
| 14 | Manufacture of foods | 25 | 4 | 29 | 13.79% |
| 15 | Manufacture of beverages | 19 | 2 | 21 | 9.52% |
| 16 | Manufacture of tobacco | 1 | 0 | 1 | 0.00% |
| 17 | Manufacture of textiles | 71 | 5 | 76 | 6.58% |
| 18 | Manufacture of textile wearing apparel, footwear, and caps | 32 | 1 | 33 | 3.03% |
| 19 | Manufacture of leather, fur, feather, and related products | 18 | 0 | 18 | 0.00% |
| 20 | Processing of timber; manufacture of wood, bamboo, rattan, palm, and straw products | 3 | 3 | 6 | 50.00% |
| 21 | Manufacture of furniture | 5 | 1 | 6 | 16.67% |
| 22 | Manufacture of paper and paper products | 20 | 0 | 20 | 0.00% |
| 23 | Printing; reproduction of recording media | 17 | 0 | 17 | 0.00% |
| 24 | Manufacture of articles for culture, education, and sport activity | 3 | 0 | 3 | 0.00% |
| 25 | Processing of petroleum, coking, and nuclear fuel | 10 | 0 | 10 | 0.00% |
| 26 | Manufacture of raw chemical materials and chemical products | 72 | 11 | 83 | 13.25% |
| 27 | Manufacture of medicines | 21 | 3 | 24 | 12.50% |
| 28 | Manufacture of chemical fibers | 10 | 0 | 10 | 0.00% |
| 29 | Manufacture of rubber | 10 | 0 | 10 | 0.00% |
| 30 | Manufacture of plastics | 25 | 4 | 29 | 13.79% |
| 31 | Manufacture of nonmetallic mineral products | 55 | 2 | 57 | 3.51% |
| 32 | Smelting and pressing of ferrous metals | 30 | 3 | 33 | 9.09% |
| 33 | Smelting and pressing of nonferrous metals | 18 | 1 | 19 | 5.26% |
| 34 | Manufacture of metal products | 37 | 1 | 38 | 2.63% |
| 35 | Manufacture of general purpose machinery | 56 | 4 | 60 | 6.67% |
| 36 | Manufacture of special purpose machinery | 43 | 2 | 45 | 4.44% |
| 37 | Manufacture of transport equipment | 116 | 4 | 120 | 3.33% |
| 39 | Manufacture of electrical machinery and equipment | 53 | 5 | 58 | 8.62% |
| 40 | Manufacture of communication equipment, computers, and other electronic equipment | 35 | 3 | 38 | 7.89% |
| 41 | Manufacture of measuring instruments and machinery for cultural activity and office work | 10 | 0 | 10 | 0.00% |
| 42 | Manufacture of artwork and other manufacturing | 8 | 1 | 9 | 11.11% |
| Total | | 866 | 70 | 936 | 7.48% |

whether Firm i was certified for environmental labeling at time $t - 1$ as the main independent variable (Labeling Status $_{i,t-1}$).

Moderating variables. The first moderator is firm size, measured by the logarithm of Firm i 's total assets at year $t - 1$ (Size $_{i,t-1}$) (Bansal & Clelland, 2004). The second moderator is whether the firm is publicly listed in a stock market (Listed $_{i,t-1}$), measured by a dummy variable with value of 1 if Firm i was listed in a stock market at $t - 1$ and 0 otherwise. The questionnaire only asked respondents whether the firm was listed in 2005. We manually searched online to find the listing status of all firms at $t - 1$.

Control variables. We controlled for industries (two-digit industry codes), ownership type, and time effects. We obtained industry and ownership information from the Chinese Federation of Industry and Commerce. We controlled for ownership type by including three dummy variables that indicated whether a firm was state-owned (SOE), foreign-owned (FIE), or Hong Kong/Macau/Taiwan-invested (HMT). Domestic private firms were the reference group. We used 28 industry dummy variables and four year dummy variables.

Analyses

We used cross-sectional time-series regression models with firm-level fixed effect to test our hypotheses concerning the relationship between environmental labeling and financial performance. Firm-level fixed-effect models are appropriate, because every firm appeared in multiple years of observation, which violated the assumption of independence of observations. This could lead to the problem of unobserved heterogeneity. Fixed-effect models are effective for dealing with this problem. Hausman's (1978) test also suggested that fixed-effects models are more appropriate. The models can be specified as follows:

$$y_{it} = \alpha_i + \alpha_1(\text{Labeling Status})_{i,t-1} + \alpha_2 X_{i,t-1} + \alpha_t \text{Year}_t + \varepsilon_{it},$$

where y_{it} is the financial performance measure, and α_i is the firm-specific fixed effect, which controls for unobservable firm-level differences. $X_{i,t-1}$ is a vector of firm-specific factors that explain the outcomes; that is, firm size, listing status, ownership type, and the primary industry a firm was in at $t - 1$. Year_t is the year dummy variable capturing contemporaneous correlation, and ε_{it} is the random error that reflects unobserved shocks affecting firm performance.

We also estimated the random-effects models and found similar results. We report the results based on fixed-effects models only.

RESULTS

Table 3 presents the descriptive statistics and correlation matrix of the major variables. While firm size and firm sales were highly correlated ($r = 0.78$), they were not on the same side of regression equations. Therefore, multicollinearity

Table 3. Descriptive statistics and correlation matrix^{†‡}

| <i>Variables</i> | <i>Mean</i> | <i>s.d.</i> | <i>Min</i> | <i>Max</i> | <i>1</i> | <i>2</i> | <i>3</i> | <i>4</i> | <i>5</i> | <i>6</i> | <i>7</i> | <i>8</i> |
|------------------------------|-------------|-------------|------------|------------|----------|----------|----------|----------|----------|----------|----------|----------|
| 1. Sales (ln) [§] | 10.81 | 1.49 | 4.99 | 17.28 | | | | | | | | |
| 2. Profits (ln) [§] | 13.68 | 0.27 | 0.00 | 14.74 | 0.04 | | | | | | | |
| 3. ROS | -0.01 | 0.15 | -2.16 | 0.62 | 0.14 | 0.07 | | | | | | |
| 4. Labeling status | 0.05 | 0.21 | 0.00 | 1.00 | 0.08 | 0.01 | 0.04 | | | | | |
| 5. SOE | 0.20 | 0.40 | 0.00 | 1.00 | 0.04 | 0.01 | -0.20 | -0.04 | | | | |
| 6. FIE | 0.13 | 0.34 | 0.00 | 1.00 | 0.12 | 0.03 | 0.08 | 0.03 | -0.19 | | | |
| 7. HMT | 0.11 | 0.31 | 0.00 | 1.00 | 0.05 | 0.00 | 0.05 | 0.02 | -0.17 | -0.13 | | |
| 8. Size (ln) [§] | 9.89 | 1.84 | 0.69 | 15.84 | 0.78 | 0.03 | -0.07 | 0.06 | 0.19 | 0.14 | 0.04 | |
| 9. Listed firm | 0.04 | 0.20 | 0.00 | 1.00 | 0.22 | -0.07 | 0.05 | 0.02 | -0.05 | 0.04 | -0.00 | 0.23 |

Notes:

[†] N = 2,749.

[‡] Correlations with absolute values equal to or greater than 0.04 are significant at the 0.05 level.

[§] Values are in logarithm, in RMB 1,000 yuan.

Table 4. The main effect of environmental labeling status on firm performance

| | <i>Model 1</i> <i>Ln(Sales)</i> | <i>Model 2</i> <i>Ln(Profits)</i> | <i>Model 3</i> <i>ROS</i> |
|---|------------------------------------|--------------------------------------|-------------------------------|
| Labeling Status _{<i>i,t-1</i>} | 0.25 [†] (0.14) | - 0.00 (0.01) | - 0.00 (0.01) |
| Size _{<i>i,t-1</i>} | 0.17*** (0.03) | - 0.01 (0.02) | - 0.01* (0.00) |
| Listed _{<i>i,t-1</i>} | - 0.14 (0.12) | - 0.00 (0.02) | - 0.05 [†] (0.03) |
| SOE _{<i>i,t-1</i>} | - 0.05 (0.06) | 0.00 (0.00) | 0.02* (0.01) |
| FIE _{<i>i,t-1</i>} | 0.08 (0.13) | 0.02 (0.02) | 0.02 (0.03) |
| HMT _{<i>i,t-1</i>} | 0.06 (0.11) | 0.01 (0.01) | 0.01 (0.02) |
| Industry dummies | YES | YES | YES |
| Year dummies | YES | YES | YES |
| Constant | 8.12*** (0.28) | 13.74*** (0.15) | 0.22*** (0.04) |
| R ² | 0.30 | 0.00 | 0.02 |

Notes:

N = 2,749.

Robust standard errors are in parentheses.

[†]p < 0.1, *p < 0.05, **p < 0.01, and ***p < 0.001.

should not be a problem. Table 4 presents the results of cross-sectional time-series regression analysis testing (Hypothesis 1), which predicted that environmental labeling positively affects a firm's financial performance.

Models 1 to 3 use sales, profit, and ROS as dependent variables, respectively. The results show that environmental labeling positively impacted sales but only at the 0.10 level (Model 1, $\beta = 0.25$, $p < 0.10$). We found no significant relationship between environmental labeling and firm profits (Model 2) or ROS (Model 3). The results indicate that, on average, environmental labeling only marginally increased sales but had no effect on profit and ROS, giving limited support to Hypothesis 1.

Table 5 presents results for Hypothesis 2, which suggests that environmental labeling benefits smaller firms more than it benefits larger firms. Models 4 to 6 use sales, profit, and ROS as dependent variables, respectively. In each model, we added the interaction term of environmental labeling and firm size to test Hypothesis 2. The interaction term was negative and significant in Model 4 ($\beta = -0.12$, $p < 0.05$) and negative but marginally significant in Models 5 and 6. Overall, Hypothesis 2 was supported. Figure 1 graphically depicts the significant interaction effect on Ln(Sales). For a small firm with total assets of RMB 3.13 million *yuan* (1 standard deviation lower than the average Ln(Assets) of sampled firms, i.e., $\text{Ln(Assets)} = 9.89 - 1.84 = 8.05$), environmental labeling causes a 51.4% increase in Ln(Sales) change, which is a 67% ($\exp(0.514)$) increase in firm sales in the following year (the slope coefficient of labeling status is 0.514, $p < 0.01$). For large firms with total

Table 5. The moderating effect of firm size on the relationship between environmental labeling status and firm performance

| | <i>Model 4</i> <i>Ln(Sales)</i> | <i>Model 5</i> <i>Ln(Profits)</i> | <i>Model 6</i> <i>ROS</i> |
|--|------------------------------------|--------------------------------------|------------------------------|
| Labeling Status _{<i>i,t-1</i>} | 1.48* (0.59) | 0.05 [†] (0.03) | 0.09 [†] (0.05) |
| Labeling Status _{<i>i,t-1</i>} * Size _{<i>i,t-1</i>} | -0.12* (0.05) | -0.00 [†] (0.00) | -0.01 [†] (0.00) |
| Size _{<i>i,t-1</i>} | 0.17*** (0.03) | -0.01 (0.02) | -0.01* (0.00) |
| Listed _{<i>i,t-1</i>} | -0.15 (0.12) | -0.00 (0.02) | -0.05 [†] (0.03) |
| SOE _{<i>i,t-1</i>} | -0.05 (0.06) | 0.00 (0.00) | 0.02* (0.01) |
| FIE _{<i>i,t-1</i>} | 0.09 (0.13) | 0.02 (0.02) | 0.02 (0.03) |
| HMT _{<i>i,t-1</i>} | 0.06 (0.11) | 0.01 (0.01) | 0.01 (0.02) |
| Industry dummies | YES | YES | YES |
| Year dummies | YES | YES | YES |
| Constant | 8.12*** (0.28) | 13.74*** (0.15) | 0.22*** (0.04) |
| R ² | 0.30 | 0.00 | 0.02 |

Notes:
 N = 2,749.
 Robust standard errors are in parentheses.
[†]p < 0.1, *p < 0.05, **p < 0.01, and ***p < 0.001.

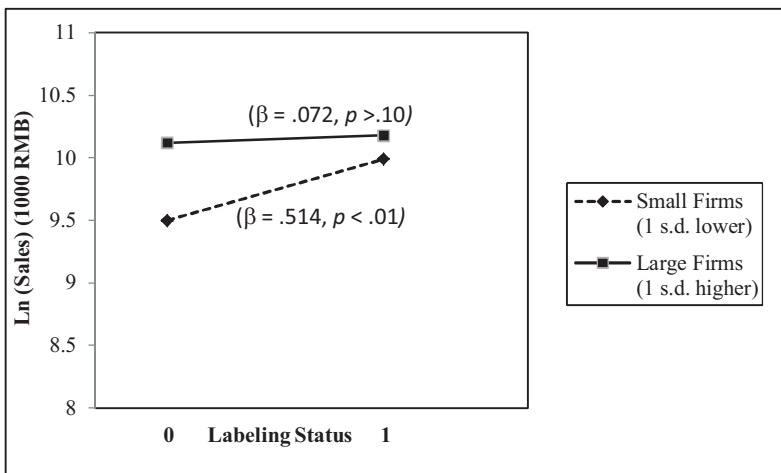


Figure 1. The moderating effect of firm size on the relationship between environmental labeling status and sales

assets of RMB 124.24 million *yuan* (1 standard deviation higher than the average Ln(Assets) of sampled firms, i.e., Ln(Assets) = 9.89 + 1.84 = 11.73), environmental labeling increases firm sales by 7% in the following year (the slope coefficient of labeling status is 0.072, p > 0.10).

Table 6. The moderating effect of public listing status on the relationship between environmental labeling status and firm performance

| | <i>Model 7</i> <i>Ln(Sales)</i> | <i>Model 8</i> <i>Ln(Profits)</i> | <i>Model 9</i> <i>ROS</i> |
|--|------------------------------------|--------------------------------------|------------------------------|
| Labeling Status _{<i>i,t-1</i>} | 0.32* (0.15) | 0.00 (0.01) | 0.00 (0.01) |
| Labeling Status _{<i>i,t-1</i>} * Listed _{<i>i,t-1</i>} | -0.64*** (0.16) | -0.04** (0.02) | -0.03† (0.01) |
| Listed _{<i>i,t-1</i>} | -0.14 (0.12) | -0.00 (0.02) | -0.05† (0.03) |
| Size _{<i>i,t-1</i>} | 0.17*** (0.03) | -0.01 (0.01) | -0.01* (0.00) |
| SOE _{<i>i,t-1</i>} | -0.05 (0.06) | 0.00 (0.00) | 0.02* (0.01) |
| FIE _{<i>i,t-1</i>} | 0.09 (0.13) | 0.02 (0.02) | 0.02 (0.03) |
| HMT _{<i>i,t-1</i>} | 0.06 (0.11) | 0.01 (0.01) | 0.01 (0.02) |
| Industry dummies | YES | YES | YES |
| Year dummies | YES | YES | YES |
| Constant | 8.14*** (0.28) | 13.74*** (0.15) | 0.23*** (0.04) |
| R ² | 0.30 | 0.00 | 0.01 |

Notes:

N = 2,749.

Robust standard errors are in parentheses.

†p < 0.1, *p < 0.05, **p < 0.01, and *** p < 0.001.

Models 7 to 9 in Table 6 tested Hypothesis 3, which predicted that environmental labeling would benefit listed firms less than it would benefit unlisted firms. In all three models (with sales, profit, and return on sales as dependent variables, respectively), we added the interaction term between listed firm and environmental labeling at $t - 1$. The interaction terms were negative and significant in Model 7 ($\beta = -0.64$, $p < 0.001$) and Model 8 ($\beta = -0.04$, $p < 0.01$) and marginally significant in Model 9 ($\beta = -0.03$, $p < 0.10$). Further subgroup analysis for the listed firms showed that the relationships between environmental labeling and next-year sales/profits were not different from zero statistically, showing no evidence of financial damage from environmental labeling for listed firms. The results are consistent with Hypothesis 3, which predicts a stronger positive relationship between environmental labeling and financial performance for unlisted firms. Hypothesis 3 was supported. Figure 2 shows the results of Model 7. For unlisted firms, environmental labeling increased the next-year sales by 37.7% ($\beta = 0.32$, $p < 0.01$). In contrast, environmental labeling decreased the next-year sales by 26.7% ($\beta = -0.32$, $p > 10$) for listed firms, although a subgroup analysis containing only listed firms showed that the environmental labeling effect on next-year sales was not significantly different from zero.

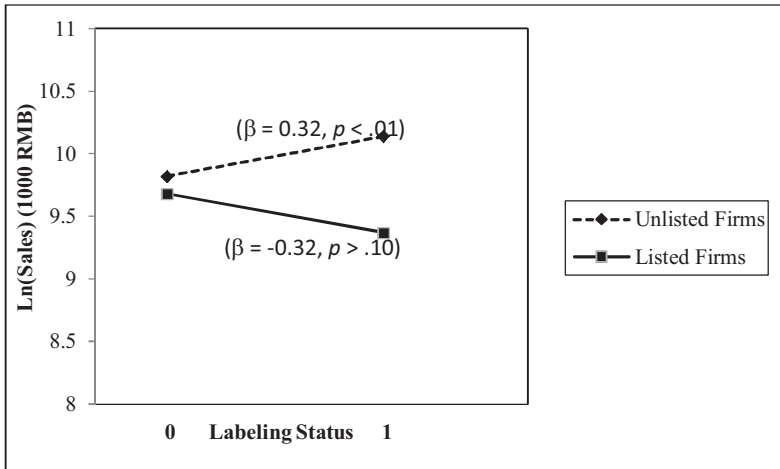


Figure 2. The moderating effect of public listing status on the relationship between environmental labeling status and sales

DISCUSSION

Our study contributes to the current research on environmental initiatives by offering theoretical accounts and empirical evidence showing whether and when voluntary third-party certification of environmental labeling may benefit firms financially. This study is timely given the increasing popularity of environmental labeling programs worldwide and the lack of empirical evidence related to their impact.

Using economic, sociological, and strategic perspectives, we predicted that environmental labeling would positively affect a firm's financial performance by reducing information asymmetry, enhancing organizational legitimacy, and providing strategic benefits of cost reduction and product differentiation. We find only weak support for that prediction, however. Specifically, we find that firms only marginally benefit from environmental labeling through increased sales and that environmental labeling has no significant impact on profits or ROS. Although we fail to find consistent support for positive effects of environmental labeling, we also find no negative effects. Our results differ from Delmas and Grant (2014), who showed harmful effects of environmental labeling in terms of the prices wine producers could charge. In general, environmental labeling is still relatively new to customers in China, where environmental standards are lower and where consumers are less environmentally aware than they are in developed countries (Stalley, 2010). Voluntary environmental initiatives, such as environmental labeling, are not yet widely recognized, since only a small proportion of our sample firms have certified for environmental labeling. This may, in part, explain the weak link between environmental labeling and financial performance.

Another possible reason for the weak effect of environmental labeling on financial performance in our study is that environmental labeling does not benefit all firms equally. We predicted that firms suffering more information asymmetry

with stakeholders or firms with less legitimacy would have more to gain from environmental labeling. Because smaller firms and unlisted firms tend to have more information asymmetry and less legitimacy with stakeholders, we predicted that they could potentially benefit more from environmental labeling. Our findings show that, indeed, smaller and unlisted firms benefited more in terms of sales.

Limitations and Future Research Directions

This study has several limitations. First, we have information only on whether a firm had products certified for environmental labels. We do not know how many products were labeled or how many products a firm was producing. Environmental labeling may convey weak benefits for larger firms if only a few of their products are labeled, whereas small firms may produce just one product so that the labeling would have a more dramatic effect in reducing information asymmetry and enhancing legitimacy. Future studies may provide greater insight by collecting more refined data on environmental labeling practices.

Another limitation is that we lack information about the financial benefits of environmental labeling of a specific product, since environmental labeling is at the product level rather than the firm level. However, we can reasonably assume that a firm could accrue trust, legitimacy, and firm-level financial benefits through environmental labeling certification for one or more of its products. Potential buyers routinely associate products with the firms producing them. If the firm's products are certified with environmental labeling, potential buyers may view the firm as more environmentally friendly, compared with firms lacking products certified for environmental labeling. Further, better sales of labeled products contribute to the overall financial performance of the firm. Nevertheless, future studies could significantly enhance our understanding of financial benefits of environmental labeling by collecting information on the financial consequences from labeling of specific products.

Our study focused on only two contingent variables – firm size and listing status. Might there be other factors that also influence the relationship between environmental labeling and financial performance? One such variable could be firm reputation. Scholars from both economics and sociology fields recognize the importance of reputation under information asymmetry situations (Kreps & Wilson, 1982). When buyers and sellers have significant information asymmetry between them, reputation becomes a less-costly way to indicate the quality of firms' offerings. A firm's reputation for environmental friendliness could moderate the relationship between environmental labeling and financial performance. Presumably, an earth-friendly reputation should dampen the positive effect of environmental labeling, because a firm's reputation performs a similar role in reducing information asymmetry. Customers may use a firm's reputation to infer whether its products are environmentally friendly.

However, because of individual bounded rationality (Arrow, 1974), customers may not always know a firm's reputation. In this case, the reputation of an industry

to which a firm belongs may affect the financial effects of environmental labeling. Specifically, environmental labeling might be more financially beneficial if a firm belongs to an industry that has a poor environmental reputation. As reputation commons theory (King, Lenox, & Barnett, 2002) suggests, when stakeholders cannot adequately differentiate the relative reputation of individual firms in an industry, and when one firm in that industry violates stakeholders' expectations, stakeholders may sanction the entire industry (Barnett, 2006; Yue & Ingram, 2012). For example, in April 2010, BP spilled oil into the Gulf of Mexico, leading President Obama to order all 33 deep-water oil rigs in the Gulf of Mexico to stop drilling. As a result, the E2 index of the oil industry, developed by the research firm Market Strategies International to measure consumer perception of the energy industry's economic and environmental performance and credibility, dropped 25% from December 2009 to June 2010 (Market Strategies International, 2010). In such cases, certifying for environmental labeling might be an effective way for firms to 'privatize' their reputations and distinguish themselves from other firms in the same industry.

Future studies could further investigate various conditions and motivations for environmental labeling. Longer-term financial impacts may be more motivating than shorter-term impacts. Top management may view environmentalism as a moral issue rather than an economic decision, so that even if environmental labeling fails to bring short-term financial benefits, firms will do it because it is the right thing to do.

In addition, data from multiple countries could shed light on whether cultures and institutions affect the financial consequences of environmental labeling and what factors may influence firms' decisions to pursue labeling or other environmental strategies. For example, a meta-analysis study by Liu, Guo, and Chi (2015) examines how cultural and institutional factors, such as regulations, stakeholder norms, and managerial mindsets, may affect firms' proactive environmental strategies (PESs) and how PESs may affect the environmental and economic performance of firms. The results suggest that managerial mindsets have the strongest effect and regulations have the weakest effect on PESs in western countries. In China, however, regulation, stakeholder norms, and managerial mindsets have similar effects on PESs. In addition, this study found that PESs have a stronger effect on environmental performance and a weaker effect on economic performance in western countries than they do in China. Cross-national studies of environmental labeling and other strategies should yield much needed knowledge about how to create the most beneficial environmental efforts for all stakeholders in different institutional and cultural contexts.

Further, it might be useful to compare the financial consequences of environmental labeling with other environmental initiatives, such as whether a firm periodically publishes self-disclosed environmental performance reports. Because firms typically have limited resources for implementing environmental initiatives, this comparison may enhance our understanding of strategic choices.

Research could also examine the benefits of first mover advantage or disadvantage and diffusion of environmental practices, especially in developing

economies where such practices are just beginning. For example, a study of corporate social responsibility (CSR) reporting in 142 banks in China (Sun, Wang, Wang, & Yin, 2015) provides some insight into the motivation of the first adoption and diffusion process of CSR reporting. Understanding the early adoption and diffusion process would be especially interesting for practices that are visible to the public, such as environmental labeling. Future studies could also investigate factors that may trigger changes in environmental strategies. That is, what are the political and institutional dynamics that lead some firms to accelerate, decelerate, or even suspend their environmental practices, including labeling (Liu, Feng, & Li, 2015)?

Finally, future research could examine separately how information asymmetry, legitimacy, and strategic considerations may differentially affect financial benefits of environmental labeling. Such research can significantly enhance our theoretical understanding of how environmental labeling may affect a firm's financial performance and also provide insight into why firms may choose to label their products.

Practical Implications

Our results have practical implications for firms. The marginal increase in sales from environmental labeling suggests that firms could potentially increase sales by attracting more environmentally conscious customers or by charging higher prices. Although environmental labeling may not immediately increase profitability or ROS, it will at least do no financial harm. It might be a win-win situation for firms to certify for labels, benefiting both customers and the environment without financial losses. In addition, our results indicate that small and unlisted firms should especially certify for environmental labeling to boost their market share and achieve rapid growth through increased sales revenue.

CONCLUSION

Prior literature on the financial consequences of firms' environmental initiatives generated mixed empirical evidence. In this study, we use economic, sociological, and strategic perspectives to explain why environmental labeling may affect a firm's financial performance, especially for smaller and unlisted firms that suffer from lack of information about them in the marketplace or legitimacy. We hope our study will inspire more research on environmental issues in China, the world's largest emerging economy, where environmental problems are critical and the effects of environmental labeling programs on businesses are less understood. We also hope that the results will add to the growing literature and interest in environment management globally.

NOTE

[1] See http://www.sepacec.com/lxhjbz/gkwj/201209/t20120913_236162.htm.

APPENDIX

Summary of studies linking environmental initiatives and financial performance

| <i>Study</i> | <i>Sample</i> | <i>Environmental initiatives</i> | <i>Financial performance</i> | <i>Main findings</i> |
|------------------------------|---|---|---|---|
| Ann, Zhalani, & Wahid (2006) | 45 sites that were certified for ISO 14001 in Malaysia | ISO 14001 certification | Perceived economic impact, customer satisfaction, and market position | Certification impacts positively on perceived economic performance. |
| Chien & Peng (2012) | Public companies in five polluting industries in Taiwan from 1989 to 2006 | Investment in pollution control: proactive pollution prevention control vs. end-of-pipe solutions | ROA, ROE, earnings per share, and cash flow to total assets. | Firms investing for pollution prevention outperform firms using end-of-pipe solutions in financial performance. End-of-pipe solutions are negatively related to short-term financial performance, while pollution prevention investment is positively related to long-term financial performance. |
| Christmann (2000) | 88 U.S. chemical companies | Use of pollution prevention technology (PPT) | Perceived cost advantage | Positive effect of PPT innovation on perceived cost advantage. Capabilities for process innovation moderate the relationship. |
| Delmas & Grant (2014) | 13,426 wines of California, ranging in vintage from 1998 to 2005 | Eco-certification and eco-labeling of products | Manufacturer's suggested retail price | Eco-labeling has a negative impact on prices in the wine industry. But a price premium is associated with eco-certification. |

APPENDIX

Continued.

| <i>Study</i> | <i>Sample</i> | <i>Environmental initiatives</i> | <i>Financial performance</i> | <i>Main findings</i> |
|--|---|---|---|---|
| Dowell, Hart, & Yeung (2000) | A sample of U.S.-based MNCs | Participation of global environmental standards | Tobin's q | Firms adopting a single stringent global environmental standard have much higher market values, as measured by Tobin's q , than firms defaulting to less stringent or poorly enforced host country standards. |
| Gil, Jiménez, & Lorente (2001) | 262 three-, four- and five-star hotels in Spain | Environmental management strategies | Current year profitability, profitability in the last three years, occupancy rate | Findings show a positive relationship between environmental management practices and financial performance. |
| Gilley, Worrell, & El-Jelly (2000) | 71 announcements of environmental initiatives | 39 process-driven initiatives and 32 product-driven initiatives | Stock market returns | No significant effect of the announcement of environmental initiatives on stock market returns. |
| González-Benito & González-Benito (2005) | 186 Spanish firms in the chemical sector (63), the electronic and electric equipment sector (96), and the furniture sector (27) | 27 environmental practices | ROA | Mixed results: Overall environmental management leads to competitive opportunities, but some environmental practices are negatively related to ROA. |

APPENDIX

Continued.

| <i>Study</i> | <i>Sample</i> | <i>Environmental initiatives</i> | <i>Financial performance</i> | <i>Main findings</i> |
|---------------------------------------|---|---|---|--|
| Hart & Ahuja (1996) | 127 U.S. firms listed in S&P 500 with Standard Industrial Classification (SIC) codes below 5000 | Pollution prevention and emission reduction of toxic chemicals | ROS, ROE | Efforts for pollution prevention and emission reduction enhanced financial performance within one to two years of initiation. Firms with high emissions levels benefit more from such efforts. |
| Khanna & Damon (1999) | 123 U.S. public firms in the chemical industry | Environmental Protection Agency's (EPA) Voluntary 33/50 Program | Return on investment (ROI) | Program participation negatively impacts current ROI, but the expected long-term profitability is positive. |
| Link & Naveh (2006) | 77 organizations that certified for ISO 14001 in Israel | Certification of ISO 14001 | Gross profit margin | No effect of certification of ISO 14001 on an organization's financial performance. |
| Melnyk, Sroufe, & Calantone (2003) | 1,222 manufacturing firms | EMS | Perceptual corporate performance | Positive relationship between EMS and performance. |
| Montabon, Sroufe, & Narasimhan (2007) | 45 U.S. and international companies in various industries | Recycling, waste reduction, remanufacturing, environmental design | ROI, sales growth, product innovation, process innovation | Positive relationship between environmental practices and firm performance. |
| Nehrt (1996) | 50 pulp and paper companies | Timing and intensity of investment in pollution prevention | Profits | Positive relationship between early movers in pollution prevention and profit growth. |

APPENDIX

Continued.

| <i>Study</i> | <i>Sample</i> | <i>Environmental initiatives</i> | <i>Financial performance</i> | <i>Main findings</i> |
|----------------------|---|----------------------------------|--|---|
| Nga (2009) | A sample of publicly listed firms in Malaysia | ISO 14000 certification | ROE, sales, capitalization | Positive relationship between ISO 14000 and ROE but not sales and capitalization. |
| Wahba (2007) | 156 Egyptian firms in several sectors | ISO 14001 certification | Tobin's q ratio | ISO 14001 is positively related to Tobin's q ratio. |
| Watson et al. (2004) | A sample of U.S. firms in various industries | EMS adoption | ROA, profit margin, price-to-earning ratio, market-to-book ratio, ROIC, operating margin, beta | No significant relationship between EMS adoption and financial performance. |

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Manuscript received: November 6, 2012

Final version accepted: December 12, 2014

Accepted by: Yuan Li