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The Impact of Forest Certification on Firm Financial Performance in Canada and the U.S.

Kais Bouslah
Bouchra M'Zali
Marie-France Turcotte
Maher Kooli

ABSTRACT. The purpose of this article is to examine empirically the impact of environmental certification on firm financial performance (FP). The main question is whether there is a ''green premium'' for certified firms, and, if so, for what kind of certification. We analyze the short-run and the long-run stock price performance using an event-study methodology on a sample of Canadian and U.S. firms. The results of short-run event abnormal returns indicate that forest certification does not have any significant impact on firm FP regardless of the certification system carried out by firms. Unlike the short-run results, the long-run post-event abnormal returns suggest that forest certification has, on average, a negative impact on firm FP. However, the impact of forest certification on firm FP depends on who grants the certification, since only industry-led certification (Sustainable Forestry Initiative, Canadian Standards Association and ISO14001) are penalized by financial markets, whereas non-governmental organizations–led Forest Stewardship Council certification is not.

KEY WORDS: abnormal returns, buy-and-hold abnormal returns, cumulative abnormal returns, environmental performance, event study, financial performance, forest certification

ABBREVIATIONS: AF&PA: American Forest and Paper Association; ADR: American Depositary Receipts; AR: Abnormal return; BHAR: Buy-and-hold abnormal return; BVC: Bureau Veritas Certification; CAR: Cumulative abnormal return; CD: Certification announcement date; CEP: Council on Economic Priorities; CSA: Canadian Standards Association; EP: Environmental performance; FP: Financial performance; FSC: Forest Stewardship Council; ISO: International Organization of Standardization; KPMG: KPMG Forest Certification Services Inc; NGO: Non-governmental organizations; PWC: PricewaterhouseCoopers LLP; QMI: Quality Management Institute; SFI: Sustainable Forestry Initiative; SCS: Scientific Certification Systems; SGS: SGS Systems & Services Certification; SIC: Standard Industrial Classification; SW: SmartWood, Rainforest Alliance; TRI: Toxic Release Inventory; UNCED: United Nations Conference in Environment and Development; WWF: World Wildlife Fund

Authors are from the École des sciences de la gestion (ESG), Université du Québec à Montréal (UQAM). Kais Bouslah is a Ph.D. Candidate (Finance). Bouchra M'Zali and Maher Kooli are professors at the Department of Finance. Marie-France Turcotte is a professor at the Department of Strategy, Social and Environmental Responsibility.

Introduction

Since the early 1990s, private organizations including transnational and domestic non-governmental organizations (NGOs) as well as industry associations contributed to the creation of social and environmental standards and certification schemes. These standards have been described as non-state market-driven governance systems (Cashore, 2002), and it has been argued that they embody a new model for global corporate governance in which the civil society, i.e., NGOs, play an important role (Cashore, 2002; Gereffi et al., 2001). Although they are generally presented as a voluntary mechanism, these standards are often adopted by companies as a result of pressures from one or more coalition of stakeholders (Turcotte et al., 2007), such as environmental NGOs, distributors, clients, and investors.

Many individual and institutional investors concerned with the impacts of firms' activities on the environment, community, and society as a whole

integrate social and environmental criteria into their financial performance (FP) objectives.[1] For these investors with ethical, social, or environmental concerns, collecting relevant information and assessing firms' performance in these domains presents several challenges, including the lack of information (Turcotte and M'Zali, 2004). Indeed, the issue of how to assess social or environmental performance (EP) also raises the question of the sources of information used in this evaluation (Turcotte and M'Zali, 2004). By means of adopting social or environmental certification, firms might signal their commitments to meet stakeholders' expectations. Certification systems have the potential to be an informational tool for investors, and therefore might become an indicator of social or EP.

Forest certification programs recognize officially those companies and landowners who *voluntarily* operate "*well-managed*" or "*sustainable*" forestland according to predefined criteria (Cashore, 2002, p. 505). Since the Earth Summit on Sustainable Development (UNCED[2]) held in 1992, several forest certification programs have been established in Canada and the United States: Forest Stewardship Council (FSC), the Canadian Standards Association (CSA) program, Sustainable Forestry Initiative (SFI) and the International Standards Organisation (ISO14001) program. The FSC program is widely supported by environmental groups and NGOs, whereas the SFI and CSA programs are considered industry-oriented certification (Cashore, 2002; Gereffi et al., 2001). ISO14001 is a management system that is not specific to the forestry industry and can be applied to all industries.

Most existing studies on forest certification examine the willingness of consumers to pay a premium for environmentally certified wood products (see, e.g., Anderson and Hansen, 2004; Ozanne and Volsky, 1997; Stevens et al., 1998), and the impact of certification programs on EP (see, e.g., Barla, 2007[3]) or on corporate strategy (see, e.g., Bansal and Hunter, 2003; Delmas, 2001; Jiang and Bansal, 2003). In addition to this literature, most empirical studies that examine the impact of EP on FP, in any form, report empirical evidence consistent with a positive short-run impact (Feldman et al., 1997; Hamilton, 1995; Klassen and McLaughlin, 1996; Shane and Spicer, 1983; Sharfman and Fernando, 2008). However, these studies do not provide a complete picture of the potential effect that EP may have on FP.

Why? First, because these studies do not examine the long-run effects. Our study will examine both the short-term and long-term effects. Second, because these studies use different measures of EP, each of them having its advantages and limits. Our study will not only be more specific by using environmental certification systems, but will also compare each of them. Third, because the samples of these studies include firms from different industries for which environmental issues are not necessarily equally important. Our study will focus on one industry: the forest and paper industry.

The aim of our study is to analyze the relationship between the FP and the adoption of forest environmental certification. We are interested in examining whether certification does significantly impact the firm's FP and whether investors evaluate certification programs differently.

Forest certification is used as a signal sent by firms to inform financial markets that their divisions, products and/or forests have been certified by a third-party expert team. Although, adopting certification does increase costs,[4] these might be offset by increased revenues, better reputation, and better relationships with stakeholders, and thus provide a competitive advantage for certified firms. Based on this argument, certified firms would be rewarded, whereas non-certified firms would experience a loss of wealth for their shareholders that may exceed these costs. Thus, investors might assume that certified firms have good EP relative to non-certified firms, and that this represents a competitive advantage.

However, not all certification systems have the same market value. Based on the analysis of the market reactions to each certification, we are able to see how the financial market reacts, if at all. Most studies have asked whether the market offers a "green premium." More specifically, in this study, we ask: how does the market respond to each certification? While doing so, we will consider both the short-term and the long-term. Furthermore, we will consider the distinctive characteristics of the certification systems.

The main results are as follows. The results of short-run event abnormal returns indicate that forest certification does not have any significant impact on firm FP regardless of the certification system used by firms. Unlike the short-run results, the long-run

post-event abnormal returns suggest that forest certification has, on average, a negative impact on firm FP. However, the impact of forest certification on firm FP depends on who grants the certification since only industry-led certification (SFI, CSA and ISO14001) is penalized by financial markets, whereas NGOs–led FSC certification is not.

The article proceeds as follows. The first section presents a definition and a typology of certification programs used in Canada and the United States. The second section summarizes the relevant literature that investigated the relationship between corporate EP and FP, and develops our research hypotheses. Then, we describe the data set and their sources in the third section, and discuss the statistical estimation procedures used in the tests in the fourth section. In the fifth section, we present the empirical results and their interpretation. In the final section of the article, we explore some implications for managers, and make some proposals for future empirical research.

Forest certification: definition and typology

During the last 30 years, environmental concerns about global forest destruction, the impact of deforestation, clear-cutting, loss of biodiversity, and the pollution from pulp and paper mills evolved into a higher level of environmental awareness. In order to force firm-level environmental protection upward, environmental NGOs of developed countries have initially used market-based boycott campaigns. Forest certification emerged in the 1990s as an innovative market-based alternative (Cashore, 2002) and sometimes to complement corporate campaigns in which other strategies such as shareholder activism (Rojas et al., 2009) and boycott are also used. The certification of forest management practices has emerged as one possible policy instrument for helping attain sustainable forest management and communicate environmental information to consumers about the forest resources (Stevens et al., 1998).

According to Meidinger et al. (2003), the key elements of forest certification programs are standard setting and implementation (i.e., verification/audit/monitoring, accreditation of the certifier, labelling). The verification process differs by certification program, but generally involves preliminary discussion, field verification, verification report and follow-up audits. There are two basic types of certification in the forest and paper industry: ''Forest Management'' and ''Chain-of-Custody'' certifications. The ''Chain-of-Custody'' certification traces the amount of certified wood in a product from the forest floor to the consumer shelf (Gereffi et al., 2001). Firms meeting the chain-of-custody requirements are allowed to display a ''label'' or ''logo'' on their certified products.

In 1993, powerful NGOs such as the World Wildlife Fund (WWF) and Greenpeace helped create the FSC as an international non-governmental, non-profit, multi-stakeholder certification program (Meidinger et al., 2003). The FSC has developed a set of standards (principles) and detailed criteria that are performance-based and broad in scope (economic, social and environmental). Arguing that the FSC standards are onerous and unwieldy, the forestry industry in Canada, the United States, and Europe quickly matched the FSC with their own certification programs for appropriate forestry practices (Gereffi et al., 2001). In 1994, the American Forest and Paper Association (AF&PA) in the United States had developed the SFI, partly in response to the growth of the FSC (Meidinger et al., 2003). In Canada, the FSC competitor is the CSA program established in 1996. Furthermore, the International Organization for Standardization (ISO) has developed the environmental management standard ISO14001 in 1994. ISO14001 can be applied to all industries, including the forestry industry. ISO14001 does not require that a set of standards or performance criteria be followed. The firm defines its own environmental criteria and objectives, and then develops an environmental management system. The FSC, SFI, CSA, and ISO14001 are the four certification programs examined in this study. Table I describes their characteristics.

These four certifications differ in terms of which kind of actors initiated them, what standards they promote, what verification process they use, and what governance structure and financing they have. SFI and CSA programs operate under a different conception of governance from that of the FSC program (Cashore, 2002). Under the FSC program, environmental and social groups have an important role in the development of standards and firms cannot dominate the rule-making. In contrast, firms and forest landowners have the dominant role in the SFI and CSA programs regarding who makes the

TABLE I

Typology of forest certification programs

Certification program	FSC (1993)	SFI (1994)	CSAZ808/809 (1996)	ISO14001 (1994)
Promoter	Environmental NGOs: World Wildlife Fund (WWF), Greenpeace	American Forest and Paper Association (AF&PA)	Canadian Standards Association (CSA)	International Standard Organisation (ISO)
Approach (standards type)	Performance	Process	Hybrid (mix)	Process
Type of verification	Third-party	First-, second- and third-party (optional)	Third-party	First-, second- and third-party (optional)
Governance	NGO with an international board Three rooms: economic, social and environmental Each has the third of vote power	Sustainable Forestry Board (SFB): six members of SFI and nine environmental, professionals, government representatives	CSA: Non-Profit Organization specialized in the development of standards for a variety of products	ND
Financing	Private foundation: 85% Members: 15%	Members: 82% Other: 18%	Members: 100% (diverse certifications)	ND

ND not defined.

rules. For the environmental groups (e.g., WWF, Greenpeace), the FSC is the only credible certification program (Gereffi et al., 2001).

Certification programs use two fundamental approaches to evaluation (Haener and Luckert, 1998). The first approach is the *performance-based standards*, also called product or outcome approach, where the focus of assessment is the forest resource itself. This approach focuses on variables that reflect the condition of the forest area, which results from forestry activities. The second approach is the *management system-based standards* where the focus of assessment is on defining management responsibilities and processes. The firm is evaluated based on objectives, planning, quality-control measurements, record-keeping, and the training and education of employees. This approach focuses on management practices rather than the actual results of these practices (continuous improvement). Although most programs are a combination of these approaches, the FSC program emphasizes the *performance-based* approach, the SFI program emphasizes the *management system-based* approach, and the CSA program emphasizes both approaches. ISO14001 is only a *management system-based* approach.

As noted earlier, the certification program has two key components: a set of rules, principles or standards, and a monitoring or verification mechanism (usually an audit). The credibility of the certification program depends heavily on the type of verification. Verification is important because it provides validation necessary for legitimacy to occur and to distinguish products to be consumed in the marketplace (Cashore, 2002). Therefore, according to those who produce the standards and conduct the monitoring, certification can take three basic forms: 1. *First-party certification* is an internal assessment by the firm of its own systems and practices (''self-regulation'' since the firm develops its own rules and report on compliance); 2. *Second-party certification* is an assessment by a customer or a trade association/organization representing the industry to which the firm belongs; 3. *Third-party certification* is an assessment by an independent (neutral/external) organization. Third-party certification is conducted by accredited certifiers (e.g., BVC, KPMG, PWC, QMI, SW,

SCS, and SGS[5]). Third-party certifiers in the FSC system are directly accredited by the FSC, whereas for SFI, CSA, and ISO14001 certification, they are accredited by national accreditation organizations such as the American National Standards Institute in the United States.

Third-party certification is required in the FSC and CSA programs, whereas it is optional in the SFI and ISO14001 programs. The inherent conflicts of interest give little credibility to the first- and second-party certifications. Environmental NGOs consider that third-party certification is the most credible because an independent certifier assesses the forest operations and practices according to a specific set of environmental criteria. Third-party certification can be compared with the independent accounting audit that all public firms must undergo each year.

Relationship between environmental performance and financial performance

Prior literature about the impact of EP on FP highlights several arguments that support a positive, negative, or neutral association between EP and FP. The stakeholder theory predicts that a higher (lower) EP leads to a higher (lower) FP (McGuire et al., 1988; Waddock and Graves, 1997). According to this theory, the value of a firm depends not only on the costs of explicit claims (e.g., stockholders and bondholders), but also on the costs of implicit claims such as costs associated with improved environmental management practices. Firms having good EP would have lower costs of implicit claims than other firms and thus a higher FP. Higher EP may also lower a firm's expected risk (Feldman et al., 1997; Sharfman and Fernando, 2008). Investors may consider firms with a higher EP to be less risky investments because they consider that the quality of their management is higher (McGuire et al., 1988). Moreover, Sharfman and Fernando (2008) argue that improved environmental risk management is theoretically synonymous to strategic risk management. Investments aiming to improve EP (e.g., emissions and pollution reduction) reduce the firm's risk from known and unknown hazards, and consequently reduce the number of potential claimants on the firm's cash flows (e.g., potential fines, settlements, compliance, litigation costs). In short, the stakeholder theory predicts that a firm might, after a certain period of time, improve its FP as a result of improved EP through increased profits/higher future cash flows (McGuire et al., 1988; Waddock and Graves, 1997), and/or reduced risk associated with environmental issues (Feldman et al., 1997; Sharfman and Fernando, 2008).

In contrast with the stakeholder view, the traditional view of the corporation (neo-classical economists' argument, which focuses exclusively on the manager–shareholder relationship), predicts that EP will have a negative impact on FP because managers face a trade-off between environmental costs and other costs (Feldman et al., 1997; McGuire et al., 1988; Ullmann, 1985; Waddock and Graves, 1997). Proponents of this argument have argued that higher EP results in additional costs that put the firm at a competitive disadvantage and reduce their strategic alternatives compared with other less environmentally responsible firms (McGuire et al., 1988) since they are incurring costs that can be avoided or should be assumed by other actors such as government (Waddock and Graves, 1997). The decision to establish environmental protection procedures (e.g., pollution reduction initiatives, adoption of certification programs, product life cycle analyses, recycling programs) when other competitors do not is an example of action that might be a financial burden for environmentally responsible firms. Managers are expected to make investments in EP only to the extent that their benefits (pecuniary and non-pecuniary) exceed their costs (Feldman et al., 1997). In other words, managers should minimize environmental costs to reduce their impact on FP. According to this view, environmental costs reduce profits and thus shareholders' wealth.

Finally, another argument suggests that there should be no relationship between EP and FP because of, among other things, the measurement problem of EP[6] (Klassen and McLaughlin, 1996; McGuire et al., 1988; McWilliams and Siegel, 2001; Waddock and Graves, 1997). Ullmann (1985) argues that there is no reason to expect the existence of a relationship, except by chance, because there are many intervening variables between EP and FP.

The impact of EP on FP, whether positive or negative, can materialize in the short-run as well as in the long-run. The impact of EP on FP can materialize in the short-run if investors fully understand and

anticipate the impact of environmental actions at the times of their implementation on expected future cash flows and/or their risk. In this case, investors will revise the probability distributions of future cash flows at the times of the signaling of the implementation of these environmental actions. Investors can use the information about EP that is signaled by the firms themselves (Feldman et al., 1997) or by external organizations (Shane and Spicer, 1983) to discriminate between firms based on their perceived EP. However, it is also possible that the impact of many environmental actions can only be seen in the long-run. Investment in EP necessarily imposes short-term costs, while the benefits associated with such investment can be materialized only in the long-run. Therefore, investors may not be able to fully understand and anticipate the impact of environmental actions at the times of their implementation on expected future cash flows and/or their risk. In this case, the impact of EP on FP in the short-run may be minimal. As more information about EP and its potential impact on expected future cash flows and/or their risk becomes available, investors revise their probability distributions of future cash flows and adjust stock prices accordingly.

Our review of empirical studies that examine the impact of EP on FP in any form shows that most of them have focused on the short-run impact. For example, Shane and Spicer (1983) find that poor external ratings of pollution performance published by the *Council on Economic Priorities* (CEP) had a significant negative impact on a firm's stock price at the time of the release of the CEP reports. Similarly, Hamilton (1995) finds significant negative abnormal returns following the announcement of a higher level of toxic emissions. Klassen and McLaughlin (1996) found a positive average cumulative abnormal return (CAR) of 0.82% following positive environmental events for a sample of 96 firms, and a negative average CAR of 1.5% following negative environmental events for a sample of 16 firms. White (1996) examine returns following an environmental disaster (Exxon Valdez) and shows that firms having higher environmental management practices experience higher returns relative to firms having poor environmental management practices. Stanwick and Stanwick (1998) perform a yearly cross-sectional regression and find for 2 out of the 6 years of their study that EP (amount of pollution emissions based on *Toxic Release Inventory* (TRI) report) is negatively related to social performance (*Fortune* reputation index), after controlling for firm size and profitability.

Other studies examine the impact of EP on firm risk and report empirical evidence consistent with a negative relationship. For example, Spicer (1978) found that less polluting firms have lower total and systematic risk than more polluting firms. Feldman et al. (1997) found that improved environmental management system (measured using proprietary environmental rating system) and EP (measured using TRI data) lead to a lower cost of equity capital due to the substantial reduction in the systematic risk (market beta). Using factor analysis, Sharfman and Fernando (2008) constructed a combined measure of EP using TRI data and the KLD Research & Analytics Inc (KLD) environmental scores for a sample of firms included in the S&P 500. They found that EP is negatively related to the weighted average cost of capital after controlling for size, leverage, and industry effects. The negative relationship is mainly due to the lower cost of equity. EP is negatively related to the cost of equity because of lower firm's systematic risk (unlevered equity beta), but positively related to the cost of debt.

Overall, most empirical studies that examine the impact of EP on FP in any form report empirical evidence consistent with a positive short-run impact. However, these studies do not provide a complete picture of the potential impact that EP may have on FP since they do not examine the long-run impact. Moreover, these studies use different measures of EP, each of them having its specificities and a different set of advantages and limits in terms of representing EP. The comparison between the results of these studies is also problematic because their samples include firms from different industries for which environmental issues are not necessarily equally important.

In this article, we focus on one specific industry, the forest and paper industry, for which environmental issues are more likely to be the same across all firms. We also analyze both the short-run and long-run impact of EP on FP. The examination of the long-run impact is important because the impact of many environmental actions can only be seen in the long-run. We measured EP through environmental certification systems. A certification system provides a synthetic measure because firms are assessed on

multiple attributes considered important to EP or to environmental management. For a given certification program, firms are uniformly assessed across the same range of environmental issues. Also, certifiers employed by the certification-issuing organizations are knowledgeable individuals specialized in the assessment of these environmental issues.

Research hypotheses

The purpose of this study is to examine whether any relationship exists in the short- and long-run between FP and a signal of ''good EP'': the forest certification announcement. The financial impacts of certification announcements are analyzed by type of certifications, trying to check whether the market reaction depends on who grants the forest certification. Forest certification could be an uncomplicated decision tool on which the investor can focus when evaluating a firm. Jones and Murrel (2001) argue that the literature on cognitive processes in decision making shows individuals are likely to simplify their evaluative decisions through the use of uncomplicated decision tools.[7] Incremental managerial decisions and actions are not easy to observe and evaluate objectively (Klassen and McLaughlin, 1996). Investors are typically not able to engage in thorough assessments of a firm when forming their impressions, but they can rely on what the firms signal about their values through their EP (Jones and Murrel, 2001). Forest certification had the benefit of signaling a firm's commitment to improve its EP to external stakeholders (Jiang and Bansal, 2003). Forest certification can also improve a firm's image by increasing environmental legitimacy, i.e., the acceptability of a firm's perceived EP (Jiang and Bansal, 2003). Therefore, one can consider forest certification as a positive environmental event that signals a strong EP and good positioning for future performance.

Although certification can increase operating costs, ignoring it could result in considerable loss of wealth to shareholders that may exceed these costs where it would result in controversy and loss of reputation. If the financial markets recognize the strategic importance of certification and price it, then certified firms will experience higher FP. In this case, shareholders of non-certified firms are more likely to increase the pressure on their firms to implement certification to avoid market penalties. Alternatively, corporate raiders may benefit from acquiring undervalued firms and certifying them. According to the coexisting theories that suggest positive, negative, or neutral relationships between EP and FP, we tested the following hypothesis:

Hypothesis 1: The forest certification program affects the financial performance of the firm.

Although a positive relationship is highlighted in several empirical studies analyzing the relationship between EP and FP, we will conduct two-tailed tests for testing purposes.

Any measure should be reliable and valid. In our study, we considered only third-party certification, which requires the evaluation of an expert team (e.g., KPMG, PWC, QMI) that have access to all relevant information about the firm. The quality and qualification of these certifiers increase the validity of certification. However, each certification scheme evaluates firms according to different criteria. As shown earlier, there are different certification programs applied in Canada and in the United States, which vary widely with respect to several dimensions (e.g., kind of actors originating them, standards type, verification process, governance structure, and financing). Thus, one may expect systematic performance differences between NGOs led-certification and industry-led certification. As such, we are interested in examining whether or not investors evaluate certification programs differently in the short- and long run. The specific hypotheses to be tested are:

Hypothesis 2-a: The short-term impact of forest certification on firm financial performance depends on who grants the certification.

Hypothesis 2-b: The long-term impact of forest certification on firm financial performance depends on who grants the certification.

Data

The unit of analysis is the certification event (firm and date), which is characterized by the following items: definition of the event, identification of the announcement date, and identification of firms

involved (Campbell et al., 1997). Our study examines certification announcements (FSC, SFI, CSA, and ISO14001) awarded by third-party organizations, which occurred between January 1998 and May 2005. The announcement date considered is the first arriving to the market: either the one issued by the firm, when it is available, or the date issued by certification program. In order to examine whether the source of the certification announcement dates (CD) (the company itself versus other sources) affects our results, we performed a regression analysis in which the dependent variable is abnormal returns and the independent variable is a dummy variable (equals to one if the source of the announcement is the company itself, and zero otherwise). We also include firm size in the regression, as well as dummy variables to control for industries. In both regressions (short-run and long-run abnormal returns), the coefficient associated with the dummy variable corresponding to the source of the announcement is not significant. This means that the source of the CD (the company itself versus other source) does not materially affect the substance of our results. Thus, our conclusions remain unchanged.

The announcement of certification is considered as a positive event that signals strong EP to the public. In order to select third-party certified firms and their announcement dates, several sources have been used: Canadian Sustainable Forestry Certification Coalition,[8] Forest Certification Resource Center,[9] Certifier organizations, and the Web sites of certification programs (FSC, CSA, SFI, and ISO14001),[10] as well as firms identified on the basis of their primary Standard Industrial Classification (SIC) codes reported on *Compustat* tapes. As its name indicates, forest certification is applied primarily to the forest product industry (SIC 24) and the paper industry (SIC 26). We also identified other related industries in which forest certification is applied (e.g., printing, publishing, and allied industries: SIC 27). In order to be included in our sample, firms must meet the following criteria:

- Certified firms must be publicly traded (listed) either on the Toronto Stock Exchange (TSX), NYSE, AMEX, or NASDAQ.
- Financial data of certified firms must be available on *Compustat* and *CRSP* or *TSX-CFMRC* databases.
- Certified forest operations, divisions, or products must be located in Canada or in the United States. Foreign firms that have certified operations in these two countries must be listed in Canada or in the United States to be included in the sample (e.g., American Depositary Receipt (ADRs)).
- Certified firms must not have announcements of confounding events in the event window [−10 days, +10 days] such as restructuring, divestitures, new products, dividends and/or earnings announcements, joint ventures, acquisitions, change in a key executive, a major contract, etc. This allows us to isolate the effect of certification events from the effects of other events.

The initial sample includes 333 third-party certification events located in Canada and in the United States made by 58 public firms. Out of these 333 certification events, 85 certification events are excluded for several reasons: e.g., some certified firms are not covered by *Compustat* database; some certified firms are acquired after being certified, while others merged with other firms; or some certified firms have certified operations in Canada or in the United States, but they are not listed in these two countries. We also excluded 74 certification events because they are accompanied by announcements of confounding events in the event window [−10 days, +10 days]. The resulting sample of 174 certification events includes 12 certification events for which we have only the certification announcement month. Moreover, we do not have the daily return data for two other certification events. The resulting final sample that can be used to examine the short-run event returns of certified firms includes 160 third-party certification events made by 42 firms. Our final sample includes nine joint certifications: seven SFI/ISO14001 certifications and two SFI/CSA certifications. These observations are used only to test the first hypothesis, but have been removed from our tests for the second hypothesis to reduce the bias related to the construction of sub-samples. Table II shows the sample distribution of third-party certification events by year and certification system, whereas Table III shows the sample distribution by industry and firm size.

About 31% of our sample belong to the forest product industry (SIC code 24), 52% to the paper industry (SIC code 26), 12% to the printing and

TABLE II

Sample distribution of third-party certification events by year and certification system

Year	Certification system				Total
	FSC	SFI	CSA	ISO14001	
1998	2	0	0	0	2
1999	0	1	0	0	1
2000	3	4	2	2	11
2001	9	3	7	8	27
2002	4	13	1	5	23
2003	7	8	8	13	36
2004	12	4	4	17	37
2005	5	3	1	5	14
Total	42	36	23	50	151

Note: The sample includes 160 third-party certification events that occurred during the 1998–2005 period and made by 42 firms. In addition to the 151 third-party certification events shown above, there are nine joint certifications: seven certifications SFI/ISO14001 (two in 1999; one in 2000; one in 2001; two in 2002; one in 2003); and two certifications SFI/CSA (2001).

TABLE III

Sample distribution by industry and size

Industry	Number of firms	Number of certifications	Firm size (US$ million)	
			Mean	Median
Lumber and wood products (SIC 24)	13	64	1659.5	577.6
Paper and allied products (SIC 26)	22	84	4392.5	1847.2
Printing, publishing, and allied industries (SIC 27)	5	10	2428.6	1339.4
Other	2	2	34.3	34.3
Full sample	42	160	3105.3	986.33

Notes:

1. The sample includes 160 third-party certification events that occurred during 1998–2005 period and made by 42 firms.
2. The ''Other'' group includes the following industries: Forestry (SIC 08) and Miscellaneous Manufacturing Industries (SIC 39).
3. The correlation coefficient between firm size and number of certification is 0.19, which is not statistically significant.

publishing industry (SIC code 27), and the remaining 5% (two firms) belong to other related industries (SIC code 08 and 39).

The same firm can obtain multiple certifications (FSC, SFI, CSA, and/or ISO14001) and can be certified several times by the same certification program (e.g., multiple divisions or forests). In order to analyze long-run performance, we considered only the initial certification for each firm relative to a particular certification program. Thus, we can only use 68 third-party certification events made by 39 firms to examine the long-run performance of certified firms. These 68 certification events include 56 certification events out of the 160 shown in Table II, plus the 12 certification events for which we have only the certification announcement month. Accounting data were obtained from the *Compustat* Industrial and research tapes, while return data were obtained from

the *CRSP* master tapes for U.S. firms and the *TSX-CFMRC* database for Canadian firms.

Methodology

The control firm approach

The control firm approach matches sample firms to control firms on the basis of specified firm characteristics (Barber and Lyon, 1997). In this study, we use the return on a size and industry-matched control firm as a proxy for the expected (normal) return for each sample firm when calculating abnormal returns. Our approach matches a sample firm to a control firm of similar size and industry.[11] In order to identify a size and industry-matched control firm, we first identify all non-event firms (i.e., control firms should not have experienced the event) operating in the same industry of the sample firm. From this set of firms, we chose the firm with the closest size to that of the sample firm (i.e., firm, or portfolio of firms when possible, with market value of equity between 70 and 130% of the market value of equity of the sample firm). Specifically, we first choose all non-certified firms with the same two-digit SIC code from *Compustat*.[12] Among these firms, we selected those with a size within ±30% of the size of the sample firm in the fiscal-end year prior to the year of the certification announcement.

Calculation of short-run abnormal returns

In accordance with Campbell et al. (1997) and Kothari and Warner (2006), we conducted an event study to capture any abnormal return of certified firms compared with their paired firms. The abnormal return, if it exists, may show whether a green premium exists or not, and if being certified is more of a burden than an advantage for firms. The daily abnormal return for certified firm i on day t relative to its comparable firm c is computed as follows:

$$\mathrm{AR}_{it} = R_{it} - R_{ct}$$

where R_{it} is the daily return of the certified firm i, and R_{ct} is the daily return of the comparable firm c on day t. $t \in (-10, \ldots, 0, \ldots, +10)$, where 0 is the certification announcement day. The abnormal return, AR_{it}, is the difference between the return conditional on the event and the expected return unconditional on the event since we assume that "event" or certified firms differ from matching firms only in that they experience the event. Thus, AR_{it} is a direct measure of the unexpected change in stockholder wealth associated with the certification event.

The abnormal return observations must be aggregated to draw inferences for the certification events (Campbell et al., 1997). The aggregation is along two dimensions: through time and across securities. Let $\mathrm{CAR}_i(T_1, T_2)$ denote the CAR of firm i from T_1 to T_2 over the event window:

$$\mathrm{CAR}_i(T_1, T_2) = \sum_{t=T_1}^{T_2} \mathrm{AR}_{it}$$

The cross-sectional mean CAR across N firms is given by

$$\overline{\mathrm{CAR}}(T_1, T_2) = \frac{1}{N}\sum_{i=1}^{N} \mathrm{CAR}_i(T_1, T_2)$$

The mean CAR for any event window can be analyzed separately given the estimates of their variances. The mean CAR represents average total effect of the certification event across all sample events over the event window. The specific null hypothesis to be tested is whether the mean cumulative abnormal performance, $\overline{\mathrm{CAR}}(T_1, T_2)$, is equal to zero.

Calculation of long-run abnormal returns

In order to evaluate the long-run abnormal returns of certified firms, we use two measures: CAR and buy-and-hold abnormal return (BHAR). The BHAR analysis answers the question of whether sample firms earned abnormal returns over a particular horizon of analysis, whereas the CAR analysis answers the question of whether sample firms persistently earn monthly abnormal returns (Lyon et al., 1999).

CAR approach

The monthly abnormal return for certified firm i on month t relative to its comparable firm c is computed as follows:

$$AR_{it} = R_{it} - R_{ct}$$

where R_{it} is the return of the certified firm i, during month t, and R_{ct} is the return on the comparable firm c during the corresponding time period. $t \in (1, 2, \ldots, 36)$, where month 0 is the certification announcement month. Let $CAR_i(1, T)$ denote the CAR of firm i from month 1 to month T after certification:

$$CAR_i(1, T) = \sum_{t=1}^{T} AR_{it}, \quad T = 12, 24, 36 \text{ months.}$$

The cross-sectional mean CAR across N firms for each event window is given by

$$\overline{CAR}(1, T) = \frac{1}{N}\sum_{i=1}^{N} CAR_i(1, T)$$

BHAR approach

> Buy-and-hold abnormal returns measure the average multiyear return from a strategy of investing in all firms that complete an event and selling at the end of a prespecified holding period versus a comparable strategy using otherwise similar non-event firms. (Mitchell and Stafford, 2000, p. 296)

Buy-and-hold abnormal return is calculated as the T period buy-and-hold return on a sample firm less the T period buy-and-hold return on a control firm. We calculate one, 2- and 3-year BHARs for each sample firm (i.e., sample event) using control firm returns as expected return benchmark:

$$BHAR_i(1, T) = \prod_{t=1}^{T}(1 + R_{it}) - \prod_{t=1}^{T}(1 + R_{ct})$$

where R_{it} is the return of the certified firm i during month t, and R_{ct} is the return on the comparable firm c during the corresponding time period. T = 12, 24, and 36 months.

The mean BHAR is the equally weighted average of the individual BHARs:

$$\overline{BHAR}(1, T) = \frac{1}{N}\sum_{i=1}^{N} BHAR_i(1, T)$$

where N is the number of sample events.

The mean CAR or BHAR represents the average total effect of the certification events across all sample events over the event window. The specific null hypothesis to be tested is whether $\overline{CAR}(1, T)$ or $\overline{BHAR}(1, T)$ is equal to zero.

Statistical tests for abnormal stock returns

In order to test the null hypothesis that the mean CAR is equal to zero for a sample of N observations (i.e., certification announcements), we used the following parametric test statistic (Barber and Lyon, 1997):

$$t_{CAR} = \frac{\overline{CAR}(T_1, T_2)}{\left(\frac{\sigma[CAR_i(T_1, T_2)]}{\sqrt{N}}\right)}$$

where $\overline{CAR}(T_1, T_2)$ is the sample average, and $\sigma[CAR_i(T_1, T_2)]$ is the cross-sectional sample standard deviation of the individual CARs for the sample of N certification events considered in a given CAR calculation.

In order to test the null hypothesis of zero mean BHAR, we use the skewness-adjusted t-statistic (Lyon et al., 1999):

$$t_{BHAR} = \sqrt{N}\left(S + \frac{1}{3}\hat{\gamma}S^2 + \frac{1}{6N}\hat{\gamma}\right)$$

where

$$S = \frac{\overline{BHAR}(1, T)}{\sigma[BHAR_i(1, T)]},$$

$$\text{and } \hat{\gamma} = \frac{\sum_{i=1}^{N}\left[BHAR_i(1, T) - \overline{BHAR}(1, T)\right]^3}{N\sigma[BHAR_i(1, T)]^3}$$

where $\overline{BHAR}(1, T)$ is the sample average, and $\sigma[BHAR_i(1, T)]$ is the cross-sectional sample standard deviation of the individual BHARs for the sample of N certification events considered in a given BHAR calculation. $\hat{\gamma}$ is an estimate of the coefficient of skewness of $BHAR_i(1, T)$. Note that the conventional t-statistic is $S\sqrt{N}$. The skewness-adjusted t-statistic adjusts the usual t-statistic by two terms that are a function of the skewness of the distribution of abnormal returns. Assuming that abnormal returns (CARs and BHARs) are normally distributed and are cross-sectionally independent, the test statistics t_{CAR} and t_{BHAR} follow a

Student's *t*-distribution under the null hypothesis. Critical values are based on tabulated distribution of *t*-statistic.[13]

Methodological issues[14]

The analysis of long-run abnormal returns is treacherous (Lyon et al., 1999, p. 165). Barber and Lyon (1997) advocate the use of BHAR over CAR, because CAR is a biased predictor of BHAR, and this problem can lead to incorrect inferences if researchers restrict attention to CAR only. They refer to this problem as the *measurement bias*. However, Fama (1998) argues that theoretical and statistical considerations alike suggest that CAR should be used, rather than BHAR because it poses fewer statistical problems. Generally, misspecification of test statistics for long-run abnormal returns are caused by the new listing bias (survivor bias), the rebalancing of benchmark bias, the skewness bias, the cross-sectional dependence (i.e., cross-correlations of individual-firm abnormal returns), and a bad model of asset pricing (Lyon et al., 1999). Fortunately, the control firm approach eliminates the new listing, the rebalancing, and the skewness biases (Barber and Lyon, 1997, p. 354). CAR is more affected by the new listing bias, whereas BHAR is more affected by the rebalancing and skewness biases (Barber and Lyon, 1997). The skewness bias is less severe for CAR than for BHAR because the monthly returns of sample firms are summed rather than compounded (Barber and Lyon, 1997; Fama, 1998). The extent of the skewness bias in the test statistic is expected to decline with sample size (Kothari and Warner, 2006). Skewness bias is a concern for small samples (Kothari and Warner, 2006). This is why we use the skewness-adjusted *t*-statistic to test the null hypothesis of zero mean BHAR.

Cross-sectional dependence is likely to be a problem when return calculations involve overlapping periods or when there is severe industry clustering (Lyon et al., 1999). This problem is more severe in the BHAR approach (Mitchell and Stafford, 2000). Assessing the statistical significance of the mean BHAR has been particularly difficult because long-horizon abnormal returns depart from normality and tend to be cross-correlated (Kothari and Warner, 2006). The two main sources of cross-sectional correlations of the individual event firm abnormal returns are (Lyon et al., 1999; Mitchell and Stafford, 2000): 1. *calendar clustering*: overlapping observations, in calendar time, of similar firms such as those in the same industry (e.g., sample firms that complete certification events in the same month); 2. *overlapping return calculations*: overlapping periods of return calculation for the same firm (e.g., multiple certification events by the same firm within 3-year period). This is the most severe form of cross-sectional dependence. The only ready solution to this source of bias is to purge the sample of observations of overlapping returns (Lyon et al., 1999). Therefore, in order to mitigate the problem of cross-sectional correlations of the individual event firm abnormal returns in our sample, we repeat the analysis after excluding multiple certification events on the same firm that occur within any 3-year period of the initial certification. In other words, after the first certification event, we ignore additional certification events until after the 3-year event window.

Another major difficulty when assessing long-run abnormal returns is the bad model problem. Event study tests are joint tests of whether abnormal returns are zero (i.e., market efficiency) and of whether the assumed model of expected (normal) returns is correct (Kothari and Warner, 2006). In this article, we implicitly assume an expected return model in which the-matched characteristics (size and industry) perfectly proxy for the expected return on a security. In order to minimize the errors in risk adjustment, the benchmark is a portfolio of firms rather than a single firm, when possible.

In addition to all these difficulties, there is another concern associated with small samples: extreme observations (outliers). With small samples, it is crucial to assess whether the results are driven by outliers (McWilliams and Siegel, 1997). A negative (positive) mean BHAR or CAR can be driven by unusually large negative (positive) abnormal returns for a few sample firms. In order to identify outliers, we calculate the interval [mean -3σ; mean $+3\sigma$] for a given CAR or BHAR calculation. If some CAR or BHAR observations lie outside this interval, then we repeat the analysis without these outliers. If the results are different (i.e., results are affected by these outliers), then we report the results

without outliers. Moreover, it is important to report the median values, because they are less affected by outliers. McWilliams and Siegel (1997) argue that one important control for outliers is to report non-parametric test statistics. We use the non-parametric *Wilcoxon signed-rank test statistic* to test the null hypothesis that the median abnormal return (CAR or BHAR) estimate is equal to zero. In all the results, we also report the proportion of positive CAR or BHAR. The mean (median) values for CAR and BHAR estimates that are significant at the 1, 5, or 10% levels are referred to hereafter as being highly significant, significant or marginally significant, respectively.

Results and analysis

Short-run event returns

Our purpose is to examine the stock price response to the certification announcement. Specifically, we examine four event windows. First, the pre-announcement period (days −10 through −1 relative to the certification announcement day), which may capture any abnormal performance (price run-up) prior to the CD. Second, the post-announcement period (day +1 through +10), which may capture any abnormal performance after the announcement date. Third, we examine the period around the announcement date (day −1 through +1) to capture the market's response to the certification announcements. Fourth, we examine the overall event window (day −10 through +10). Remember that the CD is day 0.

Table IV reports the average and median values of the CAR for these four event windows. The mean (median) CAR estimates for the pre-announcement window [CD−10, CD−1] of 0.59% (0.26%) are not significant (*t*-statistic of 0.98; *p*-value of 0.54), and suggests that the certification announcement is not anticipated by the market. The mean CAR estimate for the announcement window [CD−1, CD+1] of 0.47% is marginally significant (*t*-statistic of 1.56) suggesting that the certifications announcements contain some new information. However, the corresponding median CAR estimate of 0.09% is not significant (*p*-value of 0.1). A closer examination of the data reveals the existence of five outliers (extreme observations) that lie outside the interval $[\text{Mean(CAR)} \pm 3 \times \sigma(\text{CAR})]$. After removing these outliers, the mean (median) 3-day CAR estimates become 0.19% (0.07%) and not significant. The mean (median) CAR estimates for the post-announcement window [CD+1, CD+10] of 0.31% (0.82%) and the overall event window [CD−10, CD+10] of 0.98% (0.25%) are not significant.

Although positive, as expected, the mean (median) CAR estimates reported in Table IV provide little support for our first hypothesis (H_1), which suggests that strong EP (i.e., forest certification) affects the FP of the firm. Overall, the evidence indicates that forest certification announcements do not convey new information to the market.

This result can be easily understood if we consider the certification process itself. In fact, the certification announcement is the output of a process that can take more or less time depending on the nature of the certification (forest, division, product, process). Therefore, market participants may anticipate the impact of certification on future cash flows and firm performance well before the announcement date. However, we do not find support for this explanation since certified firms do not show any abnormal performance over 36 months before the certifications announcements month.[15]

Table IV also reports the average and median values of the CAR surrounding the certification announcement by certification system. Only the mean CAR estimate for the overall announcement window [CD−10, CD+10] of 2.60% and the median CAR estimate for the pre-announcement window [CD−10, CD−1] of 1.5% experienced by firms certified SFI are marginally significant (*t*-statistic of 1.56 and *p*-value of 0.089, respectively). Except for these results, the average and median values of the CAR for the four event windows considered are not statistically significant regardless of the certification system. For example, the mean CAR estimates realized by firms certified FSC, SFI, CSA, and ISO14001 for the announcement window [CD−1, CD+1] are 0.54, 0.66, 0.93, and 0.12%, respectively. The corresponding median values show a similar trend (i.e., positive values) except for ISO14001 certification (median value of −0.18%) since only 46% of ISO14001-certified firms have experienced positive CAR. The results reported in

TABLE IV

Cumulative abnormal return (CAR) for third-party-certified firms surrounding the certification announcement dates

Certification system	FSC	SFI	CSA	ISO14001	All certifications
Mean CAR(−10, −1)	0.44% (0.49)	1.21% (1.28)	−1.03% (−0.80)	0.07% (0.06)	0.59% (0.98)
Median CAR(−10, −1)	2.10% (0.56)	1.50% (0.089)⋆	0.12% (0.56)	−1.41% (0.3)	0.26% (0.54)
% Positive CAR(−10, −1)	54.76	66.67	56.52	40	53.13
Mean CAR(1, 10)	−0.06% (−0.05)	1.27% (0.91)	−1.16% (−0.83)	0.53% (0.70)	0.31% (0.58)
Median CAR(1, 10)	0.61% (0.88)	−0.22% (0.82)	−1.17% (0.36)	1.28% (0.42)	0.82% (0.69)
% Positive CAR(1, 10)	54.76	47.22	43.48	58	53.13
Mean CAR(−1, +1)	0.54% (1.06)	0.66% (0.81)	0.93% (1.11)	0.12% (0.23)	0.47% (1.56)⋆
Median CAR(−1, +1)	0.56% (0.13)	0.23% (0.27)	1.22% (0.37)	−0.18% (0.76)	0.09% (0.10)
% Positive CAR(−1, +1)	57.14	50	60.87	46	51.25
Mean CAR(−10, +10)	0.56% (0.38)	2.60% (1.56)⋆	−1.81% (−1.30)	0.39% (0.28)	0.98% (1.25)
Median CAR(−10, +10)	2% (0.63)	0.95% (0.13)	−2.80% (0.21)	−1.41% (0.79)	0.25% (0.32)
% Positive CAR(−10, +10)	57.14	55.56	39.13	44	51.25
Number of observations	42	36	23	50	160
Number of firms	18	22	7	19	42

Notes:

1. The statistical significance of the mean CAR is given in the parentheses by its *t*-statistic (t_{CAR}) values.
2. The statistical significance of the median CAR is given in the parentheses by its *p*-value of the non-parametric Wilcoxon signed rank test for zero median.
3. The total number of observations (i.e., certification events) for sub-samples (42 + 36 + 23 + 50 = 151) is less than the total of 160 observations because we do not take into account nine joint (double) certifications to eliminate the bias associated with the construction of the sub-samples. Furthermore, the total number of firms for sub-samples (18 + 22 + 7 + 19 = 66) is higher than the total number of firms included (42) because the same firm can get certified by more than one system at different points in time.

⋆Significant at 10% level.

Table IV do not support our second hypothesis (H_2) suggesting that the impact of forest certification on firm FP depends on who grants the certification. In summary, the results of short-run event returns indicate that forest certification do not have any significant impact on firm FP regardless of the certification system carried out by firms.

Long-run event returns

In this section, we examine the long-run event abnormal returns by analyzing the post-announcement period using two approaches: CAR and BHAR. Table V provides a summary of the results of CAR over 36 months following the certification announcement month.

At 12 months after certification, the mean CAR estimate is negative (−4.46%) but not significant (*t*-statistic: −1.28). The corresponding median value is also negative (−11.25%) but marginally significant (*p*-value: 0.085). At 24 months after certification, the mean CAR estimate of −11.02% is significantly negative (*t*-statistic: −2.22). At 36 months after certification, the mean CAR estimate is also negative (−16.14%) and highly significant (*t*-statistic: −2.68). The corresponding median values show a similar trend.

These results support our first hypothesis highlighting a negative relationship between FP and EP as measured by certification. Our results suggest that forest certification has, on average, a negative impact on firm FP. It is likely that the market has not recognized the benefits of forest certification. As a result, the expected benefits of certification relative to its associated costs have not been realized.

Table V also reports the results of CAR over 36 months following the certification announcement

TABLE V

Cumulative abnormal return (CAR) for third-party-certified firms over 36 months following the certification announcement month

Certification system	FSC	SFI	CSA	ISO14001	All certifications
Mean CAR(1, 12)	0.25% (0.04)	−7.91% (−1.35)*	−12.03% (−1.41)	−1.20% (−0.14)	−4.46% (−1.28)
Median CAR(1, 12)	3.07% (0.94)	−14.61% (0.16)	−6.34% (0.15)	−6.06% (0.68)	−11.25% (0.085)*
% Positive CAR(1, 12)	52.94	30	28.57	50	41.18
Mean CAR(1, 24)	−3.87% (−0.25)	−10.48% (−1.86)**	−16.10% (−1.68)*	−17.46% (−2.09)**	−11.02% (−2.22)**
Median CAR(1, 24)	−1.28% (0.98)	−13.13% (0.022)**	−6.51% (0.29)	−25.73% (0.052)*	−10.83% (0.0069)***
% Positive CAR(1, 24)	47.06	20	42.86	30	32.35
Mean CAR(1, 36)	8.07% (0.61)	−20.73% (−1.71)*	−37.88% (−2.60)**	−25.99% (−2.64)***	−16.14% (−2.68)***
Median CAR(1, 36)	7.02% (0.58)	−22.04% (0.10)	−47.46% (0.078)*	−27.81% (0.022)**	−12.43% (0.0099)***
% Positive CAR(1, 36)	52.94	30	28.57	25	33.82
Number of observations	17	20	7	20	68
Number of firms	17	20	7	20	39

Notes:

1. The statistical significance of the mean CAR is given in the parentheses by its *t*-statistic (t_{CAR}) values.
2. The statistical significance of the median CAR is given in the parentheses by its *p*-value of the non-parametric Wilcoxon signed rank test for zero median.
3. The total number of observations (i.e., certification events) for sub-samples (17 + 20 + 7 + 20 = 64) is less than the total of 68 observations because we do not take into account four joint (double) certifications to eliminate the bias associated with the construction of the sub-samples. Furthermore, the total number of firms for sub-samples (64) is higher than the total number of firms (39) because the same firm can get certified by more than one system at different points in time.
4. After removing two outliers (extreme observations) that lie outside the interval [Mean(CAR) $\pm 3 \times \sigma$(CAR)] for the 2-year CAR(1, 24)and one outlier for the 3-year CAR(1, 36), the corresponding mean (median) CAR estimates for all certifications become −10.11% (−10.83%) and −13.91% (−12.33%), respectively. All these figures are significant at 1% level.
5. After controlling simultaneously for outliers and cross-sectional correlations of abnormal returns (i.e., excluding multiple certification events on the same firm that occur within any 3-year period of the initial certification), the 1-, 2-, and 3-year mean CAR estimates for all certification are negative and marginally significant (−5.23, −8.33, and −10.7%, respectively). The corresponding median values are also negative, but only the 2-year median CAR estimate of −8.84% is significant at the 5% level. The sub-samples analysis shows that the results remain unchanged. The only modification is that the significance level for CSA-certified firms decreases markedly since this sub-sample includes only two firms.

*Significant at 10% level.
**Significant at 5% level.
***Significant at 1% level.

month for each certification program separately. At 36 months after certification, the mean (median) CAR estimates of 8.07% (7.02%) earned by FSC-certified firms are not significant. Similarly, the positive 1-year mean (median) CAR estimates of 0.25% (3.07%) and the negative 2-year mean (median) CAR estimates of −3.87% (−1.28%) earned by FSC-certified firms following certification are not significant.

Unlike FSC-certified firms, SFI-, CSA-, and ISO14001-certified firms have experienced only negative mean (median) CAR estimates, which are significant in many cases. The 1-, 2-, and 3-year mean CAR estimates experienced by SFI-certified firms are −7.91, −10.48, and −20.73%, respectively. The 1- and 3-year mean CAR estimates earned by SFI-certified firms are marginally significant, whereas the 2-year mean (median) CAR estimates are significant at the 5% level.

Similarly, CSA-certified firms have experienced significantly negative mean CAR estimate over 36 months following certification (−37.88%). The 2-year mean CAR estimate of −16.1% experienced by CSA-certified firms is marginally significant, whereas the 1-year mean CAR estimate of −12.03% is not significant.

The 1-year mean CAR estimate of −1.2% earned by ISO14001-certified firms is not significant. For a longer period after certification (24 and 36 months), ISO14001-certified firms also have experienced significantly negative mean CAR estimates (−17.46 and −25.99%, respectively). The corresponding median values show a similar trend.

At 36 months after certification, SFI-, CSA-, and ISO14001-certified firms have been penalized by financial markets. During this period, only FSC certified firms have experienced positive, although not significant, mean CAR estimate of 8.07%. SFI-, CSA-, and ISO14001-certified firms have experienced significantly negative mean CAR estimates over the same period. This finding supports our second hypothesis (H_2). The impact of forest certification on firm FP, as measured by CAR, depends on who grants the certification. Industry-led certifications (SFI, CSA, and ISO14001) are penalized by financial markets. The NGOs–led FSC certification is not penalized in the long term.

We also examine whether or not our two hypotheses continue to hold if we use an alternative FP measure, namely the BHAR. Table VI provides a summary of the results of BHAR over 36 months following the certification announcement month.

At 12 and 24 months after certification, the mean BHAR estimates are significantly negative (−6.21 and −9.39%, respectively). At 36 months after certification, the mean BHAR estimate is also negative (−10.55%) but marginally significant. The corresponding median values show a similar trend. As when the FP is measured using CAR, the results using BHAR support our first hypothesis highlighting a negative relationship between FP and EP as measured by certification. Forest certification has, on average, a negative impact on firm FP.

Table VI also reports the results of BHAR over 36 months following the certification announcement month for each certification program separately. At 36 months after certification, the mean BHAR estimate of 19.32% earned by FSC-certified firms is marginally significant. Although positive, the corresponding median value of 13.73% is not significant. The negative 1-year mean BHAR estimate of −0.42% and the positive 2-year mean BHAR estimate of 2.35% earned by FSC-certified firms following certification are not significant.

Similar to the results shown in Table V in which only FSC certification is associated with some positive numbers, the results of Table VI show that SFI, CSA and ISO14001 certifications are associated with negative mean BHAR estimates, which are significant in some cases. For example, the 1-year, 2-year and 3-year mean BHAR estimates experienced by SFI-certified firms are all negative (−8.83, −8.46 and −12.87%, respectively) but not significant. CSA-certified firms have experienced significantly negative mean BHAR estimate over 36 months following certification (−45.39%). The 1-year and 2-year mean BHAR estimates of −17.56 and −20.97% earned by CSA-certified firms are only marginally significant. ISO14001-certified firms have also experienced negative mean BHAR estimate over 36 months following certification (−20.5%), which is marginally significant. The 1-year and 2-year mean BHAR estimates of 2.33 and −10.19% earned by ISO14001-certified firms are not significant.

Overall, the results reported in Table VI provide some supports to our second hypothesis (H_2). The impact of forest certification on firm FP, as measured by BHAR, depends on who grants the

TABLE VI

Buy and hold abnormal return (BHAR) for third-party-certified firms over 36 months following the certification announcement month

Certification system	FSC	SFI	CSA	ISO14001	All certifications
Mean BHAR(1, 12)	−0.42% (−0.07)	−8.83% (−1.16)	−17.56% (−1.86)★	2.33% (0.29)	−6.21% (−1,68)★★
Median BHAR(1, 12)	0.45% (0.98)	−14.96% (0.19)	−10.5% (0.15)	−1.92% (0.76)	−11.68% (0.055)★
% Positive BHAR(1, 12)	52.94	30	28.57	45	38.8
Mean BHAR(1, 24)	2.35% (0.22)	−8.46% (−0.84)	−20.97% (−1.65)★	−10.19% (−0.7)	−9.39% (−1.67)★★
Median BHAR(1, 24)	−4.42% (0.75)	−12.97% (0.1)	2.34% (0.57)	−23.84% (0.16)	−12.25% (0.0085)★★★
% Positive BHAR(1, 24)	47.05	25	57.14	25	32.83
Mean BHAR(1, 36)	19.32% (1.37)★	−12.87% (−0.92)	−45.39% (−2.31)★★	−20.5% (−1.38)★	−10.55% (−1.4)★
Median BHAR(1, 36)	13.73% (0.3)	−18.43% (0.27)	−30.92% (0.078)★	−23.75% (0.062)★	−18.1% (0.071)★
% Positive BHAR(1, 36)	58.82	42.1	28.57	25	38.8
Number of observations	17	20	7	20	67
Number of firms	17	20	7	20	39

Notes:

1. The statistical significance of the mean BHAR is given in the parentheses by its skewness-adjusted *t*-statistic (t_{BHAR}) values.
2. The statistical significance of the median BHAR is given in the parentheses by its *p*-value of the non-parametric Wilcoxon signed rank test for zero median.
3. The total number of observations (i.e., certification events) for sub-samples (17 + 20 + 7 + 20 = 64) is less than the total of 68 observations examined in the long-run study because we do not take into account four joint (double) certifications to eliminate the bias associated with the construction of the sub-samples. Furthermore, the total number of firms for sub-samples (64) is higher than the total number of firms (39) because the same firm can get certified by more than one system at different points in time.
4. The total number of observations is 67 for BHAR (68 for CAR) because we remove one extreme observation (outlier) that lies outside the interval [Mean(BHAR) $\pm 3 \times \sigma$(BHAR)] for each BHAR calculation (12, 24, and 36 months). Inclusion of these observations changes dramatically the results. For example, the 3-year mean BHAR(1, 36) for all certifications becomes −16.48%, which is significant at 5% level. The sub-samples' analysis is not affected by outliers, except the SFI sub-sample, which include one outlier for the BHAR(1, 36). If we include this observation,then the mean 3-year BHAR(1, 36) becomes −32.9%, which is significant at 5% level.
5. After controlling simultaneously for outliers and cross-sectional correlations of abnormal returns (i.e., excluding multiple certification events on the same firm that occur within any 3-year period of the initial certification), the 1-, 2-, and 3-year mean BHAR estimates for all certification are negative (−5.65, −8.63, and −7.28%, respectively). Only the 1-year mean BHAR estimate is marginally significant. The corresponding median values are also negative, but only the 2-year median BHAR estimate of −11.67% is significant at the 5% level. The sub-samples' analysis shows that the 1-, 2-, and 3-year mean (median) BHAR estimates experienced by FSC certified firms are all positive, but insignificant. The 1- and 2-year mean (median) BHAR estimates experienced by SFI-certified firms are −14.52% (−15.15%), and −14.04% (−12.04%), respectively. The 1-year mean and the 2-year median BHAR estimates earned by SFI-certified firms are marginally significant, whereas the 2-year mean BHAR estimate is significant at the 5% level. The 3-year mean (median) BHAR estimates of −32.3% (−28.88%) experienced by ISO14001-certified firms are significant. The results for CSA-certified firms remain unchanged, except that the significance level decreases markedly since this sub-sample includes only two firms.

★Significant at 10% level.
★★Significant at 5% level.
★★★Significant at 1% level.

certification since only industry-led certification (SFI, CSA, and ISO14001) are penalized by financial markets. 36 months after certification, SFI-, CSA-, and ISO14001-certified firms have experienced negative mean (median) BHAR estimates. Over the same period, only FSC-certified firms have experienced positive, although not significant, mean (median) BHAR estimates. Again, the NGOs-led FSC certification is not penalized by financial markets. Controlling simultaneously for outliers and cross-sectional correlations of abnormal returns (i.e., excluding multiple certification events on the same firm that occur within any 3-year period of the initial certification) does not alter the substantive results of this article.

When faced with the question of whether or not to undertake the investment to adopt certification, managers should answer two questions: 1. Should we engage in forest certification (i.e., invest or not invest, which is equivalent to cost-benefit analysis)? 2. Which certification program should be selected? The nature of the certification program can be an important element in the final decision. The expected outcome of the cost–benefit analysis can be zero, negative, or positive. The results reported in this article suggest that, on average, the costs of certification outweigh the benefits to the firm in the long-run (up to 3 years). Investors anticipate a negative impact of certification on expected future cash flows and/or their risk, and consequently adjust stock prices of certified firms downward relative to non-certified firms during the 3 years following the adoption of certification.

This finding is consistent with theoretical argument suggesting that EP will have a negative impact on FP because managers face a trade-off between environmental costs and other costs (i.e., the line of thought supporting the traditional view of the corporation, which focuses on profit or shareholder return maximization). The decision to adopt certification program when other competitors do not seems to be a financial burden for environmentally responsible firms.[16]

Several reasons may explain why certification costs are not covered by the associated benefits. For example, there may be a lower demand for certified products that command higher prices relative to traditional products. Consumers may not be willing enough to pay higher prices for certified products (Anderson and Hansen, 2004). Furthermore, there may be little or no financial effect on the firm's reputation as more firms adopt certification. It is also possible that the expected benefits of certification such as the attraction of ''environmentally responsible'' investors and consumers necessary to boost sales and stock market valuation sufficiently to overcome the certification costs may only be realized much later on (more than 3 years). Moreover, certification might be a reaction of the forestry industry, which has suffered from a loss of legitimacy, but it might not be sufficient to regain the market confidence over a 3-year period. Another potential explanation is that certified firms are simply not able to be profitable because of competitive pressures.

Our evidence also suggests that NGOs-led certification (FSC) has a neutral impact on FP, whereas industry-led certification (SFI, CSA, ISO14001) has a negative impact on FP. In other words, the nature or identity of the certification program can offset the negative impact of certification on FP. This finding could be partially explained by the conclusion reached by Gereffi et al. (2001) and Cashore (2002) who argue that FSC certification is considered as the more credible by social and environmental groups, as well as by the finding of Barla (2007) who argues that ISO 14001 certification does not significantly impact EP. Like social and environmental groups, investors seem to distinguish between different certification programs, at least in the long-run.

The most likely explanation for these performance differences between NGOs-led certification (FSC) and industry-led certification (SFI, CSA, and ISO14001) is the difference between the characteristics of certification programs (i.e., kind of actors originating them, standards type, verification process, governance structure, and financing). For example, the FSC standards and criteria focus equally on the three basic aspects associated with sustainable development (economic, social, and environmental), whereas those of SFI, CSA, and ISO14001 focus more on environmental aspects.

The findings regarding the second hypothesis lead us to ask an important question: Which certification program should managers choose for their firms? Managers might have several reasons to discriminate between certification programs if they decide to adopt the certification. In their survey on a sample of Canadian firms, Takahashi et al. (2003) found that

most Canadian firms adopted the FSC certification for their international markets because of its higher credibility at the international level. ISO14001 and CSA certifications are used only for domestic markets. Overall, the results of Takahashi et al. (2003) show that increased demand for certified products, and the likelihood to attract environmentally responsible investors are two of the main reasons for Canadian firms to adopt certification.

Conclusion

The purpose of this article is to examine empirically the impact of forest certification on firm FP in Canada and the United States. Specifically, we analyzed the market reaction around the dates of the third-party forest certification announcements, as well as the impact of forest certification on the long-run ex-post firm FP. The main question is whether there is a ''green premium'' for certified firms, and whether or not this ''green premium'' depends on who grants the certification. Third-party forest certification is used as a measure (proxy) for EP. Certification is conceived as a signal sent by certified firms to the financial market. Based on an event study methodology, we analyzed the short- and the long-run stock price performance.

In our empirical tests, we distinguish between certification led and financed by the industry and certification led by NGOs and financed by private foundations. Regarding the relationship between EP and FP, our conclusion highlights a difference between the short-run and long-run results. The results of short-run event returns indicate that forest certification does not have any significant impact on firm FP regardless of the certification system carried out by firms. In contrast, the long-run post-event abnormal returns vary according to certification systems. Forest certification has, on average, a negative impact on firm FP. This finding supports a negative relationship between EP, as measured by certification, and FP. It is likely that the market has not recognized the benefits of forest certification. As a result, the expected benefits of certification relative to its associated costs have not been realized. However, in the long-run, the financial impact of forest certification depends on who grants the certification since only industry-led certification (SFI, CSA and ISO14001) are penalized by financial markets. The NGOs-led FSC certification is not penalized. When the FP is measured using CAR or BHAR, we get virtually the same result. 36 months after certification, only FSC-certified firms have experienced positive mean CAR estimate, although not significant, and a marginally significant positive mean BHAR estimate. Over the same period, SFI-, CSA-, and ISO14001-certified firms have experienced negative mean CAR and BHAR estimates that are significant in many cases.

The weight of our evidence is twofold. First, forest certification has negative impact on FP during the first three years following the adoption of certification. Second, this negative impact may be attenuated by the nature of the certification program selected. The results suggest that firms are better off by selecting certification recognized and supported by environmental groups. This might contribute to their long-term reputation. For environmental groups, to be considered credible, a certification system must be performance-based and require third-party verification.

Overall, our results support the view that improving EP does not necessarily increase shareholder returns. Certified firms seem to adopt certification for reasons other than maximizing shareholder returns. Managers may adopt certification for ethical considerations (Kolstad, 2007), e.g., managers' beliefs that certification is the right thing to do for their firms to be good corporate citizens. Another plausible reason may be that these firms have adopted certification to respond adequately, based on their beliefs, to stakeholders pressures, e.g., activist stockholders, environmental NGOs, and community.

The findings of this article suggest possible directions for future research. First, one potential extension of our study is to examine the operating performance of certified firms. Second, future research should examine the impact of FSC, SFI and CSA certifications on EP as Barla (2007) does for ISO14001 certification. In fact, the underperformance of ISO14001-certified firms shown in this study could be partially explained by the findings of Barla (2007) who shows that ISO14001 certification does not significantly impact EP of certified plants in Quebec's pulp and paper industry. Finally, since certification has appeared in almost every major

industry targeted by NGOs (e.g., chemical, mining, apparel, and footwear), it is interesting to see whether certifications in these industries are priced by financial markets.

Notes

[1] Social Investment Organization (SIO), Canadian Socially Responsible Investment Review 2006. www.socialinvestment.ca.

[2] United Nations Conference in Environment and Development.

[3] Barla (2007) finds that ISO14001 certification does not significantly impact environmental performance (as measured by total suspended solids or total quantity of rejected process water) of certified plants in Quebec's pulp and paper industry over the 1997–2003 period.

[4] Certification programs have not only several benefits, but also some limitations (Haener and Luckert, 1998). Benefits of certification are: access to new markets and secured position in existing markets, better relationship with stakeholders (credibility and legitimacy), higher sales (premium for certified products), and better reputation (''green reputation''). The major limitations of certification are its direct costs (initial certification, and subsequent audit) and indirect costs (management planning, alteration of operations to comply with certification standards and requirements, modification of management practices, training and education of employees, identifying and tracking the chain of custody, and finding markets for certified products).

[5] Bureau Veritas Certification (BVC), KPMG Forest Certification Services Inc (KPMG), PricewaterhouseCoopers LLP (PWC), Quality Management Institute (QMI), SmartWood, Rainforest Alliance (SW), Scientific Certification Systems (SCS), and SGS Systems & Services Certification (SGS).

[6] In order to measure EP, previous empirical studies have often used pollution emission level (TRI), investment level in environmental management system, and information produced outside the firm (Council on Economic Priorities or CEP reports) or inside the firm (annuals reports).

[7] An uncomplicated decision tool, or heuristic, is a feature related to particular decision that is widely understood, simple, and intuitively appealing (Jones and Murrel, 2001).

[8] www.certificationcanada.org.

[9] www.certifiedwood.org.

[10] Canadian Standard Association (CSA): www.csa.ca. Forest Stewardship Council (FSC): www.fscus.org, www.fscoax.org. International Organization for Standardization: www.iso.org. Sustainable Forestry Initiative (SFI): www.sfiprogram.org.

[11] We also consider, but abandon, the use of a control firm of similar size, industry, and book-to-market ratio, because this approach considerably reduces the number of sample firms due to the difficulty to find control firms on the basis of these three characteristics simultaneously. Moreover, we argue that controlling for industry effects is crucial, especially when dealing with the relationship between financial performance and social/environmental performance issues. In fact, different industries face different social and environmental issues. That is why we consider industry as the first criteria to select control firms. Following Fama and French (1993), most studies control only for size and book-to-market ratio. However, Lyon et al. (1999) document that controlling for these two firm's characteristics alone is not sufficient to yield well-specified test statistics for non-random samples, regardless of the approach used.

[12] We are able to match all sample firms only if we consider control firms with the same two-digit SIC code.

[13] In our study, the bootstrapped version of the skewness-adjusted *t*-statistic is difficult to apply for several reasons: certified firms are concentrated in specific industries, particularly the forest and paper industries, and short sample period (1998–2005). Moreover, the bootstrapping procedure yield misspecified test statistics in the case of industry clustering (Lyon et al., 1999) and does not capture the cross-sectional correlation structure related to industry effects (Mitchell and Stafford, 2000).

[14] We do not claim that the methodology used in this article is perfect and not susceptible to some bias, which might arise from other sources not controlled. The debate about the appropriate measure of long-run abnormal stock returns and associated test statistics has not yet fully resolved (see, for example, Barber and Lyon, 1997; Brav et al., 2000; Fama, 1998; Kothari and Warner, 1997, 2006; Loughran and Ritter, 2000; Lyon et al., 1999; Mitchell and Stafford, 2000). For example, Fama (1998) and Mitchell and Stafford (2000) argue against the BHAR approach and advocate CAR or calendar-time portfolio approach, whereas Barber and Lyon (1997) and Lyon et al. (1999) advocate the BHAR approach. Calendar-time portfolio approach (e.g., Jensen-alpha from the Fama and French (1993) three-factor model) eliminates the problem of cross-sectional dependence among sample firms but, this approach often yield misspecified test statistics in non-random samples, e.g., when sample is drawn from a single industry (Lyon et al., 1999). In this article, we do not use the calendar-time portfolio approach because size

and book-to-market factors are not available for the Canadian market. The construction of these factors is beyond the scope of this article.

[15] We calculated the cumulative abnormal return (CAR) over 36 months before the certification announcement month to examine whether certifications have been anticipated by market participants before the certification events. The mean (median) 1-, 2-, and 3-year CAR estimates before the certification announcement month are 5.82% (5.04%), 4.04% (0.87%), and −7.01% (−13.1%), respectively. Only the mean 1-year CAR estimate before the certification announcement month is marginally significant.

[16] It is worth pointing out that Cordeiro and Sarkis (1997) find a significant negative relationship between environmental performance (a measure of environmental proactivism constructed using Toxic Release Inventory data) and security analysts' 1- and 5-year earnings-per-share forecasts after controlling for firm size, leverage and industry effects.

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École des sciences de la gestion,
Université du Québec à Montréal,
Montreal, QC, Canada
E-mail: bouslah.kais@courrier.uqam.ca