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Corporate Decision Making and Socio-Environmental Investments In Brazil: An Analysis Based On Social Audits

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Abstract

The purpose of this paper is to analyse environmental investments made between 1996 and 2008 by two hundred Brazilian firms. The study uses traditional techniques to establish the representativeness and importance of the variables and the extent of correlations between them. The results indicate a significant correlation between the amount of environmental investments and variables such as age, level of education, professional training of employees and profit-sharing policies. However, no significant correlation between environmental investments and profitability was found. The analysis revealed a linkage between decisions to invest in the environment and social investments outside the firm.

Keywords: Environmental Investments, Social Audit, CSP, CSR

Introduction

In recent years, the socio-environmental responsibility of firms has been at stake. Many people advocate transparency in corporations' activities, and others are engaged in seeking out the best way to achieve this objective. In Brazil, one alternative for corporate transparency is the publication of socio-environmental reports. A majority of these reports are generated in accordance with a well-established social audit model developed by the Instituto Brasileiro de Análises Sociais e Econômicas - IBASE (Brazilian Institute for Social and Economic Analysis), a non-profit organisation with no religious or political party affiliations. Annually, about 200 large Brazilian firms publish socio-environmental reports using this model.

The current literature on socio-environmental responsibility shows that a considerable

number of studies have been carried out, but typically they limit themselves to the format of social audit models, together with various types of indicators. Moreover, as with much of the social research in Brazil, the lack of a consistent and comprehensive database has hindered efforts towards an in-depth understanding of the firm's socio-environmental responsibility behaviour.

The study investigates which variables are important in determining the investments made to reduce the impact on the environment of firms' activities. The goal is to analyse which variables are relevant for firms achieving regulation, standards, or economics optimal levels of environmental impact. We used the traditional quantitative regression analysis on a 588 social reports observations of more than 200 companies in Brasil contained in the IBASE database of social audits, published between 1996 and 2008.

This paper is important due to the increasing consumers demand for more environmentally friendly products (Khanna & Anton, 2002), demand that hits all supply chain, since these goals cannot be achieved without the involvement of the supplier (Geffen & Rothenberg, 2000). Cetindamar&Husoy, (2007) also pointed out that USA and UK institutional investors in their decisions consider the natural environment relevant, and banks too (Boiral, 2006; Hutchinson, 1996). Jaggi& Freedman (1975), already had found a preference of normal investors for firms that disclosure socio-environmental information.

This issue is also strategic since many conducted research found a significant relationship of socio-environmental responsibility and visibility, customer loyalty, future merges and acquisitions, new products, new markets and productivity gains (Dentchev, 2004). It also affects the market regulations, and so the access to them, restricting competition (over compliance), with certifications, standards and economic instruments (Arora & Cangopadhyay, 1995; Denicolò, 2008)or moving to where they are weak (pollution heavens) (Christmann & Taylor, 2001).In other words, the companies that neglectthe socio-environment can damage your reputation and limit their performance (Mahon, 2002; Miles & Covin, 2000).

The paper is organised into five sections in addition to this introduction. Section 2 undertakes a brief survey of social and environmental investments by firms and the relationship of these actions with their disclosure and transparency policies. Section 3 presents the IBASE social audit model in the context of international initiatives regarding the development and publication of social indicators and also describes the regression model used to test several hypotheses about firms' socio-environmental investments and some of their characteristics. Section 4 discusses the model's results and their implications. Finally, Section 5 draws some conclusions on the whole study.

Theoretical Framework and Hypotheses

The consideration of social and environmental issues is increasingly important to business success (Owen & Swift, 2001; O'Dwyer, 2001). Merely perfecting business proc-

esses is no longer enough. Indeed, it is necessary to consider values, conduct and procedures that induce and encourage the conservation and improvement of society's quality of life in terms of ethical, social and environmental issues (Tachizawa, 2002).

In fact, the advent of new economic models and the concepts of social responsibility and sustainable development have led to an increase in external and internal pressures on firms, not only to implement actions that address social and environmental issues, but to substantiate them as well (Gray, Kouhy, & Lavers, 1995; Adams, 2002). Advocates of this kind of behaviour justify it on economic, philosophical and pragmatic grounds (AICPA[1] as in Roth (1982)).

In this sense, two theories are often used to support research on corporate social responsibility and performance: stakeholder theory (Gago & Antolín, 2004; Henriques & Sadorsky, 1999)and there source-based view (RBV) (Kuhn, 2008; Russo & Fouts, 1997). At resource-based view, firms are baskets of assets that must have competencies and capacities to produce any economic value. According to RBV, every firm has a unique configuration of competences, capacities and resources that make it also unique in environmental performance (Marcus & Anderson, 2006; Banerjee, 2001; Judge Jr. & Douglas, 1998; Jiang & Basal, 2003; Chan, 2005; McGee, 1998).

Stakeholders are defined here as anyone with the capacity to influence the environmental performance aims and results. External pressures arise from minorities, consumers, environmentalists, community services and other stakeholders (Clarkson, 1995; Mikkilä, 2003). They require firms to provide more information when pursuing access to markets in developed countries, whether through certification — an institutionalised, direct and usually private approach — or norms emanating from regulatory agencies — a public, indirect and formal approach (Bufoni & Ferreira, 2006). Moreover, inside firms themselves, managers have begun to understand that transparency may reduce the cost of capital (Cox, Brammer, & Millington, 2004; Botosan & Plumlee, 2002; Miller, 2001), increase opportunities for access to international markets (Donaire, 1999; Lima & Viegas, 2002) and demonstrate better planning capacity (Klassen & McLaughlin, 1996)).

Thorough, firms established and classified their strategies to deal with the social-environmental in being, simple passive, reactive to damages, preventive to risk, or proactive to issues (Murillo-Luna, Garcés-Ayerbe, & Rivera-Torres, 2007; Vastaga, Kerekesb, & Rondinelli, 1996; Winn & Angell, 2000). Despite of the choice of general strategy, is not obvious to where the firm shall drive their efforts in order to maximize the utility of the invested values. Hutchinson (1996) and Boiral (2002; 2006) list a large variety of social-environmental actions and investment decisions, while Nehrt (1996) studied whether and where they should happen, and their subsequent consequences. Per example, firms interested to invest resources in new technologies to improve their environment performance could do it in terms of pollution's prevention,

[1] Commitee on Social Measurement of the American Institute of Certified Public Accountants.The Measurement of Corporate Social Performance.New York, 1977. p.1

environmental management systems or pollution control (Klassen, 2000; Klassen & Whybark, 1999).

Furthermore, the literature appears to have a consensus about many variables that are out of managers' decisions range. These variables are named contingent and classified according to their level of influence, that are: organizational environmental (regulation, stakeholders, consumers, economy), industry (culture, auto-regulation, barriers) or entity levels (financial, tactical or circumstantial) (Etzion, 2007; Lounsbury, 2001). Bansal & Gao (2006) point that there are few studies at individual level (internal factors of firms), the aim of this study.

Corporate Environmental Performance and Investment (I_a)

However, because corporate social performance (CSP) and environmental performance (CEP) are not one-dimensional and interdisciplinary concepts (Etzion, 2007; Werner, Brouthers, & Brouthers, 1996; Waddock & Graves, 1997; Wood, 1991), methodological criticisms are the extremely wide constructs conceptualizations in conjunction to the straight and isolated valuation of their proxies (Dooley & Fryxell, 1999). Gunther & Kaulich (2006) brought the idea that the quantity of constructs are more due to approaches, meanings and uses of "performance" neologism, than to the diversity of "environmental" definitions.

Absolute measures like "corporate environmental initiative", defined as any effort to reduce products and processes impacts to the environment (Gilley, Worrell, Davidson, & El–Jelly, 2000) and eco-efficiency, defined as the value maximization with minimum natural resources use and pollution emissions (Michelsen, 2007), are in disuse because of incompleteness to access the external environmental investment impacts (Chen, Patten, & Roberts, 2007; Brammer & Millington, 2005).Moreover, relative measures as "high levels of environmental performance", that designates the institutional behaviour to go beyond the norms incorporating pro-active postures to anticipate future regulations, social trends and design or modifications in operations, processes and products to prevent negative environmental impacts (Sharfman, Shaft, & Tihanyi, 2004), are preferred because, according to researchers(Gunther & Kaulich, 2006; Gilley, Worrell, Davidson, & El–Jelly, 2000), they would led to a healthy planet and products (Mirvis, 1994).

Indeed, a common point in most CEP definitions is that it could be measure in two dimensions: (1) the environmental management system (process measures); (2) the internal environmental aspects and their external impacts (output measures) (Sharma, 2000).Thus, most researches operationalize their measures of performance through rates of toxic emissions, specific CEP indexes or even the amount of information provided by the companies (Orlitzky, Schmidt, & Rynes, 2003).Valuate information, factors and efforts to comply with some certification processes (Alberton & Costa Junior, 2007; González-Benito & González-Benito, 2005) and the amount of fines (Davidson III & Worrel, 2001) are other two manners to rank firms or measure their environmental performance.

Unfortunately, CEP and toxic emissions indexes are generally viable and operationalized at developed countries and the methodology used in weighting the various factors that comprise them are often inaccessible, while fines amounts are not available or too disperse. So, because of this, we use the voluntary given information at social audit model due to annual certification of IBASE, which some known problems are that:(1) voluntary information can be easily manipulated (2) indicators enclose managers messages that try to be consistent with others audit indicators and to give socially desirable responses, (3) managers seek to classify their spending according their own criteria and interests (Igalens & Gond, 2005).

We also highlight that despite of a monetary indicator as proxy for environmental performance to suffer from the problems of allocation and the use's efficiency of resources, the aim of this work is not to verify the performance level, but verify the relationship among environmental and others investments as follows.

Employee Training and Professional Development (I_{pd})

The firm engagement to this new paradigmatic "environmental conscience" seems to be a continuous institutional learning (cognitive) or adaptive (behaviourism) process (Gond & Herrbach, 2006) with many phases (Halme, 2002).

The RBV advocates that it is the capacity that allow firms to transform resources and it is the competence how they coordinate their activities (Chan, 2005). Thus, the tacit learning and explicit knowledge would have special importance in how managers approach the environmental issues (Angelidis & Ibrahim, 2002).

The stakeholders theory approach and ethics, when incorporated in manager's training, are also positively related to social performance (Valentine & Fleischman, 2008; Boiral, 2002), and how more and more is this approach generalized, the expected relationship between investment at professional development of employees and investments in the environment is positive (Lamsa, Vehkapera, Puttonen, & Pesonen, 2007).

Besides, as Vuontisjarvi(2006)attests, "if a company does not assume a high level of responsibility to its own staff, it is unlikely to do so to its customers or to the social and natural environment in which it works".

Thus, the hypothesis to be tested is:

> ***H_{pd}**: firms that invest in their employees' training and professional development also invest in the environment.*

These are the investments made in training, courses, internships (excluding salaries) and spending specifically aimed at the professional development of employees' activities.

Proactivity – External Social Investments (I_E)

The investments in the community undertaken by firms on a regular basis aresometimes called "corporate philanthropy" (Whitehouse, 2006). Henriques e Sadorsky (1999) affirm that the given attention to some historically preferred stakeholders demands, as community and employees, makes the difference between a environmental reactive and pro-active company. Then, we expect that a firm that gives time and attention to these two groups shows an institutional behaviour to "go beyond the norms" which would result also in "high levels of environmental performance" (Hoffman, Riley, Troast JR., & Bazerman, 2002; Sharfman, Shaft, & Tihanyi, 2004).

Actually, this is not an accurate term because firms seek some form of business benefit from giving and thus are not truly altruistic(Porter & Kramer, 2002; Gan, 2006). Moreover, Moir and Taffer (2004) and Brammer and Millington (2005), show that "the main motivations [of firms] are either marketing or reputation with key opinion formers" and that "the giving is a means to an end rather than an end in itself".

Brammer and Millington (2005) also point the external investments as the way which firms can partially restore their good name after they have been responsible for illegal acts, while Gan (2006)attests that donation value will be as bigger as the case's repercussion. Thus, philanthropy are bigger at mining, tobacco, oil and other high environmental and social impact sectors.

Hypothesis $\boldsymbol{H_E}$, then, is that firms that make more outside investments have a broader decision-making process over a longer time span (Quazi & O'Brien, 2000). Consequently, they should invest more in the environment. Thus, the hypothesis to be tested is:

> $\boldsymbol{H_E}$*: firms that invest more in external social projects also invest in the environment.*

Age – Employees over the age of 45 (E_{45})

The consideration of the employees and their characteristics are some of the recent concerns of the researchers (Daily, Bishop, & Govindarajulu, 2008). This firm-level, contingent and demographic variable is used as a proxy for environmental concern in the corporate culture (Angelidis & Ibrahim, 2002). In fact, a recent study of 50 global MBA courses revealed that ethics, CSR and sustainability are present in one third of them (Christensen, Pierce, Hartman, Hoffman, & Carrier, 2007).

Younger employees are expected to have greater environmental concerns. First because they were more exposed to environmental education than their elders (Lamsa, Vehkapera, Puttonen, & Pesonen, 2007), and second, because studies shows that a longer exposure to an institutional environment more economically-oriented reduces the participant ethics' level (Ibrahim, Angelidis, & Howard, 2006).

Despite of their apparently contradictory results, Weeks, Moore, & McKinney (1999)

affirm that young managers are more permissive than older managers in what they accept as ethical behaviour, but we considered the assertion as a risk-aggressive comportment of young manager, compared to a more conservative attitude of the seniors (Bufoni, Ferreira, & Legey, 2007). In other words, it is a variance (homoscedasticity) and not a tendency (slope) problem. This could be object for future researches.

Thus, we may expect a negative relationship between this and the environmental investment.

H_{45}: firms in which employees are younger invest more in the environment.

Firm size– Net Revenue (NR)

There is a vast evidence of firm size as control variable in empirical corporate social and environmental responsible studies. The proxy is usual in many research efforts (Fombrun & Shanley, 1990; Cowen, Ferreri, & Parker, 1990; Stanwick & Stanwick, 1998). The literature shows that regardless of whether the firm is a polluter or not, there is a relationship between investments in the environment and production levels (Brammer & Millington, 2004; Cerin, 2002; Konar & Cohen, 1997; Lehman, 2004; Baker, 1996; Lima & Viegas, 2002; Williams & Phillips, 1994).

The common reasons presented by stakeholders theory and RBV to explain this relationship are that (1) bigger companies receive greater levels of attention from general public, that can 'encourage' also greater levels of social performance (Stanwick & Stanwick, 1998; Brammer & Millington, 2004) and (2) the capacity to access some strategic resources that allow different production's configurations than of the smaller firms and, thus, can better fit them to stakeholders demands (Udayasankar, 2007). Therefore,

H_{NR}: larger firms spend more on mitigating the effects of production on the environment.

In order to operationalize this hypothesis test, researchers use the annual revenue (Fombrun & Shanley, 1990; Cowen, Ferreri, & Parker, 1990; Stanwick & Stanwick, 1998), the number of shareholders or employees, total of assets (Amato & Amato, 2007), net worth, number of domestic operations, or some of this variables' combination (Orlitzky, 2001).

Profit-Sharing (I_{ps})

Profit-sharing is defined as "shares in profits that are not typified as bonuses". The hypothesis tested was that, given budget limitations, investments in the environment reduce the amount of funds available for profit sharing (trade-off hypothesis) (Moore, 2001). Thus, for any given increase in environmental investment (I_a), there is likely to be a reduction in employees' participations and other beneficiary parties in firms' profits.

McGuire, Dow, & Argheyd(2003) tested the same hypothesis and found that "high levels of salary and long-term incentives are related to poor social performance." This result "may reflect a 'trade-off' between corporate governance objectives and other elements of social performance". Mahoney and Thorne (2005) and Deckop, Merriman and Gupta (2006) arrived at the same conclusion. Our hypothesis in this case is,

***H_{ps}**: firms with less generous profit-sharing schemes invest more in the environment*

Financial Performance – Return on Revenue (ROR)

This variable is a financial indicator defined as the ratio of operating result to net revenue (Orlitzky, Schmidt, & Rynes, 2003). The rationale that led to the inclusion of this indicator in the analysis is that firms that are more profitable should have more funds to invest in the environment (available funding hypothesis) (Moore, 2001; Preston & O'Bannon, 1997). However, the opposite result may occur because higher returnsmay come at the expense of less environmental spending (managerial opportunism hypothesis – *cash in*), which translates into uncompensated costs (externalities) from other economic agents.

Indeed, Dentchev (2004) — who summarised 127 studies devoted to exploring the relationship between profitability and environmental investments in the period 1972–2002 — and Laan, Ees and Witteloostuijn, (2007) reported that the relationship between aggregate measures of social performance and various ratios of profitability showed inconsistent results. These authors concluded that this relationship must be regarded as inconclusive, complex, and nuanced.

Thus, because it is not possible to assess *ex ante* how this variable will behave, our hypothesis is formulated as

***H_{ROR}**: more profitable firms invest more (less) in the environment.*

Model and Methods

The Model

The regression model presented here seeks to investigate the relationship between variables represented by indicators published by firms according to the IBASE social audit model and decisions to invest in the firm's operations so as to improve their environmental performance and reduce environmental impacts.

Before proceeding with the presentation of the model, however, it is necessary to clarify two points. First, the literature on the evaluation of Corporate Social Performance (CSP) and sustainability(Lee, 2008; Graaf & Herkströter, 2007; Agle & Kelley, 2001; Secchi, 2007; Detomasi, 2007) argues that it should be multidimensional and thus should encompass a range of factors (Kok, Wiele, McKenna, & Brown, 2001; Iyer, 1999; McGuire, Dow, & Argheyd, 2003). In our study, we will address the environmental dimension of the CSP.

Second, despite the fact that the hypotheses formulated refer to specific issues, we will relate

them to a broader view found in the literature reviewed (Marrewijk, 2003). It is important to note, though, that these hypotheses are only exploratory and should be seen only as a starting point for further discussion and analyses.

The complete regression model used is presented below. Equation 3.1 shows its general form and equation 3.2 its linear form.

$$I_a = f(I_{pd}, I_E, E_{45}, NR, I_{ps}, ROR) \quad (3.1)$$

$$I_a = \beta_{pd} I_{pd} + \beta_E I_E + \beta_{45} E_{45} + \beta_{NR} NR + \beta_{ps} I_{ps} + \beta_{ROR} ROR + \varepsilon \quad (3.2)$$

The backward stepwise method was used to select the variables to be excluded (*p-value*> 0.10) or included in the model (*p-value*< 0.05) from the indicators used in IBASE's social audit model. Tests of the various variables that could be related to the dependent variable were performed. The purpose was to evaluate which of the "various firm-level attributes are likely to affect the firm's Corporate Social Responsibility participation, and to attempt to derive strategic value from CSR" (Udayasankar, 2007).

Instrument and Sample Selection

International initiatives regarding the development and publication of social indicators have been undertaken even before the United Nations Millennium Declaration in 2000 (United Nations, 2000) and the effective establishment of the Millennium Targets in 2001 (United Nations, 2001). They include the Global Reporting Initiative - GRI (GRI, 2008; Willis, 2004), which proposed a reporting framework; the corporate accountability standard AA1000, launched by the Global Leadership Network - GLN, (GLN, 2008); and the SA8000, which is a set of work standards developed by the Social Accountability International (SAI, 2008; Miles & Munilla, 2004). The last initiative is recognised by the European Commission as the international standard framework (European Commission, 2001). For an extensive review on this subject, see Brink and Woerd (2004).

In Brazil, the most well-known international initiative is the ISO 16.001, adopted in 2004 by the Brazilian Association for Technical Norms - ABNT (*AssociaçãoBrasileira de NormasTécnicas*) as the Brazilian Norm - NBR (*Norma Brasileira*) 16.001. However, this norm does not, in itself, establish any disclosure standard. Rather, it specifies procedures for socio-environmental management and continuous improvement.

A Brazilian initiative that has been very popular among firms and has lasted through the years is the IBASE's Social Audit model. This initiative was launched in 1996 by the late Brazilian sociologist and political activist known as Betinho, with the support of many Brazilian business leaders. In the following year, to encourage the participation of a larger number of corporations, IBASE set up the Social Audit Stamp. This stamp is granted on an annual basis to all firms that publish a social audit using the methodology and criteria proposed by the IBASE model.

The IBASE's certification is undoubtedly the most successful effortin terms of social audit in Brazil. The Institute has annually certified around 60 firms from a selection of

more than 350 participants. The data gathered constitutes a valuable source for academic research and technical studies. In addition, regional initiatives, such as the CertificadoEmpresaCidadã (Citizen Corporation Certificate), granted by the Rio de Janeiro Regional Accounting Council, have used the IBASE's social audits as their primary data source (Bufoni, Muniz, & Ferreira, 2008). Unfortunately, IBASE recently discontinued this audit report and the certification process, rationalising that it was remodelling the report.

The analysis was concentrated in this century, between 2001 and 2008, to be more relevant. Table 1 summarises its main variables group totals.

Table 1. Summary of the data sample (US$ millions)

Variable	2001	2002	2003	2004	2005	2006	2007	2008	Total/ Ave
Number of Firms	172	175	212	198	121	124	60	24	1086
Total Net Revenue (US$ millions)	193,765	246,576	314,871	321,425	280,110	379,924	262,771	138,030	2,137,472
Total Operating Result (US$ millions)	26,542	25,864	50,767	59,023	54,803	84,461	56,994	31,177	389,631
Total Payroll (US$ millions)	19,552	24,098	32,142	35,157	28,843	27,892	14,147	6,654	188,485
Internal Investments (US$ millions)	10,814	12,380	17,765	18,911	16,489	19,110	12,136	6,300	113,905
External Investments (US$ millions)	1,098	1,399	1,672	1,915	2,199	1,988	1,099	654	12,024
Environmental Investments (US$ millions)	1,160	2,053	2,641	2,075	2,034	3,508	2,614	1,368	17,453
Average Operational Return	13.70%	10.49%	16.12%	18.36%	19.57%	22.23%	21.67%	10.55%	16.59%
Total number of employees	862,802	1,020,462	1,261,582	1,266,636	768,294	817,319	407,136	109,751	6,404,231

Source: Authors' own elaboration

Note: Figures were converted from Brazilian Reals to US Dollars using the rate US$ 1.00 = R$1.73

According to the Instituto Brasileiro de Geografia e Estatística - IBGE (Brazilian Geography and Statistics Institute), Brazil's GDP was US$ 647 billion in 2001 and US$ 1.7 trillion in 2008, thus making the sample's total net revenues a significant one quarter of GDP in the last year of the sample. However, the sample's total number of employees in 2006 accounts for only 0.6% of the Brazilian economically active population in that year (97.52 million workers). This imbalance in representativeness shows the important role played by small and medium firms in job creation in Brazil, as compared to that of the larger firms that publish social audits.

Figure 1 shows that there was a considerable decline in the number of firms that published 2007 social audits. A further investigation should be made of the causes of this decline. Explanations might include a loss of momentum on the environmental issue in that year and a migration of various firms to other audit models, such as GRI.

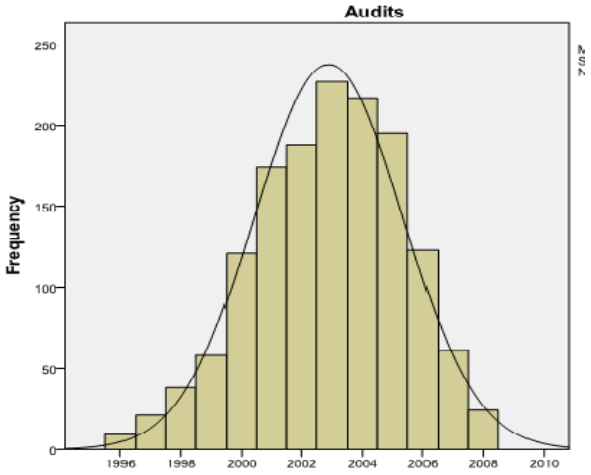

Figure 1. Audit frequencies per year (Source: Authors' own elaboration)

Variables Measurement

All substitutes (proxies)at IBASE's audit model, except the number of employee over the age of 45 (E_{45}), are monetary and self-declared by firms that applied to certification. The IBASE form contains detailed information about what every variable represent and we transcript their definition right below in Table 2.

Table 2. Environmental Investment as a Proportion of Net Revenue

Basis of calculation	Variable	Proxy	Information Source
Net Revenues	Firm Size	NR	Gross earning less taxes, interest expenses, deductions and income taxes
Training and professional development	Training	I_{pd}	Investments on training, internships (less salaries) and expenses on training programs in company-related activities only.
Total contributions to society	Pro- activity	I_E	Sum of all listed investments in the community. (e.g., housing, daycarecenter, leisure and recreation, education).
Profit Sharing	Profit Sharing	I_{ps}	Profit-sharing that are not typified as bonuses.
Return on Revenue	Financial Performance	ROR	Calculated ratio of operating result to net revenue
# Employees over 45	Age	I_{45}	Declared number of employees over 45 years old
Corporate Environmental Performance	Dependent	I_a	Investments, monitoring of pollution residuum, pollution cleansing programs, costs of pollution-free methods, environmental audits and assessments, environmental education programs for employees, other expenses related to the improvement of company's operation environmental quality

Source: IBASE (2009)

The majority of surrogates extracted from the form of IBASE is financial and therefore should be used with caution. First, because there is no guarantee that companies have not mistakenly or purposely classified expenditures and fines. Second, because it is not clear and direct the relationship between efficiency and values of the investments made, meaning that waste can truncate the ranking and evaluation of performance.

Results

In order to analyse the relationship between the main variables in the sample, correlations among main group of the social audit (Appendix I) were computed, as shown in Table 3.

Table 3. Pearson's correlations between groups of the social balance sheet

	Net Revenue	Operating Result	Payroll	Internal Investment	External Investment	Environmental Investment
Net Revenue	1.0000					
Operating Result	0.9047	1.0000				
Payroll	0.7520	0.6278	1.0000			
Internal Investment	0.9352	0.8694	0.8942	1.0000		
External Investment	0.4768	0.4315	0.4293	0.4925	1.0000	
Environmental Investment	0.8215	0.8466	0.4517	0.7337	0.4110	1.0000

All correlations are significant at the 0.01 level (2-tailed).

Source: Authors

At this point, some conjectures are in order. First, we note that correlations of both net revenues and operating results with internal and external investments are diverse. In fact, the larger correlations with internal investments seem to indicate that returns on internal investments are higher than those obtained through external ones, maybe crediting the former with more effective gains in competitiveness, as Russo and Fouts (1997) concluded. A recent study indicates that economic performance leads, and is the causal basis of, social performance (Bakker, Groenewegen, & Hond, 2005).

As to the variable "environmental investments", the correlations are higher with net revenues and operating results than with payroll. Given the stability of payrolls, this result suggests that internal investments are subject to greater planning, while external and environmental investments cater more to periodic or sporadic demands, small projects and contingencies, such as environmental accidents.

Looking at different economic sectors from 2001 to 2005 (69% of the sample) through the index "environmental investment as a percentage of net revenue" (Table 4), it is possible to verify that (1) more organised markets publish more information and that (2) sectors that pollute more, such as pulp, steel and sugar mills, invest more in the environment

Table 4. Environmental Investment as a Proportion of Net Revenue

SECTOR	No.of Obs.	Average	Median	StandDev
Agriculture	24	2.143	0.095	4.672
Food	31	1.410	0.211	4.779
Banks	55	0.273	0.006	0.807
Commerce	10	0.046	0.026	0.048
Construction	22	0.696	0.326	1.289
Energy	136	1.068	0.310	2.775
Other Industry	65	0.282	0.141	0.300
Paper	22	2.384	1.534	2.275
Oil	32	1.436	0.182	3.439
Health	17	1.326	0.049	5.390
Steel	34	0.744	0.496	0.820
Telecom	34	0.030	0.000	0.054
Transportation	27	0.290	0.066	0.542
Sugar Mills	79	1.662	0.157	5.793
Total	588	1.325	0.145	9.649

In terms of median performance, we can observe that firms in more than half of the economic sectors invest above 0.15% of their net revenue in the environment. On the other hand, in most sectors, environmental investments amount to less than 2% of their net revenue, on average.

First, tests were performed using all observations in the sample, including those from the 1990s. Becausethe number of firms in the sample is relatively large and observations span over a relatively short time period, we should expect no auto-correlation problems (Wooldridge, 2002). In fact, the Durbin-Watson test confirms that result. In addition, all coefficients of the independent variables were significant ($p<0.000005$). Overall results are shown in Table 5.

Table 5. Stepwise results using the whole sample (1996-2008)

Model Summary[b]

Model	R	R2	Adjusted R2	Std. Error of the Estimate
1	0.893[a]	0.798	.797	76522.165

ANOVA[b]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	1.863E13	6	3.105E12	527.384	.000[a]
	Residual	4.716E12	801	5.887E9		
	Total	2.334E13	807			

Coefficients[a]

Model		Unstandardised Coefficients		Standardised Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	3137.786	3067.342		1.023	.307
	Employee Training	4.594	.300	.824	15.306	.000
	External Investments	.113	.031	.068	3.586	.000
	Over 45 years	-8.403	.948	-.194	-8.865	.000
	Net Revenue (NR)	.004	.001	.322	5.791	.000
	Profit-Sharing (Ips)	-.280	.059	-.186	-4.763	.000
	Return on Revenue	80.974	102.975	.013	.786	.432

a. Dependent Variable: Environmental Investments in Production (Internal)

The backward stepwise method used in the analysis shows that it is not possible to reject the null hypothesis concerning the coefficient of the variable Return on Revenue (ROR), both in the whole sample and in the yearly cross sectional data (Table 6), with the exception of the data in year 2005. In other words, except for 2005, results show that there is no significant relationship between a firm's profitability and its environmental investments.

Table 6 also shows that the signs of coefficients β_{pd} and β_{ps} in 2001 are different from those in the following years. One explanation for this result may be the increase in the number of firms in the samples from that year on. We decided to test hypotheses from 1997 to 2000 and 2008 to verify the variables' behaviour, and we confirmed that the sample was too small (less than 25 observations). The results was always truncated, as in 2001. Thus, we decided not to present the results of those years

Table 6 .Coefficients of the Variables in the Model (β) - yearly cross sectional data

Variables	2001	2002	2003	2004	2005	2006	2007	Average
No. obs.	68	108	140	151	99	116	54	105.14
β_{NR}	0.009	0.012	0.007	0.003	0.006	0.005	0.009	0.007
β_{pd}	-7.476	7.573	7.801	5.766	2.414	3.069	3.081	3.175
β_{ps}	2.147	ns	-0.515	-0.618	-0.370	-0.240	-0.636	-0.476
β_{E}	0.180	0.430	0.346	0.438	0.313	-0.083	0.221	0.264
β_{45}	-5.482	-29.583	-22.037	-8.053	-13.964	-5.772	-11.264	-13.736
β_{ROR}	ns	ns	ns	ns	1240.192	ns	ns	ns

Note. ns: non-significant

However, the signs of the remaining explanatory variables did not vary. With respect to E_{45}, for example, in all yearly sample years, its coefficients were negative. This result is a bit unexpected because this coefficient could possibly be related to firm size, in which case the coefficient would be positive. But this result actually did not occur.

The training and professional development coefficients (β_{pd}) were positive. This result suggests that (1) firms that invest more in their employees' training and professional development make more investments in the environment as well and that (2) managers with a broader vision invest in the environment. However, these possibilities have to be carefully examined because investments in environmental training and professional development may not have been correctly informed or may have been double-counted.

The coefficients (β_{ps}) of the variable profit-sharing (I_{ps}) for years 2003 to 2007 are

negative, suggesting that the socio-environmental priorities of the firm are in line with hypothesis $\boldsymbol{H_{ps}}$; that is, firms with less generous profit-sharing schemes invest more in the environment.

The coefficients of both net revenue (NR)and external investments (I_E) were significantly positive throughout the analyses. This result is in accordance with the literature on the subject (Stanwick & Stanwick, 1998; Brammer & Millington, 2004; Seifert, Morris, & Bartkus, 2003), which asserts the importance of the firm's size in the overall level of investments, as well as its impact on a possible inseparability (symbiosis) of social and environmental investment decisions.

Conclusions

This paper presented an investigation of the factors that influence Brazilian firms in their decisions to invest to improve their environmental performance. The analyses were based on 1,456 social audits published by firms between 1996 and 2008 as a requirement for obtaining the social audit stamp granted by the Brazilian Institute of Social and Economic Analyses (IBASE).

As a proxy for the cost of reducing pollution (I_a), the analysis used item 4 of the IBASE's social audit, which refers to "Environmental indicators investments related to the production/operation of the firm".

Using a multiple regression model, the study investigated pre-formulated hypotheses regarding the influence of different factors in the firm's decision to invest in the environment. Hypotheses were tested by considering the level of significance of the coefficients (Student's t-test) of the variables used in the model. For this purpose, a backward stepwise method with the following criteria was used: variables for which coefficients had a p-value greater than 0.10 were discarded and those with a p-value of less than 0.05 were included.

Results suggest, along with the literature on the subject (Stanwick & Stanwick, 1998; Brammer & Millington, 2004; Seifert, Morris, & Bartkus, 2003), that there is a positive relationship between revenues and environmental investments. They also suggest that there is a positive relationship between external investments and those in the environment, indicating a possible inseparability (symbiosis) of social and environmental investment decisions.

The fact that the profit-sharing coefficient is significantly negative shows a possible implicit trade-off between socio-environmental priorities and the distribution of the firm's profits (profit-sharing). A positive relationship, however, was found between environmental investments and the variable "training and professional development of employees", which indicates once again a joint-costs behaviour.

Perhaps the most important result of this study is the significant negative relationship between the variable "number of employees over 45" and environmental investment.

This result suggests the following conclusions:

1. Society's investment in young people's environmental education – manifested by their increasing exposure to environmental issues since primary school – has been effective in changing firms' behaviour

2. There are signs of a possible and imminent change in firms' investment behaviour in coming years, as those employees who have been exposed to this kind of education, for a longer period of time, reach top management positions.

This work sheds some light on the limits of decision making as it proves the representation of some contingent variables that effectively influence and restrict corporate environmental performance. Thus, managers and other researchers in better understanding the relationships between different variables, especially those related to types of investments made, may target their efforts to maximize the efficiency ontheir resources' application.

This study has some limitations, as the relationship between investment values and proactivity and of all other quantitative methods. Perhaps, this relevance and relationship found here must be used with reserve and care. Maybe they should be used only as a sign for future investigation. Anyway, because of de sample size and the time series, the data and the literature review in every variable, they have their reflexive value and utility.

The possibilities for further studies, however, are much broader. The IBASE Social Audit, in itself or in comparison with other sources of Brazilian financial and population data, constitutes an invaluable supply of information for empirical investigations.

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