Why Brazilian companies are certifying their forests?

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A R T I C L E   I N F O

A B S T R A C T

The paper examines the two forest certification schemes in Brazil, the Brazilian Program of Forest Certification (Cerflor) and the Forest Stewardship Council (FSC), from the private sector perspective. The main focus is to test the relevance of three mechanisms—market, learning, and signaling—suggested by Overdevest and Rickenbach (2006), to explain forest certification adoption by Brazilian companies. Furthermore, companies' familiarity with certification systems, external influences on pursuing forest certification, and companies' intention to recertify their forests are investigated. An exploratory factor analysis (EFA) suggests that signaling and learning mechanisms lead to better and more transparent forest management, explaining the movement towards certification, but market incentives do not play an important role in the adoption of forest certification. An importance and performance analysis (IPA) demonstrates that companies do not see any return in terms of a better price for certified products; however, certificate holders indicated overall high satisfaction with market access. Interestingly, a high performance was found for non-economic benefits such as public confidence, improvement of forest management and practices, improvement of management systems and performance, self-discovery of non-conformance, and better public, landowner, and supplier communication. International consumers and shareholders were considered the most important groups influencing companies to seek certification and FSC was reported to be the most familiar scheme. Generally, companies were pleased with certification and indicated their intention to recertify.

1. Introduction

Since the early 1980s, the world's forests have been forced to endure a variety of stresses resulting in a significant degradation of forest ecosystems. The most recent global deforestation rate indicates an alarming loss of 13 million hectares of forest cover per year (FAO, 2005). These concerns resulted in appeals for actions to improve global forest conservation and management favouring the emergence of Sustainable Forest Management (SFM). In order to identify how to evaluate changes in forest management and practices, many initiatives at national and international levels developed sets of Criteria and Indicators (C&I) (Brand, 1997; Rametsteiner and Simula, 2003). In parallel to C&I, Forest Certification arose as a new instrument to assure forest management compliance with social, economic, and environmental sustainability principles, which are reinforced through third-party audits (Cashore et al., 2004, 2006; Elliot and Donovan, 1996; Overdevest and Rickenbach, 2006; Rametsteiner and Simula, 2003). In

addition, through the use of a label or logo, forest certification gives consumers a credible guarantee that the product comes from an environmentally responsible, socially beneficial, and economically viable forest management (Johnson and Walck, 2004; Upton and Bass, 1996; Vogt et al., 2000).

The movement towards forest certification has developed rapidly since 1993. In Brazil, the challenges faced by the forest industry either in dealing with the native forests or with fast growing plantations provided a favourable groundwork for the arrival and establishment of forest certification. Today, Brazil demonstrates substantial acceptance of forest certification and has the largest area certified by Forest Stewardship Council (FSC) in Latin America followed by Bolivia, Mexico and Chile (Cubbage, F., personal communication). Furthermore, the Brazilian Forest Certification Program (Cerflor) has also certified eight companies covering about 1,041,552 ha of forests (INMETRO, 2008).

Not surprisingly, forest certification and its impacts have drawn the interest of many researchers. A number of economic aspects of forest certification have been investigated, such as consumers' responses to certified products (Anderson and Hansen, 2004; Archer et al., 2005; Kozak et al., 2004; Ozanne and Vlosky, 1997; Spinazze and Kant, 1999), certification costs (Gan, 2005; Hartsfield and Ostermeier, 2003; Hayward and Vertinsky, 1999), and price premium analysis (Gan, 2005; Murray and Abt, 2001). Other researchers have also examined: the various parameters that determine why companies

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voluntarily certify their forests (van Kooten et al., 2005; Hartsfield and Ostermeier, 2003; Henriques and Sadorsky, 1996; Nakamura et al., 2001), mechanisms that have attracted companies to certification (Cashore et al., 2005; Overdevest and Rickenbach, 2006; Rickenbach and Overdevest, 2006; Vertinsky and Zhou, 2000), and changes made by organizations for implementing forest certification (Cubbage, F., personal communication; Hartsfield and Ostermeier, 2003; Hayward and Vertinsky, 1999).

Despite this comprehensive research effort, there is still an information deficit around the analysis of forest certification in Brazil. Only few studies have focused on the establishment of forest certification in Brazil (May, 2002, 2006; Verissimo and Smeraldi, 1999), the importance of forest certification in community forest management projects (Jones, 2003), the forest certification in forest plantations (Carrere, 2004), and the barriers to forest certification in the Amazon region (May and Veiga Neto, 2000).

Therefore, the main objective of this paper is to analyze forest certification from the perspective of the Brazilian private forest sector. Specifically, our main focus is to identify the motives behind the adoption of certification based on the governance mechanisms suggested by Overdevest and Rickenbach (2006). Other objectives include: (i) a better understanding of the companies' familiarity with certification systems; (ii) the identification of different organizations influencing companies to pursue forest certification; and (iii) the companies' intention to recertify their forests.

2. Theoretical concepts related to the adoption of forest certification

In the middle of the 1990s, most studies were concerned about introducing and developing new concepts about forest certification (Baharuddin, 1996; Kiekens, 1996; Merry and Carter, 1997). Since the early stages, forest certification was seen as a market-based incentive, but economic and market implications were completely unknown (Hansen, 1997). Furthermore, these studies had little evidence to reveal any kind of impacts or accomplishments of certification. Only after a few years that researchers could analyze and collect evidence about overall accomplishments.

Certificate holders in the US indicated price premium and market advantage as prime motivators to certify their forests (Hayward and Vertinsky, 1999). However, they reported the absence of both economic returns and a specific market for certified products. In a similar study (Auld et al., 2002), respondents indicated securing general public confidence, responding better to pressures from environmental groups, and securing markets as possible advantages of certification. Also in 2003, Hartsfield and Ostermeier found that the three most important goals in pursuing the FSC certificate in North America were market benefits, recognition and credibility, and the promotion of good forestry. Specifically in Canada, companies placed greater weight on securing public confidence and responding to pressures from non-governmental organizations. However, they were highly concerned with an increase in paperwork, the expenses of certification, and the absence of a price premium (Wilson et al., 2001). In Argentina, companies decided to seek certification because they consider it "the right thing to do" and "as corporate social responsibility". In addition, they were motivated by a better organizational and professional image, better work training, and retaining or gaining better market access (Cubbage, F., personal communication).

Other researchers have focused on mechanisms explaining forest certification adoption. Takahashi (2001) suggested four potential motivational models explaining why firms participate in voluntary initiatives (e.g., forest certification). The market economic model states that firms are attracted by voluntary initiatives if they are to generate economic benefits. The production economic model accepts voluntary initiatives to produce additional profits through required improvements achieving efficiency. In the social model, companies decide upon voluntary initiatives due to social exchanges generated between firms and stakeholders. Lastly, the moral model demonstrates that firms decide to participate in voluntary initiatives because of intrinsic ethical morality. In Canada, empirical results revealed that the market economic and social models both explain participation in forest certification (Takahashi, 2001). Identically, Nakamura et al. (2001) also found that the market economic and social models mostly explained the adoption of certification (in this case ISO 14000) by Japanese companies. In general, aspects from each model were supported by both case studies; however, the production economic and moral models were not elaborated as distinct models.

Recently, Overdevest and Rickenbach (2006) proposed three mechanisms that investigate how non-state governance systems perform, in this case, forest certification. The first mechanism, market-based, demonstrates that companies participate in forest certification for economic motives. The certification process seeks to benefit companies through the use of green labels on products affecting directly the purchase decisions by conscientious consumers. With all the potential market benefits and not surprisingly, certification has become globally recognized as a market-based incentive (Cashore et al., 2004, 2006; Gullison, 2003; Hansen and Juslin, 1999; Karna et al., 2003; Overdevest and Rickenbach, 2006; Rametsteiner, 2002; Vertinsky and Zhou, 2000). The second mechanism is signaling, which demonstrates certificate holders' efforts to meet high standards in their forest practices and management through a verification procedure, usually done through a third-party audit (Rametsteiner, 2002). This external evaluation ensures transparency in the production process, securing public confidence and improving access to social returns such as social acceptance and respect. Lastly, forest certification is seen as a learning and technology transfer mechanism. Forest certification attempts to fill the gap through the integration of scientific experts (e.g., biologists, forest engineers, economists, and sociologists) and forest managers in a way to achieve high standards in production, maintenance and monitoring of forest values. In 2003, these mechanisms were tested on all FSC certificate holders in the US and successfully validated. Findings indicated that the market mechanism accounted for 46% of the data variance becoming the most important mechanism explaining the adoption of certification in the US. Following market mechanism, certification was adopted because it could operate as a way to transfer knowledge, and finally, the signaling mechanism explained the support of certification in a way to assure external agencies of SFM.

3. Methods

3.1. Data collection

This article is part of a project that assessed overall choices and impacts of forest certification in Brazil from the perspective of all private companies that achieved FSC and/or Cerflor forest management certificates by December 2006. The survey population was obtained from the FSC and Cerflor websites that contained a list of all certified forests with the names of key individuals (landowner or forest manager) from each certified forest.

A survey package containing a 'Letter of Invitation' and the questionnaire was electronically mailed out in December 2006. According to Dillman's (2000) recommendations, two follow-ups were made and data collection was completed in March 2007. The questionnaire was based on a diverse conceptual literature containing questions that were specifically designed for this project and others that were either adapted from or developed by previous studies (such as Ann et al., 2006; Auld et al., 2002; Cashore et al., 2005; Hartsfield and Ostermeier, 2003; Nakamura et al., 2001; Overdevest and Rickenbach, 2006). The survey included questions related to participation in forest certification programs, familiarity with certification schemes, possible benefits of certification and benefits received. The

survey was sent to 58 private forests, out of which 52 were certified only by FSC, 3 only by Cerflor, and 3 by both. In total, 48 completed surveys were obtained, representing a response rate of 82.7%.

Of these certified forest management units, approximately 46% are geographically located in Southern states, 25% in South-eastern, 17% in Northern, 8% in Centre-western, and 4% in North-eastern states. As far as their business is concerned, most companies ($n = 46$) produce timber products such as logs, sawlogs, charcoal, pulp, and sawdust from *Eucalyptus* spp., *Pinus* spp., and native species. Only two companies produce non-timber products such as essential oil from *Eremanthus erythropappus* and erva mate (*Illex paranguariensis*).

For further analyses, the responses were classified into three categories based on forest type, forest size, and status of forest certification. Forest type represented certified companies either dealing with plantations ($n = 39$) or native forests ($n = 9$). In general, within the plantations category, most of the companies deal with *Pinus* spp., *Eucalyptus* spp., Teak (*Tectona grandis*), Araucaria (*Araucaria angustifolia*), and Acacia Negra (*Acacia mearnsi De Willd*). The companies dealing with native forests produce timber products from native species (e.g., *Andira* spp., *Pouteria* spp., *Dinizia excelsa*), generally in the Amazon region. Regarding forest size, small certified forests ($n = 25$) were defined as companies owning 25,090 ha or fewer, while large certified forests ($n = 23$) were defined as companies owning more than 25,090 ha of forests. Status of forest certification was defined as the phase in which a company decided to certify their forests; pioneers were companies that certified their forests from 1994 to 2000 ($n = 9$) and followers ($n = 39$) were those who had their forests certified from 2001 to 2006.

3.2. Statistical analysis

All statistical tests and analyses were performed using the computer software Statistical Analysis System (SAS). An overview of the questions and statistical tests used to address different components of the research are discussed next.

3.2.1. External influence on companies' decision for forest certification

In order to verify the role of external organizations, respondents were asked to indicate the importance of each group, such as academics, international and national consumers, labour unions, shareholders, state and federal governmental agencies, social and environmental groups, and non-governmental organizations (NGOs), in influencing their decision to pursue certification on a scale ranging from 'not important at all' to 'very important'. In addition, they were asked to rate their familiarity with FSC and Cerflor ('not familiar at all' to 'extremely familiar'). Chi-squared tests (χ^2) were performed to explore how the responses to pressure and relative familiarities differed across forest type, forest size, and certification status. Whenever the expected values in some classes were less than 5, the chi-squared (χ^2) was replaced by Fisher exact tests providing an exact *p*-value (Triola and Triola, 2006). In addition to χ^2 and Fisher tests, the Cochram–Armitage test was also used to detect any trend in the responses.

3.2.2. Identification of governance mechanisms

The data to identify governance mechanisms were based on responses of the importance of possible benefits of forest certification on a five point Likert-type scale ('not important at all' to 'very important'). Since one of the objectives is to test whether the three proposed mechanisms by Overdevest and Rickenbach (2006) fit the sample of the private certificate holders in Brazil, the first idea was to perform a confirmatory factor analysis (CFA). However, the sample size was too small to conduct a CFA, which would result in a sparse distribution of the data impeding the computational procedures to conduct reliable analyses (Hatcher, 1994; Kline, 1994). Hence, an exploratory factor analysis (EFA) was performed instead to uncover the underlying factor structure of our set of observed variables without imposing a hypothesis about the nature of the structure.

Investigators have suggested different minimums for sample size (100 to 1000) to proceed with EFA and others have demonstrated that rules of thumb to determine the adequate sample size are not valid, since the research design and the nature of the data should also be considered (Costello and Osborne, 2005; MacCallum et al., 1999). In this particular study, the sample size is comprised of forty-eight observations, which is considered a poor sample size for factor analysis (Comrey and Lee, 1992); however, it represented 83% of the number of private certificate holders in Brazil, thus supporting the use of factor analysis (MacCallum et al., 1999). In order to achieve an accurate recovery of major common factors present in the population, Cattell (1978) recommended that the ratio of sample size (n) to the number of variables (p) should vary from 3:1 to 6:1. For this reason, our original set of possible benefits with the adoption of certification ($p = 28$) was reduced to a set of ten items ($p = 10$) (Table 1). Variable selection was based on the exclusion of variables sharing conceptual meaning and selection of similar variables used by Overdevest and Rickenbach (2006). Another recommendation to proceed with factor analysis is that the measure of sampling adequacy (MSA) should be higher than 0.50 (Kaiser and Rice, 1974). We obtained an MSA of 0.51, which is considered low but acceptable for factor-analytic purposes. It is clear that the number of observations ($n = 48$) had a very significant impact on the sampling adequacy, as Cerny and Kaiser (1977) contend that MSA increases as the number of variables and the sample size increase. Finally, Olsson (1979) demonstrated that the use of factor analysis on discrete data might lead to erroneous results, such as incorrect numbers of factors and biased estimates of the factor loadings. For this reason, a new data set based on polychoric correlations matrices was created.

The number of factors to be retained was based on eigenvalues greater than 1.0, visual examination of the scree plot, and the use of the proportion of variance. Considering that correlations may exist among the three views of certification, the oblique rotation was chosen and promax rotation was applied to each factor solution. The internal consistency of the extracted and rotated factor was determined by Cronbach's alpha coefficient (Hatcher, 1994).

3.2.3. Importance and performance of each governance mechanisms

After identifying the mechanisms, the factor analysis items were used to generate an importance and performance analysis (IPA) matrix aiming at the examination of how well each mechanism is operating. IPA has been a popular graphical tool, developed by

Table 1
Summary of possible benefits of forest certification and factor loadings (factor pattern matrix of promax oblique rotation).

Possible benefits of forest certification	Rotated factor pattern			h^2
	Signaling	Learning	Market	
Price premium (PP)	12	−24	**84**	.720
Profitability (Prof)	9	12	**90**	.909
Retain/Gain market access (M_access)	−24	16	**81**	.671
Improve management systems and performance (MS)	6	**87**	0	.796
Improve forest management and Practices (FM)	36	**62**	10	.754
Self-discovery of non-conformances (Nonc)	−10	**93**	−3	.790
Public Confidence (Conf)	**63**	29	2	.641
Credibility with regulatory agencies (Reg)	**80**	−3	−6	.603
Better public, landowner, and supplier communication (Com)	**81**	19	12	.791
Less regulation (Less_reg)	**90**	−16	−14	.762

Martilla and James (1977), which combines measures of importance and associated performance in a two-dimensional grid (Bacon, 2003).

To produce an IPA matrix, respondents were asked to express the importance of each certification benefit to their company ('not important at all' to 'very important') and to express how well each benefit has been achieved after their forests were certified ('not at all achieved' to 'fully achieved'). The means of importance and performance for each item were plotted and the cross point is placed at the mean of the results, a practice known as a data-centre quadrants approach (Bacon, 2003; Overdevest and Rickenbach, 2006). The analysis of such an approach is conducted as follows: if the items that measure the efficacy of certification appear in quadrant A, one can understand that certificate holders feel these items to be important but that they are dissatisfied with their performance. Quadrant B would indicate that these items are important and certificate holders are pleased with their performance. Quadrant C means that certificate holders rated these items low in terms of importance and performance. Lastly, quadrant D indicates that the items were rated low in terms of importance but certificate holders are satisfied with their performance.

3.2.4. Recertification

To measure the intention to seek recertification, respondents were asked to indicate if they were interested in maintaining forest certification in the future with possible answers ranging from 'definitely not' to 'definitely yes'. Relationships between the responses to the size of forests, type of forests and the status of forest certification were also examined using chi-squared tests (χ^2) or Fisher exact tests and Cochram–Armitage.

4. Results and discussion

4.1. Organizations' influence on Brazilian companies' decision for forest certification and their familiarity with FSC and Cerflor

Fig. 1 shows the importance of each group influencing Brazilian companies to pursue certification. International consumers and shareholders' influence were considered very important by approximately 66% and 53% of the certificate holders, respectively. In addition, both groups were ranked as an important influence by approximately 24% and 30% of the certificate holders, respectively. In contrast, none of the other group of items achieved a very important ranking above 20%.

Companies gave a moderately high importance (very important + important rates) to non-governmental organizations (42.55%), environmental groups (38.29%), state governmental agencies (34.04%), social groups (27.66%), and federal governmental agencies (25.53%). The influence of academics and labour unions were rated with the lowest importance (19.15%).

No significant differences were found in the importance of different organizations across forest size, forest type, and certification status, except for national consumers across forest type ($P = 0.013$). National consumers were rated with higher influence importance by companies dealing with plantations than those dealing with native forests (Table 2). Furthermore, the trend test provided no evidence on the responses to forest size, forest type, and certification status.

In general, companies reported a higher level of familiarity with FSC than with Cerflor (Fig. 2). Out of 47 respondents, 34 companies were mostly familiar, 11 were familiar and only 2 companies were not familiar with FSC. On the other hand, 7 companies were mostly
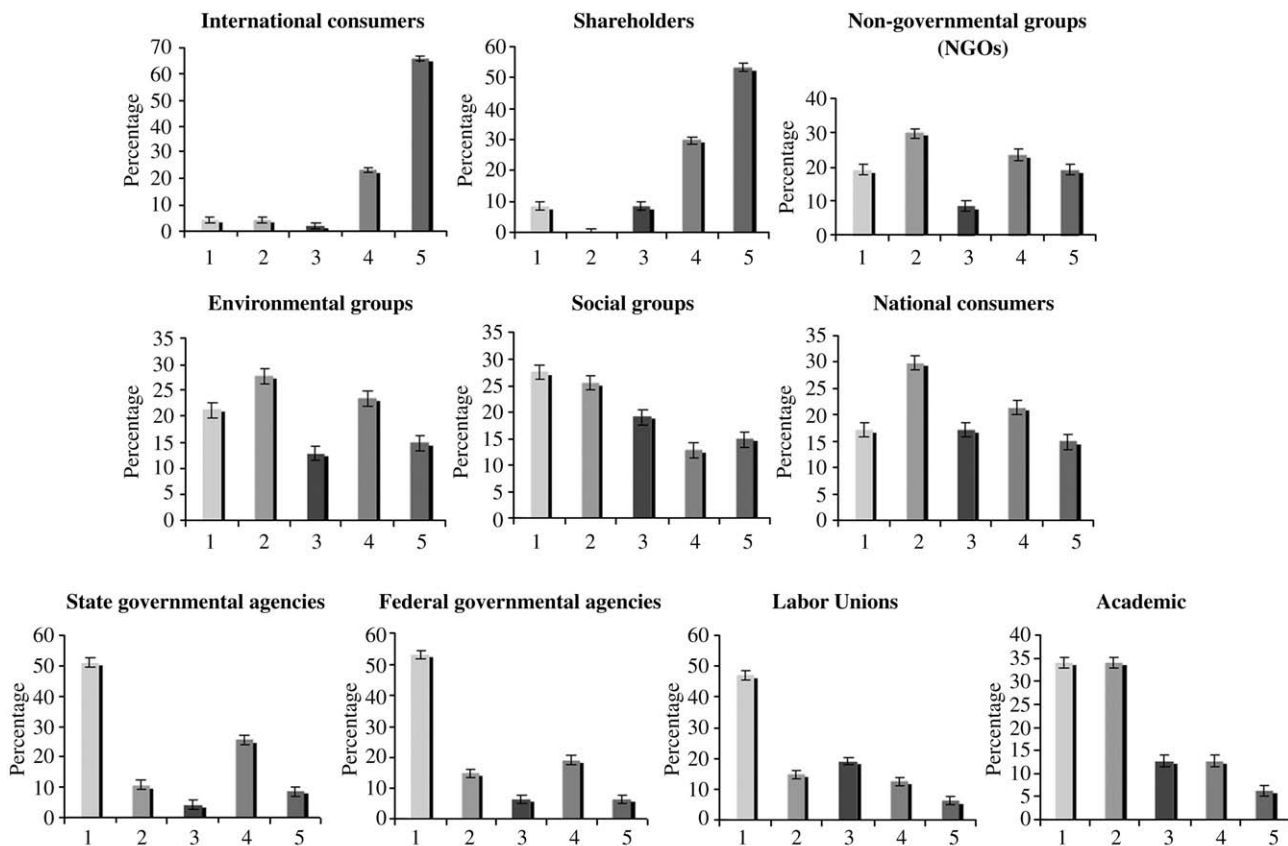
Fig. 1. Percentage of the importance of each group influencing Brazilian companies in pursuing forest certification (1 = not important at all; 2 = somewhat important; 3 = unsure; 4 = important; 5 = very important).

Table 2
Frequency of responses regarding the importance of national consumers across forest type (1 = not important at all; 2 = somewhat important; 3 = unsure; 4 = important; 5 = very important).

Forest type	National consumers					
	1	2	3	4	5	
Plantation	4 (8.51)	12 (25.53)	8 (17.02)	10 (21.28)	4 (8.51)	38 (80.85%)
Native	4 (8.51)	2 (4.26)	0 (0.00)	0 (0.00)	3 (6.38)	9 (19.15%)
	8 (17.02)	14 (29.79)	8 (17.02)	10 (21.28)	7 (14.89)	47 (100%)

Frequency counts (and percentages).

Table 3
Frequency of company responses to familiarity with Cerflor to forest size (1 = not familiar at all; 2 = minimally familiar; 3 = unsure; 4 = familiar; 5 = mostly familiar).

Forest size	Familiarity with Cerflor					
	1	2	3	4	5	
Large	3 37.50*	5 31.25*	2 66.67*	6 46.15*	7 100.00*	23 (48.94%)
Small	5 62.50*	11 68.75*	1 33.33*	7 53.85*	0 0.00*	24 (51.06%)
	8 (17.02)	16 (34.04)	3 (6.38)	13 (27.66)	7 (14.89)	47 (100%)

Notes: Frequency counts (percentages)—*Column percentages.

familiar and 13 were familiar with Cerflor. Three companies were undecided, 16 were minimally familiar and 8 were not familiar at all with Cerflor. In terms of variations of responses across forest size, forest type, and certification status, there is only a significant difference for familiarity across forest size. Table 3 shows that companies with larger area of certified forests reported higher familiarity with Cerflor than companies with small areas ($P = 0.024$). This relationship demonstrated the expected increasing trend in the proportion of familiarity with Cerflor by large companies ($P = 0.015$).

The importance of different organizations influencing companies to pursue certification can generally explain tendencies and preferences of certification schemes in a country. Generally, it is argued that environmental and social groups have played a key role in the creation and development of certification systems. However, from the market benefits perspective, organizations such as national and international consumers and shareholders can also influence companies to participate in certification. In the US, as per Auld et al. (2002), the American Forest & Paper Association (AF&PA) has been the most important organization influencing companies to pursue certification, while shareholders and consumer associations have been ranked in sixth and seventh places of importance. These results are as expected, since the domestic forest industry and landowner associations, including AF&PA, have supported the creation of the domestic certification system, SFI (Sustainable Forestry Initiative), to compete with FSC. As a result, landowners and managers in the US also indicated a higher level of familiarity with the domestic system, SFI. Similarly, Canadian companies were most familiar with the domestic program (CSA) followed by the FSC (Wilson et al., 2001).

In Brazil, it seems that the context is just the opposite of the US and Canada. Brazilian companies attributed a higher level of importance to international consumers in their willingness to pursue certification. Probably, this higher importance given to international consumers explains the higher familiarity with the international system (FSC). Hence, the future of forest certification in Brazil will depend upon the
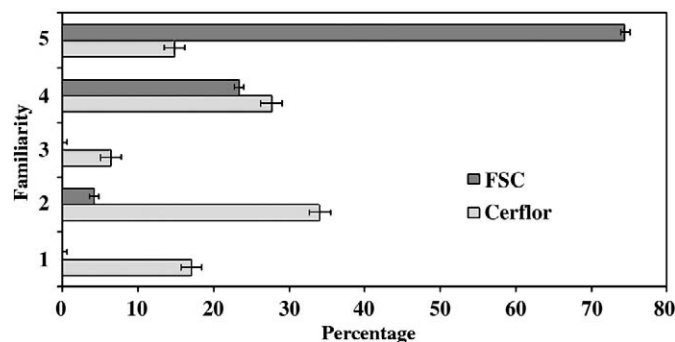
demand of certified forest products in the international market, specifically markets of countries that are the destinations of Brazilian products.

4.2. Identification of governance mechanisms

The rule of eigenvalue, the proportion criterion, and the scree plot test revealed three factors, which accounted for 94.19% of the total variance in the data. Table 1 provides the rotated pattern loading of variables with each factor, along with their communality (h^2), which indicates the proportion of variance in each variable that can be explained by the factors.

In order to identify and label the factors, only variables with loading of 40 or higher on only one factor were selected to explain certificate holders' views on certification. The examination of these variables suggests that factor 1, accounting for 53.6% of the variance, is comprised of four variables: (i) public confidence (Conf), (ii) credibility with regulatory agencies (Reg), (iii) better public, landowner, and supplier communication (Com), and (iv) less regulation (Less_reg). Factor 2, which accounted for 24.8% of the variance, contained three variables: (i) improvement of management systems and performance (MS), (ii) improvement of forest management and practices (FM), and (iii) self-discovery of non-conformance (Nonc). Factor 3 consisted of three variables: (i) price premium (PP), (ii) profitability (Prof), and (iii) retain/gain market (M_access) access accounting for 15.7% of the variance.

According to the characteristics of each governance mechanism described in Section 2, the factors from this study were labelled as: signaling mechanism (factor 1), learning mechanism (factor 2), and market-based mechanism (factor 3). The matrix of inter-factor correlations shows that the three factors have low to moderate correlation to each other (Table 4). The signaling mechanism and the learning mechanism are moderately correlated (0.43), implying that certificate holders see forest certification operating as signaling and learning in a moderately similar way. There is a low but positive correlation between market-based mechanism and signaling (0.22) and market-based mechanism and learning (0.18), suggesting that certificate holders' expectations regarding market-based mechanism were not related to those in the learning and signaling mechanisms.

The internal consistencies of the three factors all exceeded 0.70. Standardized Cronbach alpha coefficients for signaling, learning, and market-based mechanisms were 0.83, 0.80, and 0.78, respectively.

Fig. 2. Company familiarity with Cerflor and FSC in Brazil (1 = not familiar at all; 2 = minimally familiar; 3 = unsure; 4 = familiar; 5 = mostly familiar).

Table 4
Correlations among governance mechanisms.

Factors	Signaling	Learning	Market-based
Signaling	–		
Learning	0.43	–	
Market-based	0.22	0.18	–

When we analyzed how well each mechanism is operating, Brazilian certificate holders rated improvement of forest management and practices, improvement of management systems and performance, public confidence, and retain/gain market access with the highest levels of importance and performance (Fig. 3—Quadrant B). On the other hand, price premium, profitability, and less regulation were given the lowest levels of importance and performance (Fig. 3—Quadrant C). Only better public, landowner, and supplier communication was given a low level of importance but a high level of performance (Fig. 3—Quadrant D). Credibility with regulatory agencies was very close to the boundary between high and low performance (Quadrants C and D), whereas self-discovery of non-conformance was close to the boundary between high and low importance (Quadrants D and B). Therefore, a slight change on these items' values could lead to a dramatic change on their characterization.

Focusing on the point of how Brazilian certificate holders see forest certification, market mechanism items were given low importance and poor performance, except for retaining/gaining market access. Companies were satisfied with the performance of forest certification as a learning mechanism. As a signaling mechanism, only one of the four items (public confidence) was rated with high importance. Regarding the performance of signaling items, certificate holders were satisfied with public confidence and better communication, while less regulation was rated low in performance.

In exploring the mechanisms governing certification, the EFA results replicated the broad structure proposed by Overdevest and Rickenbach (2006). However, in this study, the signaling mechanism accounted for most of the data variance, which suggests that Brazilian certificate holders see certification primarily as a mechanism that communicates SFM to external audiences. This fact demonstrates the high interest of forest owners/managers in seeking forest certification to gain public confidence regarding their forest practices. In the US, signaling mechanism items were highly loaded in the third factor and positioned with high importance and high performance (Overdevest and Rickenbach, 2006).

The second factor in this study suggests that forest owners/managers also referred to forest certification as a learning mechanism. Possible benefits to improved forest management practices and to improved management systems and performance motivated owners/managers to seek certification of their forests. Most important, certificate holders were completely satisfied with certification operating as a learning mechanism. Overdevest and Rickenbach (2006) also reported that learning mechanism items were loaded in the second factor. However, US certificate holders were not motivated and not satisfied by the possible learning benefits.

Compared to other studies, surprisingly in Brazil, market-based mechanism accounted for only 15.7% of the data variance and only retaining/gaining market access was rated with high importance and performance. Companies were not motivated by an increase in their profitability and price premium. In fact, they did not achieve these benefits after certifying their forests. In 2002, Hartsfield and Ostermeier found that FSC certificate holders in the US considered market benefits to be a primary motive to certify their forests. Years later, Overdevest and Rickenbach (2006) confirmed that they still referred to market-based mechanism as the most popular motivation. Only Auld et al. (2002) found that in the US, securing general public confidence and responding better to pressures from environmental groups were rated higher than an economic motive, which in this case is securing market access.

4.3. Will Brazilian companies recertify their forests?

Even though Brazilian companies demonstrated a moderate level of satisfaction with certification, more than half of the respondents were positive about seeking for recertification. All companies certified by Cerflor ($n = 6$) indicated that they would 'definitely' seek recertification. Out of forty-five companies certified by FSC, more than one half ($n = 28$) indicated that they would 'definitely recertify their forests'; while twelve companies reported that they 'would probably seek recertification'. Specifically, five companies indicated that they would 'not recertify' their forests. Amongst these five companies, four own small forests and two are pioneers of forest certification. The Fisher's exact tests provided no evidence of relationships among responses to recertification across forest size, forest certification status, and forest type.

5. Conclusion

The results derived from the governance mechanisms analyses demonstrated that broad factor structure supported results of Overdevest and Rickenbach (2006); however, differences were revealed. Overall, the results validate market, learning and signaling mechanisms as governance functions of forest certification in Brazil. Findings revealed that signaling and learning benefits, such as better and more transparent forest management, explain the movement towards certification. Interestingly, market incentives do not play an important role for Brazilian companies in deciding upon forest certification.

The IPA analyses demonstrated that, more than a decade after the emergence of forest certification, the private forestry sector in Brazil did not see any return in terms of a better price for certified products. Despite the disappointment with the lack of price premiums, certificate holders indicated overall high satisfaction with market access. In addition to market access, most managers and landowners were satisfied with the performance of non-economic benefits: forest management and practices, management systems and performance, self-discovery of non-conformances, better communication, and public confidence. Generally, companies are pleased with FSC and Cerflor and demonstrated their intention to recertify.

This research arose from the demand described by May (2006) representing the first investigation of the overall impacts of forest certification from the perspective of private certified forests. Furthermore, the work herein may represent a necessary step in order to adopt strategies for expansion of forest certification within the forest sector. We hope that future research on the impacts of certification of communal and public forests will provide a complete overview of the progress of forest certification in Brazil.
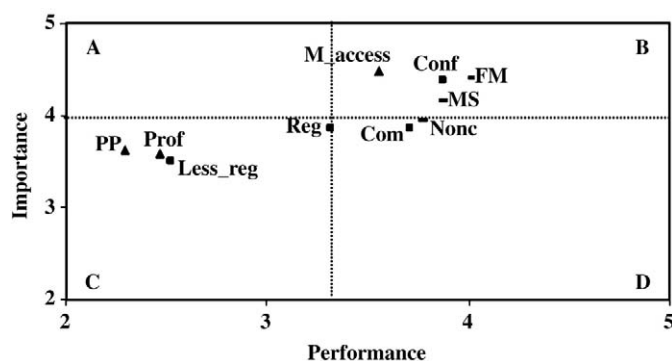
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Fig. 3. Importance and performance analysis for learning (▬), signaling (■) and marketing (▲) mechanisms.

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