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Analysis Of The Property Structure Of Companies Listed On The Corporate Sustainability Index Through The Application Of Social Networks

Abstract
This study is aimed at verifying the configuration of the property structure and relationship network of shareholders in Brazilian companies listed on the BM&FBovespa Corporate Sustainability Index (CSI). Therefore, information was sought about the property structure, the structural configuration of the shareholders' relationships and other characteristics for the 30 companies in the sample, over three consecutive years. As regards the methodological classification, a descriptive and documentary research with a quantitative approach was carried out. Data analysis was divided in two phases: the first involved descriptive statistics and the second the structuring of social relationships, when the configuration of the 1361 board of directors and executive board members' relationships was verified, besides the existence of board interlocking. The results indicate that the structural and corporate configuration of the CSI companies' relationships reveals a shared property structure, as two or more shareholders are in control; they also suggest that the property structure is interdependent, defining what part of investments will be made in according with socially responsible practices/activities, representing the application of this capital. These decisions can be influenced by the members of the company's executive board and board of directors, who participate in other companies that adhere to sustainable practices. Finally, this research contributes to the area, indicating that board interlocking can be considered a driving factor in the transmission of a sustainable culture by board members in different companies.

Key words: Property Structure. CSI. Social Networks. Corporate Social Responsibility. Board Interlocking.

Andréia Carpes Dani
M.Sc. in Accountancy (FURB), Professor at UNEC – Faculdades Integradas de Cacoal.
Contact: Rua dos Esportes, 1.038, Incra, Cacoal, RO, Brazil, CEP: 89012-900.
E-mail: andreidacarpesdani@gmail.com

Franciele Beck
M.Sc. in Accountancy, Universidade Regional de Blumenau. **Contact:** Rua Antonio da Veiga, 140, Sala D-202, Victor Konder, Blumenau, SC, Brazil, CEP: 89012-900.
E-mail: beck.franciele@gmail.com

Paulo Sérgio Almeida-Santos
M.Sc. in Accountancy (FURB), Professor at Universidade Federal de Mato Grosso (UFMT). **Contato:** Av. Fernando Corrêa da Costa, 2.367, FAeCC, Boa Esperança,Cuiabá, MT, Brasil, CEP: 78060-900.
E-mail: paulosergio.almeidasantos@gmail.com

Carlos Eduardo Facin Lavarda
Ph.D. in Accounting, Universitat de Valencia, Spain, Professor at Universidade Regional de Blumenau – FURB. **Contact:** Rua Antonio da Veiga, 140, Sala D-202, Victor Konder, Blumenau, SC, Brazil, CEP: 89012-900.
E-mail: clavarda@furb.br

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1. Introduction

Different authors, including Bertoncello and Chang Jr. (2007), have presented corporate social responsibility as an increasingly important theme in the corporate context, revealing impacts on companies' objectives and strategies. According to Silva and Quelhas (2006), the responsible position companies adopt towards social and sustainable conditions is also reflected in investors' global trend, who privilege these companies through the application of their resources.

This situation contributed to the creation of socio-environmental indicators, which signal to the market that companies are committed to social accountability and corporate sustainability. In that direction, in Brazil, the Corporate Sustainability Index (CSI) exists (BM&FBOVESPA, 2011).

According to Teixeira and Nossa (2010), the São Paulo Stock Exchange (BM&FBOVESPA) created the CSI in 2005, in cooperation with other entities. It was structured to serve as a reference for companies, focused on good corporate practices. This index is intended to show the return in a portfolio of companies that adhere to Corporate Social Responsibility (CSI) practices.

Just like companies have reconsidered their position towards issues related to the sustainability of their business, the property structure is also highlighted in the literature in relation to the constant changes that have happened in recent decades. Intense restructuring processes, both abroad and in Brazil, as well as privatizations and the opening of commercial flows influence this corporate change process, leading to the entry of foreign companies and investors in the local economy (Lazzarini, 2007).

The reflections of property structure changes also appear in the cooperative relations between shareholders and board members in different companies, consequently affecting their decisions (Dal Vesco, Dani, Krespi & Ribeiro, 2011). According to Lazzarini (2007) the interlocking of companies in the form of networks indicates the existence of alliances, in the form of strategic bonds, which also influence the accomplishment of corporate restructuring processes. In that sense, the existence of intercompany networks through board interlocking, in which a board member from one company also participates in another, indicates a channel of influence between different companies.

The intent to signal the adoption of corporate social responsibility practices to the market can be characterized as a business strategy. This strategy is linked to companies' adoption of new socio-environmental practices, and can be driven by the existence of alliances with other companies, or even by the transmission of a sustainable culture, involving board members from different companies, characterized in the form of networks.

In that sense, the following research problem is defined: What is the form of the property structure and relationship network in Brazilian companies listed on the CSI? In line with that question, the aim is to verify the configuration of the property structure and relationship networks of Brazilian companies included in the corporate sustainability index (CSI).

Mendes-Da-Silva, Rossoni, Martin and Martelac (2008, p. 2) indicate that "the notion of social networks, as well as the network analysis methods, have attracted considerable interest and curiosity in social research communities in recent decades", although this theme has been hardly explored in Brazil.

According to Leal, Silva and Valadares (2002, p. 1) "the understanding about the control structure is fundamental, as it directly influences market efficiency through corporate control". Siffert Filho (1998) believes that the property and control structure of Brazilian companies takes the form of shared control, that is, two or more shareholders are in control. Hence, decisions related to socio-environmental policies and practices are linked to internal measures, besides pressure by users. The property structure, in combination with the environmental practices, can be understood as a capital mix the company selects to invest, in accordance with Teixeira and Nossa (2010).

In that context, interdependence exists in the property structure, which defines what part of investments will be made in according with socially responsible practices/activities, representing the application of this capital. These decisions can be influenced by the members of the company's executive board and board of directors, who participate in other companies that adhere to sustainable practices. This study contributes to understand the property structure and network configuration characteristics of Brazilian companies listed on the CSI, with a view to indicating how these characteristics influence a sustainable posture in organizations.

2. Theoretical Background

In this topic, the theoretical framework for this research is presented, highlighting Corporate Social Responsibility aspects related to the CSI, property structure, followed by the owners' social networks and, finally, some earlier related studies with the application of social networks.

2.1 Corporate Social Responsibility and the Corporate Sustainability Index (CSI)

According to Bertoncello and Chang Jr. (2007), corporate social responsibility (CSR) has gained increasing importance in organizational behavior, affecting their objectives and strategies and consolidating the idea that companies need to play a broader role in society than solely in the maximization of wealth.

This theme, addressed in the academic and corporate contexts, includes companies' responsibilities towards the society they operate in (Hartman, Rubin & Dhanda, 2007). In this sense, corporate social responsibility can be defined as:

> (...) the commitment an organization needs to assume towards society, expressed through acts and attitudes that positively affect it, in a broad sense, or some community in a specific sense, acting proactive and coherently with regard to its specific role in society and its accountability. In that sense, the organization takes up moral obligations, beyond those established by law, even if they are not directly linked with its activities, but which can contribute to the sustainable development of the people (Ashley, 2002 p. 6-7).

According to Schroeder and Schroeder (2004), different authors have legitimized this conduct because companies, through the adoption of social causes, return part of the human, natural and financial resources they consume to make profit in the performance of their activities to society.

In the international and Brazilian markets, there is an ongoing trend for investors to apply their resources in socially responsible, sustainable and profitable companies (BM&FBOVESPA, 2011). This investment modality, called socially responsible investment (SRI), assesses not only financial results, but also environmental issues, social responsibility practices and ethical standards (Rezende, Nunes & Portle, 2008).

According to Silva and Quelhas (2006), investors' search for socially responsible investments (SRI) has contributed to the creation of stock indices that are exactly aimed at identifying those companies that incorporate these concepts in their practices.

Following this trend, BM&FBOVESPA, in cooperation with the Brazilian Association of Closed Complementary Pension Fund Entities [ABRAPP], the Brazilian Financial and Capital Markets Association [ANBIMA], the Brazilian Association of Capital Market Investment Analysts and Professionals [APIMEC], the Brazilian Corporate Governance Institute [IBGC], the Institute of Supervision and Control [IFC], the *Instituto ETHOS* and the Ministry of the Environment, created the Corporate Sustainability Index (CSI) in 2005, aimed at reflecting the return in a stock portfolio of companies renowned for their commitment to social accountability and corporate sustainability, as well as to promote good practices in the Brazilian corporate context (BM&FBOVESPA, 2011).

Since the creation of the CSI, many scholars have undertaken research to verify the relation between this index and a wide range of corporate aspects. Some of these studies are presented to achieve further understanding about the theme.

Silva and Quelhas (2006) verified whether belonging to the CSI is somehow related to the cost of own capital. In that research, the authors confirmed that, when adhering to sustainability standards, the company reduces the systemic risk, thus determinant the reduction of the capital cost and increasing the company's economic value.

Rezende, Nunes and Portle (2008) developed a study aimed at checking whether the CSI return is similar to the other conventional stock indices on the São Paulo Stock Exchange (BM&FBovespa), like the Bovespa Index (Ibovespa), the Brazil Index (IBrx) and the Distinguished Corporate Governance Stock Index (IGC). The research revealed that, although the CSI consists of a differentiated portfolio, focused on social, environmental and ethical issues, its return is similar to the conventional stock indices.

Teixeira and Nossa (2010) investigated the effect of the corporate sustainability index (CSI) as a mechanism that signals corporate social responsibility (CSR) in companies' structure. The results indicates that the CSI influences and potentially determines the capital structure, and also that the index can be a channel for socially accountable companies to improve the relationship with stakeholders.

The above studies revealed the range of research on corporate social responsibility and the importance the authors grant to this kind of study. Nevertheless, no study was located in the investigated data sources to explain the composition of the property structure in CSI companies, which motivated this research.

2.2 Property Structure

In the conflict of interest that exists in the market of relationships between managers and investors, the property structure acts as one of the principles that disciplines these relations, using mechanisms like: "[...] the capital structure; the structure of the Board of Directors; the manager compensation policy; competition in the product market; and the hostile takeover market [...]" (Silveira, Barros & Famá, 2008, p. 52).

The property structure can be defined as the capital mix the company selects to invest (Teixeira & Nossa, 2010). From another focus, Brigham and Houston (1999, p. 354) define that the expected capital structure consists of the "proportion of capital from third parties, preferential and ordinary stock that will maximize the company's stock prices".

It is highlighted that most property structure studies are related to corporate performance, like Galdi and Menezes (2010), Okimura (2003), Silveira (2004), and Okimura, Silveira and Rocha (2007), among others, although others were aimed at presenting a different focus on the determinants of companies' property structure, like Siffert Filho (1998), Himmelberg, Hubbarda and Paliaa (1999), and Leal, Silva and Valadares (2000).

Silveira, Barros and Famá (2008) classified some potential determinant of property concentration used in their study: nature of the operation, company size, free cash flow level, investment rate, risk, performance, industry and the type of controlling shareholders. As regards the type of shareholders, the authors infer that the type of controlling shareholder can influence the property concentration.

About the stock property, Leal, Silva and Valadares (2002) comment that, in Brazil, stocks without voting rights are used intensely. While the share of the total capital represents the cash flow rights, the share of voting capital represents the voting rights.

Concerning the type of controlling shareholder, Okimura, Silveira and Rocha (2007) classify five types: controlling individual or family, institutional investor (like pension funds), financial institution (like banks, insurance companies etc.), the government and investor groups (like corporate holdings, companies with shares in other Brazilian and foreign companies).

For this study, with regard to the property structure, the type of shareholder control was addressed, using the criteria and definitions of the Magazine Capital Aberto (2010), according to Figure 1.

	Type	Description
1	Foreign	Exercised by a multinational company or foreign investor.
2	Diluted	When the main shareholders identified own less than 25% of the company's voting shares.
3	Family Property	Control by an isolated individual (businessman) or group of individuals with family relations.
4	Public	Exercised by the government.
5	Shared	Exercised by two or more shareholders (without family relations and at least one legal entity), through an agreement among shareholders. None of them exercises control separately.
6	Multi-family	Groups of individuals (private persons) joined through a shareholder agreement.

Figure 1. Type of Property Structure

Source: Adapted from the Magazine Capital Aberto (2010).

Based on the types of stock controls displayed in Figure 1, in this study, similar to the research findings by Siffert Filho (1998), it is highlighted that, in the Brazilian case, shared control has increased in organizations, with Brazilian or foreign institutional investors as the main shareholders.

In that respect, the author explains that this fact is due to the transformations in corporate social control, besides the 100 largest companies' increasing participation in the economy (Siffert Filho, 1998).

2.3 Social Networks of Owners

Tureta, Rosa and Ávila (2006) indicate that a social network can be characterized as a set of people and organizations, joined by a set of social relationships. According to Tomaél and Marteleto (2006), social networks constitute a social structure through the mutual connections in a set of people (or organizations or other social entities), through personal relationships (links), professional relationship or information sharing.

Hence, Tomaél and Marteleto (2006, p. 78) establish that four measures can be applied to the centrality of network actors, according to their functions: "a) Information centrality); b) Degree centrality; c) Betweenness centrality; d) Closeness centrality".

Mendes-Da-Silva et al. (2008) highlight that research on the board structure, that is, which is aimed at verifying board member characteristics through relationship networks, has gained room in international literature, addressing aspects related to board interlocking (links among companies, through members of one company who simultaneously participate in another company's board) and its influence on organizational performance.

In this respect, Santos and Silveira (2007, p. 157) comment that board interlocking, as "one of the issues associated with board members' effectiveness and, consequently, with the proper functioning of the board of directors, refers to the phenomenon of these professionals' cross-participation in other companies".

Wong and Gygax (2009) characterize this network of board members as a relationship created between two companies when they share at least one director. In that sense, Mendes-da-Silva and Vidal (2011) infer that the definition of board interlocking is not unanimous. According to these authors, the most frequent definition is that, if only one member of the board of directors simultaneously occupy a place in at least another company's board, there is a board interlocking.

In addition, the authors comment that the literature presents motivations for the occurrence of board interlocking at three levels, which are: organizational, social and personal (Mendes-Da-Silva & Vidal, 2011).

According to research by Santos and Silveira (2007), boards with high levels of participation by external members tend to be more interconnected with other companies, and larger and more renowned companies tend to have more professionals from other companies on their boards.

Hence, in this study, a network of owners is characterized as a set of owners who are connected through their percentage share in the capital of other companies.

Similarly to the research by Lazzarini (2007), the observation of companies' corporate composition is susceptible to analysis, in view of some factors, such as: the existence of alliances among companies, as a form of strategic bonds; as well as the accomplishment of corporate restructuring processes, according to local networks.

In line with information by the IBGC (2009), board members should inform other members if they are part of other boards, including in service sector organizations, in view of possible conflicts of interest among board members, as well as a lack of time to perform their activities in different organizations. In addition, the IBGC (2009) highlights that, besides the board member's core activities, information should be disseminated and be available in the company's reports and other communication means.

2.4 Related Studies with Network Applications

In this item, some related studies will be presented that used social networks to verify relations in corporate restructuring processes, stockholder participation, associations of boards of directors, besides capital structure. In that sense, the research by Lazzarini (2007), Mendes-Da-Silva et al. (2008) and Dal Vesco et al. (2011) should be highlighted.

Lazzarini (2007) developed a study to verify changes in ownership relations in function of the restructuring events that took place in Brazil between 1995 and 2003 (privatizations and entry of foreign capitals). For that purpose, the social networks of mutually connected owners were analyzed, as well as their joint participation in one or more companies' capital. The research results showed that few central actors exist, who end up connecting different groups due to their position in the network. In addition, the author underlines the increased influence of certain local owners, to the detriment of foreign firms and investors.

In the study by Mendes-Da-Silva et al. (2008) about the role of the board of directors based on social network analysis in Brazil, with a view to checking for associations between centrality levels, coherence of Brazilian company boards and company performance. The research sample consisted of 615 individuals, who served on the boards of directors of the companies listed on Bovespa's New Market in 2007. The analysis was conducted in two phases. In the first, the configuration of the networks of board members and companies was presented and, in the second, associations were verified between network structure and performance. The authors concluded that higher levels of centrality, density and coherence enhance companies' ability to present higher profitability and lower indebtedness.

Finally, the study by Dal Vesco et al. (2011) is highlighted, aimed at verifying the capital structure through corporate and personal relationship networks in the corporate interests of public service and telecommunication (fixed and mobile telephony) companies listed on Bovespa. In methodological terms, the research was classified as descriptive, documentary and quantitative. The study results indicate that corporate interests are related in two distinct forms: companies join diluted stockholders, like other and treasury stock, constituting weak bonds; and show a highly concentrated property structure, in which 100% of the capital social represents a concentrated property structure.

3. Method

The methodological design is classified as descriptive regarding its objectives, documentary regarding its means, and quantitative regarding the approach to the research problem.

It is classified as quantitative, because descriptive statistics will be used and the social network technique will be applied for data analysis. Therefore, all connections will be checked manually before the use of the social network software.

The research universe comprises the 100 companies with the most traded stock on the São Paulo Stock Exchange, as classified in a special issue of the Magazine Capital Aberto, called the Corporate Governance Yearbook of publicly traded companies in 2010. From these 100 listed companies, an intentional sample was drawn, based on the companies' classification in the BM&FBOVESPA CSI. Hence, the research sample consists of the following companies, as shown in Figure 2.

AES Eletropaulo	BRF Foods	Dasa	Even	Natura	Suzano Papel
AES Tiete	Cemig	Duratex	Gerdau	Oi	Tim
Banco Brasil	Cesp	EDP	Itaú Unibanco	Redecard	Tractebel
Bradesco	Copel	Eletrobrás	Itausa	Sabesp	Useminas
Braskem	CPFL	Embraer	Light	Sul America	Vivo

Figure 2. Research sample

Source: Magazine Capital Aberto (2010).

The choice of the Corporate Sustainability Index (CSI) to delimit the sample is due to the fact that this stock index serves as a reference for socially accountable investments, as its portfolio consist of shares from companies renowned for their commitment to corporate social responsibility and corporate sustainability, through the promotion of good practices in the Brazilian corporate context (BM&FBOVESPA, 2011). Several studies have been focused on the CSI, including Rezende, Nunes and Portle (2008), Teixeira and Nossa (2010).

In view of the proposed research objective, which is to verify the property structure and relationship network of Brazilian companies listed on the corporate sustainability index (CSI), the number of companies selected for the research was appropriate to apply the network technique, given the quantity of information demanded and the graphic transposition of the results.

For the first phase of data collection, information was sought about the type of ownership structure and control, using information published in the Corporate Governance Yearbook of publicly traded companies in 2010, published by the Magazine Capital Aberto in a special issue launched in the same year. Then, the names of the members of the board of directors and executive board were collected from all companies over a three-year period (2010, 2011 and 2012), with a view to analyzing the structural configuration of the existing relationships.

Therefore, first, some information was collected to accomplish the study, included in the data collection instrument.

Initially, descriptive statistical analysis was applied to percentage information on the sample companies' percentage interests and characteristics, among others. Then, the social network technique was applied through coded matrices included in the software Ucinet, with a view to demonstrating the sample companies' types of property structures, existing connections among companies with corporate interests and among members of the Board of Directors (BD) and Executive Board members. Therefore, in the matrices, information without percentage interests was score as "0", while information with percentage interests or other percentage information were scored as "1", "2" etc.

The analysis undertaken through the social network techniques was based on Social Network Theory. This theory is aimed at defining and systemizing the use of social networks and their extensions. The networks can be defined as a set of two main elements: the actors/members (individuals, institutions/companies or groups) and their links or inter-relationships (Tureta, Rosa and Ávila, 2006; Won and Gygax, 2007; Mendes-Da-Silva and Vidal, 2011). Based on this theory, the analysis is centered on the owners' social networks, that is, on the links between the majority/controlling shareholders of Brazilian companies in the CSI.

The analysis based on the social network technique permits checking whether larger and socially more renowned companies with more established corporate governance mechanisms have some kind of preponderant ownership control.

4. Analysis of Results

In this topic, the analysis of the results is presented through descriptive statistics, concerning the characteristics of the research sample. Then, the data will be analyzed through the social network technique, focusing on the composition of the sample companies' social relationships.

4.1 Characteristics of the Research Sample

Initially, in Table 1, the research sample companies from different sectors and segments are described in the form of frequencies.

Table 1
Activity sector of sample companies

Sector	Segment	Absolute Frequency	Relative Frequency
Public services	Electric Energy	10	33,33%
	Sanitation	01	3,33%
Financial and Others	Banks	03	10,00%
	Holding of Interests	01	3,33%
	Insurances	01	3,33%
	Financial Services	01	3,33%
Non-Cyclic consumption	Food	01	3,33%
	Personal Hygiene and Cleaning Products	01	3,33%
	Health	01	3,33%
Industrial Goods	Aviation	01	3,33%
Construction and Transportation	Civil Construction	02	6,67%
Basic Materials	Iron and Steel	02	6,67%
	Paper and Pulp	01	3,33%
	Petrochemical and Rubber	01	3,33%
Telecommunication	Fixed and Mobile Telephony	03	10,00%
Total		**30**	**100,00%**

Source: Research Data.

Based on the data in Table 1, the public service sector was the largest in the sample, with 11 companies, mainly from the electric energy segment, with the highest relative frequency of 33.33%, totaling 10 companies. On the opposite, only one company was present from the industrial goods sector, in the aviation segment, with a relative frequency of 3.33%. The researchers consider that the sectors that would be more prone to inclusion in the index in view of their main activity, like the industrial goods sector, should have an equal/similar share in the index when compared to the electric energy sector, evidencing their socio-environmental concerns to their investors and stakeholders.

In Table 2, the frequencies of the types of property structure are displayed according to the sample companies' segments.

Table 2
Type of property structure control in sample companies

Property Structure	Absolute Frequency	Relative Frequency
Shared	12	40,00%
Public Control	06	20,00%
Foreign	04	13,33%
Family	05	16,67%
Diluted	03	10,00%
Total	**30**	**100,00%**

Source: Research Data.

In Table 2, it is observed that 40%, that is, 12 sample companies have a shared property structure. In this type, two ore more shareholders are in control, one of which should be a legal entity, in which the practice of control is shared and not isolated.

Silveira, Barros and Famá (2008) define that the controlling shareholder type is one of the determinants of the ownership concentration, or of the type of stockholder control. La Porta, Lopez-de-Silanes, Shleifer and Vishny (1999) underline that, in family-owned companies, a single individual or specific group is in control, in which the property structure is characterized as under concentrated control, or there may be no controlling stockholder, when control is shared.

The researchers consider that the increasing market competitiveness among publicly traded companies motivates a property structure with shared control, which is consequently more diluted. It could also be observed that diluted control was less frequent, corresponding to 10.00%, i.e. only three companies. This is due to the fact that only three of the sample companies possess the main shareholders with less than 25% of the companies' voting stock.

Table 3 displays the frequency list of the sample companies' classification per corporate governance level.

Table 3
Distribution of sample companies' Corporate Governance Levels

Corporate Governance Levels	Absolute Frequency	Relative Frequency
Level 1	11	36,67%
Level 2	02	6,67%
New Market	13	43,33%
Traditional	04	13,33%
Total	**30**	**100,00%**

Source: Research Data.

The analysis of data in Table 3 reveals that 43.33% or 13 of the companies under analysis are part of the New Market corporate governance levels, according to the Bovespa classification, in the following segments: financial (Banco do Brasil, Redecard), food (BRF Brasil *Foods*), public services (CPFL Energia), health (DASA), civil construction (Duratex S.A., Even Construtora e Incorporadora), aviation (Embraer), electric energy (*Light*, Tractebel Energia, EDP – Energias do Brasil), personal hygiene and cleaning products (Natura) and sanitation (Sabesp). On the other hand, only two (6.67%) companies were listed on Level 2, one in the electric energy (AES Eletropaulo) and one in the insurance segment (Sul América).

The property structure is presented as one of the main corporate governance mechanisms (Leal, Silva & Valadares, 2002). In that sense, in the study by Torres, Bruni, Rivera-Castro and Martinez (2010), a positive association was found between the ownership and control structure, the corporate governance level and the origin of the companies' capital.

In this research, the authors defend that companies with a shared ownership structure, in accordance with Siffert Filho (1998), and companies with a concentrated ownership structure equally have mechanisms that can minimize the agency conflicts, whether between management and shareholders or between controlling and minority shareholders, with a view to good governance practice and corporate sustainability.

In Table 4, the similarities are shown between the persons occupying the functions of CEO (Chief Executive Officer) and Chairman of the Board in the same companies.

Tabela 4
Similarity between functions of CEO and Chairman of the Board in sample companies

Similar	Absolute Frequency	Relative Frequency
Yes	03	10,00%
No	27	90,00%
Total	**30**	**100,00%**

Source: Research Data.

According to the data in Table 4, in 27 or 90.00% of the sample companies, different persons occupy the functions of CEO and chairman of the board. On the other hand, the same person occupies these functions in only three or 10.00% of the companies. Mendes-da-Silva and Grzybovski (2006) highlight that, "independence between the Board of Directors and the Executive Board can guarantee more efficient administrative activities".

In Table 5, the distribution of the members of the board of directors and executive board in the sample companies is displayed.

Table 5
Distribution of members of the Board of Directors and Executive Board in the sample companies

Companies	Members BD			Members EB			Companies	Members BD			Members EB		
	Period (Years)							Period (Years)					
	2010	2011	2012	2010	2011	2012		2010	2011	2012	2010	2011	2012
AES Eletropaulo	10	10	11	06	7	7	Even	07	6	6	04	5	5
AES Tietê	11	10	10	07	8	8	Gerdau	09	8	8	08	7	6
Banco do Brasil	07	7	6	14	10	9	Itaú Unibanco	13	13	12	13	13	14
Bradesco	09	9	8	07	7	7	Itaúsa	06	6	6	04	8	4
Braskem	11	11	11	07	7	7	Light	11	10	12	07	7	8
BRF Foods	11	3	3	08	2	1	Natura	06	9	8	04	4	5
Cemig	09	14	14	03	10	11	Oi (Tele Norte Leste)	09	15	16	05	9	9
CESP	10	10	10	04	4	4	Redecard	05	8	8	04	8	7
Copel	08	9	9	08	9	9	Sabesp	11	10	9	07	6	6
CPFL	07	3	3	06	4	6	Sul América	09	9	9	04	4	4
DASA	06	6	5	10	7	9	Suzano Papel e Celulose	09	9	9	07	7	6
Duratex	09	9	9	09	14	14	TIM	08	8	9	06	7	8
EDP	07	8	8	04	5	5	Tractebel Energia	09	9	9	07	7	7
Eletrobras	09	4	9	06	2	9	Useminas	09	10	10	04	5	7
Embraer	11	13	6	10	7	5	Vivo	09	9	0	07	5	0

Source: Research Data.

Table 5 displays the members of the companies' boards of directors and executive boards, 440 of whom were analyzed in 2010, 466 in 2011 and 455 in 2012, totaling 1361 members (social actors).

The distribution of the members of the companies' boards of directors and executive boards was analyzed over a three-year period, revealing that, independently of the number of members on the board, some members are repeated, within the same company as well as in different companies, and may be serving on the board of directors or on the executive board.

Similarly to the study by Dani, Beck and Beuren (2012), board interlocking is characterized as the concomitant participation of individuals in different companies, occupying strategic functions, on the executive board (EB), board of directors (BD), statutory audit committee (SAC) or as other counselors (OC), among others.

Regarding this practice, the abovementioned study in family-owned companies considered the years 2010 and 2011. The results indicated that not many changes were made in the relations and functions, as the renewal of board members varies among companies, and can also be motivated by a board member's decision. The authors conclude that the large majority of the companies analyzed reveal family relations between the members of the executive board and the board of directors. Also, the members of the board of directors are more numerous than those of the executive board in most of the companies investigated in this study.

4.2 Structural Configuration of Relationships

In this item, the analysis of the sample companies' ownership structure and corporate interests is presented based on the social network technique. According to Rossoni and Guarido Filho (2007, p. 75) "there are different possibilities of network analysis, covering a large number of measures to assess the characteristics of cooperative networks". In Figure 3, the types of ownership structure in the sample companies are displayed.

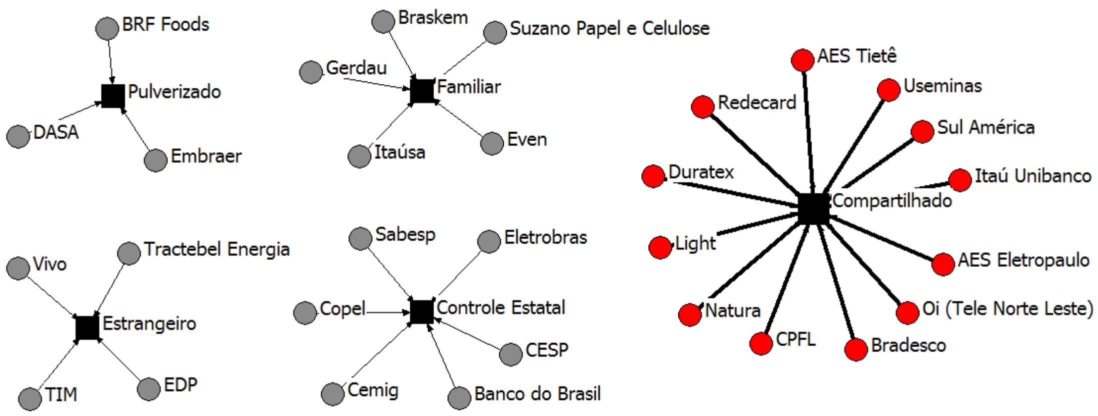


Figure 3. Social networks of ownership structure types in sample companies.
Legend: Red color (highlights the dominant type of ownership structure)

Source: Research Data.

In Figure 3, the structural distribution of relationships is displayed with regard to the sample companies' types of property structures. Among the five classification types used in this research, the shared type was the most concentrated, with 12 bonds, that is, the property structure was shared in 12 out of 30 CSI companies.

This reveals that larger and more renowned companies with more established corporate governance mechanisms predominantly have a shared property structure. In the other companies, the structure is less concentrated, with the dilated, triad-shaped structure as the least concentrated type.

In line with Lazzarini (2007), it is highlighted that the owners who are most linked with other actors or members are able to maintain or lever their presence in the Brazilian economy. In addition, "an owner who is centrally connected in the network will be capable of using opportunities to purchase stock interests put at sale by other owners (s)he is connected with" (Lazzarini, 2007, p.4).

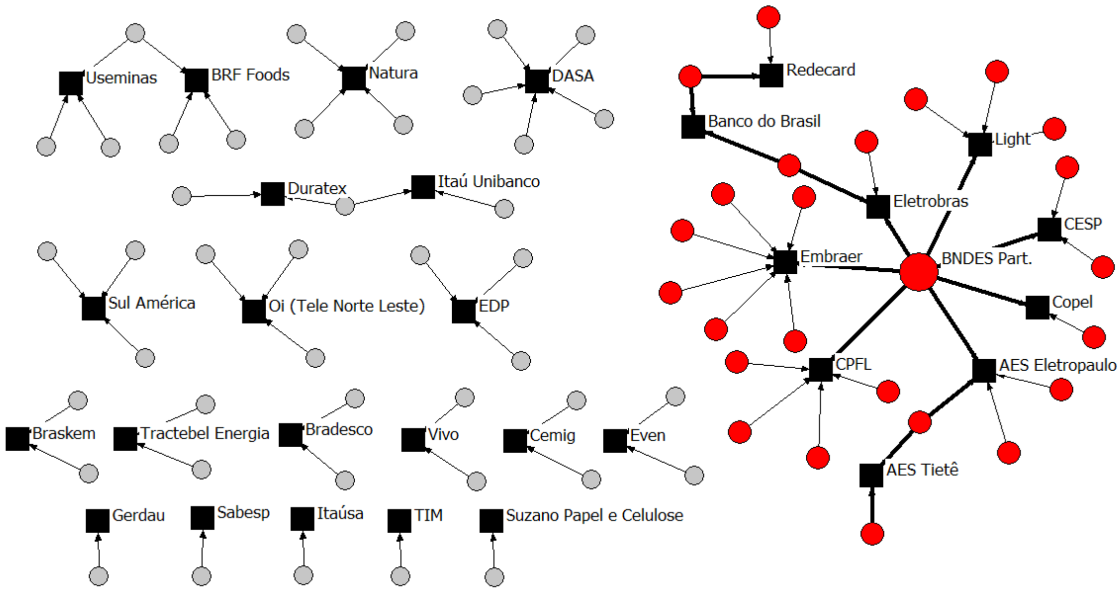


Figure 4. Social networks of sample companies' shareholders.
Legend: Red color (highlights the dominant company in terms of the number of connections)
Source: Research Data.

In Figure 4, the constitution of social structures can be observed, through a set of connections, characterized as centralized and including organizations from different sectors, mutually connected through stockholder interests. As shown in the most concentrated network, these structures are defined by the joint stockholder interest in one or more companies. In this respect, it was observed that BNDS Part. was the company with the largest number of stock interests in other companies, being linked to Embraer, Eletrobrás, Light, Cia. Energética de São Paulo [CESP], Companhia Paranaense de Energia [Copel], AES Eletropaulo and CPFL. In addition, these companies are also linked with Redecard, Banco do Brasil, e AES Tietê. The other companies, on the other hand, are diluted with fewer bonds, less than five in all companies, indicating a low concentration level.

Santos and Silveira (2007) mention that boards with high participation levels by external members tend to show a larger number of interconnections with other companies, and also that larger and more renowned companies tend to have more professionals from other companies on their boards. In this research, the network displays bonds among shareholders, characterized as a set of owners who are interconnected through percentage interests in other companies' capital. In view of these considerations, in Table 7, BNDS Part.'s corporate interest is highlighted, as the company with the highest concentration level.

Table 7
Corporate interest of company with greatest concentration of bonds

Companies	Interest %	Nº. Bonds
Eletrobrás	21,08%	03
Light	22,96%	04
Cesp	8,56%	03
Copel	26,41%	02
AES Eletropaulo	0,73%	04
CPFL	8,40%	05
Embraer	5,50%	07

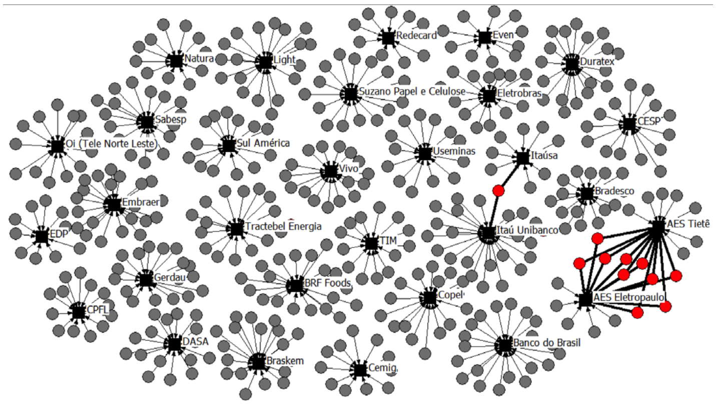
Source: Research Data.

In addition, it is observed in Table 7 that BNDS Part., more predominant in the network and linked to seven other sample companies, also reveals different percentage interests in those companies. The company shows the highest percentage interest in three main companies: Copel, with 26,41%, followed by Light with 22.96% and Eletrobrás with 21.08%. Among these, Embraer showed the largest number of social bonds when considering the other companies.

The results indicate that social and corporate inter-relations, which represent a board interlocking practice, are present in these companies, characterized by public control and working in the electric energy segment. These results indicate that these companies share characteristics that distinguish them from the other companies.

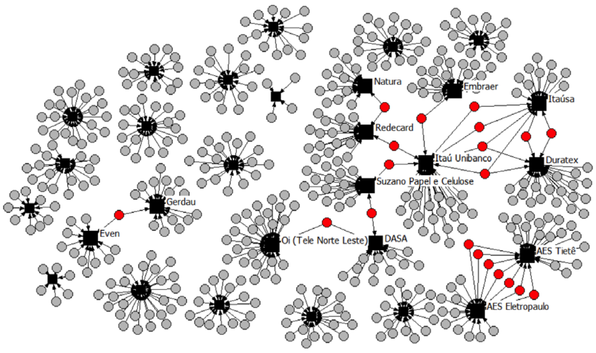
Figure 5 shows the structural configuration of the relationship among the members of the boards of directors and executive boards in the sample companies over a three-year period.

2010



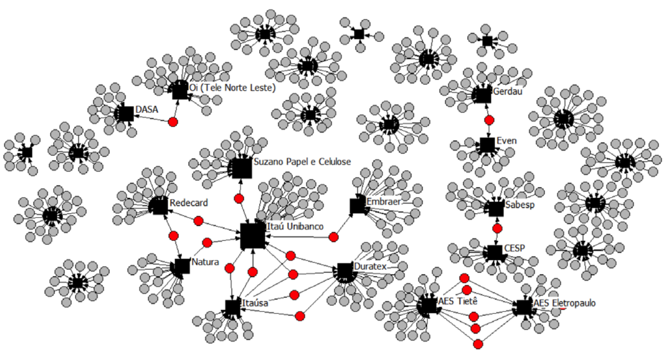
Social bonds – 2010		Board Inter.
Companies		
Itaú Unibanco	Itaúsa	1
AES Eletropaulo	AES Tietê	10

2011



Social Bonds – 2011		Board Inter.
Companies		
Oi	Dasa	1
Gerdau	Even	1
Sabesp	CESP	1
AES Tietê	AES Eletropaulo	5
Itaú Unibanco	Susano Papel e Celulose	1
	Recard	1
	Natura	1
	Itaúsa	2
	Duratex	1
	Embraer	1

2012



Social Bonds – 2012		Board Inter.
Companies		
Gerdau	Even	1
AES Eletropaulo	AES Tietê	7
Redecard	Natura	1
Oi	Dasa	1
Itaú Unibanco	Susano Papel e Celulose	1
	Redecard	1
	Embraer	1
	Itaúsa	4
	Duratex	

Figure 5. Social networks of board of directors and executive board members' interests in sample companies.

Legend: Red color (highlights the board members serving on the boards of more than two companies - Board Interlocking).

Source: Research Data.

In Figure 5, it is highlighted that different structural forms were found, which are strongly concentrated, showing a centralized ownership structure with bonds among the board members, like AES Eletropaulo and AES Tietê, with similarities between the following members: Luiz Gonzaga de Mello Belluzzo, Sergio Silva do Amaral, Cibele Castro, Pedro de Freitas Almeida Bueno Vieira, Rinaldo Pecchio Júnior, Sheilly Caden Contente. In the second network with similar members, Itaú SA and Itaú Unibanco stand out with the board member Roberto Egydio Setubal.

A continuous increase in the number of common board members is found across the three-year period in the boards of directors and executive boards of the companies analyzed. Then, the occurrence of board interlocking was observed in different companies in the same period. In this respect, in the first year, this practice occurred in companies from the same sector/segment. In 2011 and 2012, on the other hand, board interlocking was predominant in companies from different sectors/segments.

It is presupposed that the participation of board members in companies from different segments not only reveals the similarity between the companies' ownership control types (shared), but also demonstrates a market trend that goes beyond family relations and assumes a characteristic of the Brazilian capital market, aiming for the use of similar socio-environmental practices and the constant renewal of decision makers due to constant improvement and competitiveness.

Silveira, Barros and Famá (2008) defend that the use of corporate governance mechanisms like the structure of the Board of Directors and market competition are factors that discipline and condition the relations among board members (managers and investors).

As observed, board interlocking is present in most of the sample companies, due to existing bonds through the simultaneous participation of their board members in the board of directors or executive board of other companies (Mendes-Da-Silva et al., 2008), in this study mostly belonging to different activity sectors or segments.

The results suggest that board interlocking can be considered a driving factor of alliances with other companies, or even of the transmission of a sustainable culture by board members from different companies.

In the same direction as the results Dani, Beck and Beuren (2012) found with regard to board interlocking, it is concluded that the companies listed on the corporate governance levels of the São Paulo Stock Exchange, with shared ownership control, have similar socio-environmental practices that may or may not be related to the degree of family relationship among the members, or even with the transmission of a sustainable culture.

5. Conclusions and Limitations

The general objective in this research was to verify the property structure and relationship networks of Brazilian companies listed on the CSI.

Therefore, 30 companies were analyzed that are listed on Bovespa's Corporate Sustainability Index. Then, information was analyzed about the type of ownership structure, the type of control, stockholder composition, the relationship structure through social relations among the members of the board of directors and executive board, and the companies' practice of board interlocking.

To analyze the ownership and relationship structures, in total, 1361 board members were analyzed over a three-year period. This revealed that they participants mostly in companies from different segments, and less in companies from the same sector. This result reveals that, although the companies are active in different sector, they may have shared interests/activities, like the adoption of socio-environmental practices.

The results found suggest the interdependence of the ownership structure, defining the share of investments that will be made through socially responsible practices/activities, representing the application of that capital. The company boards and board members, who may participate in other companies that adhere to sustainable practices, can influence these decisions.

Therefore, it is suggested that the intent to indicate the adoption of corporate social responsibility practices to the market can be characterized as a corporate strategy.

As mentioned by Siffert Filho (1998), Brazilian companies predominantly maintain a shared ownership and control structure. Thus, decisions on socio-environmental policies and practices are linked with internal targets, besides pressure from users.

The ownership structure, linked with socio-environmental practices, can be understood as a capital mix the company selects to invest, in accordance with Teixeira and Nossa (2010).

In that sense, board interlocking can be considered a driving factor of alliances with other companies, or even of the transmission of a sustainable culture by board members from different companies.

This research contributes to the literature in the area, as it helps to understand the structure configuration of social relationships and interest among companies with different types of ownership control, whose social reputation represents a preponderant factor in these relations. In addition, it suggests that these characteristics influence organizations to adopt a sustainable posture.

Study limitations relate to the number of companies analyzed and the choice of the data treatment technique.

Finally, for the sake of future research, the company characteristics could be distinguished with regard to the occurrence of corporate restructuring processes, as a factor related to board interlocking, as well as the investment percentage in the CSI. Also, the most common type of ownership control in the boards of Brazilian publicly-traded companies could be verified.

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