BOARD INTERLOCKING NETWORK IN THE BRAZILIAN STOCK MARKET. A HYPOTHESIS ON THE CONFLICTING MANAGER

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Abstract

Brazilian law establishes a set of provisions regarding the defense of competition, usually with a dissuasive effect on the conflicting performance of the multi-company manager. However, research highlights that practices such as interlocking directorates (i.e., interconnected directorates with board members operating in multiple companies) are widespread, especially in the stock market. The present article explores this paradox by analyzing a social network of 347 Brazilian listed companies. An E-I (external-internal) index and a permutation test are used to verify the occurrence of direct and indirect intermediation within and among economic sectors. The paper advances towards a hypothesis on the effectiveness of the Brazilian antitrust legislation.

Keywords: Antitrust Law, Brazil, Conflicting Manager, Multiple Directorships, Social Network Analysis

1. INTRODUCTION

The presence and diffusion of the interlocking directorates is an element that should be considered when analyzing governance practices: most Brazilian companies are coordinated through interlocking directorates (i.e., the bonds among businesses created by the members of the boards of directors acting in multiple companies, interconnecting them (Dooley, 1969; Lazzarini, 2011)). Competition law aside, the diffusion of interlocking has become important for the understanding and analysis of market regulation and competitiveness, enabling an alternative approach to the standard statistical analysis: the social network analysis (SNA) which transforms this set of interlocking among directorates in a graph, the 'vertices' (or 'nodes') representing the firms, and the ties, the interlocking. The set of techniques and statistics proposed by SNA allows analyzing this graph and understanding its structure (Scott, 1991a, pp. 73-78).

The economic coordination function performed by interlocking is important and represents an alternative to the traditional form of the market. As pointed out by Mizruchi (1996), a manager occupying positions in two companies may favor the access of commercially sensitive information (among others), facilitating the occurrence of collusive practices. The company can also absorb the external potential disturbance elements through interlocking: which allows reducing the environmental uncertainty (due to the instability of markets) besides favoring collusion and co-option among companies. The board of directors becomes then crucial: board members ensure higher gains for multiple companies (Wesley, 2011). Such as ownership structure (Dockery, Tsegba, & Herbert, 2012) social networks influence firm performance (Radipere & Ladzani, 2014; Hundal, 2017).

The diffusion of interlocking increases but not the control devices (OECD, 2009). Regarding the Brazilian case, the legislation has a clearly dissuasive orientation, making it difficult for a manager to act in competing companies, through a series of provisions and sanctions in force since the 1930s. On the other hand, the studies on the subject emphasize the spreading of interlocking practices, representing an evident paradox (Lazzarini, 2011).

The research responds to the paradox through a SNA from a sample of listed companies (totaling 347 companies organized in 10 economic sectors). SNA explores mainly two types of ties: 1) the direct ties among companies of the same branch (interconnected through the common manager who acts in both board); 2) indirect ties, when two companies from sector *x* are not tied directly, but indirectly, through managers of other companies, in sectors other than *x* (an "indirect collusive interlock" according to Buch-Hansen, 2014, p. 256). In this second case, the interlocking does not constitute a violation of the current Brazilian legislation: the provisions regarding conflicting actions of the manager is limited to prohibiting direct relationships among companies of the same branch. The main topic of this paper is that indirect ties, as well as direct ones, reduce environmental uncertainty, indeed, favoring collusion and co-option among companies.

The first part of the paper introduces the Brazilian law on the manager's conflicting performance; thereafter, the article presents some research on the subject and a SNA from a sample of 347 Brazilian listed companies. The article presents a descriptive analysis of the interlocking network and an index for the calculation of internal and external interlocking to the economic sectors (I-E index); afterwards, a permutation test is presented to verify whether the index value is by chance or not (Krackhardt & Stern, 1988). Further details on the terms and concept used in the text can be found in Wasserman and Faust (1994).

2. THE COMMON MANAGER'S LAW

According to Decree-Law No. 869 of 1938 (Brazil, 1938), the common manager among companies of the same branch acting "in order to avoid or hinder competition" may receive criminal treatment (Art. 2). Later incorporated in Art. 3 of Law No. 1521 of 1951 (Law on crimes against the Public Economy), the provision has a penalty from two to ten years imprisonment and a fine (Brazil, 1951; Carvalho, 2015).

Moreover, article 147 of the Limited Liability Corporation Act (Brazil, 1976) – Incorporated in Law No. 10303 of 2001 – has a dissuasive orientation: the article establishes the impediment for the election of board members of the candidate who (i) is holding positions in companies which may be considered as competitors in the market and (ii) has a conflict of interest with the proper company. However, in order to safeguard the shareholders' private interest, the Law allows waiving the impediment to the shareholders' general assembly (Falcão, 2013, p. 65).

The issue related to the positions accumulated in multiple companies is also present in the Code of Best Practice of Corporate Governance of the Brazilian Institute of Corporate Governance (IBGC, 2015). In addition to item 2.5, whereby the board member should be exempt from any conflict of fundamental interest, the Code lists a set of recommendations and guidelines in Section 2.8.1 regarding the board member's participation in other boards: the approval of the General Meeting, the maximum number of boards and multiple committees, and other ad hoc guidelines for companies from the same group. Additionally, pursuant to the Instruction of the Brazilian Securities and Exchange Commission (CVM) No. 367 of May 29, 2002, a person who has been elected by a shareholder who has also elected a board member in a competing company (I) and maintains a subordination tie with the shareholder who elected him (II) is ineligible to positions in the company management (Art. 2, Brazil, 2002).

In spite of research highlighting the spreading of interlocking (Wesley, 2011; Santos et al., 2012), even though it is not organized around a single mechanism, the legislation has a clearly dissuasive guideline. The Law No. 10.149 of 2000 (Brazil, 2000) is also considered, which extends the powers of the Administrative Council for Economic Defense (CADE) in the investigation of anti-competitive behavior: however, there is no record hitherto of administrative or criminal investigation establishing possible anti-competitive behavior of an interlocking (Martinez & Tavares, 2012).

After all, legislation intervenes in the manager's conflict – the direct tie among companies – which can theoretically enable uniform conduct among competitors, thus in contrast to the law. On the contrary, SNA exposes the broad system of relationships among companies: the network in its complexity, being unequivocal to pay attention to indirect links among competing companies, which similarly constitute a practice of collusion and coordination, not expressly prohibited by law.

3. PERSONAL TIES AND BUSINESS NETWORKS

The internal levels of an organization (intra-organizational) and its boundaries (the inter-organizational level) are crossed by ties and relationships of several types: business relations, interlocking directorates, trust, friendship, kinship, etc. The economic actions are embedded in this network of social relationships (Granovetter, 1985). Considering the structural dimension of the market and capital, a structural approach, such as SNA, can be used in order to investigate hypotheses which otherwise would not be explained (Minella, 2013). Actually, the number of research using interlocking as an object of study and the SNA as a technical and methodological basis is increasing: in order to study national cases (Chiesi, 1982), specific economic branches (Baker, 1984), or, more recently, developing comparative studies (Windolf, 2002; Cárdenas, 2012). A review of the vast literature on the subject can be found in Hubert Buch-Hansen (2014) and Murray (2006).

In primis, among the hypotheses, the very national legislation: it explains the differences among corporate networks and interlocking diffusion (Windolf, 2002). Moreover, according to OECD (2009), most national antitrust authorities do not have any legislation ad hoc for limiting interlocking diffusion.

Comparative research points out the lower accumulation of positions and proportion of multiple directors in Anglo-American governance systems, suggesting greater competition among economic agents (Scott, 1991b); in contrast, the so-called "elitist" networks (Italy, France, Germany, Spain and Canada) are characterized by a high number of connections among large corporations, which can promote collusion and coordination more easily (Cardénas, 2012).

Anyway, the interlocking practice is also recurrent in Brazil. At the early 20th century, according to Musacchio and Read (2007), 67% of Brazilian companies shared managers with other companies. More recently, Santos et al. (2012) show that 74% of the 319 companies had at least one director from another company. Why such practice is also diffused in Brazil? Santos et al. (2012) and Wesley et al. (2008) point out that Brazilian companies with more directors in their boards had greater profitability.

4. SOCIAL NETWORK ANALYSIS AND METHODOLOGY

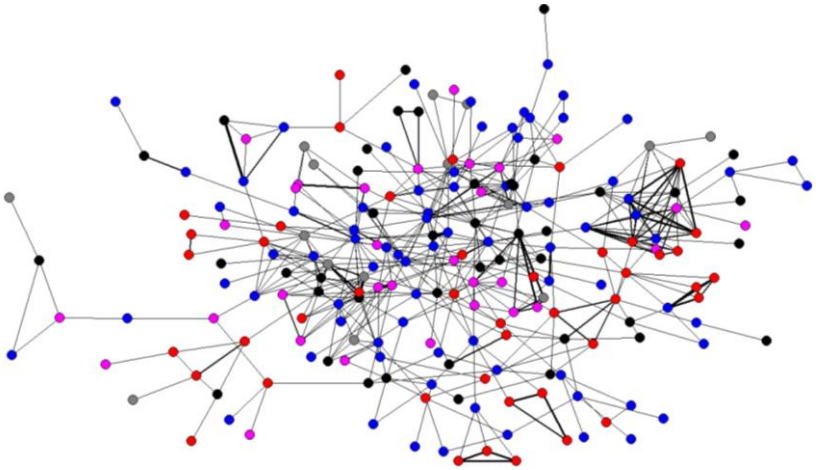
4.1. Methodology and data

The article presents a descriptive analysis of 347 listed companies in the Brazilian stock market: an ad hoc social network analysis (SNA) of the database used by Lazzarini (2011). Differently from Lazzarini (2011), the analysis divides the sample into 10 economic sectors and presents; afterwards, SNA tests an "internality-externality" hypothesis of the interlocking ties, i.e., counting the interlocking occurring among companies from different sectors and within the same sector. The permutation test verifies whether the network configuration is due to the case or not (Krackhardt & Stern, 1988).

As aforementioned regarding the Brazilian case, in which the law hinders the conflicting performance of a manager in competing companies (from the same economic branch), the study explores the possibility of competing companies may be related through the so-called indirect collusive interlocking: companies in sector *x* related through other company(ies) of sectors other than *x* (Figure 2).

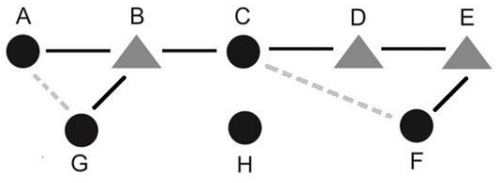
Lazzarini's data are organized into binary-type incidence matrices: board members appear on the horizontal lines of the matrix, while companies (affiliations) appear on columns vertically. Based on this binary incidence matrix, two symmetrical adjacency matrices can be derived, representing: 1) the managers and the ties between them; 2) the ties among companies. Companies appear on the rows and columns of this second matrix and the number of common managers on the cells. This second matrix is analyzed for research purposes (and represented in Figure 1). In the graph, the different network colors represent five sectors (instead of 10, as in the analysis to simplify the graph view): Oil and gas industry (purple); Industrial and basic materials (red); Construction and transportation (black); Public utility, telecommunications and technology (blue); Financial sector (gray). In the graph (Figure 1) are represented the vertices included in the main component: 212 companies (0.61% of the sample). Isolated nodes and other smaller components are not included. The graph view allows understanding the phenomenon diffusion: most interlocking occurs among nodes of different economic sectors (different colors). A more marked link indicates the presence of a greater number of directors in common (Figure 1).

Figure 1. Listed companies and economic sectors



The analysis shows the main SNA statistics – also calculated by economic sector: degree, betweenness and centrality of the ego-network (Freeman, 1979). The E-I (external-internal) index allows exploring the differences between incoming and outgoing ties by each economic sector. After all, a permutation test is used to verify whether the distribution of ties among sectors is by chance or not (Tatari & Teymuroglu, 2013). The sociogram (Figure 2) illustrate this main hypothesis: because of the indirect ties among companies, it is possible to circumvent the legislation on the conflicting manager (e.g. companies A and G from the same economic sector interconnected through B, company from another branch; companies C and F from the same economic sector interconnected through D and E). After all, the legislation on the manager's conflicting performance can be activated only in the direct relationships between two companies of the same branch.

Figure 2. Example of indirect collusive interlock



The research used the database provided by Lazzarini (2011), which gathers information on a sample of 347 companies operating in the Brazilian market in 2009. The companies are reclassified into 10 macroeconomic sectors based on the latest BM&FBovespa classification model: 1) oil, gas and biofuels (10 companies); 2) basic materials (39); 3) industrial goods (37); 4) construction and transportation (54); 5) consumer non-cyclical (37); 6) consumer cyclical (44); 7) information technology (5); 8) telecommunications (8); 9) utilities (44); 10) financial and others (69). In Table 1 is presented the main descriptive statistics of the graph defined as follows: 1) the number of vertices included in the network (the amplitude); 2) the number of components, i.e., subsections of the graph, whose vertices are connected, directly or indirectly, among themselves; 3) the number of components in relation to the amplitude; 4) average number of directors shared; 5) the average number of adjacent enterprises; 6) the number of vertices without connections (and percentage with respect to the total of the sample); 7) the number of vertices in the component with the greatest amplitude (and percentage in relation to the total of the sample).

4.2. Results

As described in Table 1, 61% of the sampled companies fit into a large single 'component' of the graph (shown in Figure 1): a subgroup of companies with almost two-thirds of the total is interconnected directly or indirectly by other companies. In this component, 212 companies are connected, on average, by geodetic paths of 4.6 degrees distance.

In this graph component are allocated the companies of all the 10 sectors; however, three sectors are more recurrent: public utility companies (72.7% of companies in the sector), all companies in the Telecommunications sector, 8 out of 10 companies in the Oil, Gas and Biofuels sector.

The average number of common managers among the companies included in the sampling is 5.2 (Degree) while the average number of companies adjacent to each other is 3.06 (Table 1).

Table 1. Descriptive statistics (Brazilian listed companies)

Amplitude	*Components*	*Component ratio*	*Degree*	*Ego-network*	*Isolated vertices*	*Main component*
(1)	(2)	(3)	(4)	(5)	(6)	(7)
347	118	0.33	5.27	3.06	108	212
					(31.1%)	(61.1%)

Notes: 1. Number of vertices included in the network. 2. Sections of the graph, whose vertices are connected, directly or indirectly, among themselves. 3. Number of components in relation to the amplitude. 4. Average number of directors shared; 5. Average number of adjacent enterprises. 6. Number of vertices without connections (and percentage with respect to the total of the sample). 7. Number of vertices in the component with the greatest amplitude (and percentage in relation to the total of the sample).

The Telecommunications sector shows the highest number of common managers (Degree equal to 20), of adjacent companies (Ego-network equal to 7.25) and one of the highest values of betweenness (it is crossed by 251.62 short paths"). The ANOVA test shows significant differences among the groups in the case of centrality by degree and Ego-N, although not significant in the case of betweeness (mean value): since all sectors are connected to each other in the main graph component, the betweenness values are balanced.

Table 2. Mean values of Degree, Ego-Network, Betweenness by sector (ANOVA)

	N	*Degree*	*Ego-N*	*Betweenness*
Oil, gas and biofuels	10	7,9	4,7	319,88
Basic mMaterials	39	5,25	2,8	239,30
Industrial goods	37	3,1	2,1	167,40
Construction and transportation	54	3,61	2,64	253,82
Consumer non-cyclical	37	4,78	3,56	406,89
Consumer cyclical	44	3,36	2,18	128,45
Information technology	5	2,4	2,4	75,61
Telecommunications	8	20	7,25	251,62
Public utility	44	8,7	3,47	225,59
Financial and others	69	5,13	3,31	214,98
Total	347	5,27	3,06	231,38
	F	*P*		
Degree	7,77	0,00		
Ego-N	2,60	0,00		
Betwenness	0,92	0,51		

4.3. What are interlocking directorates for?

Given a graph partition into a mutually exclusive number of groups (the ten macroeconomic sectors), the E-I (external-internal) index represents a valid trend measure of groups to be related to companies in the same or different sectors. The E-I index is expressed by the number of external ties in the group, minus the number of internal ties in the group, divided by the total ties (Table 3).

All the groups externalize interlocking with companies from other economic sectors; however, companies in the macro sector of Information Technology and Oil share most of managers with other sectors (Table 3). After all, the overall E-I index is equal to 0,56: 830 external ties, minus 232 internal ties, divided by the total ties (1062). Most companies are related with companies in different sectors, with external ties occurring more than three times than the internal ones. When calculated in the main component (Figure 1), the E-I index is equal to

0,62. In the main component, there are 180 ties among same-sector companies against 816 among different-sector ones (Figure 2). In this case, indirect ties occur four times more than the direct ones.

As presented in Table 1, a company interacts with three other companies on average (see Ego-network statistics), which, together with the other statistics in Table 1, indicates a suspicious conflict management of multi-company directors. Nevertheless, in the majority of cases (as highlighted by the E-I index), this set of ties links same-sector companies (which is theoretically desired by the actors and expressly forbidden by the legislation) mainly through indirect collusive interlocks, thus not violating the provisions of the law.

However, if 5000 graphs were set randomly under the hypothesis that the tie distribution maintains the same density and the size of groups (Krackhardt and Stern, 1988), the routine in Ucinet VI returns an expected average value of 0,73, differing significantly ($p \leq 0.00$) from the observed value (0,56).

Table 3. E-I Index in 10 economic sectors

	Internal	*External*	*Total*	*(E-I)/(E+I)*
Oil, gas and biofuels	2	45	47	0.91
Basic materials	12	99	111	0.78
Industrial goods	10	71	81	0.75
Construction and transportation	14	129	143	0.80
Consumer non-cyclical	14	118	132	0.78
Consumer cyclical	16	80	96	0.66
Information technology	0	12	12	1
Telecommunications	18	40	58	0.37
Public utility	74	79	153	0.03
Financial and others	72	157	229	0.37
Total	232	830	1062	0.56

In the first column of Table 4, the E-I index is present as observed; thereafter, there are the values referring to the test: minimum, mean (expected value) and maximum value of 5000 random permutations (column two, three and four), the standard deviation of the random distribution (column five), and the number of times the expected index is higher or lower than the observed one (which can be used as a significance test of the model). Due to the $p \leq 0.00$, the 0,56 value is not by chance; however, its intensity is significantly lower than the average value resulting from the random permutation, suggesting the collusive practice of companies.

Table 4. E-I index permutation test by economic sector

	Obs	*Min*	*Average*	*Max*	*Standard deviation*	*p≥obs*	*p≤obs*
Internal	0,22	0,08	0,13	0,19	0,01	0.00	1
External	0,78	0,81	0,86	0,91	0,01	1	0.00
E-I	0,56	0,62	0,73	0,83	0,03	1	0.00

5. FINAL CONSIDERATIONS

Some methodological considerations are necessary. As ironically highlighted by Kurt Rudolf Mirow (1978, p. 178) when questioned by the CADE, directors of the interconnected boards respond that their main function is "to convene meetings of the board of directors with no obligation to be aware of any discussed matter". In short, it is possible to understand the systemic dimension of the relationships among companies, but little is known about such relations. With regard to anticompetitive behaviors, since the mere presence of interlocking does not constitute a criminal act, it is necessary to demonstrate the manager's intention to influence the adoption of a concerted commercial conduct among competitors (Law 12.529 of 2011; Brazil, 2011).

The manager must "serve with loyalty to the company and keep secrecy on its business" (Art. 155 of Law 6.404 of 1976; Brazil, 1976); is it possible to keep this "secrecy" when two out of three directorates are communicating with one another through interlocking? In Brazil, a listed company shares on average about five managers with more than three companies: why? These values represent simply signals of an excess in the use of interlocking directorates, although the economic, sociological, but also legal literature does not specify neither maximum nor minimum degree values, above which the interlocking diffusion could affect the regular functioning of the market, nor indicators for benchmarking. The random permutation suggests a collusive practice of companies, anyhow.

As stated by Kurt Rudolf Mirow, "Brazil's steering group of subsidiaries of multinational corporations" is small (1978, p. 178); continuing: "coincidentally, probably due to the lack of able managers, the most important sectors of petrochemicals, chemistry, electronics, and capital goods industries are cleverly interconnected by common directors, sympathetic elderly gentlemen with a fairly frank memory."

After all, the Brazilian case is not an exception when compared to other national cases, either from the point of view of degree values (among others) or in terms of legislation. In the case of the number of common managers (degree), the Van Veen and Kratzer (2011) research regarding European countries presents statistics not differing significantly from the Brazilian case: 4.6 interlocking (degree) per company in Germany, 3.8 in France (among the examples).

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