

# PATTERNS OF EFFICIENCY IN DISPERSED, DOMINANT AND CONCENTRATED OWNERSHIP STRUCTURES IN BRAZIL

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## ABSTRACT

**Purpose:** The article aims to trace the behaviour of dispersed, dominant and concentrated ownership structures in Brazil and verify which of these structures is more efficient operationally and if there is a pattern to be followed.

**Originality/gap/relevance/implications:** Static optimisation techniques are used by data envelopment analysis (DEA) to calculate the variable 'efficiency', a differential in relation to previous studies that consider only outcome variables as a performance indicator. The article is one of the first in the area that traces the pattern of efficiency of ownership structures in Brazil.

**Key methodological aspects:** The sample consists of 8,298 company years in the period between 1995 to 2012. To calculate the efficiency (dependent variable), static optimisation techniques were used by data envelopment analysis (DEA). After, the unbalanced panel data by GMM-Sys (system generalised method of moments) is applied to identify the influence of dispersed, dominant and concentrated ownership structures on efficiency.

**Summary of key results:** The results showed that, although all the variables are positively related to efficiency, the graphic presented an inverted "U" format, i.e. dispersed and concentrated structures, mostly, are less efficient than dominant.

**Key considerations/conclusions:** The study identifies that both agency problems and the expropriation of minority shareholders by the majority, stemming from weak legal protection in the country, significantly affect the efficiency of Brazilian companies, thus making dominant structures the most appropriated form of ownership structure in Brazil.

## KEYWORDS

Governance. Efficiency. Ownership Structure. Pattern. Optimisation.

## 1. INTRODUCTION

The relation between ownership structure and corporate performance is a controversial subject widely explored by academia. Aldrichi and Mazzer (2007) argue that assessing the benefits and costs of a greater concentration of ownership can be rationalised in terms of the trade-off between incentives to monitor executives (which may result in the creation of value for the firm) and gains—liquidity and diversification of the risk to its wealth (the renunciation of which may incite the search for ‘private benefits of control’).

For Jensen and Meckling (1976), the concentrated ownership structure has the potential to limit agency problems due to more efficient monitoring since the concentration in the hands of a single shareholder generates incentives and great power to better monitor the business at a lower cost. On the other hand, the conflicts of interest between majority and minority shareholders have also consumed a lot of space in academic studies. This divergence induces the possibility of the expropriation of minority shareholders, and may generate inefficient investments. This fact suggests that a highly concentrated structure may not be optimal for shareholders (La Porta, Lopez-De-Silanes, & Shleifer, 1999). For this reason, Pedersen and Thomsen (1997) argue that ownership structure is highly dependent on regulation and the institutions prevailing in market economies.

In this context, La Porta *et al.* (1998) classified four different types of laws regarding the legal protection of shareholders which significantly influence the ownership structure. Countries with common laws (e.g. USA, UK, among others) have more protection for shareholders, leading to fewer minority expropriations; countries with French civil law (e.g. Brazil, Belgium, France, among others), German civil law (e.g. Japan, Germany, Austria, among others) and Scandinavian civil law (e.g. Denmark, Finland, Switzerland, among others) have less protection, thus facilitating the expropriation of minority shareholders. As a result, these countries end up having smaller and less developed capital markets.

According to these assumptions, the present article aims to trace the behaviour of dispersed, dominant and concentrated ownership structures in Brazil to verify which of these structures is more efficient operationally and if there is a pattern to be followed.

This is a pertinent question from an academic point of view since the discovery of the way the property structure is designed can influence the company’s results, thereby helping in many ways to get an optimal point

between these two variables. But the impasse concerns how to identify the company's performance. Belkaoui and Pavlik (1992) used a as dependent variable representing the performance of the company, the logarithm of EBITDA and market capitalisation. In their study, Frydman *et al.* (1999) considered profitability as an efficiency measure. However, these authors have neglected the fact that the strategic focus of an organisation is its operational function, that is, the process of transforming inputs into outputs. Margaritis and Psillaki (2010) and Wang, Lu, and Lin (2012) also used the efficiency calculation through data envelopment analysis to identify the influence of governance on company performance.

## 2. OWNERSHIP STRUCTURE: CONCEPTIONS AND CATEGORIES

The ownership structure (the form in which company capital is distributed relative to votes and the degree of concentration of owners of capital) is considered an important mechanism of corporate governance. This mechanism differs significantly between countries because of national disparities in the ownership structure and composition of the board, over which ownership has a major influence on the composition and, consequently, on the performance of the firm (Belkaoui & Pavlik, 1992).

Realising a study in Brazil which compares the country with the other BRIC countries (Russia, India and Korea), Black, Carvalho, and Gorga (2012) suggested that country characteristics strongly influence governance aspects of company performance. Better governance in emerging markets benefits companies with better access to finance, lower capital costs, better performance and better treatment for all shareholders (Claessens & Yurtoglu, 2013). Clemente *et al.* (2014) identified that companies that adhered to the governance practices presented a lower risk for the investor and a greater share of valorisation in Brazil. This benefit is also identified in terms of corporate globalisation (Min & Smyth, 2014).

In contrast, testing whether companies listed in the corporate governance segment would be more efficient than companies listed in the traditional Brazilian market, Ferreira (2012) found no evidence to support this claim. Macedo and Corrar (2012) only verified a superior performance of companies in the electricity distribution sector in Brazil in 2005, did not show a superior performance for companies with greater corporate governance practices in subsequent years. Góis *et al.* (2015) identified that the share

concentration does not influence investment spending (R&D) of Brazilian companies.

Also, the ownership structure varies systematically according to the company's value maximisation. When shareholders decide to change the ownership structure of a company from concentrated to dispersed the consequences of losing control over management should be made clear. For this reason, finding the optimal point of an ownership structure is essential to add value to the firm (Chen, 2013).

According to the classification of Pedersen and Thomsen (1997), there are three main types of property structures: 1. dispersed – where the main shareholder has less than 20% of the ownership of the company; 2. dominant – where the main shareholder owns between 20% and 50% of the company's property; and 3. concentrated – where the main shareholder owns more than 50% of the company's ownership.

This section is divided into two parts to better explain the peculiar aspects of the property structure; they are: 1. property and efficiency in dispersed structures, and 2. ownership and efficiency in concentrated structures.

## 2.1. Ownership and efficiency in dispersed structures

There are some countries in which the ownership structure is very dispersed, that is, the majority shareholders usually do not own more than 20% of the shares of the companies. La Porta, Lopez-de-Silanes, and Shleifer (1999) have argued that this type of structure is beneficial because it reduces the possibility of expropriation of minority shareholders by the majority. These issues can be mitigated depending upon the type of the shareholder's legal protection prevailing in these countries. The following studies are favourable to dispersed ownership structures.

Bae *et al.* (2012) found that the expropriation of minority shareholders by majorities affects the value of the company in countries with weak legal protection, especially when these countries are experiencing periods of financial crisis. This same result was identified by Hamadi (2010) in Belgium, by Samaha (2012) in Egypt and by Connelly, Limpaphayom and Nagarajan (2012) in Thailand in companies that had pyramidal structures. Lin *et al.* (2012), Lin, Ma, and Xuan (2011), Lin *et al.* (2013) and Paligorova and Xu (2012) showed that the divergence between control rules and cash flow rules negatively influences the financing capacity and, consequently, the financial performance of the company.



Another pertinent question is the professionalisation of the ownership structure. Silveira (2004) identified that the ownership structure influences the quality of corporate governance in Brazil. Specifically, the results highlighted a significant negative relation between the excess of voting rights held by the controlling shareholder and the quality of governance, thus showing that more professional administrations, generally more pulverised, have better quality and that the concentration of the decision in the hands of one person, or one family, generates inefficiencies.

Aldrighi and Mazzer (2007) showed that families prevailed among the majority shareholders (54.7%), followed by foreign investors (18.4%), governments (7.5%) and funds of investment (5.2%). The results found by the authors showed the incipience of the capital market in Brazil, mainly due to the high concentration of ownership of the companies in the hands of a single shareholder (around 51% of the capital and almost 73% of the voting rights), and indications of the expropriation of minority shareholders, thus evidencing the lack of professionalisation of Brazilian companies. Pinto and Leal (2013) have identified that companies with less concentrated structures better remunerate their managers.

## **2.2. Ownership and efficiency in concentrated structures**

Contrary to what occurs in dispersed structures, ownership in concentrated structures can, according to Jensen and Meckling (1976), diminish agency problems. The following studies are favourable to concentrated ownership structures.

Hotchkiss and Strickland (2003) have identified that the ownership structure is directly related to company performance, and Khorana, Servaes and Wedge (2007) showed that in US investment funds, company performance increases by three percentage points for each increase by one percentage point in the ownership structure. Coles, Lemmon and Meschke (2012) have shown that increases in productivity have a strong positive effect on the ownership structure of US firms. Through a natural experiment, Giannetti and Laeven (2009) also identified a positive relationship between ownership and efficiency in Sweden, using pension funds as an exogenous instrument. San Martin-Reyna and Duran-Encalada (2012) suggest that there is a better performance among companies with more concentrated ownership structures in the Mexican market. This result was also found by Kang and Kin (2012) in China. Morck, Shleifer and Vishny (1988) and Ng (2005)



have identified a non-monotonic relationship between ownership and performance in the USA and Asia.

In this context, according to Cornelli *et al.* (2013), concentrated structures generate efficient monitoring of executives, thereby increasing the company's performance.

### 3. METHODOLOGICAL ASPECTS

In order to trace the behaviour of dispersed, dominant and concentrated ownership structures in Brazil and to identify if there is an efficiency pattern in these structures, an exploratory-descriptive research based on quantitative methods is applied. The secondary data related to the ownership structure, balance sheets and income statements, are drawn from the ECONOMATICA database. Those referring to the number of employees are taken from companies' sites and the Exame portal.

The data collected are on an annual basis from 1995 to 2012 (18 years) and constitute a sample of 461 publicly traded companies on BM&FBovespa, totalising 8,298 companies per year. Only common shares are used since they are the ones that give voting rights which influence the decisions and the efficiency of the companies.

Data analysis is performed in two stages. The first stage is the calculation of the relative efficiency of Brazilian public companies through DEA, during which two types of input variables are considered: 1. capital – capital stock (tangible assets), investment (two types of capital expenditures, one based on sales and the other on total assets) and operational working capital; and 2. labour – logarithm of the number of employees. Only one type of output variable is considered: 1. profitability – ROA (return on asset); ROE (return on equity) and ROS (return on sales) (see Table 1). The model used in the study is the SBM (slack-based model) which takes into account variable returns of scale (BCC) and total efficiency (GRS) because it corrects the problems arising from the other models which may consider a DMU (decision making unit) efficient, despite presenting excesses of inputs and lack of outputs (TONE, 2001).

For the calculation of the DEA, three steps are necessary, as described below: 1. the variables are winsorised considering 5%; that is, a new variable is generated, similar to the previous one, except for the 5% lower and higher extreme values; 2. the correlation test is applied and, if there are highly related variables, one of them is withdrawn from the study; and





3. the variables are separated by year and by industry, generating 234 analyses (18 years and 13 different types of industry).

This separation by year and by industry is made because as the DEA is a relative efficiency calculation (is efficient in relation to the other companies that are in the sample), it cannot compare companies with themselves in the previous years nor companies that belong to different industries, in which measures, standards and conventions are totally different. The classification of industries is obtained from the ECONOMATICA database and some are reclassified by similarity. The index generated constitutes the relative efficiency of the companies and is used as a dependent variable in the regression.

In the second step, in order to verify the influence of dispersed, dominant and concentrated structures on the efficiency of the companies, the panel data method by GMM (generalised method of moments), a tool that considers a given sample of individuals over time and enables multiple observations of each individual in the sample, is applied. In this case, the dynamic model (which considers the lagged dependent variable as explanatory) and systemic (GMM-Sys of Blundell and Bond, 1998) is applied. The instruments used are the lagged independent variables, as proposed by Almeida *et al.* (2010). To perform the analysis, the following tests are applied: 1. correlation test, 2. Arellano and Bond test (1991) that tests the existence of serial correlation, 3. overidentification test of Hansen (1982), and 4. chi-square test ( $\chi^2$ ). As in the DEA analysis, the variables are winsorised at 5%. Formula (1) presents the dependent variable, as well as the independent variables of the model:

$$E_{it} = \alpha_i + Z_{it}\gamma + W_{it}\delta + \sum_i^n EFind_i + \sum_t^n EFtemp_t + \varepsilon_{it} \quad (1)$$

The variable E represents the efficiency of firms i in period t,  $\alpha$  is the intercept of firms i,  $\gamma$  and  $\delta$  are the coefficients of the variables,  $Z_{it}$  are the variables referring to the ownership structure of firms i in period t,  $W_{it}$  are the control variables of the firms i in the period t, EFind represents the fixed industrial effects, EFtemp represents the fixed time effects and  $\varepsilon_{it}$  represents the error term of the companies i in period t. In some analyses the fixed industrial and temporal effects and the shareholders' agreement were not considered, since the proposed model, in differences, does not include dummies.





**(Table 1)**

**FORMULAS AND EXPLANATION OF THE VARIABLES USED IN THE STUDY**

Formulas for variables related to data envelopment analysis	
Input variables - Capital (K)	
GCv - Investment: Capital expenditure on sales	$GCv = \frac{CAPEX}{Sales}$
GCa - Investment: Capital expenditure on total assets	$GCa = \frac{CAPEX}{Total\ assets}$
CG - Investment: Operational working capital	$CG = \log(receivables + inventories - payables)$
TA - Capital Stock: Tangible assets	$TA = \frac{Fixed\ assests}{Total\ assets}$
Input Variables - Labour (L)	
NT - Number of employees	$NT = \log(\text{number of employees})$
Output Variables - Profitability (R)	
ROA - Return on assets	$ROA = \frac{Net\ profit}{Total\ assets}$
ROE - Return on equity	$ROE = \frac{Net\ profit}{Equity}$
ROS - Return on sales	$ROS = \frac{Net\ profit}{Sales}$
Formulas for variables related to general analysis	
BCC - Variable returns of scale	Index obtained by the DEA calculation using the variables described above, the maximum value of which is 1. Consider only variable returns of scale.
GRS - Total efficiency	It is the junction of the two models (CCR and BCC).
MCV - Ownership of the major shareholder	Percentage number of common shares owned by the company's main shareholder.
TCV - Ownership of 3 Major Shareholders	Sum of the percentage of common shares of the company's first three shareholders.
CCV - Ownership of 5 Major Shareholders	Sum of the percentage of common shares of the company's first five shareholders.

*(continue)*

**(Table 1 (Conclusion))**

**FORMULAS AND EXPLANATION OF THE VARIABLES USED IN THE STUDY**

Formulas for variables related to general analysis	
AA – Shareholders agreement	Dummy where 1 indicates that there is a shareholders’ agreement in the company, and 0 otherwise.
Dissipated	Dummy where 1 indicates if the shareholders own less than 20% of the ownership, and 0 otherwise, multiplied by the ownership structure.
Dom. – Dominant	Dummy where 1 indicates if the shareholders own between 20% and 50% of the ownership, and 0 otherwise, multiplied by ownership structure.
Concent. – Concentrated	Dummy where 1 indicates if the shareholders own more than 50% of the ownership, and 0 otherwise, multiplied by the ownership structure.
Control variables	
REC – Size: EBITDA	Logarithm of EBITDA
AT – Size: Total assets	Logarithm of total assets (descriptive statistics only)
Q – Tobin’s Q	Ratio of the market value to the total assets (descriptive statistics only)
AL – Leverage	$AL = \frac{\text{Total liabilities}}{\text{Equity}}$
EFind – Industrial fixed effects	Dummies where 1 indicates that the company belongs to the industrial branch, and 0 otherwise (in some analyses these dummies were not considered).
Eftemp – Time fixed effects	Dummies where 1 indicates the year in which the data is generated, and 0 otherwise (in some analyses these dummies were not considered).
Regression tests	
Chi2	Chi-square test
Hansen	Hansen test
Ar1 and Ar2	Arelano and Bond test for serial correlation with order 1 e 2

Source: Elaborated by the author.

Regarding the property structure, dummies were created for dispersed structures (less than 20% of ownership), dominant (between 20% and

50% of ownership) and concentrated (more than 50% ownership), which were multiplied by the variables ‘concentration of ownership of the main shareholder’, ‘three major shareholders’ and the ‘five major shareholders’. For example, in the concentration of the main shareholder, for the variable of dispersed structures, the value was assigned 1 if the main shareholder had less than 20% of the ownership of the company and, otherwise, this dummy was multiplied by the concentration, only making the percentage in which the main shareholder had less than 20% ownership. This procedure was performed for all the analyses, thus generating 9 different variables, elaborated from the definition of Pedersen and Thomsen (1997) presented in the literature review. According to Laeven and Levine (2008), one third of European companies have multiple large shareholders, whose market value differs from companies that have a dispersion or concentration of shares. In Brazil, it is no different, thus illustrating the necessity to analyse not only the main shareholder, but also the other major shareholders. To chart the behaviour of these structures, graphs are drawn from the indices obtained in these regressions. With regard to control variables, the following measures are inserted in equation (1): 1. shareholders’ agreement, 2. size—revenue, 3. leverage, 4. industry fixed effects, and 5. time fixed effects (see Table 1).

## 4. ANALYSIS OF RESULTS

This subsection is divided into two parts to better explain the results achieved: 1. descriptive statistics and correlation, and 2. influence of dispersed, dominant and concentrated structures on efficiency.

### 4.1. Descriptive statistics and correlation

Before performing the analysis of the results, it is necessary to verify the correlation between the variables and the descriptive statistics. As expected, some variables present a significant correlation (above 0.7). It is identified that the BCC (efficiency with variable scale returns) and the GRS (total efficiency) are correlated with each other. This pattern is also observed between the MCV (major shareholder with voting), TCV (three major voting shareholders) and CCV (five voting shareholders) variables, and between EBITDA and total assets. None of these variables is used in the same regression to avoid multicollinearity problems.

After verifying the correlation between the variables, an analysis of the descriptive statistics is made. As can be seen in Table 2, after applying the winsorisation, the variables related to efficiency and ownership structure have very close means and medians. On average, companies are efficient at 38.48% considering the total efficiency (GRS) model, but increase their performance to 56.25% considering variable returns of scale (BCC). In this case, the median for GRS is 19.63%, evidencing a large disparity between this variable and the mean. The indexes presented significant variance; for this reason, it was agreed to use a logarithm in these variables as well.

**(Table 2)**  
**DESCRIPTIVE STATISTICS**

Est.	BCC	GRS	MCV	TCV	CCV	AL	Q	REC	AT
Mean	56.25	38.48	58.74	80.41	84.37	2.85	1.51	11.93	12.72
Median	58.77	19.63	58.40	87.30	90.00	1.45	1.02	12.22	12.88
p10	0.60	0.27	19.00	51.00	57.20	0.35	0.27	9.34	9.88
p25	8.99	2.37	35.00	68.50	76.00	0.73	0.52	10.77	11.32
p75	100.00	100.00	86.20	97.30	97.90	3.18	1.99	13.41	14.12
p90	100.00	100.00	98.70	100.00	100.00	8.37	3.56	14.47	15.36
Var.	19.1x10 <sup>2</sup>	16.6x10 <sup>2</sup>	8.4x10 <sup>2</sup>	3.9x10 <sup>2</sup>	3x10 <sup>2</sup>	12.13	1.97	4.51	3.75
Min	0.18	0.09	0.00	0.00	0.00	0.00	0.01	1.50	9.06
Max	100.00	100.00	100.00	100.00	100.00	13.17	5.48	15.05	16.08

Note: For the definition of the variables, see Table 1.

Source: Elaborated by the author.

The variables related to the ownership structure presented similar patterns, with means and medians quite close, thus representing little variability between them. In the companies analysed, the major voting shareholder (MCV) owns, on average, 58.74% of the company’s shares, showing highly concentrated structures with the three and five main shareholders having voting rights over an average of 80.41% and 84.37% of the company’s shares, thereby highlighting the importance of taking more shareholders into account in the analysis to avoid many distortions that could occur if only the first shareholder were considered. In this case, the variance is significant, thus evidencing the need to use a logarithm in these variables.

In leverage, a large disparity between the mean and the median is observed, showing that, to this variable, a logarithm should also be applied. In the analysis, the companies are leveraged, on average, 2.85 times; that is, for each \$1.00 of shareholders' equity, these companies are indebted in the short and long term, around \$2.85. In the case of Tobin's Q, companies, on average, have a market value that exceeds the asset value by 50%. Finally, control variables related to size (EBITDA and total assets) show similar patterns and a large proximity between the mean and the median (after application of a logarithm). The variability is also small.

## **4.2. Influence of dispersed, dominant and concentrated structures on efficiency**

As explained in the methodology, to identify the influence of ownership structures on business efficiency, two variables of efficiency (BCC and GRS) and three ownership variables (dummies for dispersed, dominant and concentrated structures), multiplied by three concentrations of ownership (major shareholder, three major shareholders and five major shareholders) are considered. To guarantee the robustness of the results, in all analyses three situations are considered, adding and removing control variables, thus totaling 18 regressions. This situation should not be interpreted as a data snooping bias (where the researcher changes the data purposely for best results); the objective of this robustness is to test the consistency of the analysis since the results are very close and all regressions are displayed. The control variables used are: size (EBITDA), shareholders' agreement, leverage, and industrial and time fixed effects (binary variables are only considered in some cases because the model, in principle, does not contain dummies). The results are presented in Tables 3 (considering BCC as the dependent variable) and 4 (considering GRS as the dependent variable).

In the lower part of the tables, the Hansen (1982) overidentification test is shown, which identifies that in all analyses the null hypothesis cannot be rejected. This indicates that the instruments are apparently not correlated with the regression error term. In the chi-square test ( $\chi^2$ ), the null hypothesis is rejected, thereby indicating that the observed frequencies are not different from the expected frequencies; that is, there is an association between the groups of variables. To test the consistency of the results, the Arellano and Bond tests (1991) (ABond AR (1) and ABond AR (2)) are applied (see Tables 3 and 4). In most of the analyses (except the GRS model for the three and five major shareholders), the null hypothesis of absence of

serial correlation in the first-order residues is rejected and the hypothesis for the second order is not rejected. Therefore, the model presents serial correlation of the first order, an important assumption for the validity of the regressor-based instruments, such as is the case of GMM-Sys (Blundell and Bond, 1998) used in the analysis.

In all analyses, dispersed, dominant and concentrated structures positively affect efficiency, but this influence varies considerably. Considering only the dissipated ownership structure, the change in 1% of the major shareholder ownership structure (MCV) positively affects the efficiency in 0.76% in regression 1 and in 0.74% in regression 2 in the GRS model, both at a significance level of 5%. In economic terms, considering a standard deviation of 0.32 for both models, the 1% increase in the ownership of the major shareholder, increases the efficiency of companies by 0.25% and 0.23%, respectively.

**(Table 3)**

**ANALYSIS OF THE INFLUENCE OF DISPERSED, DOMINANT AND CONCENTRATED STRUCTURES ON EFFICIENCY - BCC**

Variables	MCV			TCV			CCV		
	1	2	3	1	2	3	1	2	3
BCC(-1)	0.10***	0.03	0.02	-0.02	-0.15***	0.11*	0.04	0.01	0.02
Z	(2.59)	(0.66)	(0.49)	(-0.26)	(-2.72)	(1.68)	(0.93)	(0.35)	(0.51)
Disper.	0.43	0.20	0.46	1.70	1.79*	1.66*	3.14***	2.90***	2.11*
Z	(1.11)	(0.59)	(1.14)	(1.37)	(1.72)	(1.73)	(2.79)	(2.85)	(1.66)
Dom.	0.49*	0.37	0.52*	1.71**	1.45*	1.16*	2.15***	1.92***	1.45*
Z	(1.77)	(1.47)	(1.75)	(1.93)	(1.83)	(1.62)	(3.24)	(2.74)	(1.65)
Concent.	0.39*	0.34*	0.42*	1.28*	1.26*	0.74	1.64***	1.45***	1.09
Z	(1.74)	(1.73)	(1.73)	(1.79)	(1.79)	(1.37)	(2.89)	(2.58)	(1.48)
Size		0.02	-0.02		0.14	0.08		0.04	0.02
Z		(0.39)	(-0.29)		(0.93)	(1.24)		(0.85)	(0.36)
AL		-0.71***	-0.72***		-1.04***	-0.45***		-0.72***	-0.77***
Z		(-6.39)	(-6.06)		(-6.33)	(-3.12)		(-5.41)	(-5.25)
AA			0.39			0.26			0.13

(continue)

**(Table 3 (Conclusion))**

**ANALYSIS OF THE INFLUENCE OF DISPERSED, DOMINANT AND CONCENTRATED STRUCTURES ON EFFICIENCY - BCC**

Variables	MCV			TCV			CCV		
	1	2	3	1	2	3	1	2	3
Z			(1.29)			(0.75)			(0.32)
Constant	2.11	<b>1.92*</b>	3.19	-3.23	4.88	-1.23	<b>-5.30**</b>	-3.44	-1.64
Z	(1.16)	(1.91)	(1.51)	(-0.94)	(0.64)	(-0.47)	(-2.01)	(-1.32)	(-0.48)
EF Ind.	Yes	No	Yes	Yes	No	No	Yes	No	No
EF temp.	Yes	No	Yes	Yes	No	No	Yes	No	No
chi2	98.79	56.88	439.87	53.45	55.96	35.53	77.49	49.59	44.34
chi2p	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hansen	371.68	401.38	380.86	287.14	400.56	261.50	442.84	392.48	317.53
Hansenp	1.00	1.00	1.00	0.60	1.00	1.00	1.00	1.00	1.00
ar1	-7.59	-7.08	-7.03	-5.40	-7.14	-5.21	-7.92	-6.89	-6.16
ar1p	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ar2	0.75	0.25	0.04	-0.04	0.06	0.12	0.65	-0.06	-0.10
ar2p	0.46	0.80	0.97	0.97	0.95	0.90	0.52	0.95	0.92

Note: For the definition of the variables, see Table 1. Chi2 - Chi-square test; Hansen - Hansen test; Ar1 and Ar2 - Arelano and Bond tests for serial correlations of order 1 and 2. \*\*\* - Sig. 1%; \*\* - Sig. 5%; \* - Sig. 10%.

Source: Elaborated by the author.

In the case of the three major shareholders (TCV) in the dispersed structures, the change in 1% of the ownership structure positively affects the efficiency in 1.79% in regression 2 and 1.66% in regression 3 in the BCC model and in 1.91% in regression 2 in the GRS model, both at a significance level of 10%. In economic terms, considering a standard deviation of 1.04 and 0.96 for the BCC and 1.08 for the GRS, the 1% increase in ownership of the three major shareholders increases by 1.86, 1.58% and 2.07%, respectively, the efficiency of the companies.



**(Table 4)**

**ANALYSIS OF THE INFLUENCE OF THE DISPERSED, DOMINANT AND CONCENTRATED STRUCTURES ON EFFICIENCY - GRS**

Variables	MCV			TCV			CCV		
	1	2	3	1	2	3	1	2	3
GRS(-1)	0.19***	0.08**	0.06	-0.07	-0.06	-0.02	0.08*	-0.06	0.04
Z	(4.56)	(2.12)	(1.35)	(-1.23)	(-1.08)	(-0.40)	(1.65)	(-1.06)	(0.73)
Disper.	0.76**	0.74**	0.93	1.53	1.91*	0.74	1.24	2.04	0.75
Z	(2.36)	(2.31)	(1.52)	(1.30)	(1.76)	(0.40)	(1.06)	(1.37)	(0.38)
Dom.	0.63***	0.74***	0.85**	1.64**	1.94***	0.84	1.43*	2.07**	0.89
Z	(2.89)	(3.11)	(1.90)	(1.95)	(2.49)	(0.60)	(1.75)	(2.14)	(0.63)
Concent.	0.52***	0.64***	0.75**	1.15*	1.53**	0.70	0.94	1.63**	0.83
Z	(3.00)	(3.49)	(2.03)	(1.70)	(2.39)	(0.60)	(1.34)	(1.99)	(0.70)
Size		0.15***	0.10*		0.24	0.10		0.25*	0.18
Z		(3.07)	(1.75)		(1.62)	(0.50)		(1.63)	(1.22)
AL		-0.83***	-0.96***			1.00			0.66
Z		(-6.43)	(-6.41)			(1.40)			(1.21)
AA			0.63*			-1.03***			-0.96***
Z			(1.69)			(-4.17)			(-4.24)
Constant	-0.16	-1.64*	-1.55	-3.26	-5.00	-0.39	-2.13	-4.89	-0.15
Z	(-0.20)	(-1.66)	(-0.90)	(-1.00)	(-0.93)	(-0.04)	(-0.65)	(-0.81)	(-0.05)
EF Ind.	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
EF Temp.	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
chi2	29.73	79.51	73.30	48.28	53.03	104.79	103.53	55.73	105.48
chi2p	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00
Hansen	462.84	398.36	316.08	318.19	306.98	221.27	432.22	307.35	253.35
Hansenp	1.00	1.00	1.00	0.32	0.46	0.48	1.00	0.45	0.99
ar1	-9.18	-8.35	-7.00	-5.35	-5.34	-5.36	-7.80	-5.45	-5.67

(continue)

**(Table 4 (Conclusion))**

**ANALYSIS OF THE INFLUENCE OF THE DISPERSED, DOMINANT AND CONCENTRATED STRUCTURES ON EFFICIENCY - GRS**

Variables	MCV			TCV			CCV		
	1	2	3	1	2	3	1	2	3
ar1p	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ar2	-0.01	-2.25	-1.90	-1.25	-2.26	-2.45	-0.61	-2.21	-2.19
ar2p	1.00	0.02	0.06	0.21	0.02	0.01	0.54	0.03	0.03

Note: For the definition of the variables, see Table 1. Chi2 - Chi-square test; Hansen - Hansen test; Ar1 and Ar2 - Arelano and Bond tests for serial correlations of order 1 and 2 (see Table 1). \*\*\* - Sig. 1%; \*\* - Sig. 5%; \* - Sig. 10%.

Source: Elaborated by the author.

For the five major shareholders (CCV) in the dispersed structures, the 1% change in ownership structure positively affects efficiency by 3.14% in regression 1 and 2.90% in regression 2 at a significance level of 1%, and in 2.11% in regression 3 at a significance level of 10%, both in the BCC model. In economic terms, considering a standard deviation of 1.12, 1.02 and 1.27, the 1% increase in the ownership of the five major shareholders increases by 3.52%, 2.95% and 2.68% the efficiency of enterprises, respectively. In the other regressions, the results were not statistically significant.

In the dominant structures, a greater consistency in the data is identified. Practically all regressions are statistically significant with the exception of the regression 2 of the major shareholder in the BCC model and the regression 3 of the three and five major shareholders in the GRS model. In these structures, the 1% change in main shareholder property (MCV) positively affects the efficiency in 0.49% in regression 1 and 0.52% in regression 3 at the 10% significance level in the BCC model. In the GRS model, this influence is 0.63% and 0.74% at 1% significance in regressions 1 and 2 and 0.85% at 5% significance in regression 3. In economic terms, considering a standard deviation of 0.28 and 0.30 in the BCC model and 0.22, 0.24 and 0.46 in the GRS model, the 1% increase in ownership of the main shareholder increases the efficiency by 0.13%, 0, 16%, 0.14%, 0.18% and 0.39%, respectively.

For the three major stakeholders (TCV) in the dominant structures, the 1% change in ownership structure positively affects the efficiency by 1.71% in regression 1 at 5% of significance, 1.45% in regression 2 and 1.16% in



regression 3, both at 10% significance in the BCC model. In the GRS model, this influence is 1.64% in regression 1 at 5% significance and 1.94% in regression 2 at 1% significance. In economic terms, considering a standard deviation of 0.89, 0.79 and 0.72 in the regressions with BCC and 0.84 and 0.78 in the regressions with GRS, the 1% increase in ownership of the three major shareholders increases by 1.51%, 1.15%, 0.83%, 1.37% and 1.51% the efficiency of companies, respectively.

For the five major shareholders (CCV) in the dominant structures, the 1% change in ownership structure positively affects the efficiency at 2.15% in regression 1, 1.92% in regression 2 at 1% significance, and 1.45% at 10% significance in regression 3 of the BCC model. In the GRS model, this influence is 1.43% at 10% significance, and 2.07% at 5% significance in regressions 1 and 2. In economic terms, considering a standard deviation of 0.66, 0.70 and 0.90 in the BCC model and 0.81 and 0.97 in the GRS model, the 1% increase in the ownership of the five major shareholders increases, respectively, by 1.43%, 1.34%, 1.30%, 1.16% and 2.00% the efficiency of the companies.

In the concentrated structures, the change in 1% in the main shareholder's ownership (MCV) positively affects the efficiency in 0.39% in regression 1, 0.34% in regression 2 and 0.42% in regression 3 at 10% significance in the BCC model. In the GRS model, this influence is 0.52% in regression 1 and 0.64% in regression 2, both at 1% significance, and 0.75% in regression 3 at 5% significance. In economic terms, considering a standard deviation of 0.23, 0.20 and 0.24 in the BCC model and 0.17, 0.18 and 0.37 in the GRS model, the 1% increase in ownership of the main shareholder, increases, respectively, by 0.09%, 0.07%, 0.10%, 0.09%, 0.12% and 0.28% the efficiency of the companies.

Considering the three main shareholders (TCV), the 1% change in ownership structure positively affects the efficiency in 1.28% in regression 1 and 1.26% in regression 2, both at 10% significance in the BCC model. In the GRS model, this influence is 1.15% at 10% significance in regression 1 and 1.53% at 5% significance in regression 2. In economic terms, considering a standard deviation of 0.71 and 0.70 in the BCC model and 0.67 and 0.64 in the GRS model, the 1% increase in the ownership of the three major shareholders increases by 0.91%, 0.88%, 0.77% and 0.98% the efficiency of enterprises.

Finally, for the five major shareholders (CCV) in the concentrated structures, the 1% change in ownership structure positively affects the efficiency in 1.64% and 1.45% in regressions 1 and 2, both at 1% significance in the

BCC model and in 1.63% at 5% significance in regression 2 of the GRS model. In economic terms, considering a standard deviation of 0.57 and 0.56 in the BCC model and 0.82 in the GRS model, the 1% increase in ownership of the five major shareholders increases, respectively, the efficiency of the companies by 0.93%, 0.81% and 1.33%.

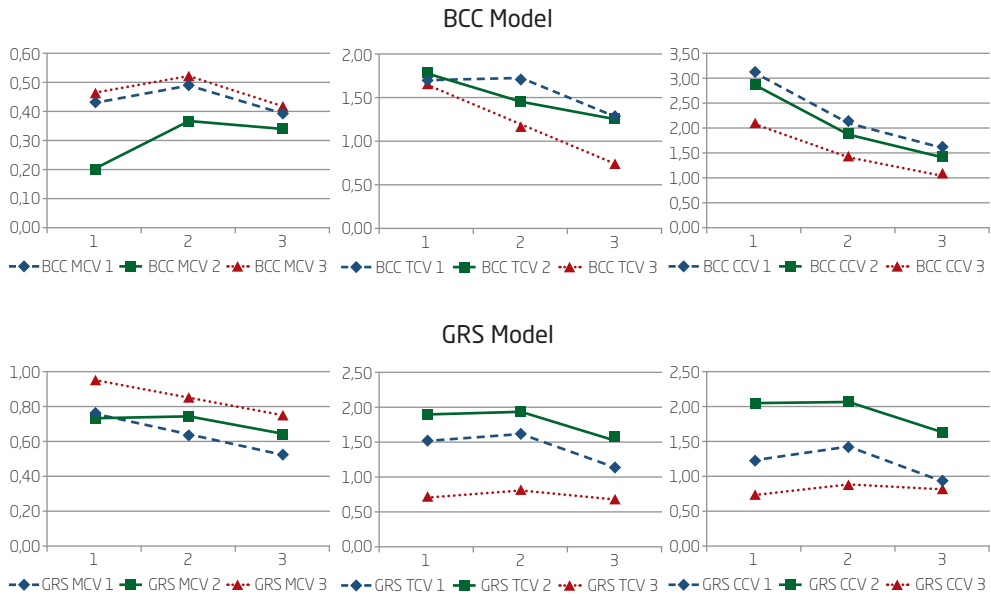
In terms of control variables, the one related to size (EBITDA) presented statistical significance only in the GRS model, with varying influence from 0.10% to 0.25% on the company efficiency, thus corroborating the findings of Pedersen and Thomsen (1997) who identified that the bigger the size of the company, the greater the search for efficiency.

The leverage variable was negatively and significantly related to efficiency at a significance level of 1% in most of the analyses, with varying influence from -1.04% to -0.45%, according with Boubakri and Cosset (1998) who affirm that there is a tendency for a decrease in leverage as efficiency increases because an increase in indebtedness may hinder the efficient allocation of resources. Finally, temporal and industrial dummies were used in some regressions, taking into consideration the sectorial particularities and conditions of each year covered in the analysis. The lagged dependent variable is positive in almost all the analyses that are statistically significant (except in regression 2 of the BCC model for the three major shareholders), showing that the efficiency in a previous period positively affects the same variable in a future period.

To plot the behaviour of dispersed, dominant and concentrated structures, from the indexes obtained in Tables 3 and 4 six graphs are generated, each of which contain three regressions (MCV, TCV and CCV), as shown in Figure 1. It is perceived that, although all variables present a positive relationship with efficiency, the graphs, in most of the analyses, present a non-monotonic relationship with an inverted 'U' format; that is, dispersed and concentrated structures are mostly less efficient than dominant structures. The result is more evident in regressions related to the GRS (total efficiency) model. In the analysis of the BCC model, when considering only the main shareholder, this inverted 'U' format is identified, but in the other analyses, a decreasing monotonic relation is found starting from the dispersed structures, thereby showing that these structures are more beneficial for these specific cases.

(Figure 1)

**BEHAVIOUR OF DISPERSED, DOMINANT AND CONCENTRATED STRUCTURES IN BCC AND GRS MODELS**



Note: The patterns of dispersed, dominant and concentrated structures are presented in six types of regressions: (i) one, three and five major shareholders by the BCC model (variable returns of scale), without size and leverage variables; ii) one, three and five major shareholders by the BCC model, with the shareholders' agreement and size variables; iii) one, three and five major shareholders by the BCC model, with the size and leverage variables; iv) one, three and five principal shareholders by the GRS (total efficiency) model, without shareholder agreement, size and leverage variables; v) one, three and five major shareholders by the GRS model, with shareholders' agreement and size variables; vi) one, three and five major shareholders by the GRS model, with the size and leverage variables.

Source: Elaborated by the author.

This fact suggests that both the problems of agency advocated by Jensen and Meckling (1976) and the expropriation of minority by the majority shareholders (stemming from the weak legal protection of the country), advocated by La Porta, Lopez-de-Silanes, and Shleifer (1999) significantly affect the efficiency of Brazilian firms. This, therefore, makes the dominant structures that are in the middle between dispersed and concentrated structures, the ideal form of ownership structure in Brazil. This inference can also be identified in Tables 3 and 4, where, in practically all the analyses, the variables related to the dominant structures present greater statistical significance and greater data consistency.

## 5. CONCLUSIONS, CONTRIBUTIONS AND LIMITATIONS OF THE STUDY

There is a great controversy over how ownership structure affects efficiency. Seminal articles, such as that of Jensen and Meckling (1976), say that the dispersed structures are detrimental to a company because they increase the costs of agency problems. La Porta, Lopez-de-Silanes and Shleifer (1999) argue that this type of structure is beneficial because it reduces the possibility of expropriation of minority shareholders by majority ones in countries where legal protection is weak, as in the case of Brazil, where civil laws predominate.

As can be seen, in all the analyses presented, dispersed, dominant and concentrated structures positively affect efficiency, but this influence varies from one level to another. Only this isolated fact leads us to believe that all ownership structures are beneficial to Brazilian companies, with an emphasis on dominant structures, which show statistical significance and consistency in data in practically all analyses.

From the regressions, graphs are traced to identify the pattern of behaviour of these structures, evidencing a non-monotonic relationship in an inverted 'U' format; i.e. the extremities (dispersed and concentrated structures) have a lower influence on efficiency than the dominant structures do. This fact corroborates the arguments about the relationship between ownership structure and efficiency. Non-monotonic relationships among these variables were also found by Morck, Shleifer and Vishny (1988) and Ng (2005), but the results were opposite as in the US, the dominant structure is the least efficient.

The present study is in line with the paper of Jensen and Meckling (1976) who consider dispersed structures as more harmful to efficiency because they can exacerbate agency problems, thereby hampering more efficient monitoring and increasing the possibility of private benefits of control. It also corroborates La Porta, Lopez-de-Silanes and Shleifer's (1999) arguments, which show that Brazil, as well as a large number of underdeveloped countries, has weak legal protection against expropriation of minority shareholders, due to historical factors stemming from the legal formation in the country, which allows the more concentrated structures to favour such expropriation. The study by Silveira (2004) also identifies an explanation for the argument that concentrated structures are detrimental to Brazilian companies. The study shows that more professional administrations, generally more pulverised, are of better quality and that concentration of the

decision in the hands of a single person, or a single family, generates inefficiencies in Brazilian companies. In this case, dominant structures, which remain in the middle between dispersed and concentrated structures, are the most adequate form of ownership structure in Brazil for the companies analysed during the period investigated.

Otherwise, the paper has some limitations which are mentioned below. Because DEA is used to calculate the model-dependent variable, the study suffers from the same criticisms related to this method since it is a measure of relative efficiency. Another constraint of the study is that the relationship between efficiency and ownership structure may be endogenous. Finally, when the dependent variable is a proportion, it can cause distortions in the analysis due to the fact that it constitutes a truncated variable, limited to values ranging from 0 to 1. Then, in this case, the Tobit method should be applied. This method was applied to the model, but the results were qualitatively similar.

## PADRÕES DE EFICIÊNCIA EM ESTRUTURAS DE PROPRIEDADE DISPERSAS, DOMINANTES E CONCENTRADAS NO BRASIL

### RESUMO

**Objetivo:** O artigo em questão visa traçar o comportamento das estruturas de propriedade dispersas, dominantes e concentradas no Brasil e verificar qual destas estruturas é mais eficiente em termos operacionais e se existe um padrão a ser seguido.

**Originalidade/lacuna/relevância/implicações:** São utilizadas técnicas de otimização estática por meio de Análise Envoltória de Dados (DEA) para o cálculo da variável de eficiência, sendo um diferencial com relação aos estudos anteriores, que consideram somente variáveis de resultado como indicadores de desempenho. O artigo é um dos primeiros da área que traça o padrão de eficiência das estruturas de propriedade no Brasil.

**Principais aspectos metodológicos:** A amostra é constituída por 8.298 empresas-ano entre os períodos de 1995 a 2012. Para calcular a eficiência (variável dependente), são utilizadas técnicas de otimização estática através de Análise Envoltória de Dados (DEA). Após, é aplicado o método de dados em painel não balanceado por GMM-Sys (Método dos Momentos Generalizado Sistemico).



**Síntese dos principais resultados:** Os resultados obtidos mostram que, apesar de todas as variáveis serem positivamente relacionadas com a eficiência, o padrão traçado apresentou-se em formato de “U” invertido, ou seja, estruturas dispersas e concentradas, em sua maioria, são menos eficientes que as dominantes.

**Principais considerações/conclusões:** O estudo identifica que tanto os problemas de agência, quanto a expropriação de minoritários pelos majoritários, decorrente da fraca proteção legal do país, afetam significativamente a eficiência das empresas brasileiras, fazendo com que as estruturas dominantes sejam a forma mais apropriada de estrutura de propriedade no Brasil.

## **PALAVRAS-CHAVE**

Governança. Eficiência. Estrutura de Propriedade. Padrão. Otimização.



# **PATRONES DE EFICIENCIA EN LAS ESTRUCTURAS DE PROPIEDAD DISPERSAS, DOMINANTES Y CONCENTRADAS EN BRASIL**

## **RESUMEN**

**Objetivo:** El artículo en cuestión tiene como objetivo rastrear el comportamiento de las estructuras de propiedad dispersas, dominantes y concentradas en Brasil y verificar cuál de estas estructuras es más eficiente operacionalmente y si hay un patrón a seguir.

**Originalidad/laguna/relevancia/implicaciones:** Para calcular la eficiencia de la variable dependiente, técnicas de optimización estática son utilizadas por el Análisis Envoltante de Datos (DEA), un diferencial con respecto a estudios previos que sólo tienen en cuenta rendimiento como indicador de resultado. El artículo es uno de los primeros en el área que traza el nivel de eficiencia de las estructuras de propiedad en Brasil.

**Principales aspectos metodológicos:** La muestra se compone de 8.298 empresas-año entre 1995 y 2012. Para el cálculo de la eficiencia (variable dependiente) se utilizan técnicas de optimización estática a través del Análisis Envoltante de Datos (DEA). Después, es aplicado el método

de datos de panel no equilibrado por GMM-Sys (Método Generalizado de Momentos Sistémico).

**Síntesis de los principales resultados:** Los resultados muestran que, a pesar de todas las variables ser positivamente relacionadas con la eficiencia, el padrón se presenta en forma de “U” invertido, es decir, estructuras dispersas y concentradas son menos eficientes que las dominantes.

**Principales consideraciones/conclusiones:** El estudio identifica que tanto los problemas de agencia, como la expropiación de los accionistas minoritarios por mayoritarios, debido a la escasa protección jurídica del país, afectan significativamente la eficiencia de las empresas brasileñas, haciendo con que las estructuras dominantes sean la forma más adecuada de estructura de propiedad en Brasil.

## PALABRAS CLAVE

Gobernanza. Eficiencia. Estructura de la propiedad. Patrón. Optimización.

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