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## **MODELAGEM MULTINÍVEL DA SUA VARIÂNCIA**

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### **MODELOS MULTINIVEL DE LA VARIANZA RENDIMIENTO**

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## MODELAGEM MULTINÍVEL DA SUA VARIÂNCIA

### RESUMO

Com foco na identificação do papel desempenhado pela indústria sobre as relações entre os fatores estratégicos corporativos e de desempenho, o método de modelagem hierárquica multinível foi adotado quando medir e analisar as relações entre as variáveis que compõem cada nível de análise. A adequação do ponto de vista de vários níveis para o estudo das relações propostas foi identificada e o ponto de análise relativa importância para a indústria de menor relevância como moderador dos efeitos de factores sociais estratégicos no desempenho, quando este último foi medido por meio de retorno sobre os ativos, e que a indústria não modera as relações entre fatores estratégicos corporativos e Tobin Q. as principais conclusões da pesquisa são que as escolhas das organizações em termos de estratégia corporativa apresenta uma influência considerável e desempenha um papel fundamental na determinação do desempenho nível, mas que a indústria deve ser considerado quando se analisa a variação de desempenho apesar de seu papel como um moderador ou não das relações entre fatores estratégicos corporativos e desempenho.

**Palavras-chave:** Organização Industrial; Estratégia Corporativa; Visão Baseada em Recursos, desempenho; Modelos multinível.

## MULTILEVEL MODELING OF THE PERFORMANCE VARIANCE

### ABSTRACT

Focusing on the identification of the role played by Industry on the relations between Corporate Strategic Factors and Performance, the hierarchical multilevel modeling method was adopted when measuring and analyzing the relations between the variables that comprise each level of analysis. The adequacy of the multilevel perspective to the study of the proposed relations was identified and the relative importance analysis point out to the lower relevance of industry as a moderator of the effects of corporate strategic factors on performance, when the latter was measured by means of return on assets, and that industry don't moderates the relations between corporate strategic factors and Tobin's Q. The main conclusions of the research are that the organizations choices in terms of corporate strategy presents a considerable influence and plays a key role on the determination of performance level, but that industry should be considered when analyzing the performance variation despite its role as a moderator or not of the relations between corporate strategic factors and performance.

**Keywords:** Industrial Organization; Corporate Strategy; Resource Based View; Performance; Multilevel Models.

## MODELOS MULTINIVEL DE LA VARIANZA RENDIMIENTO

### RESUMEN

Centrarse en la identificación del papel desempeñado por la industria de las relaciones entre los factores estratégicos corporativos y el rendimiento, el método jerárquico modelos multinivel se adoptó en la medición y el análisis de las relaciones entre las variables que componen cada nivel de análisis. La adecuación de la perspectiva multinivel para el estudio de las relaciones propuestas fue identificado y la importancia relativa de punto de análisis a la menor relevancia de la industria como un moderador de los efectos de los factores estratégicos corporativos en el rendimiento, cuando este último se midió por medio de retorno de los activos, y que la industria no modera las relaciones entre los factores estratégicos corporativos y los de Tobin P. Las principales conclusiones de la investigación son que las elecciones las organizaciones en términos de estrategia corporativa presenta una influencia considerable y desempeña un papel clave en la determinación del rendimiento nivel, pero la industria que debe ser considerado al analizar la variación en el rendimiento a pesar de su papel de moderador o no de las relaciones entre los factores estratégicos corporativos y el rendimiento.

**Palabras-clave:** Organización Industrial, Estrategia Corporativa, basada en la Vista de recursos, rendimiento, modelos multinivel.

## 1 INTRODUCTION

Among the several researches aiming at explaining organizational performance variation, the one developed by Lenz (1981) points out six research lines directly connected to this objective: (a) researches related to the connections between environment and performance, with a conceptual reference established on the Industrial Organization field theories; (b) researches focused on the interaction between environment and organizational structure and its effects on performance, based primarily on the Contingency Theory; (c) papers directed towards the understanding of the relations between organizational structure and performance, focused on the influence exercised by the size of the firm; (d) studies on the relations between strategy, organizational culture and performance; (e) works on the interactions between environment and strategy as determinant factors of the firm's performance; and (f) approaches on the effects of various factors connected to management over the organizational performance, such as governance structure and Agency Theory.

Aligned with Lenz (1981), this paper's objectives are to identify, under a multilevel perspective, the role played by Industry in the relations between Corporate Strategic Factors and Performance and to identify which of the four models proposed is the most adequate to the approach.

This research goal is in tune with the one developed by Misangyi, Elms, Greckhamer and Lepine (2006), whose main premise was the consideration that firm performance varies in time, between business units, between firms and between industries. The authors adopted three analysis levels and significant effects of factors linked to business units were identified, followed by effects of similar magnitude for firm and industry.

## 2 THEORY

The structure of the theoretical references follows the hierarchy of the approaches established in the research objectives, as well as in the proposed models.

### 2.1 INDUSTRIAL ORGANIZATION THEORY

The Industrial Organization Theory has as its basis the theories of monopolistic competition and of oligopolies, but considering the aspects related to firm organization and to decision taking processes, always under the perspective of the market structure in which the firm competes

(GRETHER, 1970). Quoting the work of Mason (1939), Grether (1970) points out that the market structure must be analyzed under the perspective of the positioning of a given supplier or buyer, including all the aspects which are taken into account in determining its business policies, as well as all the suppliers and buyers which potentially influence their sales.

Also referenced in Bain's (1959) studies, the initial paradigm of the Industrial Organization Theory has as its premise that the industry structure determines the individual behavior of firms and that the joint behavior of these determines the collective development in the market. As the author highlights, his work has as a focus the organizations action in the market, and does not concentrate greater efforts on their internal aspects. Also under the so-called classical perspective of the Industrial Organization Theory, strongly influenced by the work of Bain, Porter (1981) comes up with an interesting point, revised afterwards: having in mind that industry structure determines strategy, which in turn determines the firm's performance, strategy may be ignored and the researchers focus should be turned directly to the industry structure, so as to explain the variations on the organizations performance level.

The possibility of excluding strategy from the research field of the Industrial Organization is minimized by the incorporation to the theory's conceptual basis of principles from Oligopolies Theory – “the study of the results of the competitive interaction in markets in which one firm actions affect its rivals” (PORTER, 1981, p. 611) -, as well as from Game Theory.

As a result of this development, Porter (1981) points out the change of the industrial organization perspective from a tool to be considered in the strategy formulation, to a central field for the elaboration of conceptual bases in strategy research. As consequences of this change, we highlight: (a) the refocusing of the theory – the analysis unit is no longer the industry, but firm and industry; (b) the change from a static perspective to a dynamic one, which gathers models based on strategic decisions of individual firms and on the industry evolution; (c) the less consideration of Bain's determinist perspective under which strategic decisions do not influence the industry structure, in favor of the acknowledgment of the effects of organizational strategies on the market structure and also that performance in previous periods influences the strategic decisions of the organizations at a given period.

Hansen and Wernerfelt (1989) approach the economics and organizational factors which have influence over firms' performance. Among the first the authors highlight the relevance of the industry to which the firm belongs, whose effect may be measured in terms of the average performance of the firms which comprise the industry, and the relative position of the firm in this industry, represented by its market share. As reinforcement to their perspective, the authors give



reference to the work of Schmalensee (1985) which identified a significant influence of the differences between the performances of firms comprising an industry, measured by the average return on assets, on performance measured at the business unit level.

Brush, Bromiley and Hendrickx (1999), referencing the work of Rumelt (1991), proposed the approach of the implications of variations on performance relating to industry and firms and on capital structure, on the profitability variation of the business units of companies acting on three of four segments, identifying a higher influence of firm performance, compared to the influence of industry performance. Ruefli and Wiggins (2003) studied the influences of industry, corporation and segment over the firm performance and identified a higher and statistically significant influence of the factors relating to corporation when in comparison to the factors relating to industry.

Powell (1996) identified a positive and relevant influence of factors related to industry over performance variation and McGahan and Porter (1997), including in their analysis the variable year as explaining performance variations, apart from industry, organizations and business segments representative variables, identified significant influences of the industry and business segments, and that on the other hand, the industry effects were more persistent throughout time.

## **2.2 CORPORATE STRATEGIC FACTORS**

According to Vance (1970) corporate strategy is intrinsically bound to resource allocation as a mean to achieve a goal and that independent of where and when it was elaborated and of the process used for its formation, it directs the organization in a broader manner and informs its components of when the actions shall be implemented. With the knowledge acquired with experience, the organization shall be apt to develop a plan focused on the future, so as to include products, markets, returns, debt level, and property structure and growth projections.

According to Stigler (1983), under the perspective of industrial competition, it is considered that all resources in an industry allows the attainment of equal, but not superior, gains to the ones which it would make possible if it was directed to another industry. In the search for satisfying their personal interests, the owners of the production goods tend to direct their resources for industries which allow the higher return, migrating to those most attractive and abandoning those less attractive. This resource movement looking for gaining better results leads the organizations to adopt the strategy of diversifying business and products, broadening their market boundaries and the sources of financial returns.

According to Montgomery and Wernerfelt (1988), the more it diversifies, the more the firm becomes distant of its main business, the higher will be the reduction in its efficiency and the lower will be the competitive advantage arising from the production factors, which, when considered together, lead to a decline of incomes along time. The results assessed by the authors point towards the confirmation of the hypothesis in which there exists a negative relation between diversification level and performance, due to the increase in the management complexity of the firms and the reduction of the scale gain.

Pfeiffer (1972) considers that the board composition reflects the organization's perception in terms of the different ways of dealing with the different industries and organizations which comprise its task environment, which may be done in two but not mutually excluding manners: (a) through the efficiency of productive processes, so as to maximize resource utilization and maintain or increase business; and (b) through assuring business favorable to the organization, referenced in political relations with the other market components, established through formal long-term agreements or through the interlocking strategy – situation in which a member of an organization maintains formal relations with other organizations, by taking part of their board, their executive team or both.

Bazerman and Schoorman (1983) affirm that organizations may benefit from the relations established through interlocking by obtaining information relating to the definition of prices practiced at the market, to the directions in terms of publicity and the investments in research and development, in this case horizontal relations established with competitors, and by developing vertical relations with suppliers aiming at reducing the uncertainty as to resource availability and accessibility, and also creating means of controlling the environment, reducing the transaction costs. The duration and intensity of the use of interlocking strategy shall be determined by the short or long-term perspectives adopted by the decision takers and by a more or less aggressive posture.

Ferrier (2001) developed a model which approaches the competitive interaction process, with the objective of describing the relevance of organizational and market characteristics for the availability and limitation of the forces which influence the competitive actions considered as aggressive, defined in terms of volume, duration, complexity and unpredictability, and also of discovering how such process influences the economic-financial performance of the companies, due to the allocation of material, human and financial resources.

As Almazan and Molina (2005) highlight, firms which act in the same industry may adopt different debt levels by third-party capital, due to a more or less aggressive competitive posture by its managers, as well as different proportions between short and long-term debts.



Wernerfelt (1984) proposed the approach of the factors related to the companies based on their resources – Resource Based View, RBV – in substitution of an evaluation of the capacities and organizational results focused only on the available product line, affirming that the company's growth is directly bound to the equilibrium between capitalizing on the available resources and the development of new resources. This did not mean, however, that diversifying resource allocation will assure a better performance, as there is a tendency that the competition for them will be intensified.

According to Barney and Clark (2007), Wernerfelt's perspective is referenced in Porter (1980), by complementing its proposal that the competitive advantages arise from the market positioning of the products offered by the firm, with the role played by the developed or acquired resources having the objective of implementing market strategies, assuming the influence of product market positions on the resource set used by the firm.

At short-term, a company's competitiveness is originated from the attributes related to product price and financial performance, while at long-term it is derived from its ability to build, at lower cost and quicker than its competitors, the competencies which allow them to develop products not yet planned (PRAHALAD & HAMEL, 1990). According to the authors, the true advantage sources are in the managers' ability in consolidating technological and productive training in competencies, which strengthen the organization's capability of quickly adapting itself to new scenarios.

According to Kor and Mahoney (2000), a company's growth is related to the use of the available resources and to the development of new resources and training, as well as being based on the dynamic and continuous evaluation of the adequacy of actions to the organizational objectives and of competitive capacities, with basis on their competences, and may be approached as a dynamic process in which management and resources interact with each other.

## **2.3 RESEARCH MODELS**

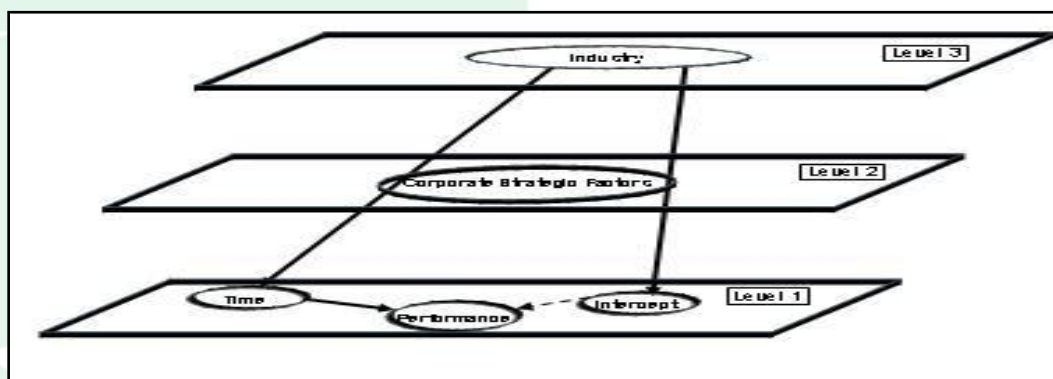
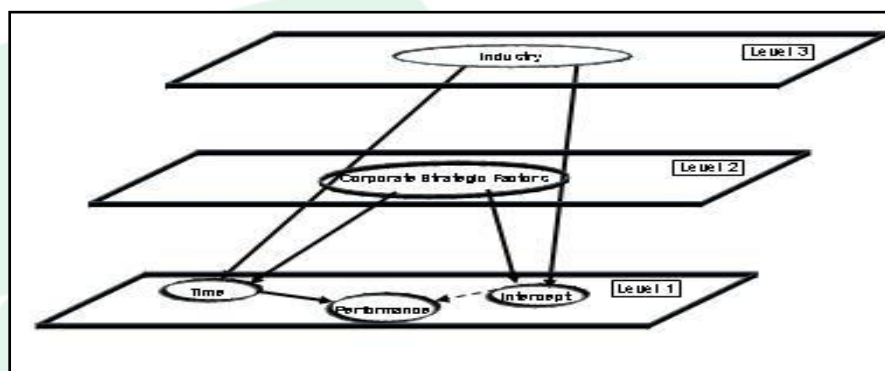
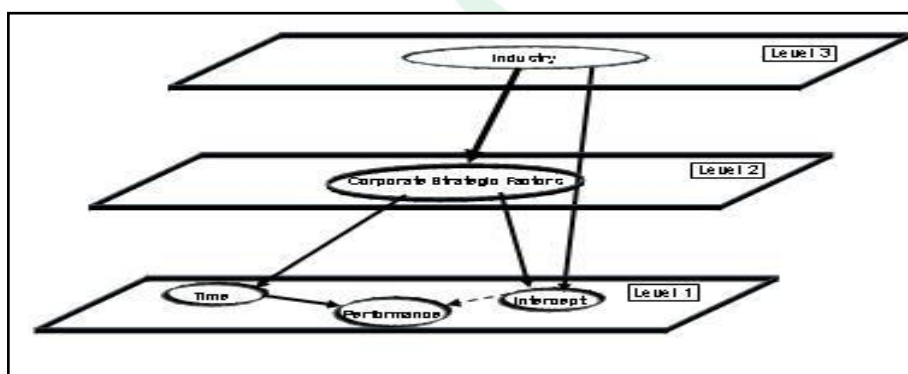
Model 1 was proposed considering the role played by industry as a direct determinant of organizational performance but without relations between corporate strategic factors and organizational performance, which was measured by means of financial performance (Return on Assets) and stock market performance (Tobin's Q) – Figure 1. In Model 2 a direct effect of industry on organizational performance was modeled, but in contrast with Model 1 a direct effect of corporate strategic factors on organizational performance was considered - Figure 2.

It is also considered the direct effect of industry on organizational performance, taking into account the role of industry as moderator of the relations between corporate strategic factors and organizational performance – Models 3 and 4, Figure 3 and Figure 4, respectively. In the perspectives presented in Model 4, the influence of the corporate strategic factors acts as a moderator of the effects of resource use capability on organizational performance.

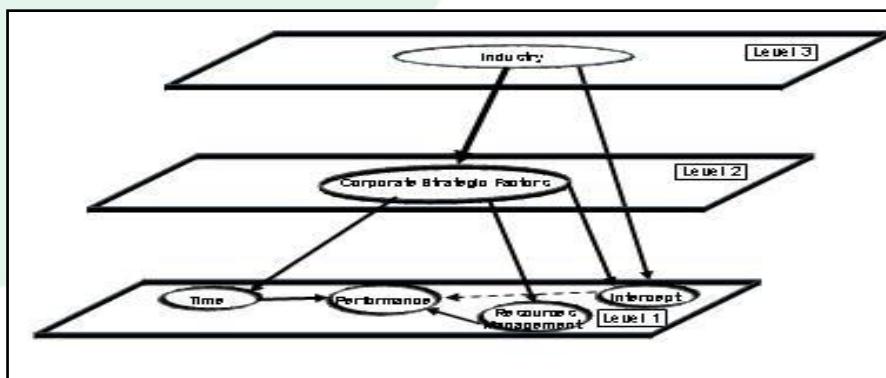
Aimed in answering the research question and in order to achieve the proposed objectives, the cross-level, top-down perspective is adopted for the multilevel analysis. According to St. John (2005), it establishes that the constructs considered being of a higher level exercise a direct or indirect influence over the lower level constructs. When the influence is direct, the factors relating to the context influence the actors' behavior, as when we consider the industry's direct influence over the organizations' performance.

In Model 1 (Figure 1), the influence of industry (level 3) over performance (level 1) is considered throughout time and the influence of the corporate strategic factors is not considered. In Model 2 (Figure 2) the direct influence of industry (level 3) over the performance (level 1) is considered throughout time, as are the direct influences over performance exercised by the corporate strategic factors (level 2) also throughout time.

When we suppose the influence as an indirect one, there is the intervention of a third or even more constructs over the analyzed relations, as in Model 3 (Figure 3), in which we consider the role of the corporate strategic factors (level 2) in the relations between industry (level 3) and performance (level 1), considering the direct relation between industry and performance. In Model 4 (Figure 4) we propose that the corporate strategic factors (level 2) have a relevant role in the relation between industry (level 3) and performance (level 1), considering the direct relation between industry and performance and the influence of the resource management capability over performance (level 1).

**Figure 1** - Direct Relations Between Industry and Performance.**Figure 2** - Direct Relations Between Industry, Corporate Strategic Factors and Performance.**Figure 3** - Industry as Moderator of the Relations Between Corporate Strategic Factors and Performance.

**Figure 4** - Industry as Moderator of the Relations Between Corporate Strategic Factors and Performance, Including Resource Management Capability.



### 3 RESEARCH METHODOLOGY AND DATA TECHNIQUES

#### 3.1 MULTILEVEL MODELING

As James and Williams (2000) highlight, the analysis of multilevel models, specifically those of the cross-level, top-down type, through the HLM – Hierarchical Linear Model - method, consists on estimating the variance proportion of those lower level variables which is explained by the higher level variables. The relations between independent and dependent variables may be identified through the average of the dependent variables (analysis under the perspective of intercept as a result) or through the load of the independent variables in determining the dependent variable (slopes as results). It is fit to affirm the viability of a simultaneous application of the two perspectives on one same analysis model.

Hierarchical linear models make possible to investigate the variance of the variable which is the object of study both on the lower level and also on the highest level, maintaining the analysis level of the independent variables (HOFFMAN, 1997; WECH & HECK, 2004). Furthermore, we may model the variance of the dependent variable both for the organizations and for the industries, which is the case in this research, at the same time in which predictive variables relating to organizations and industries are used, at the respective levels, characterizing approaches of inner-level and inter-level relations (EDDLESTON, OTONDO & KELLERMANNNS, 2008; HOFFMAN, 1997).

### 3.2 VARIABLES MEASUREMENT

The conceptual grounding for the use of variables representing the industry environment finds its support in Bain's (1959) perspective that the firm's performance level is established by the performance level of the industry in which it is inserted. The data representative of industry performance were obtained from the Brazilian Institute of Geography and Statistics – IBGE databases: (a) variation of the total income; (b) variation of the incomes arising from net sales; (c) variation of the gross income from industrial products sales; (d) variation of the gross income from goods sales; and (e) the variation of other operational incomes (IBGE, 2004).

As to those variables representative of the Corporate Strategic Factors, we have: (a) the debt profile which reflects the long or short term posture adopted by the organization; (b) the aggressive posture is expressed by the investment in assets; (c) the company size was estimated by the logarithmic transformation of the total asset, as done by Hansen and Wernerfelt (1989) and Mendes-da-Silva and Pontual (2005); (d) the diversification level was obtained by means of the Herfindahl-Hirschman index for the concentration of sales per product line.

The variables representative of the interlocking strategies were: (a) number of individuals with formal bounds to other organizations and which belong only to the executive board; (b) number of individuals which participate only in the board of directors and which maintain formal bounds with other organizations; and (c) number of individuals which act both in the board of directors and in the executive board and which are formally bound to other organizations.

The Resource Management Capability reflects the organization's competence when using the available resources for generating net results. It is composed by the variables (a) sales intensity; (b) efficiency - proportion between the cost of the sold product and net sales; and (c) capital expenditures – proportion between net capital expenditures and net sales. These variables were developed by Hambrick (1983) and used by Berman, Wicks, Kotha, & Jones (1999).

The Organizational Performance was measured by means of the variables RETURN ON ASSETS and TOBIN'S Q, the latter representing the performance in the stock market and which was calculated as proposed by Chung and Pruitt (1994).

## 4 DATA ANALYSIS AND RESULTS

### 4.1 ADEQUACY OF THE MULTILEVEL APPROACH

According to Ringdal (1992), the analysis of hierarchical linear models occurs in two stages: the first being the estimate of a non-conditional random regression model, also called null model, in which the loads vary between the groups, without the inclusion of predicting variables; after that, the estimate of the model with the inclusion of the independent variables should be performed, whose results shall be compared to the ones in the null model, so as to verify the explanatory capacity of the final model.

Following the procedures proposed by Ringdal (1992), a null model was estimated for each of the dependent variables – Return on Assets and Tobin's Q – in order to verify the adequacy of the hierarchical perspective to the analysis of the determinant factors in the performance of the studied organizations.

The assessment of the models referenced in the Intraclass Correlation Index – ICI, which measures the variance explanation proportion in the dependent variables corresponding to each hierarchical level (LUKE, 2004), points to the adequacy of estimating the parameters for three levels, in the case of the dependent variable Return on Assets and that there are significant variance percentages between the considered levels and without expressive concentration in a given level. For the dependent variable Tobin's Q the relevance in only two levels was indicated, and it must be stated that the level relative to industry presents a low contribution for the understanding of the variable variations, reflecting the possibility of a nonoccurrence of significant variations between the analyzed industries – Table 1.

**Table 1** - Intraclass Correlation Index - NULL and Proposed Models.

DEPENDENT VARIABLE	TIME $\varepsilon_{TLj}$		BETWEEN FIRMS $r_{0Lj}$				BETWEEN INDUSTRIES $\mu_j$			
	Variance Component	ICI	Variance Component	Chi-square $X^2$		ICI	Variance Component	Chi-square $X^2$		ICI
Return on Assets	435.23	48.48	369.70	211.24	***	41.18	92.82	30.11	*	10.34
Tobin's Q	2.14	50.92	2.05	571.19	***	48.87	0.01	24.63		0.21

\* $p < .05$ . \*\*\* $p < .001$ .



As proposed by Luke (2004) the models may be compared with reference to the Deviance, the Akaike Information Criterion (AIC) and the Bayesian Information Criterion (BIC) indexes. The author highlights that the Deviance index is directly and inversely influenced by the number of estimated parameters in the model. As alternatives and complements for the model evaluation, the author suggests the adoption of the AIC and BIC tests, due to the fact that these indexes are based on the Deviance and in a certain matter penalize models with a greater number of parameters. In a similar manner to the Deviance, the lower the AIC and BIC, the better the model's fit. In the following analysis and evaluations, the tests for Deviance and AIC were used, due to the absence of a reference relating to the sample to be used in the BIC calculation – if from the model's first, second or third level (LUKE, 2004).

Following the procedures indicated by Luke (2004) and aimed at checking the adequacy of the proposed models to the analysis of hierarchical relations, adjustment comparisons were performed for each of the four models to the NULL model (Table 2). All the four models presented Deviance values lower than the NULL model and the differences between them are statistically significant ( $p < 0.01$ ). In a similar way, the AIC index for the models 1, 2, 3 and 4 is lower than the one for the NULL model.

According to the results all the proposed models have shown to be adequate for the analysis of the relations between factors that influence the performance of the studied organizations, under a hierarchical perspective. Such affirmation also finds support on the explanatory capacity of the models assessed through the difference between the Variance Components – VC of the NULL model and the proposed models (Table 3).

**Table 2** - Adjustment for NULL and Proposed Models.

Comparison Criteria	Dependent Variable	MODELS									
		Null	1		2		3		4		
Deviance	Return on Assets	4,637.70	4,535.13		4,477.99		4,363.93		4,219.50		
	Tobin's Q	1,951.57	1,616.02		1,580.37		1,480.86		1,444.54		
Deviance's Difference <sup>a</sup>	Return on Assets	---	102.57	***	159.71	***	273.77	***	418.20	***	
	Tobin's Q	---	335.56	***	371.21	***	470.71	***	507.04	***	
Number of Parameters Estimated	Return on Assets	4	19		33		96		141		
	Tobin's Q	4	19		33		96		141		
AIC	Return on Assets	4,645.70	4,573.13		4,543.99		4,555.93		4,501.50		
	Tobin's Q	1,959.57	1,654.02		1,646.37		1,672.86		1,726.54		

<sup>a</sup> Significance tested by means of Chi-square test.

\*\*\* $p < .001$ .

The models proposed presented a better explanatory capacity of the dependent variable variance than the NULL model for all the dependent variables, when considering the first level of analysis. As to the second level, the models 1, 2 and 3 presented a better explanatory capacity than the NULL model for the Return on Assets; for Tobin's Q all the models presented a better explanatory capacity than the NULL model.

When focusing on the third level, we could identify that the models present a better explanatory capacity of the dependent variable variance for the variable Return on Assets than the NULL model. However, when analyzing the Tobin's Q, we could identify a better explanatory capacity only for the model 1, compared to the NULL model.

**Table 3** - Compared Explanatory Capacity - NULL and Proposed Models.

Comparison Criteria	Dependent Variable	MODELS				
		Null	1	2	3	4
Variance Component (VC) - Level 1	Return on Assets	435.23	270.74	265.18	243.88	125.49
	Tobin's Q	2.14	0.91	0.91	0.91	0.81
VC difference <sup>a</sup> Level 1	Return on Assets	-----	0.38	0.39	0.44	0.71
	Tobin's Q	-----	0.57	0.58	0.57	0.62
Variance Component (VC) - Level 2	Return on Assets	369.70	249.02	193.84	268.72	716.46
	Tobin's Q	2.05	0.36	0.15	0.16	0.19
VC difference <sup>a</sup> Level 2	Return on Assets	-----	0.33	0.48	0.27	-0.94
	Tobin's Q	-----	0.83	0.93	0.92	0.91
Variance Component (VC) - Level 3	Return on Assets	92.82	0.29	4.64	9.38	0.19
	Tobin's Q	0.01	0.00	0.06	0.05	0.03
VC difference <sup>a</sup> Level 3	Return on Assets	-----	1.00	0.95	0.90	1.00
	Tobin's Q	-----	0.95	-6.06	-5.03	-2.68

<sup>a</sup> Non-explained variance reduction. Negative values represent a decrease in the explanatory capacity.

## 5 COMPARATIVE ANALYSIS

Still with the objective of verifying the adequacy of the models to the proposed hierarchical relations analysis, comparisons were elaborated approaching the adjustments between the four models, per dependent variable (Table 4), according to the procedure proposed by Luke (2004) and previously adopted in the analysis of the adjustment of the proposed models and the NULL model.

As it may be observed in Table 4 and considering both performance variables, all models present Deviance values lower than those estimated for model 1 and the differences between them

are statistically significant. In what regards to model 2, we could verify that it presents Deviance values higher than the ones for the models 3 and 4 and that the differences between them are statistically significant. With regards to model 4 and considering only the Return on Assets, the Deviance values for model 4 are lower than the values of model 3 and the difference between them is statistically significant. At the other side, when focusing on Tobin's Q, the Deviance difference between models 4 and 3 is not statistically significant.

In a similar vein, the AIC index for models 2, 3 and 4 is lower than the one calculated for model 1, in the case of the dependent variable Return on Assets. In relation to Tobin's Q variable it was only assessed a lower AIC value for model 2, also maintaining model 1 as a reference.

When the analysis is focused on model 2, we could see a higher AIC value for model 3 for both performance variables and a lower AIC value for model 4, in the case of Return on Assets. Regarding model 3, model 4 presents a lower AIC value for the Return on Assets and a higher one in the case of the dependent variable Tobin's Q.

Considering the comparisons between the models adjustments previously presented, we could conclude that the variations in the performance of the organizations which comprise the studied sample, measured through the variable Return on Assets, should be better approached taking as a reference the model 4, which presents a better adjustment than the other models proposed. As to the variable Tobin's Q, model 2 presents a better adjustment than model 1, which, on its turn, presents a better adjustment than the other models. With these results as a reference, we pass on, in the next session, to the analysis of the relations between the independent variables which comprise the selected models through the best adjustment – model 4 for variable Return on Assets and model 2 for Tobin's Q.

**Table 4 - Models Adjustment per Dependent Variable** <sup>a, b, c</sup>

Variables	Models	MODELS					
		1		2		3	4
Return on Assets	1	-----		-29.14		-17.20	-71.63
	2	-57.14	***	-----		11.94	-42.49
	3	-171.20	***	-114.06	***	-----	-54.43
	4	-315.63	***	-258.49	***	-144.43	***
Tobin's Q	1	-----		-7.65		18.85	72.52
	2	-35.65	***	-----		26.50	80.17
	3	-135.15	***	-99.50	***	-----	53.67
	4	-171.48	***	-135.83	*	-36.33	-----

<sup>a</sup> Values above the diagonal = difference between AIC

- Example: AIC model2 – AIC model1 = -29.14.

<sup>b</sup> Values below the diagonal = difference between Deviance

- Example: Deviance model 2 – Deviance model 1 = -57.14.

<sup>c</sup> Significance tested by means of Chi-square test.

\*p < .05. \*\*\*p < .001.

## 5.1 VARIANCE COMPOSITION AND RELATIVE IMPORTANCE

In Table 5 the relative importance for each level of the proposed and analyzed models is presented. The relative importance is obtained by means of the square root of the variance component, according to the procedure adopted by Brush and Bromiley (1997) and Goldzmidt, Brito and Vasconcelos (2007).

**Table 5** - Variance composition and relative importance.

Variable	LEVEL	VARIANCE COMPONENT	%	IMPORTANCE	RELATIVE IMPORTANCE (%)
Return on Assets	1	125.49	14.90	11.20	29.17
	2	716.46	85.08	26.77	69.71
	3	0.19	0.02	0.43	1.12
	Total	842.14		38.40	
Tobin's Q	1	0.91	81.00	0.95	59.89
	2	0.15	13.41	0.39	24.37
	3	0.06	5.59	0.25	15.74
	Total	1.12		1.59	

First of all is important to highlight that in the case of Return on Assets, the relations between the constructs that are used with the objective of explain the variation in performance were established by means of Model 4 and, in the case of Tobin's Q, by means of Model 2.

When performance is measured by means of Return on Assets, we could identify a higher importance of the corporate strategic factors (level 2) with a percentage of around 85% of performance variance explanation. The effects of resource management capability represent less than a quarter of the effects of the corporate strategic factors (almost 15%) and the industry performance represented by level 3 shows a negligible explanatory capacity (less than 1%). These results allow us to affirm that Industry presents a negligible moderation effect on the relations between corporate strategic factors, resource management capability and performance. Another point that deserves consideration is the role of corporate strategic factors as moderators of the relations between resource management capability and performance and its direct effects on

performance variation. These results reinforce the role of strategic factors as determinants of the level of performance attained from the companies studied.

When considering the variable Tobin's Q, level 1 presents a higher relative importance – approximately 60% – than the other levels, reflecting the relevance of time variation as a factor that influences the performance variation. The relative importance of the corporate strategic factors (24.37%) reinforces the role played by time variation, considered at level 1, due to its role in the relation between diversification, size and Tobin's Q. The industry performance was not identified as a moderator of the relations between corporate strategic factors and organizational performance, but presents a relative importance of approximately 16% and a variance explanation of more than 5% – level 3 – Table 5.

## 6 CONCLUSIONS

This paper's objectives are to identify, under a multilevel perspective, the role played by Industry in the relations between Corporate Strategic Factors and Performance and also to identify which of the four models proposed is the most adequate to approach the relations between the models' levels. These objectives were established with reference to the perspectives of the Industrial Organization Theory in its classic and modern theoretical lines of research.

Focusing on the understanding of the relations between the presented dimensions, four models were proposed and each model's adequacy to approach the relations between Industry, Corporate Strategic Factors and Performance evaluated. The hierarchical multilevel modeling method was adopted when measuring and analyzing the relations between the variables that comprise each level of analysis.

The adequacy of the multilevel perspective to the study of the proposed relations was verified. Model 4 was identified as the most adequate to approach the role of industry as moderator of the relations between corporate strategic factors and performance, including resource management capability, when performance was measured by means of Return on Assets. Model 2, which do not consider industry as a moderator of the relations between corporate strategic factors and neither the role played by resource management capability as a determinant of performance variation, was identified as the most adequate to approach the relations proposed when performance was measured by means of Tobin's Q.

These results, when jointly approached with the relative importance analysis, point out to the lower relevance of industry as a moderator of the effects of corporate strategic factors on



performance, when the latter was measured by means of return on assets, and that industry don't moderates the relations between corporate strategic factors and Tobin's Q.

Finally, the research's results do not confirm those from Misangyi *et al.* (2006) but considering that they are in alignment with Porter (1981) we can conclude that the organizations choices in terms of corporate strategy presents a considerable influence and plays a key role on the determination of performance level, but that industry should be considered when analyzing the performance variation despite its role as a moderator or not of the relations between corporate strategic factors and performance.

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