How Much Does the Interaction Between Firm and Industry Matter?

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Abstract

An ongoing debate on different and sustainable profitability sources among competing firms is central within the strategy and organizational literature. Numerous studies tried to demonstrate that the main influences on persistent profitability may be explained by industry, firm, temporal and others effects. Traditionally, this debate finds support in two dominant perspectives, predominantly employing the logic of contrast to compare the effectiveness of the firm-focused resource-based view (RBV) and sometimes dynamic capabilities with the industry-focused industrial organization view (IO) in explaining performance differences. The present research concentrates on a third interaction perspective according to which these dominants perspectives are viewed as complements rather than contrasts.

By carrying out a quantitative analysis on the data made available by the publication on the ranking of firms of the Diario do Grande ABC newspaper, the main purpose of this paper is to establish whether a firm–industry interaction effect is a co-determinant of business performance and thus complements the industry and firm effects usually found to be significant in most of the previous research. The sample included 758 observations of 146 firms in 68 industries and relate to the period between 2001 and 2008.

Much of the research in the variance decomposition stream employed variance component analysis (VCA) and regression. However, the study of industry and firm effects on firm's performance has hierarchical nature, with two levels of analysis (industry and firm), and therefore, multilevel modeling is a more consistent method. For this reason, a multilevel regression model is carried out to explore the different drivers of business performance in the studied context. Bayesian estimation was employed because of its adherence in coping with outliers, usually observations of interest when abnormal returns are under study.

As results, we found that residual unexplained variance of performance attributable to industry effects according to the fitted model is approximately 46.32%, while the remaining 53.68% is attributable to the firm effect. However, the effect of the interaction between firm and industry was not statistically significant. Also, the cumulative wealth created by the firm during the years is positively and significantly related to future performance, reinforcing the assumption of the dynamic capabilities perspective that performance maintenance is related to the trajectory of the firm.

These findings add relevance to the debate on the interaction between industry and firm effect, which has been found to be both significant and insignificant in different previous studies. To better understand in which conditions this effect will be significant, research on business performance faces the opportunity of developing meta-theory including the dynamic capabilities view and the resource dependence theory with managerial implications; even though it is suggested here that the interaction between firm and industry does not really matter, our results indicate that what the firm individually does, on the run, matters a lot.

1 Introduction

An ongoing debate on different and sustainable profitability sources among competing firms is central within the strategy and partial organizational literature. Numerous studies tried to demonstrate that the main influences on persistent profitability may be explained by industry, firm, temporal and others effects (Brush, Bromiley, & Hendrickx, 1999; Hough, 2006; McGahan & Porter, 1997; Misangyi, Elms, Greckhamer, & Lepine, 2006; Roquebert, Phillips, & Westfall, 1996; Rumelt, 1991; Schumacher & Boland, 2005; Wernerfelt & Montgomery, 1988). Traditionally, this debate finds support in two dominant perspectives predominantly employing the logic of contrast to compare the effectiveness of the firm-focused resource-based view (RBV) with the industry-focused industrial organization view (IO) in explaining performance differences (Arend, 2009). Following Eriksen & Knudsen (2003), the present research concentrates on a third interaction perspective according to which these dominants perspectives are viewed as complements rather than contrasts.

Studying the sources of performance assuming the IO perspective, its theoretical and empirical implication became closer to a testable hypothesis that difference in profitability between industries should be greater than differences within industries. Considering the RBV perspective, on its turn, the theoretical hypothesis is that differences in profitability within industries should be greater than differences between industries. Finally, there is the interactionism perspective with its theoretical implication: the mutual existence of industry-effect and firm-effect, and significant interaction between industry and firm effects and the codetermination of persistent firm profitability.

This paper presents an exploratory investigation of the performance of firms in the Great ABC Region. The data refer to the publication Who's Who in Grande ABC (Diário do Grande ABC, 2007). We conducted a quantitative analysis of the data contained in the ranking of the region's largest companies published by Diário do Grande ABC (2001-2008). The goal is to identify preliminary issues and evidence that may lead to specific research focusing on firm performance and trying to identify the influences of factors such as the effects of firm and industry and their interaction.

The work advances the debates in the research field of business strategy, which aims to identify the sources of performance of firms. It is relevant because of the contributions it may provide to the understanding of business performance. By carrying out a quantitative analysis on the data made available by the publication on the ranking of firms of the Diario do Grande ABC newspaper (2001-2008), the main purpose is to establish whether a firm–industry interaction effect is a codeterminant of financial performance and thus complements the industry and firm effects usually found to be significant in extensive previous research.

Much of the research in the variance decomposition stream employed variance component analysis (VCA) and regression. However, the study of industry and firm effects on firm's performance has hierarchical nature, with two levels of analysis (industry and firm), and therefore, multilevel modeling is a more consistent method. For this reason, a multilevel regression model is carried out to explore the different drivers of business performance in the studied context. Bayesian estimation was employed because of its adherence in coping with outliers, usually observations of interest when abnormal returns are under study.

The article begins with a literature review in which we explore a theoretical review and pieces of the variance decomposition research stream. Then, we present a section containing the research context, sample and model specification. In the closing topics, the analysis and conclusions are presented

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2 Literature review

The organizational economics and strategic business research's fields encompass an ongoing debate on business unit profitability and its main influences. Schmalensee (1985) is widely considered the pioneer which analyzed the influence of industry, economic group and market share as influents factors on firms' profitability variance. Since this work, several researches reported many and different evidences. This section aims to briefly review this research stream identifying main theoretical affiliations and highlighting the recent debate on the interaction between firm and industry as a primary driver of profitability (Arend, 2009; Bamiatzi & Hall, 2009; Eriksen & Knudsen, 2003).

Although corporate-effects and market share-effects are not the topic of this research, we understand that some references dealing with these topics cannot be omitted in the literature review. The next topic briefly describes the theoretical framework and debate.

2.1 Theoretical framework

At the heart of the management strategy field remain two major theoretical positions – Industrial Organization (Porter, 1980, 1985, 2008) and Resource Based View (Barney, 1986, 1989, 1991, 2001b; Penrose, 1959; Teece, Pisano, & Shuen, 1997; Wernerfelt, 1984). Dynamic Capabilities View (Di Stefano, Peteraf, & Verona, 2010; Drnevich & Kriauciunas, 2011; Helfat & Peteraf, 2009; Teece, 2007; Teece, et al., 1997), a recent and promising development within the field, is sometimes considered as an extension of RBV framework (Eisenhardt & Martin, 2000).

The combination of industrial organization and strategic management resulted in research guideline that seeks to identify and measure the importance of industry as a predictor of firm performance. Accordingly, Dess, Ireland & Hitt (1990, p. 8) state that "among widely recognized arguments for the importance of industry context on firm performance are those proposed by Porter (1980)". Firms are considered mostly homogeneous while context (industry) differs in several aspects (structure, timing, cost, and demand, for example.).

The IO view considers that the average return on invested capital varies markedly from industry to industry, since each industry is assumed to have a unique set of forces. The firm performance differences is explained by means of the relative attractiveness of similar set of forces present in any industry: threat of new entrants, bargaining power of buyers, threat of substitute products or services, bargaining power of suppliers and rivalry among existing competitors. The industry influences firm performance and analysts play an important role in this process by providing information to managers, who officially control decisions; "the strongest competitive force or forces determine the profitability of an industry and become the most important to strategy formulation. The most salient force, however, is not always obvious" (Porter, 2008, p. 80).

RBV is a business performance model focusing on resources and capabilities controlled by the firm (business unit) as a main source of competitive advantage and performance. It represents an approach fundamentally different of industrial organization by focusing on the internal environment. The notions of capabilities and resources are central to this perspective. Resources are tangible or intangible assets used to create and implement strategies and represent strengths or weaknesses of the firm. Capabilities are a subset of the resources of the firm that allows for fully leveraging of other resources it controls. According to Barney (1991), the firm's assets can be classified into three categories: physical, individual (human resources) and organizational. Financial resources were considered in subsequent works (Barney, 1986; Newbert, 2008; Sirmon & Hitt, 2009; Wernerfelt, 1984).

Mainly based on the writings of Selznick (1957), Penrose (1959) and Wernerfelt (1984), the resource-based view essentially states that any form of sustainable competitive advantage results from unique resources controlled by the firm. It is based on two fundamental assumptions: the heterogeneity and immobility of resources (Barney, 2001a; Priem & Butler, 2001; Rumelt, 1991).

Together, these assumptions can explain why firms outperform others. If a firm has valuable resources and capabilities which other firms consider very costly to imitate, it may develop sustainable competitive advantage (Barney, 1991).

The resource-based view in strategic thinking has introduced a concept of firm as an accumulation of heterogeneous resources and capabilities. Subsequently, Teece et al. (1997) developed a dynamic perspective on organizational capabilities, suggesting that organizational skills to create value in environments with significant level of change depends on existing capabilities involving process technologies, organizational and internal management. The dynamic capabilities view argues that the creation of competitive advantage requires distinctive forms of coordinating resources and capabilities. The way the firm seeks to coordinate resources is determined by the existing resource portfolio and the evolutionary trajectory (evolutionary path) it has adopted. The existing capacities and future of a firm are always path-dependent and relatively stable (Sydow, Schreyögg, & Koch, 2009; Vergne & Durand, 2010). It is understood that the environments and the companies own evolutionary trajectories and these events occur simultaneously (co-evolution). New capabilities are shaped by the existing capabilities as a result of an evolutionary trajectory.

For Teece et al. (1997) competitive advantage requires the exploitation of specific capacities, internal and external to the firm. In this sense, advances have been made to incorporate the following factors as central to the model: the notion of change (Jones, Jimmieson, & Griffiths, 2005), the nature and micro foundations of sustainable enterprise performance (Teece, 2007), context (Kay, 2010), and evolutionary perspectives (Vergne & Durand, forthcoming).

2.2 The variance decomposition research stream

Much of the research in the variance decomposition stream employed variance component analysis (VCA) and regression. In general, the aim is to test whether firm level of profitability (business unit) is better explained by their own level (firm or business effect) or the average within sector (industry effect).

Arend (2009) states that although numerous studies have reveled several categories of factors that influence profitability (firm, industry, year, etc), industry effects and firm effects remain at the core of the research stream. Main works of this research stream are comprehensively revised by Bamiatzi & Hall (2009) and others, and will be addressed in the next topic. Research to estimate the industry effect importance find a relative large impact, measured as 4% to 20% of the variance in the observed firm performance (Arend, 2009; Brush, et al., 1999). Control for industry effect is used on firm performance analysis in cross-sectional data (Chatterjee & Hambrick, 2007; Guillén, 2002; Jiang, Tao, & Santoro, 2010). According to Arend (2009), industry as a variable (e.g., a set of dummy variables) it is most often statistically significant.

Surveys included other variables that such as the interaction between industry and year, and year effects. Researchers tried to demonstrate other categories types of effects -- subnational region (Chan, Makino, & Isobe, 2010), business segment (Ruefli & Wiggins, 2003), CEO (Chatterjee & Hambrick, 2007), owners (Fitza, Matusik, & Mosakowski, 2009), country (Goldszmidt, Brito, & Vasconcelos, 2007), market (Park, Li, & Tse, 2006) – in different contexts, such as developing countries (Chang & Hong, 2002) and emerging markets (Khanna & Rivkin, 2001), size of firms (Ebben & Johnson, 2005) and firm activity (Fitza, et al., 2009). An essential debate on what drives business unit performance – whether industry or firm-specific factors (Hawawini, Subramanian, & Verdin, 2003) remain ongoing in forums like the *Journal Business Research*.

Twenty research papers are briefly revised in this section. Their presentations encompass their general purpose, goals, theoretical considerations, methodological specificities, results and conclusions. Each of these papers has been seen strongly grounded on IO and/or RBV, holding different positions regarding the theoretical debate.

Schmalensee (1985) pointed to the significance of industry-effect based on one year database of 456 firms operating in 242 manufacturing industries. The research consisted in a cross-section study. Using ordinary-least-squares (OLS) and variance components (VCA), the analysis was

fundamentally descriptive and provided strong support for four empirical propositions: 1) Firm effects do not exist (0.10%, not significant for VCA population and sample); 2) Industry effects exist and are important, accounting for at least 75% of the variance of industry rates of return on assets; and 3) Market share effects are not significant. The conclusion was "the finding that industry effects are important supports the classical focus on industry-level analysis as against the revisionist tendency to downplay industry differences" (Schmalensee, 1985, p. 349).

Wernerfelt & Montgomery (1988), establishing a dialogue with Schmalensee (1985), claim the contribution was to add a focus effect, to use Tobin's q as a measure of performance and conduct the analysis at the firm level. The methods are similar to those of Schmalensee, OLS with and without correction for intangible assets. Industry effect was estimated in 19.48% (without correction) and 12.30% (with correction). Firm effect was respectively 2.61% and 2.65%. Market share effect was respectively 0.94% and -0.18%; errors were respectively 76.97% and 85.23%.

Kessides (1990) contributes offering answers to the shortcomings pointed out in previous works proposing and testing a precise and carefully specified model of oligopoly. It bridged the gap between industrial organization and market structure-performance relationship literature. The model represents a monopolistically competitive industry with many differentiated niches. The empirical analysis applying weighted least squares (WLS). The analysis provides support for the following proposition: "Firm, industry, and market share effects are all both statistically significant and quantitatively important, accounting for a significant portion of the variance of business unit rates of return on sales" (Kessides, 1990, p. 790).

Rumelt (1991) is being widely cited as the first major synthesis within variance decomposition research stream. Theoretically, the paper argue that "the classical focus on industry analysis is mistaken because these industries are too heterogeneous to support classical theory" (Rumelt, 1991, p. 168). This study partitions the total variance in rate of return among FTC Line of Business reporting units into factors. The work establishes a dialogue with Schmalensee (1985) and distinguishes between stable and fluctuating effects and reaches different conclusions. Variance components (VCA) method was employed to analyses sample A (Schmalensee based) and B (adding small business-units). The analysis revealed low and stable industry effects (8.32% and 4.03%), very large and stable business unit effects (46.37% and 44.17%), and moderate industry year effect (7.84% and 5.38%). The implications related to this research are: 1) industries are heterogeneous; 2) a small part of the variance effect of the business unit may be associated with differences in the relative size; 3) the use of industry as unit of analysis has low explanatory power of the of profitability's observed dispersion; and 4) the most important economic rents sources are business-specific.

Roquebert et al. (1996) address the issue of the relative degree of variance in ROA accounted for by effects while controlling for the business cycle and the interaction between the business cycle and industry. The article establishes a dialogue with Schmalensee (1985) and Rumelt (1991). The analysis revealed insignificant year effect (0.4%), low industry year effects (2.3%), large and stable business unit effects (37.1%), and moderate industry effect (10.2%).

McGahan & Porter (1997) examine the importance of year, industry, corporate-parent, and business-specific effects on the profitability of U.S. public corporations applying the components-of-variance (COV) method. Results indicate that year, industry, and business-specific effects account for 2.39%, 18.68%, and 31.71%, respectively, of the aggregate variance in profitability. The authors argue that industry effect is important for three main reasons: industry influences aggregate variation in business-specific profits and the influence of effects differs substantially across broad economic sectors.

Mauri & Michaels (1998) explore the complementarities between resource-based view (RBV) and industrial organization (IO) by means of an empirical examination of firm and industry effects. A variance component analysis (VCA) of 264 single-business companies from 69 industries using 5- year period (1988-92) and 15-year period (1978-92) suggests that firm effects are more important than industry effects on firm performance, but not on core strategies such as technology and

marketing. The findings also point to the need of studding core strategies at lower levels of aggregation to understand the sources of competitive advantage. The results were: industry effect (respectively 6.2% and 5.8%), and firm effect (36.9% and 25.4%).

Brush, et al. (1999) use a continuous variable model to examine the issue of corporate versus industry influence on business unit profitability. He finds that corporations explain almost none of the variability in business unit profitability. Continuous variable model method was employed as an alternative to VCA or ANOVA to analyze two samples with three and four business segments. The analysis revealed significant industry effects, large business segment effects, and moderate year effect. An overall conclusion is that corporation and industry influence business unit profitability, corporation being the most important effect.

McGahan (1999) uses data from US public firms to examine the influence of year, industry corporate-focus, and firm effects on corporate performance from 1981 to 1994. Applying ANOVA method, performance is measured by Tobin's q, return over assets (ROA), and a hybrid measure of return on replacement assets (RORA). The basic model was applied separately for each of the three performance measures. The analysis pointed that firm effects (respectively Tobin´s q 37.1%, ROA 23.7%, RORA 27.0%) were more important to performance than industry effects (respectively 27.9%, 10.7%, 14.0%), even considering that industry effects presented greater permanent components. The conclusion is represented by a set of "stylized facts" comprising: 1) industry effects were important, stable, and predictable; 2) overall, firm effects were about twice as important as industry effects to performance, but were less stable and less predictable; 3) a corporate-focus effect, which arises from relatedness in diversification, had either no influence or very small influence on corporate performance; and 4) year effects had a small but significant impact on corporate performance.

Chang & Singh (2000) focused on issues related to the corporate effect on firm performance. The authors aim to shed light on corporate effect controversy with two research settings. The "negligible corporate effects position" (Rumelt, 1991; Schmalensee, 1985) argue that there are very small corporate effects on profitability or competitive position. On the other hand, the research suggesting significant corporate effects on firm performance (Andrews, Prahalad) state that corporate-level actors are an important influence on profitability or competitive position. Their objective was to resolve this controversy, which, the authors believe, reflects the limitations of the FTC and Compustat data bases. The Variance components analysis (VCA) method was employed to analyze several samples of all public manufacturing companies available in the Trinet database. The results are presented in Table 1. The authors find that corporate effects on market share are considerably greater than zero when lines of business are defined more narrowly, when small business units are included, and when firms are medium-sized. The results suggest that the relative importance of corporate, industry, and business unit effects depends on the types of criteria – such as the level of industry aggregation, whether small business units are included, and firm size – that are used to construct samples.

Table 1 – Summary of Chang & Singh (2000) study

Method	Industry effect	Firm effect	Corporate effect	Market share effect	Industry year effect	Year effect	Error
VCA	7.3%	47.2%	0.0	NT	8.0	0.0	36.7
VCA (+small firms)	4.0%	44.2%	1.6	NT	5.3	0.0	44.7
VCA (+small firms[1])	54.2%	8.9%	15.8	NT	NT	0.1	21.1
VCA (+medium firms)	40.6%	8.8%	27.3	NT	NT	0.3	23.1
VCA (+large firms)	19.3%	47.6%	9.5	NT	NT	0.4	23.2

Source: adapted from Bamiatzi & Hall (2009).
Note: [1]Line of business defined at 4-digit SIC level.

McGahan & Porter (2002) analyze the variance of accounting profitability among a broad cross-section of firms in the American economy from 1981 to 1994. The purpose of the analysis is

to identify the importance of year, industry, corporate-parent, and business-specific effects on accounting profitability among operating businesses across sectors. They employ ANOVA to analyze sample A (model uncorrected for serial correlation) and B (model corrected for serial correlation). The analysis revealed that industry and corporate effects are important and related to one another. Business-specific effects, emanating from the competitive position and other factors, have a large influence on performance. The analysis revealed strong firm effects (respectively A 32.5% and B 36.0%), significant industry effect (respectively 8.9% and 10.3%) and corporate-parent effect (respectively 8.8% and 11.6%), and modest year effect (respectively 0.8% and 0.4%).

Hawawini, et al. (2003) purpose is to revisit the debate whether firms' performance is driven primarily by industry or firm factors. The paper proposes to extend past studies by using new metrics of performance, new data set and different statistical approach. The work discusses the possibilities of findings' generalization of previous works and if these findings should not be applied to a particular class of firms within the same industry. The objective is to explore a kind of interaction between firm and industry, e.g., if exceptional firms may be responsible for the high level of firm effects within an industry, and whether the structural effects of the industry have a different level of impact for the rest of industry's firms. The analysis was done using the methods of VCA and ANOVA. The preliminary analysis for ROA revealed significant firm effects (35.8%), industry effects (8.1%), year effect (1.0%) and industry-year effects (3.1%). Subsequent analysis for modified ROA also revealed significant firm effects (16.7%), industry effects (16.0%), year effect (1.1%) and industry-year effects (4.1%). The purpose of Ruefli & Wiggins (2003) is going further the recent methodological and analytical critiques (Bowman & Helfat, 2001; Brush & Bromiley, 1997) to raise more basic issues concerning the assumptions underlying variance decomposition. The objective of work was to place extent empirical results to critically question the interpretation of the relative importance of factor. The study applied a non-parametric statistics (OLS) and a methodology that permit a "*mutatis mutantis* framework", e.g., considering the possible strategic role of managers. The analysis revealed very low year effect (0.01%), low industry effects (0.14%), larger firm effect (12.33%).

Eriksen & Knudsen's (2003) discuss whether a firm-industry interaction effect is a co-determinant of firm-level profitability and thus complements the distinct industry and firm effects found in previous research. The objective is to fill the gap of no evidence on the relevance of the interaction between firm effects and industry effects as a codeterminant of profitability. From a conceptual standpoint, the work try to overcome the traditional polarization between IO and RBV through the interaction between levels of analysis and considering if the observed differences in profitability are stable over time. Applying the ANCOVA method, the analysis pointed that all of effects studied are significant: firm effect (0.385%) was considered to be large, industry effect (0.133%) was considered a small effect and interaction effect was considered very close to results in the literature. The challenge of improving the findings of Eriksen & Knudsen's (2003) has inspired most of what we have done in this work.

Misangyi, et al. (2006) contribute with methodological improvements by applying multilevel modeling to estimate the relative influence of industry, corporate, and business segment effects on firm performance. The research demonstrates how to measure strategic factors within a class of effects. The results basically confirm previous findings; performance is influenced by industry concentration, munificence, and the resource environment provided by corporate parents. The analysis revealed significant industry effects (7.6%), larger firm effects (36.6%), moderate corporate effects (7.2%), and narrow year effect (0.8%).

Goldszmidt, et al. (2007) studied the decomposition of variance and the relative importance of firm-effect, industry-effect, country-effect and the interaction country-industry-effects on company performance (the temporal effect is equivalent to the "unexplained variance" in the model of analysis). The work was accomplished by means of multilevel modeling with use of Return on Assets (ROA) as an estimator of performance. The Global Compustat database was used accessing a sample of 83,641 observations and 10,927 firms in 37 countries and 224 industries, over a period

of 10 years. The analysis was undertaken on three selected samples (full sample, manufacturing, and other divisions) pointing to a low, stable and significant country-effect (respectively, full 3.2%, manufacturing 2.1%, other 3.6%), low, stable and significant industry-effect (respectively 1.5%, 1.2% and 2.9%) and interaction industry-country effect (respectively 2.9%, 3.1% and 3.5%), very large and stable effect-firms (respectively 32.7%, 33.5% and 31.6%). The influence of a particular country on the performance of their companies was also studied and a ranking of countries based on the profitability of the company was developed.

Short, et al. (2007) present a study on 1,165 non-diversified firms from 12 industries across 7 years to assess the variance on the level of: firm, strategic group, and industry with use of three different methods: Variance components analysis (VCA) method, ANOVA and Hierarchical Linear Modeling (HLM). The analysis indicated strong firm effect (respectively, 65.80%, 71.77%, and 65.82%), smaller industry effect (respectively, 19.25%, 16.90%, and 19.23%) and corporate effect (14.95%, 11.33%, and 14.95%).

Arend (2009), inspired by the work of Eriksen & Knudsen (2003) on the effects of interaction between industry and firm effects develop a model for such interaction and test its consistency considering the observed data from the Compustat database, including firms considering four-digit SIC code. One result refers to the model to generate a performance's distribution of firms able to better explain the observed data compared with models used in previous studies. Arend addresses these issues to find that: (1) the industry effect impact on firm performance is likely overstated; and, (2) the interaction between the calculated component firm and industry effects is likely one that includes synergistic effects (i.e., the standard additive model of decomposition is likely miss specified).

Bamiatzi & Hall (2009) bring contribution to the debate about the influence of the firm-effects versus industry-effects on firm's performance. They used a database on the performance of 71.750 enterprises in the period between 2002 and 2004. Data segmentation was made into micro, SMEs and large companies in Britain. The research objectives are: 1) to test the firm-effect, industry-effect and interrelation between them in relation to profitability, 2) to examine the influence of each effect into the groups of enterprise (micro, SMEs and large firms), and 3) to measure the performance in terms of sales growth. In relation to profitability, the interaction effect between firm and industry was significant for all groups in a broad level of aggregation (SIC4). For the more restricted level of aggregation (SIC2), the interaction-effect is only significant to micro enterprises. When the effects were tested in relation to sales growth, no significant results were found.

Carvalho et al. (2009) highlight the importance of transient effects, that is, the interaction between effects measured and temporal dimension. This analysis would be particularly important in Latin American countries which are characterized by high volatility in economic and institutional environments and large macroeconomic oscillations. Variance decomposition was made for firms' operational and economic performance in five countries (Argentina, Brazil, Chile, Mexico, and Peru) from 1998 to 2007. The analysis indicate that the country-effect is important in Latin America since its transient effects became more important during periods of intense turbulence. These effects exert greater influence on the firm's economic performance than on its operating performance.

3 Context, sample and model specification

The *Great ABC* Region, in the 2000s, was characterized as an industrial southeastern region of *Região Metropolitana de São Paulo* (São Paulo Metropolitan Region – RMSP), Brazil, with domestic product of around 2.4% of GDP, and participation in RMSP's industrial activity around 23%, 13.8% in São Paulo State, and 7.0% in Brazil (Rodrigues & Ramalho, 2007). It has more than five thousand companies and over twenty thousand merchants and service providers; almost half of its jobs are offered in major manufacturing industries (Reis, 2005). The workforce is more than a million people. It is formed by the cities of Santo André, São Bernardo do Campo, São Caetano do

Sul, Diadema, Mauá and Ribeirão Pires.

146 Private profit-oriented firms listed in the publication *Quem é Quem no Grande ABC* (DIÁRIO DO GRANDE ABC) were the units of analysis in this research, with data relating to a 7-year period embracing 2001-2008. Performance was measured by means of the operational return in assets, which is a profitability measure that does not consider the cost of capital, thus being a measure of the economic performance which one can attribute to the firm's operation. The use of ROA related measures to represent performance follow the trend of many of the previous studies referenced in this paper; also, their results tend to be consistent with the results achieved with other measures of performance, such as economic profit or value-based indicators (Hawawini; Subramanian; Verdin, 2003).

By means of associating the main business activities described for each firm with the three first digits of the CNAE code, the observations were nested in 68 different industries.

Since the study of industry and firm effects on firm's performance has an hierarchical nature, with two levels of analysis (industry and firm), multilevel modeling is a proper method; they are also adherent to situations in which the number of observations are unbalanced among groups (Luke, 2004; Raudenbush; Bryk, 2002; Snijders; Bosker, 1999), which is the case of the sample under study. Because of these characteristics of modeling variance at different levels the recent research in business performance has been applying multilevel modeling as a methodological choice, superior than VCA or ANOVA and ANCOVA.

The following model was estimated:

$$\mathrm{OROA}_{ij} = \beta_0 + u_{0j} + e_{0ij} + \beta_1 lnTotalAssets + \beta_2 CumOROA_{t\text{-}1}$$

where OROA is the operational ROA of firm *i* in industry *j*; β_0 is the intercept, u_{0j} is the industry effect, e_{0ij} is the firm effect; β_1 is the effect of firm size as a control variable (measured as the natural logarithm of the firm's total assets), since models based on ROA related performance measures as dependent variables may be biased if the firm's size in neglected; and β_2 is the effect of firm's cumulative performance (cumulative OROA) until the immediately previous year (t -1) to the year (*t*) when OROA_{ij} is observed. The variable $CumOROA_{t\text{-}1}$ is calculated by adding 1 to OROA in all years previous than (t) and then multiplying the results: $(1+\mathrm{OROA}_{ij,t-1})$ x $(1+\mathrm{OROA}_{ij,t-2})$ x $(1+\mathrm{OROA}_{ij,t-3})$ x $(1+\mathrm{OROA}_{ij,t-4})$ x $(1+\mathrm{OROA}_{ij,t-5})$ x $(1+\mathrm{OROA}_{ij,t-6})$ x $(1+\mathrm{OROA}_{ij,t-7})$. It represents the effect of accumulated performance in previous periods starting with de first year of observation, in an effort similar to that made by Eriksen & Knudsen's (2003) to capture effects of wealth created by the firms in the period under analysis. However, their approach was to consider the cumulative wealth in the whole period, and decompose variance only for observations in the last year of observation, while our equation, om its turn, is panel oriented, so it can explain variance of firm performance occurring in all the sampled periods. The fact that the cumulative observed creation of value until period (t) is included in the model is an attempt to check for effects suggested by the dynamic capabilities perspective, since it would represent the influence of performance accumulated by firms during their observed trajectories in future performance, as a means of explaining performance as an aggregate measure depending on its own evolution during time.

The effect of previously accumulated ROA until period (t-1), represented in the equation by β_2, was allowed to fluctuate by industry as a means of measuring the interaction effect of firm and industry. Once again, the attempt was inspired by the work of Eriksen & Knudsen's (2003), except for the fact that they included dummy variables for industries to model that interaction and we employed a multilevel regression, which is a more proper choice because it does not presume the variances of different industries are the same. However, no significant variance of this effect was observed for any industry, so this variance term was excluded of the final equation. Another difference of our model when compared to the study of Eriksen & Knudsen's (2003).

We employed Bayesian techniques to estimate parameters by means of a Gibbs sampler with a burn-in period of 1000 interactions out of 30000 and sequential updates after storage of 100

iterations, in order to avoid auto-correlation. According to Tang & Liou (2010), Bayesian inference is consistent to the study about business performance because it deals properly with the presence of outliers, which typically manifest abnormal returns and therefore attract the interest of researchers on strategic management and performance.

4 Results

We estimated the following equation:

$$\text{OROA}_{ij} = 0{,}365 + u_{0j} + e_{0ij} - 0{,}048 lnTotalAssets + 0{,}02 CumOROA_{t\text{-}1}$$

The residual unexplained variance of performance attributable to industry effects according to the fitted model is approximately 46.32%, while the remaining 53.68% is attributable to the firm effect. The variance of de u_{0j} (industry effect) and the variance of e_{0ij} (firm effect) are both significant at the level o 5%, as are all other the remaining parameters in the equation. The only tested effect which was not significant was the interaction firm and industry which, for this reason was excluded.

The estimated model indicates that the cumulative wealth created by the firm during the years is positively and significantly related to future performance, reinforcing thus the assumption of the dynamic capabilities perspective that performance is related to the trajectory of the firm. However, that effect is only significant at the firm level, having no relation with the interaction between the firm and its respective industry. In other words, the influence of wealth accumulated by a firm in its business trajectory on its performance is only attributable to the firm activity, regardless of the way it operates and interacts with the specificities of its industry. Also, the major part of performance variance which the model cannot explain (53.68%) occurs at the firm level, even though the magnitude of the industry effect (46.32%) is comparable to the firm effect.

5 Final Remarks

The purpose of this work is selectively and exploratory to replicate the works on firm-industry interaction effect in order to fill the gap of empirical evidence on the importance of the interaction between firm and industry-effect as a possible determinant of firm profitability. Therefore, we have measured and analyzed the relative importance of the industry, firm and interaction-effects.

Consistent with all previous studies reviewed in this work, the results showed the existence of both, industry-effect and firm-effect. Similarly, the results are consistent with previous studies on the effects' magnitude: the firm-effect is more important than the industry-effect. We have also measured and analyzed the relative importance of a firm-industry interaction is a coderminant of firm profitability. So doing, we understand that our work contributes to expand the researcher stream applying it in a new context and discussing the argument by which we seek to complement the distinct industry and firm effects targeted in previous research. The conclusion is that the hypothesized interaction effect is insignificant in the context under study, adding relevance to the debate on this effect, which has been found to be both significant and insignificant in different previous researches (see Bamiatzi & Hall, 2009 and Eriksen & Knudsen, 2009). Therefore, an agenda of future research made be foster by our findings.

The fact that the cumulative wealth created by the firm during its trajectory is an antecedent of performance regardless of its interactions with the industry in which it operates may drive future research on dynamic capabilities and even on path dependence, in order to understand which

exclusive characteristics of firms lead to their cumulative levels of wealth. However, our results are far from being definitive; because studies about business performance are usually influenced by sample criteria biases (Chang & Singh, 2000) and because other performance measures and criteria for nesting firms into industries may be employed, there is need for conducting studies with these kinds of variation in order to achieve more exhaustive results. Being and exploratory study, this work is subject to adjustment on the database and to method improvements to further explore the empirical data.

Finally, research on business performance currently faces the opportunity of developing meta-theory including the dynamic capabilities view and the resource dependence theory (Al-Amoudi & Willmott, 2011; Fleetwood, 2005; Tsoukas, 1994; Hugh Willmott, 1996, 2005; H. Willmott, 2008), an initiative which the findings of this study may support with optimistic expectations, particularly regarding managerial implications. After all, even though it is suggested here that the interaction between firm and industry does not really matter, the results indicate that what the firm individually does on the run matters a lot.

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