Revista Universo Contábil, ISSN 1809-3337
Blumenau, v. 14, n. 4, p. 160-181, out./dez., 2018

doi:10.4270/ruc.2018432
Disponível em www.furb.br/universocontabil

THE MODERATING ROLE OF MARKET STRUCTURE ON THE RELATIONSHIP BETWEEN FIRM OPERATIONAL PERFORMANCE AND DEGREE OF OPERATING LEVERAGE[1]

O EFEITO MODERADOR DA ESTRUTURA DE MERCADO NA RELAÇÃO ENTRE PERFORMANCE OPERACIONAL DA FIRMA E GRAU DE ALAVANCAGEM OPERACIONAL

EL EFECTO MODERADOR DE LA ESTRUCTURA DE MERCADO EN LA RELACIÓN ENTRE PERFORMANCE OPERACIONAL DE LA FIRMA Y GRAU DE ALAVANCADO OPERACIONAL

Wesley da Silva Lourenço
Mestre em Contabilidade e Finanças pela Universidade Federal do Espírito Santo
Endereço: Av. Fernando Ferrari, 514. Goiabeiras
CEP: 29075-910 – Vitória – ES – Brasil
Email: wesleylourenco@live.com
Telefone: (27) 99771-7626

Luiz Cláudio Louzada
Doutor em Finanças pela Universidade Federal de Minas Gerais
Professor da Universidade Federal do Espírito Santo
Endereço:Av. Fernando Ferrari, 514. Goiabeiras
CEP: 29075-910 – Vitória – ES – Brasil
Email: louzadalvi@yahoo.com.br
Telefone: (27) 98148-3939

Paulo Victor Gomes Novaes
Doutorando em Controladoria e Finanças pela Universidade Federal de Minas Gerais
Professor Substituto na Universidade Federal do Espírito Santo - UFES
Endereço:Av. Fernando Ferrari, 514. Goiabeiras
CEP: 29075-910 – Vitória – ES – Brasil
Email: pvgnovaes@hotmail.com
Telefone: +55 27 99708-7790

[1] Artigo recebido em 31/01/2018. Revisado por pares em 27/02/2019. Reformulado em 19/04/2019. Recomendado para publicação em 25/04/2019 por Tarcísio Pedro da Silva. Publicado em 13/05/2019. Organização responsável pelo periódico: FURB.

ABSTRACT

This article investigates the moderation role of market structure on the relationship between operational performance and firms' costs composition. The Herfindahl-Hirschman Index (HHI) were adopted as proxy for market structure; for operational performance, Return on Invested Capital (ROIC); and for firms' cost choices, the Degree of Operating Leverage (DOL). The database covers non-financial firms at Brazilian market from 1996 to 2016, third quarter. The output points toward to market structure moderation of the relationship between ROIC and DOL with an increase of the effect when markets move to a monopolistic structure. Overall results suggest the existence of a relation between firms' operational performance and cost behavior, indicated by a negative relationship between ROIC and DOL. Furthermore, we notice a moderating role of Size on market structure (HHI) moderation role on the relationship between ROIC and DOL, in the extent that market structure moves towards a higher concentration level configuration, the moderating effect of HHI becomes more latent.

Keywords: Degree of operating leverage; Return on invested capital; Market structure; Size Moderation.

RESUMO

O artigo investiga o papel de moderação da estrutura de mercado na relação entre desempenho operacional e composição dos custos das empresas. Como proxy para a estrutura de mercado, adotou-se o Índice Herfindahl-Hirschman (HHI); para o desempenho operacional, foi utilizado como proxy o retorno sobre o capital investido (ROIC); e para composição dos custos das empresas, o Grau de Alavancagem Operacional (DOL). Os dados abrangem empresas não financeiras no mercado brasileiro de 1996 a 2016, terceiro trimestre. Resultados apontam para uma moderação da estrutura de mercado na relação entre ROIC e DOL, tendo maior efeito à medida que os mercados se aproximam de uma estrutura monopolística. Resultados indicam uma relação negativa entre ROIC e DOL. Observa-se, também, um papel moderador significativo do Tamanho na função de moderação da estrutura de mercado (HHI) na relação entre ROIC e DOL, na medida em que a estrutura do mercado avança para configurações próximas do monopólio, o efeito moderador HHI torna-se mais latente.

Palavras-chave: Grau de Alavancagem Operacional; Retorno sobre o capital investido; Estruturas de mercado; Tamanho; Moderação.

RESUMEN

El artículo investiga el papel de moderación de la estructura de mercado en la relación entre desempeño operacional y composición de los costos de las empresas. Como proxy para la estructura de mercado, se adoptó el Índice Herfindahl-Hirschman (HHI); para el desempeño operacional, se utilizó como proxy el retorno sobre el capital invertido (ROIC); y para la composición de los costes de las empresas, el Grado de apalancamiento operativo (DOL). Los datos cubren empresas no financieras en el mercado brasileño de 1996 a 2016, tercer trimestre. Los resultados apuntan a una moderación de la estructura de mercado en la relación entre ROIC y DOL, teniendo mayor efecto hay medida que los mercados se aproximan a una estructura monopolística. Los resultados indican una relación negativa entre ROIC y DOL. Se observa, también, un papel moderador significativo del tamaño en la función de moderación de la estructura de mercado (HHI) en la relación entre ROIC y DOL, en la medida en que la estructura del mercado avanza hacia configuraciones cercanas al monopolio, el efecto moderador HHI hace más latente.

Palabras clave: Grado de apalancamiento operativo; Retorno sobre el capital invertido; Estructuras de mercado; Tamaño; La moderación.

1. INTRODUCTION

This research examines the moderating role of market structure on the relationship between firm operational performance and the cost structure, using return on invested capital (ROIC) as a proxy for firm operational performance and the degree of operating leverage (DOL) as proxy for cost behavior, for non-financial Brazilian public firms.

Nonfinancial measures are the leading indicators for financial performance, according to Banker and Mashruwala (2007), which justifies the using for evaluation performance. We adopt the Cost-Volume-Profit (CVP) approach, according to the neoclassical economic theory of markets at equilibrium (FRANÇA; LUSTOSA, 2011; LUSTOSA; FRANÇA, 2012). We follow Mandelker and Rhee (MANDELKER; RHEE, 1984), Tabak and Guerra (TABAK; GUERRA, 2007), Dantas, Medeiros and Lustosa (DANTAS; DE MEDEIROS; LUSTOSA, 2006) using the DOL as a metric of firm operating risk to study the Brazilian market, and Simons (1999) using ROIC as proxy for operational performance.

We found that market structure moderates the relation between DOL and ROIC when competition level decreases. However, DOL responds to operational performance in our sectors independently of the sectors competition level. The introduction of Size as a moderating variable of the Herfindahl-Hirschman Index (HHI) moderating role, also aligns with the Porter (1979) and Marcus (1969) findings that indicates the importance of analyzing the size impact on profitability of firms within an industry.

Under a deterministic microeconomic analysis, firms in perfectly competitive markets are price-takers, which means that they have to operate with the ratio $\frac{MR}{MC}$ close to one to have a positive Contribution Margin (CM) and to be more profitable (LUSTOSA; FRANÇA, 2012). On the other hand, firms operating with high monopoly power tend to operate outside the economic equilibrium point where marginal costs and marginal revenues ratio is equal to one, since they are price-makers. For example, monopolistic firms may operate with idle capacity to respond market demand fluctuations or use this idle capacity as an entry barrier (THOMPSON JR.; FORMBY, 2002), which do not correspond to a perfect market equilibrium and may lead to worse operational performance. Assuming the managers to be risk-takers in order to increase firm revenues, the firm leverage over its systematic risk can be measured by DOL (GAHLON, 1981; HUFFMAN, 1983; CHUNG, 1989; DUGAN; MINYARD; SHRIVER, 1994; GRIFFIN; DUGAN, 2003; HODGIN; KIYMAZ, 2005;).

The CVP approach origins from the neoclassical economic theory (WICKRAMASINGHE; ALAWATTAGE, 2007) and this addresses allocation problems, since managers face the economic problem of scarcity (DOPUCH; BIRNBERG, 1969; KARNANI, 1983). The CVP premise that firms operate in a perfectly competitive or monopolistic market (KARNANI, 1983) convey the investigation of the impact of market structure on the relation between operational risk and operational returns. Then, this paper aims to identify the moderating role of market structure on the relationship between firm's operational performance and the degree of operating leverage.

Following Adar and Barnea (1977) construction of CM, we may expect that firms adjust their production considering the market they compete in. Firms that compete in markets with higher competition level tend to present better overall performance when they adjust their DOL to a lower level (LUSTOSA; FRANÇA, 2012), maximizing the production factors usage. Empirical research on operating leverage in Brazilian market is still incipient, with few evidences of this issue in

emergent market (DANTAS; MEDEIROS; LUSTOSA, 2006; FRANÇA, 2012; LUSTOSA; FRANÇA, 2012). This pioneering study offers a solid contribution for the literature by providing a model relied on the microeconomic theory that supports the CVP (accounting) approach.

The remainder of this paper is organized as follows. Section 2 provides a literature review and develops our hypotheses. Section 3 describes the research methodology. Our results are presented in Section 4, with descriptive analysis and Section 5, with the models and econometric issues. Section 6 concludes with a summary and discussion.

2. HYPOTHESES DEVELOPMENT

2.1 Market structure

The economic theory of the firm analyze the relation between a single firm and its industry, and this states the output result to be the outcome of the market forces, considering market price (ALDRICH; PFEFFER, 1976). Differences in market-structure impact on price and production decisions of competing firms on their industries (MAS-COLELL; WHINSTON; GREEN, 1995). Under this concept, Besanko (2006) argues that the firm relies on its conduct to consider the market competitiveness. Moreover, at perfectly competition, accounting numbers and economic theory are able to converge (BEAVER; DEMSKI, 1979), since there are no opportunity costs and we can identify that firms as price-takers and consider the ratio $\frac{MR}{MC}$ to be equal to 1 (FRANÇA, 2012).

Competition level and market-share are both broadly studied due to its relevance for the firm management decisions and profitability generation capability (GALE, 1972; RHOADES, 1993; SCHERER, 1965; SHEPHERD, 1972). In addition, Hall (2004) shows that changes in economic conditions imposes significant limitation to firms so that the competition plays a moderating effect between nonfinancial indicators and financial performance (BANKER; MASHRUWALA, 2007). Banker and Mashruwala (2007) also show that nonfinancial performance measures make sense in higher competitive markets, since the market structure empowers consumers and employees to choose between different firms. However, in near monopoly markets, that affirmative may not be true due to the opposite reasons.

2.2 Size

Consider the impact of Size on firms' performance led to diverse evidences. Literature shows that size plays a major variable for firm's performance and for the study of performance at industry context, in both microeconomic theory and industrial organizational (BESANKO et al., 2006; PORTER, 1979), with firms inserted in a causality chain where firm's size influences its performance (THOMPONSON; FORMBY, 1996). However, under an operational perspective, Size may lay different roles.

Fiegenbaum and Karnani (1991) pointed the necessity of big firms to operate with intense exploration of economies of scale. Also, the study emphasizes that there is a trade-off between size and volume flexibility, where small firms have the advantage of flexibility on sales volume compared to the biggest firms. Since the smaller firms do not incurs in economies of scale, managers are encouraged to perceive better performance by other means.

Marcus (1969) findings indicates an erratic relationship between firm size and profitability within an industry, with some firms showing a positive relationship and others showing a negative relationship. Due to prior literature, we believe that size acts as a moderator of the moderating role of market structure on the relationship between DOL and operational performance, exerting a double-moderating effect.

2.3 The cost-volume-profit analysis

The CVP analysis deals with the classical economic problem about the optimal level and output mix for the firm, assuming that as long as the firm has a set of resources and, at least, one cost is fixed. The accounting cost structure analysis has the necessary characteristics to be a proxy for the economic short run model, characterized by the emphasis on costs and revenue behavior over a set of variations of mix and outputs levels (DOPUCH; BIRNBERG, 1969). The CVP analysis is a simple analytical tool for management decisions (GUIDRY; HORRIGAN; CRAYCRAFT, 1998) that provides a wide financial overview of firms' decision process (HORNGREN; FOSTER; DATAR, 1994).

The intersection between the curves of Sales Prices and Total Cost indicates the firm's accounting break-even point, measured by $\mathrm{BE} = \left(\frac{\mathrm{FC_t}}{\mathrm{CM_{unit}}}\right)$, where BE are the break-even point, which is represented in terms of volume, since the denominator has unitary volume representation; $\mathrm{FC_t}$ total fixed costs and fixes expenses; and, CM – or Contribution Margin – which is represented at unitary terms.

At this point, the revenue is equalized to costs, indicating the minimum volume of revenue not to incur in losses. In turn, the marginal revenue relates to each additional unit of production sold, with a sales price function $\mathrm{MR} = \int(\mathrm{SP})$, where MR is the Marginal Revenue and SP represent the sales prices. When firms operate at full capacity, CM and sales increasing are negatively associated since it indicates the necessity of new investments, and following this argument, idle capacity may increase the profit margin of the firm by an increase in sales (JORGENSEN; SADKA; LI, 2009).

The DOL can be used as a risk metric (HUFFMAN, 1983) since that differences in production process impacts on fixed and variable costs share (LEV, 1974), answering to the firm returns as shown in prior literature (MCDANIEL, 1984; NOVY-MARX, 2011; PERCIVAL, 1974).

2.4 Return on invested capital – ROIC

The Return on Invested Capital is an accounting metric that reflects the performance of a firm in a given period, regardless of the financial flow linked to the operation (PENMAN, 2010). Empirical researches that are based on the accounting model, adopt proxies from the accounting statements to analyze the effects of managers decisions and firms' characteristics to compare performance and indicates that firms' specific characteristics have major impact on performance than industry characteristics. Accounting numbers allow the users to recognize the firm performance by means of return indexes, such as the Return over Assets (ROA), Return over Equity (ROE) and the Return over Invested Capital – ROIC.

The ROIC excludes the interests and taxes effects, in order to isolate the operational return of the available operational resources to the firm (CHEN; HUANG, 2006; GOLDSZMIDT, 2010; HOUGH, 2006; MISANGYI et al., 2006; SIMONS, 1999). Chen and Huang (2006) argues that such number better reflects the firm operational decision making and, then, it should be preferred in relation to the metrics based on total assets or the equity. Also, this configures as a relation between operational profits and operational revenues, acting as a reliable investment decision indicator.

2.5 Hypotheses

At Brazilian capital market, the relationship between returns and DOL has been studied by Tabak and Guerra (2002), Dantas *et al.* (2006), Lustosa and França (2011) and França and Lustosa (2012). França and Lustosa (2012) points that in a near competitive market that is a negative relationship between DOL and returns. Considering DOL as a metric of operational risk, as shown by Gahlon (1981), we hypothesize that:

H1 – There is an association between the Degree of Operation Leverage and the Operational Performance.

Nature and degree of competition shapes firms' strategy (PORTER, 1989). Considering that market structure impacts on firms' costs behavior and industry returns. Then, we hypothesize that:

H2 – The relation between operational return and cost behavior is moderated by the market structure, measured by market competition level

As literature suggests, size may have significant impact on firm performance, as source of organization costs (SHEPHERD, 1972) or as source of scale economies (BESANKO, 2006; THOMPSON; FORMBY, 2002; VARIAN, 2006). Considering the relation between organizational variables and economic variables and that firms' size may influence on firms' operational performance and market structure, we hypothesize that:

H3 – Market competition level moderation of the relationship between operational return and cost behavior is moderated by firms' size.

The following chapter presents the applied methods, in order to define our sample, the variables construction, and the applied econometric issues.

3 METHOD

3.1 Performance measurement: return on invested capital

We use the ROIC as a performance measurement in order to capture the operational approach of the firm and its sensitivity or exposure to different cost structure (SIMONS, 1999)**:**

$$ROIC = \frac{EBITDA_t}{Asset_{Adj\ t}} \quad (1)$$

this research aims to study firm operational performance, detached from the exposure to taxes among industries. The Earnings before interests, taxes, depreciation, and amortization (EBITDA) overrides other profit lines on the income statement, such as NOPLAT, NOPAT, EBIT or Net Income, due to its alignment with the research purposes.

3.2 Degree of operating leverage

The Degree of Operating Leverage means the sensitivity of income to a variation of the revenues. We follow Garrison and Noreen (2001) to calculate the traditional observed DOL:

$$\frac{\Delta OI_{i,t}}{\Delta(NR_{i,t})} \quad (2)$$

where $OI_{i,t}$ is the operating income of firm *i* at quarter *t*; and, $NR_{i,t}$ is the net revenue of firm *i* at quarter *t*. The variable aim to capture how market reacts to results of managerial decisions regarding firm costs structure.

3.3 Market structure

Dhaliwal *et al*. (2008) and Gjerde *et al.* (2002) concurs that industry specific facts exert impact on firm performance variability. In this perspective, we use the Herfindhal-Hirshman as a metric of product market competition. Following Besanko et al. (2006)**,** we adopt the function:

$$HHI = \sum_{i=1}^{n} (Market - share_i)^2 \quad (3)$$

where *Market-share* is the net operating revenue of a firm *i* (or its total assets) scaled by the total of the industry. Kelly (1981) and Rhoads (1993) agree that the Herfindhal Index ought to be carefully interpreted due to its limitations, such as requiring public data of each firm, which is unavailable.

Besanko et al. (2006) consider the relative size of the biggest firms to be a major factor on the management and, consequently, on the performance. Then, the information quality conveyed by the HHI justifies its usefulness.

3.4 Size

Size has been subject of analysis over the years. Shepherd (1972), Hansen and Wenerfelt (1989), Li and Hwang (2011) evidence the effect of firm size on operating performance, and on the capacity of generate performance (VITHESSONTHI; TONGURAI, 2015). However, Lever (1996), Chuang (1999) and Pull (2003) shows a counter-hypothesis, denoting that Size plays a negative role on firm's performance. Moreover, Ibhagui and Olokoyo (2018) evidence this association to be negative for small firms and the opposite for larger firms.

In this study, the firm's size is given by the following equation:

$$Size = Firm's\ total\ assets - Mean\ sector's\ asset \quad (4)$$

To understand the role of Size at Brazilian market on the relationship between DOL and operational performance we will address the question by observing Size as a moderating variable of the relationship between DOL and ROIC.

4 DESCRIPTIVE STATISTICS

4.1 Data selection and treatment

Firms listed at the Brazilian Stock Exchange between 1996 and 2016 compose the sample, totalizing 879 firms. The characteristics of our research and characteristics of some sectors demand not to consider all database. As consequence were excluded *Finance and Insurance* and *Funds* sectors due to their specific regulations; *Others* sector due to the difficult to stablish firm market competition level; *Energy* sector exclusion is due to the strong regulation and other industry specific characteristics; and, *Software and data* sector due to the reduced number of observations. After the exclusions, 419 firms remained, totalizing 47,67% of the original sample.

All data were non-consolidated and obtained at Economatica® and Comdinheiro®, specialized databases for market information. In addition, negative results were also excluded from our database. The same treatment was applied to missing values. Table 1 shows the number of excluded observations:

Table 1 - Sample selection process

Excluded Observations	Number of Observations
Original sample	26.571
Negative Gross Revenue	1.709
Negative EBIT	10.665
Negative Net Revenue	37
Other negative results or missing values	663
Total	13.497

Source: Author

From the original 26.571 observations that remained after our first sample selection by exclusion of subsectors, we found 13.497 observations that compose the Full Sample after the second sample selection.

Previous analysis (available upon request) on the dependent variable shows the ROIC mean greater than median, which suggest a significant skewness (97,71135) and a kurtosis (10.651,46). In addition, there is a large distance between median and maximum value, denoting an asymmetry distribution, which leads to a high standard deviation, indicating presence of outliers on the distribution. Outliers may disturb the regression significance, and the selected procedure was the exclusion of outliers.

Considering that the variables variance allows to standardize the DOL and Size variables, we were able to put those variables in range. The procedure increases the data quality since it provides a sensible unit scale. In this sense *"*Scaling should be performed in such a way that the variances of the measurements reflect their relative importance" (KRESTA; MACGREGOR; MARLIN, 1991, p. 44), which is what we aim to capture with those variables in our research. Table 2 shows the final sample descriptive statistics:

Table 2 - Descriptive Statistics

Stats	$ROIC_C$	DOL_{RG}	HHI	$SIZE_{RG}$
Num. of Observation	13,497	13,497	13,497	13,497
Mean	-0.7925132	0.0094421	0.2583533	0.0875421
Standard Deviation	7.813952	0.0457071	0.176205	0.1570579
Kurtosis	602.7083	326.3715	6.750022	14.36719
Skewness	18.54133	16.55806	1.698413	3.217954
Coef. of Variation	-9.859712	4.840796	0.6820311	1.794085
Minimum	-18.93342	0	0.0677249	0
Maximum	353.9422	1	0.8766502	1
p25	-2.679531	0.0010099	0.1276707	0.0073415
p50	-1.490238	0.0021058	0.2569522	0.0284723
p75	0.1536622	0.0066064	0.3479501	0.0866556

Notes: **(i)** $ROIC_c$ represents the centered Return on Invested Capital; **(ii)** DOL_{rg} represents the Degree of Operating Leverage in range; **(iii) HHI** represents the Herfindah-Hirschman Index, which contemplates the market competition level on the sector; and, **(iv)** $Size_{rg}$ represents the firm size in range.

Differences between sectors structure lead to differences on firm operational return demands. Centering the variable waives the real and effective number in order to allow a more trusted analysis since the comparability analysis refers to the distance of firms' ROIC from the sector's ROIC mean. The outlier exclusions solved the high standard deviation and mean greater than median problems with the dependent variable, allowing considering ROIC in range.

The results do not show multicollinearity problems between the variables. Varying between -1 and 1, any result close to the extreme points indicates a strong positive (negative) correlation between the variables.

Table 4 – Pearson Correlation Matrix

	$ROIC_c$	**DOL_{rg}**	**$Size_{rg}$**	**HHI**
$ROIC_c$	1			
DOL_{rg}	-0.0649***	1		
$Size_{rg}$	-0.0137*	-0.0239***	1	
HHI	0.000000	0.138***	0.0937***	1
Observations	35.324			

Notes: **(i) $ROIC_c$** represents the centered Return On Invested Capital; **(ii) DOL_{rg}** represents the Degree of Operating Leverage in range; **(iii) $Size_{rg}$** represents the firm size in range; **(iv) HHI** represents the Herfindah-Hirschman Index, which contemplates the market competition level on the sector.

The Pearson correlation matrix for the numeric variables used in the models indicates the absence of high correlation between independent variables, which indicates the absence of multicollinearity problem (HAIR et al., 2005). We also confirmed this issue by the Variance Inflation Mean (VIF) of 5.25 denoting that the variables do not show multicollinearity problems, once this number is lower than 10 (FÁVERO et al., 2009).

4.2 Market structure

We follow (BESANKO et al., 2004) to categorize the sectors considering the observed mean HHI. Industry and Commerce subsectors of our sample as classified as Oligopolistic markets. The Services sector, however, as monopolistic market. Table 3 summarizes the sample:

Table 3 - Market Structure

Sectors	**Observations**	**Mean**	**Classification**
Industry	19,573	0.4317	Oligopoly
Commerce	2,563	0.5690	Oligopoly
Services	6,426	0.6690	Monopoly
Full Sample	28,562	0.5540	Oligopoly

Source: Author

Despite the difficulties when considering data quality for the Brazilian market, such as the low number of observations or the high level of concentration, these results shed lights to the firm's choices and to the consequent analysis of the its impacts and this also indicates those firms that conducted the best output on the period.

4.3 Models and Econometric Issues

To test the hypotheses 1, the study demands the estimation of the models 1 and 2:

$$ROIC_{i,t} = \beta_0 + \beta_1 DOL_{i,t} + \beta_2 HHI_{i,t} + \varepsilon_{i,t}$$

Where $ROIC_{i,t}$ means the Operational return over invested capital of the firm *i* at the quarter *t*; $DOL_{i,t}$ represents the degree of operational leverage for firm *i* at the quarter *t*; and, HHI represents

the Herfindahl-Hirschman Index for firm *i* at the quarter *t*. We test both DOL variable in order to determine the most significant coefficient to proceed our main analysis with HHI as control variable. According to the arguments exposed in section 2.3, we expect a positively relation between DOL and ROIC.

In addition, we estimate the model 2:

$$ROIC_{i,t} = \beta_0 + \beta_1 DOL_{i,t} + \beta_2 HHI_{i,t} + \beta_3 Size_{i,t} + \varepsilon_{i,t}$$

Where $Size_{i,t}$ represents firms' size of firm *i* at the quarter *t*; with the addition of Size at the model as control variable we expect to verify the impact of Size at firm's operational performance.

To test the second and third hypothesis, we estimate the model 3:

$$ROIC_{i,t} = \beta_0 + \beta_1 DOL_{i,t} + \beta_2 HHI_{i,t} + \beta_3 Size_{i,t} + \beta_4 DOL_{i,t} * HHI_{i,t} + \beta_5 DOL_{i,t} * Size_{i,t} + \beta_6 HHI_{i,t} * Size_{i,t} + \beta_7 DOL_{i,t} * HHI_{i,t} * Size_{i,t} + \varepsilon_{i,t}$$

Where we test the moderating role of market structure on this relationship. Then, we expect the β_4 to be negatively related with the dependent variable, and this will weak the significance of the β_1 coefficient. In addition, with the β_7 we analyze the existence of Size moderation at the moderating role of market structure on the relationship between operational performance and cost behavior. We use the proxies represented on Table 5.

Table 5 - Variables description

	Variable	Expected signal	Name	Description	Reference	Syntax
Interest Variable	Return on Invested Capital	Dependent Variable	ROIC	Captures operational performance of the firm, detached from the exposure among the industries.	(SIMONS, 1999; GOLDSZMIDT, 2010)	$ROIC = \frac{EBITDA_t}{Asset\_Adj_t}$
	Degree of Operating Leverage	Negative	DOL	Captures income sensitivity to a variation of the revenues.	(GARRISON. NOREEN, 2001)	$\frac{\Delta OI_{i,t}}{\Delta [\![(NR)]\!]_{it}}$
Moderating Variables	Market Structure	?	HHI	Captures market structure and its impacts on firms' operational performance.	(BESANKO, 2006)	$HHI = \sum_{i=1}^{n} (Market - share_i)^2$
	Size	Positive	SIZE	Captures the impact of size on the moderating role of market competition of the relationship between DOL and ROIC.	(MARCUS, 1969; PORTER, 1979)	$Size = Firm's\ total\ assets - Mean\ sector's\ asset$

We consider there is no evidences enough, to expect a signal for Market Structure on the Dependent Variable, aligned with the exploratory purpose of the paper. All following models are estimated with White robustness correction to heteroskedasticity.

4.4 Full sample model

We run the regression for the Full Sample, subdivided in three models that contemplates all variables. The model (1) considers the relation of DOL, with HHI as control variable, with firms' operational performance. Considering the relation between plant size and cost structure with firms' operational performance and the possible impact on firms' cost structure choices, model (2) adds Size as control variable to measure the impact of firms' structure on ROIC. Model (3) includes the moderation of HHI and double-moderation HHI-Size on the analysis to answer to the second and third hypotheses.

We find a negative signal for DOL in model (1), and compared to the mean, an increase on DOL impacts negatively on firms' operational performance at 1% of alfa. For the HHI variable, at 1% level, we find that more competition relates negatively with ROIC, which aligns with previous results on the relationship between DOL and performance at Brazilian market. More competition leads to lower economic profit. When market are in perfect competition there is no opportunity costs and all firms operates on MR and MC ratio equal to 1, with no abnormal profit (VARIAN, 2006).

Including Size as control variable in our model (2), however, do not alters the regression output and the variable do not show statistical significance. In addition, it does not alter HHI significance, signal or coefficient magnitude. For DOL, significance and signal remain the same, but it does have a subtle impact on DOL's coefficient, which indicates that Size plays a role on the relationship between degree of operating leverage and firms' operational performance. The third model includes HHI as proxy for market structure moderating the relationship between DOL and ROIC, and Size as a moderating variable of the HHI moderation. For our full sample, the moderating role of market structure on the relationship between DOL and ROIC do not show statistical significance, not even when moderated by Size. However, literature suggest that the heterogeneity between different sectors and market structure may have a major role in the absence of statistical significance (HANSEN; WERNERFELT, 1989; PORTER, 1979, 1989; SHEPHERD, 1972), especially when we consider the assumption of perfect competition or monopoly where the DOL roots (WICKRAMASINGHE; ALAWATTAGE, 2007).

4.5 Model by sectors

McGahan and Porter (1997) shows that profitability has a complex relationship with different characteristics, as industry effects, and how those variables impact on profitability depends of firms' sector. Following the argument, we divided our sample in three major groups: Industry, Commerce, and Services. The subdivision relies on the difference of structures for those three major groups. At Table 5 we can visualize that the variable signals for DOL, HHI, and Size for all sectors remains the same as for the full sample regression. In addition, for the model (1) we have a reduction on statistical significance for DOL variable in Commerce and Services groups.

For the Commerce and Service groups, we found in model (1) that market structure highly influences on firms' operational performance, *ceteris paribus*, more than Industry sector, as captured by HHI coefficients on the regression. We can also interpret the HHI coefficient at model (1) for Full Sample regression in the same way. On model (2), we can identify that Size have statistically significance at 1% as a controlling variable for Commerce and Services sector, with negative signal for both groups which indicates that firm structure have different impacts between sectors and is aligned with the expectancy of increase on models' relevance with segmented sample.

Table 5 – Outputs subdivided by sectors

Variables	***Full_Sample***			***Industry***			***Commerce***			***Services***		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Constant	**1.924*****	**1.90****	**2.667*****	**1.158*****	**1.186*****	**0.916*****	**6.357*****	**6.487*****	**6.120*****	**4.769*****	**5.290*****	**3.862*****
	(17.05)	(16.40)	(15.34)	(8.902)	(8.715)	(5.184)	(45.14)	(42.15)	(12.16)	(9.635)	(8.496)	(16.24)
DOL	**-6.533*****	**-6.506*****	**-6.946*****	**-7.378*****	**-7.441*****	**-6.195***	**-10.35***	**-10.42***	-24.84	**-7.060****	**-7.729****	8.729
	(-7.075)	**(-7.045)**	**(-3.161)**	**(-7.133)**	**(-7.129)**	**(-1.772)**	**(-1.824)**	**(-1.837)**	(-0.514)	**(-2.148)**	**(-2.254)**	(1.609)
HHI	**-10.28*****	**-10.28*****	**-11.07*****	**-7.107*****	**-7.090*****	**-6.226*****	**-25.10*****	**-25.25*****	**-23.91*****	**-16.99*****	**-17.11*****	**-17.81*****
	(-25.34)	**(-25.36)**	**(-22.00)**	**(-14.96)**	**(-14.99)**	**(-9.634)**	**(-80.40)**	**(-78.81)**	**(-13.08)**	**(-17.58)**	**(-16.86)**	**(-26.24)**
Size		0.156	**-2.371*****		-0.318	**1.417****		**-0.911*****	-502.6		**-5.652*****	**-16.41*****
		(0.708)	**(-3.646)**		(-1.240)	**(2.037)**		**(-2.747)**	(-0.964)		**(-3.275)**	**(-13.13)**
DOL * HHI			1.570			-5.327			59.64			**-19.21*****
			(0.219)			(-0.435)			(0.331)			**(-2.917)**
HHI * Size			**7.656*****			**-5.397****			1,896			**44.69*****
			(3.133)			**(-2.020)**			(0.963)			**(13.84)**
DOL * HHI * Size			-82.15			-29.66			**-356,666***			**687.1*****
			(-1.135)			(-0.393)			**(-1.800)**			**(3.366)**
DOL * Size			29.79			30.65			**94,411***			**-312.5*****
			(1.031)			(0.836)			**(1.799)**			**(-3.030)**
Observations	13497	13497	13497	7435	7435	7435	1141	1141	1141	2137	2137	2137
R²	17.70%	17.70%	18.00%	10.50%	10.60%	10.80%	64.80%	65.00%	65.30%	6.00%	6.30%	36.50%
Adjusted R²	17.60%	17.60%	17.90%	10.50%	10.50%	10.80%	64.70%	64.90%	65.00%	5.93%	6.16%	36.20%
Industry Control	No	No	No	No	No	No	No	No	No	No	No	No
F-Stat	367.2	245.9	116.5	151.6	101.4	51.15	3295	2200	.	162.0	113.4	116.7

Notes: Robust t-statistics in parentheses *** p<0.01, ** p<0.05, * p<0.1. (1) for Model (1) that represents DOL and HHI regressed against ROIC; (2) for Model (2) that represents DOL, HHI and Size regressed against ROIC; (3) for Model (3) that represents DOL, HHI, Size, DOL*HHI and DOL*HHI*Size regressed against ROIC.

The addition of Size as controlling variable led to slightly difference in HHI and DOL coefficients, without any signal changes. The model (3) is our main model, and we subdivided the analysis in three sectors to a better understand of our findings and to allow us to compare with our full sample. The model (3) aim to capture the moderating effect of market structure on the relationship between DOL and ROIC and analyze the double-moderation role exert by Size on market structure moderation of the relationship between ROIC and DOL.

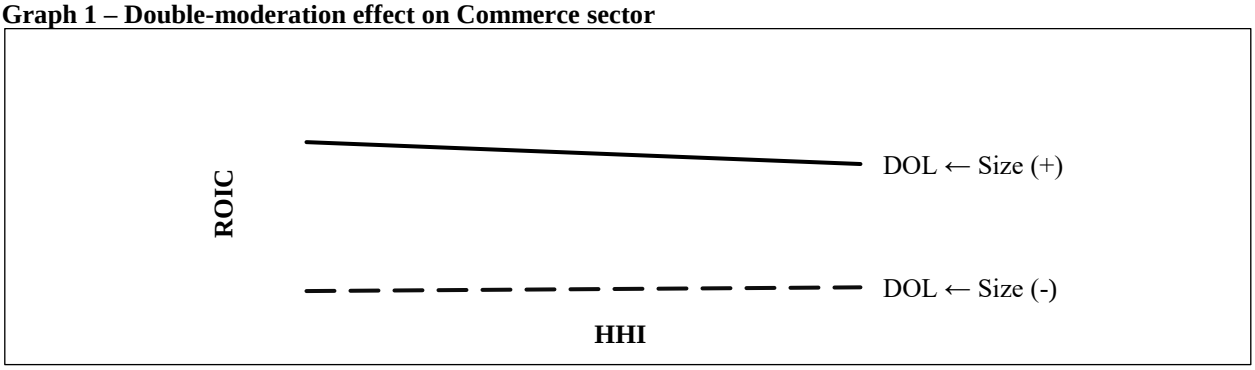
We present the model's output subdivided by sectors and between our three models. HAIR *et. al*. (2008) states that moderating effect occurs when an independent variable can affect a regression by changing the relation between the independent variable of the regression and a dependent variable when the value of the moderator variable changes.

4.6 Industry

Observing the outputs for Full Sample regression, we found that HHI, DOL, and Size are statistically significant at model (3). For the Industry subsector, we can point that DOL are statistically significant at 10% level with a negative signal, with reduction on significance level and subtle change on coefficient when compared with our Full Sample, which indicates a reduction of DOL role on performance at Industry sector. The HHI is statistically significant at 1% level with negative signal. Comparing with Full Sample, we also observed a reduction of coefficient, indicating that in the Industry sector the impact of market structure is perceived with lower intensity when compared with our Full Sample. At model 3, Size shows some alterations in comparison with our Full Sample: Size as controlling variable become statistically significant at 5% level, with a positive sign, in comparison with the Full Sample regression.

The output for Size shows that larger firms in Industry sector have better operational performance when compared with the sectors mean, *ceteris paribus*, which indicates that firms may profit from positive economies of scale due to increase on firms' margin by reducing unitary costs. Only Industry sector shows a positive sign and statistically significant coefficient for Size, indicating that this sector has characteristics that differentiates from the others. Market structure do not exert a moderating role on the relationship between DOL and ROIC, not even under double-moderation, as indicated by the absence of statistical significance for both variables (DOL*HHI and DOL*HHI*Size), leading to the rejection of the H_2 and H_3 for Industry.

Graph 1 – Double-moderation effect on Commerce sector



Notes: **(i)** Double-moderation DOL ← Size represents DOL*HHI*Size variable; **(ii) ROIC** represents the centered Return On Invested Capital; **(iii) DOL** represents the Degree of Operating Leverage in range; **(iv) HHI** represents the Herfindah-Hirschman Index, which contemplates the market competition level on the sector; and, **(v) Size** represents the firm size in range

4.7 Commerce

In Commerce sector, at model (3), DOL do not present statistical significance; the HHI coefficient maintain its statistical significance at 1% level with negative signal; and, Size does not show statistical significance.

That indicates an important role of market structure at Commerce sector, due to the absence of significance for DOL, which represents firms' cost structure, or for Size. We can visualize the effect looking at the extreme points of the Graph 1 lines. The impact of market structure on the relationship between operational performance and costs behavior is shows by the tendency of the relation when occurs a reduction on market competition. The continuous line indicates firms with higher DOL*Size, and the dotted line, those firms with lower DOL*Size:

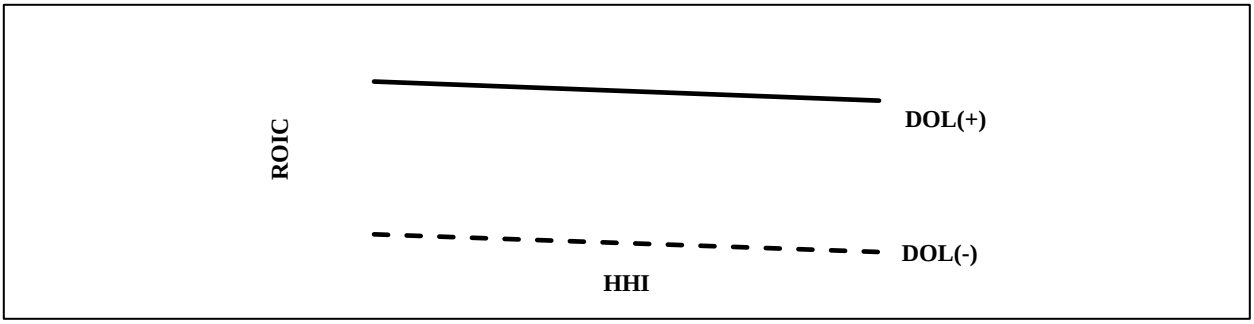
Graph 1 shows that, on mean, firms with higher DOL shows greater mean returns when compared with firms with lower DOL on Commerce sector. The double-moderation lead to differential effects on the relationship between DOL and ROIC. As the sector walks toward monopoly, larger firms show a negative tendency while smaller companies show a positive tendency, at mean. In addition, the lines slope indicates that bigger firms' operational performance is more sensitive to a decrease on competitiveness than the smaller firms are.

4.8 Services

The Services sector do not show statistical significance for DOL in our model (3), differing from our Full Sample. Market structure seems to have more important rule than firms' cost behavior on firm operational returns, considering the statistical significance of HHI. However, on Services sector Size is statistically significant at 1%. It indicates that a decrease of competitiveness and lead to a reduction of firms' operational performance when compared to sector mean.

When compared with our Full Sample, we can observe that HHI have more influence on firms' operational performance due to the decrease of coefficient. In addition, the models output shows for Size statistical significance at 1% level and coefficient decrease, which indicates that larger firms have worse operational performance than mean in Services sector.

Graph 2 – Moderation of Market Structure on Services sector



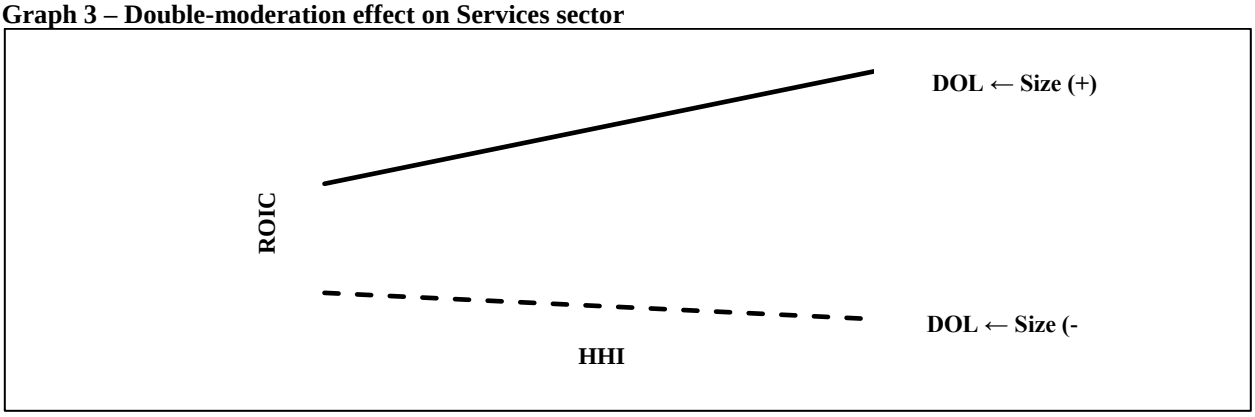
Notes: **(i)** The-moderation DOL represents DOL*HHI variable; **(ii) ROIC** represents the centered Return On Invested Capital; **(iii) DOL** represents the Degree of Operating Leverage in range; and, **(iv) HHI** represents the Herfindahl-Hirschman Index, which contemplates the market competition level on the sector.

For Services sector we found statistical significance for the moderating effect of market structure on the relationship between ROIC and DOL. The result differs from our Full Sample, Industry and Commerce outputs where no statistical significance where found. At Services sector, the moderating role of market structure on the relationship between DOL and ROIC shows statistical significance at 1% level and negative sign. Graph 2 provide us with a comparable mean and tendencies acting as a guide to understand the regression output:

Graph 2 shows that, on mean, firms with higher DOL shows greater mean operational returns when compared with firms with lower DOL. When we consider the moderating effect of market structure on the relation between ROIC and DOL, the model suggests that with a decrease on competition level of the sector, firms perceive a reduction of the effect of DOL on firms' ROIC.

When we add Size on the regression, as a double-moderation of the relationship between ROIC and DOL, it presents statistical significance at 1% level and with positive sign. Graph 3 shows the effect of the double-moderation on Services sector. On mean, firms with higher DOL shows greater mean operational returns when compared with firms with lower DOL. Size double-moderation on the relation between ROIC and DOL lead to a dispersive behavior of the relationship between DOL and ROIC when we compare the larger firms with smaller firms. As the sector walks toward monopoly, larger firms show a positive tendency while smaller companies show a negative tendency, at mean.

Graph 3 – Double-moderation effect on Services sector



Notes: **(i)** Double-moderation DOL ← Size represents DOL*HHI*Size variable; **(ii) ROIC** represents the centered Return On Invested Capital; **(iii) DOL** represents the Degree of Operating Leverage in range; **(iv) HHI** represents the Herfindah-Hirschman Index, which contemplates the market competition level on the sector; and, **(v) Size** represents the firm size in range

The output suggests that Size variable moderates the market structure moderation on the relationship between DOL and ROIC for Services sector, with the opposite effect of the effect founded for Commerce sector.

5. CONCLUSION

In this paper, we attempted to fill the gap in the literature by examining the moderating role of market structure (BESANKO et al., 2006; PORTER, 1989) on the relationship between firm's operational performance and the degree of operating leverage (HORNGREN, 1972; WICKRAMASINGHE; ALAWATTAGE, 2007), according to the microeconomic firm theory (ALDRICH; PFEFFER, 1976; MAS-COLELL; WHINSTON; GREEN, 1995). Our findings suggest that market structure exert a moderator effect on the relation between DOL and ROIC, with an increase of the moderation effect when competition level decreases.

The findings are in accordance with the literature that indicates that perfect markets are an assumption of the CVP analysis, and this result recommends managers to consider the market structure constraints when using this managerial tool. In addition, the results point toward a firms' production adjustment considering the market structure in which firms compete.

Following previous researches at Brazilian capital markets that approach the relation between DOL and operating returns (DANTAS; MEDEIROS; LUSTOSA, 2006; FRANÇA, 2012;

LUSTOSA; FRANÇA, 2012), we confirm this relation between ROIC and DOL to be negative, and we provide a step forward evidencing this relation to hold for all activity sectors. Our findings show that an increase of operating leverage leads to a worse operational performance when compared with sector mean. Moreover, results indicate the existence of a moderating effect of market structure on firms' operational performance.

This finding highlights that market structure is the only variable in our model that remains significant in all sectors and all models. The outcome, always with negative signal, indicates that the lower the competitiveness the lower the operational returns when compared to sector mean.

This result contributes to managers and practitioners to posit a cautiously interpretation due to the characteristics of Brazilian market and proxy limitations. The market structure of Industry and Commerce sectors where classified as oligopoly, with Services walking toward a monopoly

Size, as control variable, shows statistical significance on model (2) for Commerce and Services, with greater impact on Services sector, suggesting an increase of Size importance when markets tend to be more concentrated. For model (3), Size is statistically significant for Full Sample, Industry and Services sectors, with higher impact on Services sectors. For industry sector, we found a positive sign for Size coefficient, with negative sign for Services. That indicates the importance of consider the sector characteristic when analyzing the impact of Size in returns.

The addition of Size, in a double-moderation analysis, affects differently across sectors and within a sector. At Commerce sector, with increase of competition when compared to Services, Size acts as a homogenizing variable of firms' operational results. However, in Services sector the opposite effect occurs, with a detachment of the operational performance of bigger firms from the small firms. It highlights Size to have impact on market structure moderating role and that in Services sector, which have more concentration, Size is a source of advantage. The difference of slope between the outputs for Industry and Commerce when relationship between ROIC and DOL is double-moderated aligns with the literature that Size may have different impacts on firms within a sector and reassure the importance of differentiate the analyses segmented between sectors (PORTER, 1979; VITHESSONTHI; TONGURAI, 2015).

The first model being statistically significant for all sectors and groups shows a relationship between operational performance and costs behavior. When we compare HHI coefficient between sectors, we can identify that when market structure walks toward monopoly the explanatory capacity of model (3) increases. Industry shows an HHI of 0.4317 and statistical significance for models (1) and (2) variables, except Size. Services with HHI of 0.668 shows significance at all models and for all variables, except DOL on model (3).

The results also suggest that the market structure is relevant for firms' operational performance by showing statistical significance for HHI as control variable for all models and sectors. However, moderation only occurs at markets that walks toward to a more concentrated structure. It suggests that when market goes toward competition, firms' need to adjust their cost structure to equalize with market structure to remain efficient and competitive.

The results also show that the double-moderation effect on the relationship between ROIC and DOL for Full Sample and Industry. However, at Commerce and Services sectors, the variable Size moderates the moderating effect of market structure on the relationship between ROIC and DOL showing different impacts between sectors and within Services sector. The outputs differences, when segmented by sector, indicates that analyze firms comparing with similar companies improves research quality.

In summary, the test of the hypotheses is shown in Table 6:

Table 6 – Hypotheses results

Hypotheses		Model	Sector	Observed Signal	Findings
H_1	*There is an association between the Degree of Operation Leverage and the Operational Performance.*	1	Full Sample	-	There is a negative assossiation between DOL and Operational Performance
			Industry	-	
			Commerce	-	
			Services	-	
		2	Full Sample	-	There is a negative assossiation between DOL and Operational Performance
			Industry	-	
			Commerce	-	
			Services	-	
		3	Full Sample	-	There is a negative assossiation between DOL and Operational Performance
			Industry	-	
			Commerce		*non-significant*
			Services		*non-significant*
H_2	*The relation between operational return and cost behavior is moderated by the market structure, measured by market competition level*	3	Full Sample		*non-significant*
			Industry		*non-significant*
			Commerce		*non-significant*
			Services	-	Market strucuture moderates the relationship between DOL and ROIC
H_3	*Market competition level moderation of the relationship between operational return and cost behavior is moderated by firms' size.*	3	Full Sample		*non-significant*
			Industry		*non-significant*
			Commerce	-	Size moderates the market structure moderation role leading to a change of signals, considering the sector
			Services	+	

This study offers a solid contribution for the literature by using a microeconomic firm theory to develop a model and to test the adherence of cost-volume-profit (CVP) analysis, also known as a "managerial tool" for both academic and practitioners. Then, this enhance the comprehension of such tool under different market structures, even after controlling by size. França and Lustosa (2011) present a mathematically proof of an optimal level of DOL for perfect market competition, and this study offers empirical evidence and a cohesion approach with the underlying economic theory.

Some limitations are intrinsic to the present research results. Due to the empirical characteristic, and as major empirical researches, the results are limited by the observed sample. As consequence, any inference or statement beyond the observed sample must be cautious. Our sample are unbalanced, and it may affect characteristics of the information. The research also has a survival bias, due to the exclusion of missing values. The research approach of proxies also takes all limitations that characterize the methodology.

For further research, we indicate alter the sector criteria considering the production chain of each sector; apply Mandelker and Rhee (1984) approach of regression as a mean to measure the DOL and control the model by crisis, analyzing firms' behavior during time of uncertainty.

REFERENCES

ADAR, Z.; BARNEA, A.; LEV, B. A Comprehensive Cost-Volume-Profit Analysis under Uncertainty. **The Accounting Review**, v. 52, n. 1, p. 137–149, 1977.

ALDRICH, H. E.; PFEFFER, J. Environments of Organizations. **Annual Review of Sociology**, v. 2, p. 79–105, 1976.

BANKER, R. D.; MASHRUWALA, R. The Moderating Role of Competition in the Relationship between Nonfinancial Measures and Future Financial Performance*. **Contemporary Accounting Research**, v. 24, n. 3, p. 763–793, Setembro 2007.

BEAVER, W. H.; DEMSKI, J. S. The Nature of Income Measurement. **The Accounting Review**, v. 54, n. 1, p. 38–46, 1979.

BESANKO, D. et al. **Economics of strategy**. Hoboken, NJ: Wiley, 2004.

BESANKO, D. et al. **A economia da estratégia**. Porto Alegre: Bookman, 2006. v. 3

CHEN, K. S.; HUANG, M. L. Performance measurement for a manufacturing system based on quality, cost and time. **International Journal of Production Research**, v. 44, n. 11, p. 2221–2243, jun. 2006.

CHUNG, K. H. The Impact of the Demand Volatility and Leverages On the Systematic Risk of Common Stocks. **Journal of Business Finance & Accounting**, v. 16, n. 3, p. 343–360, 1 jun. 1989.

DANTAS, J. A.; DE MEDEIROS, O. R.; LUSTOSA, P. R. B. Reação do mercado à alavancagem operacional: um estudo empírico no Brasil. **Revista Contabilidade & Finanças**, v. 17, n. 41, p. 72–86, 2006.

DARRAT, A. F.; MUKHERJEE, T. K. Inter-industry differences and the impact of operating and financial leverages on equity risk. **Review of Financial Economics**, v. 4, n. 2, p. 141–155, 1 mar. 1995.

DE FRANÇA, J. A.; LUSTOSA, P. R. B. Eficiência e alavancagem operacional sob concorrência perfeita: uma discussão com base nas abordagens contábil e econômica. **Contabilidade, Gestão e Governança**, v. 14, n. 3, 2011.

DHALIWAL, D. S. et al. **Product Market Competition and Conditional Conservatism**. Rochester, NY: Social Science Research Network, 2008. Disponível em: <http://papers.ssrn.com/abstract=2312592>. Acesso em: 8 jun. 2016.

DOPUCH, N.; BIRNBERG, J. G. **Cost Accounting: Accounting Data for Managements Decisions**. [s.l.] Harcourt, Brace & World, 1969.

DUGAN, M. T.; MINYARD, D. H.; SHRIVER, K. A. A re-examination of the operating leverage-financial leverage tradeoff hypothesis. **The Quarterly Review of Economics and Finance**, v. 34, n. 3, p. 327–334, Setembro 1994.

FÁVERO, L. P. et al. **Análise de dados. Modelagem multivariada para tomada de decisões.** 7. ed. São Paulo: Elsevier, 2009.

FIEGENBAUM, A.; KARNANI, A. Output flexibility—a competitive advantage for small firms. **Strategic management journal**, v. 12, n. 2, p. 101–114, 1991.

FRANÇA, J. A. DE. **Eficiência da firma : compatibilização das visões da economia e da contabilidade**. Tese / Thesis. Disponível em: <http://repositorio.unb.br/handle/10482/10928>. Acesso em: 28 set. 2016.

GAHLON, J. M. Operating leverage as a determinant of systematic risk. **Journal of Business Research**, v. 9, n. 3, p. 297–308, Setembro 1981.

GALE, B. T. Market Share and Rate of Return. **The Review of Economics and Statistics**, v. 54, n. 4, p. 412, nov. 1972.

GARRISON, R. H.; NOREEN, E. W. **Contabilidade Gerencial**. Rio de Janeiro: LTC, 2001.

GJERDE, Ø.; KNIVSFLÅ, K.; SÆTTEM, F. Evidence on competitive advantage and superior stock market performance. **Business History Review**, v. 76, n. 1, p. 37–74, 2002.

GOLDSZMIDT, T. **Recessão e desempenho das firmas: uma abordagem multinível de curva de crescimento**. São Paulo: Programa de Pós Graduação em Administração de Empresas, Escola de Administração de Empresas de São Paulo, 2010.

GRIFFIN, H. F.; DUGAN, M. T. Systematic Risk and Revenue Volatility. **Journal of Financial Research**, v. 26, n. 2, p. 179–189, 1 jun. 2003.

GUIDRY, F.; HORRIGAN, J. O.; CRAYCRAFT, C. CVP Analysis: A New Look. **Journal of Managerial Issues**, v. 10, n. 1, p. 74–85, 1998.

HAIR, J. F. et al. **Analise Multivariada de Dados**. [s.l.] Bookman, 2005.

HALL, R. H. **Organizações: Estruturas, processos e resultados**. São Paulo: Prentice-Hall do Brasil, 2004. v. 8ª ed

HANSEN, G. S.; WERNERFELT, B. Determinants of firm performance: The relative importance of economic and organizational factors. **Strategic management journal**, v. 10, n. 5, p. 399–411, 1989.

HODGIN, R.; KIYMAZ, H. EXTENDING THE PROFIT ELASTICITY MEASURE OF OPERATING LEVERAGE IN MANAGERIAL ECONOMICS TEXTS. **Journal of Economics and Economic Education Research**, v. 6, n. 3, 2005.

HORNGREN, C. T. **Cost accounting: a managerial emphasis**. Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1972.

HORNGREN, C. T.; FOSTER, G.; DATAR, S. M. **Cost Accounting: A Managerial Emphasis**. Englewood Cliffs: Prentice-Hal, 1994. v. 8ª ed

HOUGH, J. R. Business segment performance redux: a multilevel approach. **Strategic Management Journal**, v. 27, n. 1, p. 45–61, jan. 2006.

HUFFMAN, L. Operating leverage, financial leverage, and equity risk. **Journal of Banking & Finance**, v. 7, n. 2, p. 197–212, 1 jun. 1983.

IBHAGUI, O. W.; OLOKOYO, F. O. Leverage and firm performance: New evidence on the role of firm size. **The North American Journal of Economics and Finance**, v. 45, p. 57–82, 1 jul. 2018.

JORGENSEN, B.; SADKA, G.; LI, J. **Capacity Constraints, Profit Margins and Stock Returns**. Rochester, NY: Social Science Research Network, 9 nov. 2009. Disponível em: <https://papers.ssrn.com/abstract=1517959>. Acesso em: 22 nov. 2016.

KARNANI, A. STOCHASTIC COST-VOLUME-PROFIT ANALYSIS IN A COMPETITIVE OLIGOPOLY. **Decision Sciences**, v. 14, n. 2, p. 187–193, 1983.

KELLY, W. A. A Generalized Interpretation of the Herfindahl Index. **Southern Economic Journal**, v. 48, n. 1, p. 50–57, 1981.

KRESTA, J. V.; MACGREGOR, J. F.; MARLIN, T. E. Multivariate statistical monitoring of process operating performance. **The Canadian journal of chemical engineering**, v. 69, n. 1, p. 35–47, 1991.

LEV, B. On the Association between Operating Leverage and Risk. **Journal of Financial and Quantitative Analysis**, v. 9, n. 04, p. 627–641, set. 1974.

LI, M.-Y. L.; HWANG, N.-C. R. Effects of Firm Size, Financial Leverage and R&D Expenditures on Firm Earnings: An Analysis Using Quantile Regression Approach. **Abacus**, v. 47, n. 2, p. 182–204, 2011.

LUSTOSA, P. R. B.; FRANÇA, J. A. DE. Retorno acionário e grau de alavancagem operacional: evidências sob novas abordagens metodológicas. **Revista da FAE**, v. 15, n. 2, p. 146–161, 15 dez. 2012a.

LUSTOSA, P. R. B.; FRANÇA, J. A. DE. Retorno acionário e grau de alavancagem operacional: evidências sob novas abordagens metodológicas. **Revista da FAE**, v. 15, n. 2, p. 146–161, 15 dez. 2012b.

MANDELKER, G. N.; RHEE, S. G. The Impact of the Degrees of Operating and Financial Leverage on Systematic Risk of Common Stock. **Journal of Financial and Quantitative Analysis**, v. 19, n. 01, p. 45–57, mar. 1984.

MARCUS, M. Profitability and Size of Firm: Some Further Evidence. **The Review of Economics and Statistics**, v. 51, n. 1, p. 104, fev. 1969.

MAS-COLELL, A.; WHINSTON, M. D.; GREEN, J. R. **Microeconomic theory**. New York: Oxford University Press, 1995. v. 1

MCDANIEL, W. R. Operating leverage and operating risk. **Journal of Business Finance & Accounting**, v. 11, n. 1, p. 113–125, 1984.

MISANGYI, V. F. et al. A new perspective on a fundamental debate: a multilevel approach to industry, corporate, and business unit effects. **Strategic Management Journal**, v. 27, n. 6, p. 571–590, jun. 2006.

NOVY-MARX, R. Operating Leverage. **Review of Finance**, v. 15, n. 1, p. 103–134, 1 jan. 2011.

PENMAN, S. H. **Financial Statement analysis and security valuation**. [s.l.] McGraw-Hill Companies, 2010.

PERCIVAL, J. R. Operating leverage and risk. **Journal of Business Research**, v. 2, n. 2, p. 223–227, Abril 1974.

PORTER, M. E. The Structure within Industries and Companies' Performance. **The Review of Economics and Statistics**, v. 61, n. 2, p. 214, maio 1979.

PORTER, M. E. How Competitive Forces Shape Strategy. In: ASCH, D.; BOWMAN, C. (Eds.). . **Readings in Strategic Management**. [s.l.] Macmillan Education UK, 1989. p. 133–143.

RHOADES, S. A. The Herfindahl-Hirschman Index. **Federal Reserve Bulletin**, v. 79, p. 188, 1993.

SCHERER, F. M. Firm Size, Market Structure, Opportunity, and the Output of Patented Inventions. **The American Economic Review**, v. 55, n. 5, p. 1097–1125, 1965.

SHEPHERD, W. G. The Elements of Market Structure. **The Review of Economics and Statistics**, v. 54, n. 1, p. 25–37, 1972.

SIMONS, R. **Performance Measurement and Control Systems for Implementing Strategy: text e cases**. [s.l.] Hardcover, 1999.

TABAK, B. M.; GUERRA, S. M. November, 2002. 2002.

TABAK, B. M.; GUERRA, S. M. Stock returns and volatility: the Brazilian case. **Economia Aplicada**, v. 11, n. 3, p. 329–346, 2007.

THOMPSON JR., A. A.; FORMBY, J. P. **Microeconomia da firma: teoria e prática**. 6ª ed. Rio de Janeiro: Prentice-Hall do Brasil, 2002.

VARIAN, H. R. **Microeconomia - Principios Basicos**. [s.l.] CAMPUS, 2006.

VITHESSONTHI, C.; TONGURAI, J. The effect of firm size on the leverage–performance relationship during the financial crisis of 2007–2009. **Journal of Multinational Financial Management**, v. 29, p. 1–29, 1 fev. 2015.

WICKRAMASINGHE, D.; ALAWATTAGE, C. **Management Accounting Change: Approaches and Perspectives**. [s.l.] Routledge, 2007.