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LUCAS ZUCCO SCHNEIDER

INVESTMENTS IN INNOVATION AND ITS IMPACT ON ORGANIZATION PERFORMANCE

AN EMPIRIC ANALYSIS OF THE BRAZILIAN FIRMS

SÃO PAULO – SP

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Dissertação apresentada à Escola de Administração de Empresas de São Paulo, da Fundação Getúlio Vargas, em cumprimento dos requisitos para obtenção do título de Mestre em Administração Empresas.

Linha de Pesquisa: Estratégia

Orientador: Prof. Dr. Luiz Artur Ledur Brito

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“Never regard study as a duty but as an enviable opportunity to learn to know the liberating influence of beauty in the realm of the spirit for your own personal joy and to the profit of the community to which your later works belong.”

Albert Einstein

À minha avó Maria Schneider (in memoriam),

por incluir amor em minha rotina de estudos

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RESUMO

A inovação tem sido amplamente reconhecida como um dos principais fatores que criam vantagem competitiva para as empresas. Contudo, embora as empresas continuem a estimular a adoção de práticas inovadoras em sua gestão, evidencias empíricas entre investimentos em inovação e consequentes resultados financeiros superiores ainda permanecem inconclusivos. O presente estudo visa, a partir de uso de abordagem multinível, avaliar a relação entre investimentos em inovação e o aumento de relevância de novos produtos no faturamento das empresas, e, seu consequente impacto no desempenho financeiro. Os resultados obtidos indicam que investimentos em inovação levam as empresas a terem maior participação de novos produtos em sua receita total. Entretanto, não foi encontrado relação significante entre a maior participação de produtos inovadores com crescimento e lucratividade dessas empresas. Limitações e implicações dessa pesquisa também são discutidos nesse trabalho.

Palavras-Chaves

Inovação; Innovation performance; Desempenho Empresarial; PINTEC; Método Multinível

ABSTRACT

Innovation has been recognized as one of the main factors behind competitive advantage over firms. Nonetheless, although innovation practices have been stimulated among several companies, the link between investments in innovation and financial performance of the firms is still a complex subject where the results remain inconclusive. This study evaluates this relationship by using a multilevel model between innovation, innovation performance and financial performance. Results obtained indicate that investments in innovation leads to a positive and significance increase of innovation performance of the firms, which could be measure by the increased participation on new products' revenue over total revenue. However, the study could not assert the impact of innovation performance on the financial performance of the firms, measured in this work by growth and profitability. Limitations and implications of these findings are also discussed in this work.

Keywords

Innovation; Innovation Performance; Financial Performance; PINTEC; Multilevel Model

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1 INTRODUCTION

There is a widespread consensus over the business literature that the ability of a firm to innovate is key to sustain its superior performance. Nonetheless, although innovation practices have been stimulated among several companies, the link between innovation investments and organization performance is still a complex subject where the results remain inconclusive (Bowen *et. al.*, 2010).

Furthermore, an additional challenge is posed for those who tend to figure out the relationship between these dimensions, as several studies use different definitions, frameworks and constructs of innovation and organizational performance (Walker *et. al.*, 2010).

Nationwide, the reality is no different. Few studies have been published using Brazilian data sources, with mixed results derived from them. Even though some publications have asserted the relationship between innovation and organizational performance (Brito *et. al.* 2009), others could not assert a positive relationship between these two variables (Da Silva *et. al*, 2015; Santos *et. al.*, 2014), leaving the topic still open for further debate.

Hence, this study is aimed to evaluate the relationship between investments in innovation, innovation performance and financial performance of the Brazilian firms.

In this context, we empirically investigated this relationship in Brazilian firms applying a multilevel model. In order to process this analysis, data from investments in innovation and innovation performance were collected from Brazilian Institute of Geography and Statistics (IBGE) through its PINTEC research, whilst financial performance data were obtained from Valor Economico newspaper database.

Following the rationale, the innovation construct used in this work was defined accordingly to international standards, which means that the innovation variable was used following the Statistical Office of the European Communities (EUROSTAT) in its Oslo Manual definition (OECD, 2005), the same standard has been used by PINTEC research since 2000.

PINTEC research also guided this study to scope the innovation performance metric used in this work, this variable was defined as the firm's revenue share provided from new or improved products, which means the total revenue obtained from new products over total revenue of the firm (IBGE, 2014).

For organization performance, this study followed the procedures adopted by other Combs *et. al.*, 2005 and Brito *et. al.*, 2009, where it stands that the organization performance metric should fit the primary objective of the research. In this sense, this dissertation chose the financial performance dimension as the most suitable dimension to our objective.

It is understood that a solid comprehension about the innovation-financial performance relationship is key to managers and decision makers who are responsible to decide whether to invest or not in innovative activities in their respective firms.

We understand that when it comes to innovation, the 'hype' around this term may lead to managers make decisions without proper analysis on its causes and consequences. Hence, since we investigated this relationship at firm level, this study aims to enlighten the understanding of how investments in innovation impact the relevance of new products on firms' total revenue, a metric defined as innovation performance of the firms. In addition, we also investigated how this metric is related to financial performance of those firms.

This work is divided in five parts. Next section details the theoretical framework that supports the constructs of innovation and performance metrics used in this study, also, we described the innovation-performance relationship prior to the empirical studies with their respective outcomes. The method section follows, including a brief description of the data sets, methodological procedures, samples and, the variables used in this study. The study then presents its results and discusses the outcomes encountered in our research. It ends summarizing its conclusion, where research limitation and suggestions for further research are discussed.

2 THEORY BACKGROUND

Prior to the investigation of the relationship between innovation, innovation performance and financial performance, a conceptual definition of these variables is particularly important to avoid circular reference on the innovation-performance relationship (Crossan and Apaydin, 2010).

2.1 Defining Innovation

Schumpeter (1934) was one of the first authors to study and to define the term innovation. For the author, innovation could be classified into two main types: i) radical and ii) incremental. The first was described as capable of promoting technological and market breakthroughs, thus, changing an entire industry or market environment. For this pattern, Schumpeter coined the term creative destruction (Schumpeter, 1934). Incremental innovation was then described as the one capable of providing continuous improvement on products and processes, whose prime objective would be to maintain an advantage of a firm over its competitors.

Damanpour (1991) considered innovation as a process based on three main steps – ideation, development and implementation of new ideas and behaviors. The author also described three basic types of innovation that could take place in a company: i) administrative and technical, ii) product and process and, iii) incremental and radical.

Administrative innovation would be the ones related to changes in the company's decision-making process while technical innovation refers to changes on internal processes of the company. Product innovation would be the transformations carried out by a firm to meet market demand, while innovations of processes are described

as changes in the productive process of the company. Finally, radical and incremental innovation are described by the author according to the impact generated by them, in a sense that radical would imply something with greater intensity than incremental innovation (Damanpour, 1991).

Damanpour also studied the influence of organizational aspects of the company on innovation. The author found a positive correlation between company characteristics – such as its industry, size, strategy – and innovation implementations within the firm (Damanpour, 1992; 1996). In sum, Damanpour was able to identify variances on innovation depending on the size and on the application of different operational variables in a firm.

Gopalakrishnan (2000) was one of the first authors to identify the differences of approaches related to innovation between scholars with different backgrounds. Following the author`s reasoning, economists tend to use the term innovation as a process or a practice that is new to a given industry, whereas business managers or organizational theorists use the term as a process or a practice that is new to a given firm.

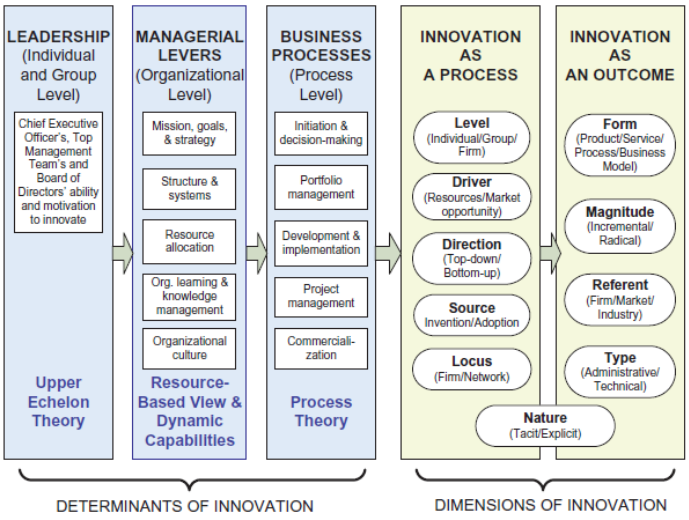
Crossan and Apaydin (2010) points the importance of avoiding circular arguments when it comes to study innovation and its effects. The authors sustain that every study should delineate the difference between innovation processes and outcomes, where the former precedes the latter in every analysis.

In the same study, the authors recognize that innovation is a construct of multiple causes and complex feedbacks loops. In this sense, their work reviews and categorizes the findings of several studies regarding organizational innovation. It also develops a sequential relationship where it describes the causality behind each stage of

the innovation process, where innovation is determined by three distinct constructs: leadership, managerial levers, and business performance (Crossan and Apaydin, 2010).

The study also provides a comprehensive approach based on the dimensions and the determinants of innovation. The authors' stand that organizational innovation could be viewed as framework of multiple determinants and outcomes. These findings are categorized in the following Figure 1, where the authors summarizes the framework of innovation in a firm.

Figure 1. Framework of Organizational Innovation



Source: Crossan and Apaydin (2010)

Given the conceptual complexity in defining innovation, Gatinson *et. al* (2002) also has developed a structural framework in order to evaluate the term. The authors discovered that the concept of innovation is composed of two distinct and correlated constructs: i) acquisition of new competence and, ii) improvement/destruction of a competence already established. For each of these constructs, the definition and the

impact of innovation would depend on its type, place of application and the characteristics on it.

From the publications described above, it is perceived that the variable innovation presents several definitions and dimensions depending on the study or the author that has been analyzed. This characteristic imposes an additional challenge to researches who aim to identify the relationship between this construct with organizational performance, which is one of the most demanded topic by business literature. (Walker *et. al.*, 2010).

In this context, Tidd (2001) designed a list of the most common measures of innovation used in management research in the following Table 1.

Table 1. Strengths and weaknesses of measures of innovation

Measure	**Strenghts**	**Weakeness**
R&D	. regular and recognized data on main source of technology	. lack details (tech fields) . underestimates small firms
Patents	. regular detailed and long-term data . Compensates weaknesses of R&D statistics	. uneven propensity to patent
Signficant Innovations	. direct measure of output	. measure of significance . cost of collection . misses incremental changes
Innovation Surveys	. direct measure of output . comprehensive coverage	. variable definition of innovation . cost
Product Announcements	. close to commercialization	. misses in-house process innovations and incremental product improvements . possible manipulation by PR
Technical Employees	. measures tacit knowledge	. lack of homogeneity of qualifications

Expert Judgments	. direct use of expertise	. finding independent experts . judgments beyond expertise

Source: Adapted from Tidd (2001)

The main conclusion derived from authors' work is that there is no single best measure of innovation. Instead, the researches should be aware about the tradeoffs of each metric as well as the objectives concerning their research (Tidd, 2001).

Moreover, not all the possibilities related to innovation measures listed by Tidd (2001) consider the potential links of these measures with their performance metrics, which expands considerably the number of potential outputs of the studies aimed to deepen this relationship.

Therefore, the Organization for Economic Cooperation and Development (OECD), in an attempt to define a standard to be applied on the several innovation surveys that are conducted in many countries, has developed an international guideline for researchers willing to use the innovation construct. Its definition was released in the OECD/Eurostat Oslo Manual in 1992 (OECD, 1992) and then updated in 1997 and 2005 (OECD, 1997; 2005).

It is important to note that the evolution of innovation measurement and definition by Oslo Manual in the following editions of 1997 and 2005 follows the need to develop a more comprehensive definition of innovation, where its concept is more holistic and integrated with market needs (Block, 2007). In brief, the later issue of Oslo's Manual defines innovation as it follows

"An Innovation is the implementation of a new or significantly improved product (good of service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations." (OECD, 2005)

As important as to its definition, the statement above brings to the innovation concept characteristics that are beyond the traditional research and development (R&D) approach, which implies that innovation could also happen in industries and firms with low technological intensity. In addition, the Oslo's definition emphasizes the deployment of new products, services and methods, rather than the investments in research and development (Bloch, 2007).

In this research, innovations of the firms were measured following the Oslo's definition and approach, which composes not only technical activities, such as R&D, but also the low technical and holistic ones, such as marketing (OECD, 2005).

2.2 Innovation Performance Construct

By defining innovation as a proxy of implementation of a new product or process for a firm, the Oslo's manual also defined the scope of the innovation performance we used in this study.

As stated by Mazur and Inków (2017), the term innovation performance could vary depending on its type, sense and dimension. Thus, they argue, each research approach generates a unique need for innovation approach measure.

Zheng *et. al.* (2013) defined innovation performance by two main dimensions: i) innovation efficiency, which is the number of new products deployment in the market, and, ii) innovation profitability, considered as the proportion of new product revenue over total revenue from the firm.

The first dimension is related to the patent view of innovation, where the patents issued by a firm is a proxy of its innovation activity. This view is widely used as a measured of innovation performance in several studies that has been published on this topic (Hsu *et. al.,* 2015*;* Chen *et. al.,* 2012**)**.

However, in spite of its wide use, patents have limitations, as it is hard to access its economic value and some of them are not commercialized (Harhoff *et. al.* 1999). In this sense, the second dimension of innovation performance defined by Zheng *et. al.* (2013) is the one closed linked to the definition of innovation used in both Oslo Manual (OECD, 2005) and in the PINTEC research (IBGE, 2014), where it stands that the innovation performance of a firm is a proxy of the proportion of new product revenue obtained from firms.

As this study uses PINTEC as one of the main data sources in its research, it makes no sense to use a different construct regarding innovation or innovation performance. Hence, we chose to use the same metric adopted by OECD (2005) and IBGE (2014) in our research.

2.3 Organizational Performance Construct

Once defined what is innovation and innovation performance in this study, the following step is to investigate what is an organization performance metric and what this definition means in terms of our research.

Walker *et. al.* (2010) describes the importance of organization performance as a central role in a business evaluation. The author points out that every business activity is judged, in its last resort, by the performance it generates.

Nonetheless, the same study demonstrates that, despite its importance, organizational performance is still a broadly open concept, with few studies using the same definition in their methodology (Walker *et. al*, 2010).

The author then concludes that organizational performance is a multi-dimensional theoretical construct, which implies that any study aimed to use this variable must take into consideration: (a) the appropriateness of the context in which the variable will be used and (b) the right selection and combination of performance measures (Walker *et. al*, 2010).

Similarly, Santos and Brito (2012) point out that there is rarely consensus regarding the definition, dimension and measurement of organization performance. In their research, made with Brazilian executives from several industries, the authors concluded that performance could be attributed to at least five dimensions: financial performance, customer satisfaction, employee satisfaction, environmental performance and social performance.

In their recommendation, the authors claim that financial performance should not be used by as a proxy of profitability, but rather as a joint analysis with growth variable (Santos, Brito, 2012).

Combs, Crook, and Shook (2005) analyzed a number of published management studies related to organizational performance in order to establish a conceptual definition of this dimension. According to the authors, operational and organizational performance are two distinct and multidimensional constructs. Thus, they suggest, operational performance is a construct that precedes organizational performance, where the latter is composed by dimensions of profitability, growth and market value.

In the same research, the authors' point that return on assets (ROA) and return on sales (ROS) are the most used profitability measures, whilst growth on sales are the most used variable to express growth (Combs *et. al*., 2005)

Brito, Brito and Morganti (2009) studied the correlation between investments in innovation and business performance, where the term performance was expressed by growth and profitability. For growth, the authors used the variation of net revenue, whist profitability was considerate by a combination of return on assets (ROA) and earnings before interest, taxes, depreciation and amortization (EBITDA) (Brito *et. al.*, 2009).

This study follows the approach used by Combs *et. al.* (2005), as it considers organizational performance as multidimensional-dimension metric. In this sense, we could argue that organizational performance is a broader set where other dimensions – such as operational performance or financial performance – are included. Following this reasoning, the focus of our analysis will be on the financial performance of the firms presented in our model.

Notwithstanding, as it was described by Santos and Brito (2012), the financial performance dimension deserves a further attention among authors as choosing profitability as it only indicator could be an inadequate representation of financial performance itself. Accordingly, this work has adopted two variables, growth and profitability, as the variables representing the financial performance dimension in or study.

For growth, the variable will be measured by the variation of net revenue, whilst profitability will be measured by return on assets (ROA) and margin EBITDA. This metrics are the same used by Brito *et. al.* (2009) in their research on innovation and financial performance of Brazilian firms.

2.4 Innovation and Organizational Performance

As we have defined the constructs of innovation, innovation performance and financial performance applied in this study, we now refer to publications that investigated the empirical relationship between these variables on firms.

In recent years, this relationship has been source of several works published by strategic management scholars. However, despite the interest over the topic, the link between innovation and financial performance is still not conclusive in many of the cases.

Grupp and Maital (2000) studied the relationship between innovation and profitability by examining the innovation perception of 73 Israeli firms. The authors conducted a survey where they statistically examined the innovation index of these firms with their correspondent performance indicators. The study managed to point out a correlation between the perception of innovation and superior performance only for

technology-based firms, whist this relationship did not prove significant for firms from other industries.

Morgan *et. al.* (2009) used a data set from 114 firms to investigate how market capabilities – ie. firms' ability to learn about customers, competitors and the broader market it operates – determine firms' profit growth. The study supports the evidences that marketing capabilities are connected with firm growth rates, it also supports the dynamic capability view that firms with superior and complementary capabilities should be better positioned to obtain value with demand growth.

Freel and Robson (2004) conducted a large study of 1347 small firms in the UK where they investigated the relationship between product and process innovation and business-level performance. For the variable performance, the authors considered four dimensions: growth in number of employees, turnover growth, productivity growth and profit margin variation.

In sum, the study pointed to a positive correlation between innovation and growth in the number of employees and a negative relationship between product innovation with sales growth and productivity. In contrast, the authors also pointed that innovations in processes are positively correlated with increases in productivity and growth in sales.

Cho and Pucik (2005) examined the relationships between innovation, quality, growth, profitability, and market value at the firm level. Based their premise on the resource-based model approach, the authors examined how innovation and quality variables impact business performance in terms of growth, profitability, and market value.

Using structural equations, the researchers conclude that there is a direct relationship between innovation and growth, however, the innovation construct could not, when analyzed in isolation, explain the positive change in corporate profit, this occurs only when the quality variable is incorporated to the model.

Bowen *et. al.* (2010) conducted a meta-analysis of 55 studies from 1975 to 2005 aimed to explore the relationship between innovation and organizational performance. Assuming also that innovation can generate rare, valuable, non-substitute and inimitable resources for firms (RBT), the authors observed that overall innovation and organizational performance are positively correlated. In addition, the study points that this relationship is stronger where innovation is measure by innovative posture, in smaller firms, and in services industries.

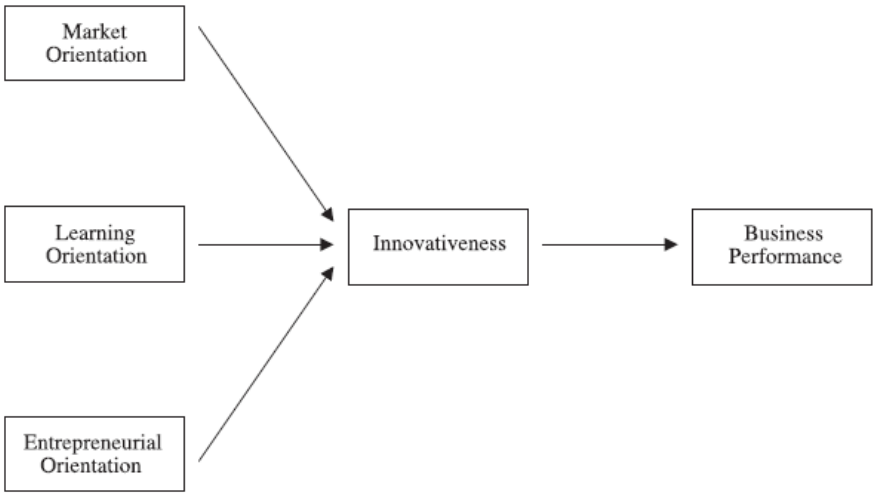
Tidd (2001) investigated the relationship between innovation measures, such as R&D expenses, with new product announcements and the consequential impact on performance, such as value added and market to book ratio. The author concluded that high R&D intensity has a significant positive impact on both the number of new product and the value for the firm.

Lin et. al (2006) studied how technology based firms deploy their R&D and marketing resources in commercialization. In sum, the authors investigated the influence of R&D intensity, knowledge stocks and commercialization orientation on firm performance. The main conclusion points to a complementary role between R&D intensity and commercialization orientation, where the latter plays a more important role in defining firms' ability to capture value.

Hult *et. al.* (2003) investigated the antecedents and impacts of innovation in Fortune 500. The authors concluded that the more market-oriented a firm tend to be, the more innovative it is. In addition, the authors were able to establish a positive empirical relationship between the degree of innovation of a company and its business performance, where this variable was defined as a metric of profitability, sales growth and market share.

The authors' findings supported the evidence that market orientation, i.e., organization's disposition to deliver superior value to its customers, has a positive and significant effect on innovation performance, in this case defined as innovativeness, and on financial performance of the firms, as it is outlined in the Figure 2.

Figure 2. Hypothesized Model by Hult *et. al.* (2003)



Source: Hult *et. al.* (2003)

Szymanski *et. al.* (2006) studied the relationship between innovativeness and new product success by conducting a meta-analysis of the main publications on this topic

in the business literature. The authors indicate that innovation performance is a relevant driver of new product success under selected conditions, such as meaningfulness attributes of the products, new-to-the-market offering, and, innovation embedded in goods versus innovation in goods and services.

In sum, the authors concluded, consumers tend to value products that are meaningful, new to the market and the results of innovation on goods are greater than in services (Szymanski *et. al.*, 2006)

The study also emphasizes the importance of the construct when it comes to relate innovation with performance. It suggests that the innovation-performance effect varies depending on the conceptualization of these dimensions, it also suggests that the more specific the definition of the construct, the more precise will be the description of its effects.

Madson and Leiblein (2015) studied the factors that affect a firm to obtain and to sustain competitive advantage in its market. By narrowing its scope on the semi-conductor industry, the authors highlighted the importance of a firm invest in its own innovation experience rather than obtain the same innovation it from their partners. The work suggests that innovation is a cumulative factor where its results yields a persistent advantage throughout time.

Lin *et. al.* (2006) appointed that firms than can successfully bring innovation to marketplace are often highly innovative. In addition, the authors suggest that market focused learning leads to higher degrees of innovation, which, in turn, enables the firm's capacity to enable competitive advantage.

Nationwide, Brazilian scholars have also struggled to demonstrate the relationship between innovation and superior performance in their publications. While few have demonstrated a positive relationship, other studies could not succeed in demonstrating this relationship.

Andreassi and Sbragia (2001) analyzed the relationship between investments in R&D and financial performance of Brazilian firms. The authors based their research on data obtained from the National Association of Research, Development and Engineering of Innovative Companies (ANPEI), where they could analyze 125 firms in the years 1994 and 1996.

The study concluded that investments in R&D are associated with future deployment of new products and services by a firm. In addition, the study found a positive correlation between investments in R&D and revenue increase in the following years. However, the same study could not support the hypothesis that investments in R&D lead to more profitability in the following years.

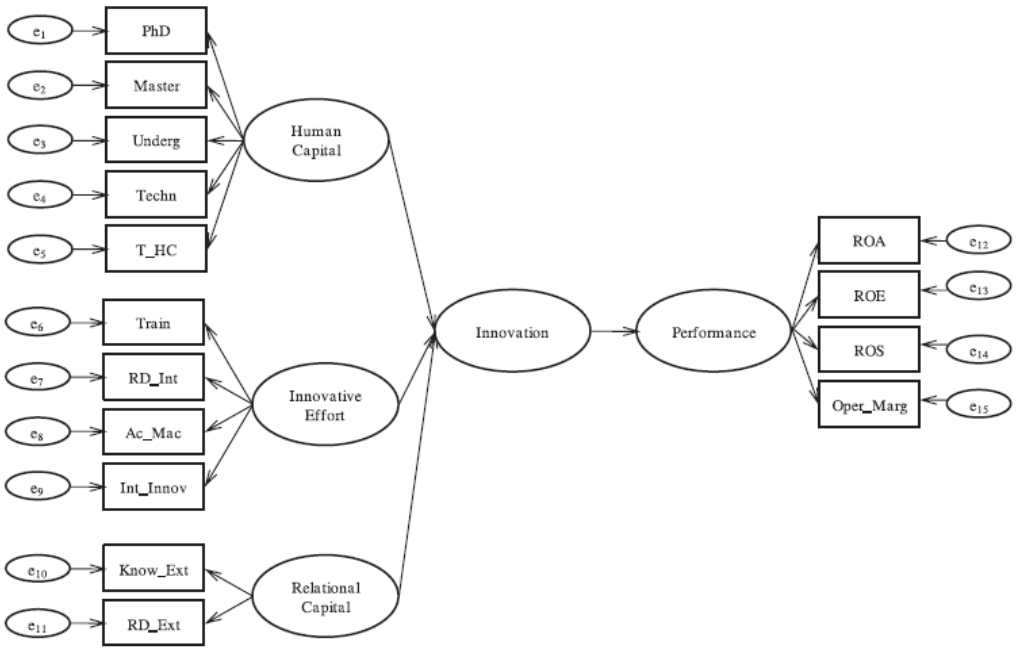
Brito *et. al.* (2009) investigated the relationship between innovation and organizational performance in the Brazilian chemical industry. This work adopted the Oslo Manual as the framework for its innovation construct, which was supported by the data obtained from PINTEC research. The study pointed to a positive relationship between innovation and growth, whereas the relationship between innovation and profitability could not be supported by the analysis.

Silva *et. al.* (2015) studied the relationship between R&D investments and market value of Brazilian listed firms. The authors collected investments made by Brazilian companies in R&D with their respective market performance in the stock exchange. The study concludes that investments in R&D itself are not sufficient to explain

the price formation and the following valuation if the Brazilian firms listed in capital market.

Santos *et. al.* (2014) investigates the innovation-performance relationship of Brazilian firms in a multi-year basis. In its starting point, the study suggested a conceptual framework where some constructs might be associated with innovation and performance. Figure 3 summarizes the conceptualization made by these authors:

Figure 3. Theoretical model between innovation and performance



Source: Santos et. al (2014)

As one could note, Santos *et. al. (2014)* conceptual innovation-performance framework follows the rationale of the work published by Crossan and Apaydin (2010), where it describes innovation as a process before it turns into an outcome. In addition, the

proposed framework by the authors integrate performance in its reasoning as its final output. Using data from PINTEC research in its publications of 2000, 2003 and 2005, along with third databases from external bureaus, Santos *et. al.* (2014) analyzes the relationship between innovation and business performance of Brazilian firms. The results obtained by this work could not support the evidence that innovation effort is followed by superior financial performance from the analyzed firms.

In spite of the lack of evidence between innovation and performance, the authors suggest that this may be occurred due to the time limitation of their analysis, once it included a lag of only one year between innovation effort and financial performance. In this context, the study ends by suggesting a further exploration of this topic by Brazilian scholars using an intertemporal approach with longer time period in its analysis.

In sum, it could be inferred from these studies that their definition of innovation and performance may vary depending on type, scope and metric used by scholars. Consequently, the empirical relationship of these variables does not have an established relationship over years of academic research, as it is described in Table 2.

Table 2. Summary of Empirical Research on Innovation and Performance

Author	Sample Characteristics	Innovation Construct	Organization Performance Construct	Findings
Grupp and Maital (2000)	73 Israeli firms	survey of innovation perception by business observers	growth in sales revenue and profitability	perceived innovation is neither a cause nor an effect of growth in sales revenue, except for tech companies
Morgan et. al (2009)	114 US firms	marketing capabilities (market sensing, CRM and brand management)	revenue growth and margin growth	market sensing affects positively revenue growth yet has no effect on margin, CRM and brand managment have opposing effects
Freel and Robson (2004)	1347 small UK firms	product and process innovation	growth in employees, turnover, productivity and profit margin	positive relationship between innovation and employees growth, negative relationship between product innovation with productivity
Cho and Pucik (2005)	Fortune 1000 companies	subjective performance measure of Innovativeness from FRS database	total assets, revenue, market capitalization, ROA, ROE and ROI	innovativeness alone does not improve profitability, innovativeness mediates the relationship between quality and growth
Bowen et. al (2010)	Meta analysis from 55 empirical studies	innovation was measured depending on study (R&D expenditure, patents,implementation of products, processes, posture and inovativeness)	market measures (Tobin q) and accounting measures (ROA, ROI)	overall innovation na organizational performance are indeed positively correlated
Lin et. al. (2006)	258 US based tech firms	number of patents ganted, commercialization orientation (firm's sales, general and administrative expenses over total assets)	Tobin's Q (market value over replacement cost of its assets)	R&D intensity and commercialization orientation complement each other, commercialization orientation has a stronger positive effect on firm performance
Szymanski et. al. (2006)	Meta analysis from 32 empirical studies	innovativeness as a new and meaningfullness product or service for a customer	new product sucess	inovativeness is a relevant driver of new product sucess under certain conditions: meaningfull for customers and new to market offerings
Madson and Leiblein (2015)	115 US firms	comparative innovation advantage from firms (patents outputs)	comparative profit advantage from firms	firms with own innovative experience yields supeior performance over time
Andreassi and Sbrigia (2000)	125 brazilian firms (ANPEI)	R&D intensity	new products' revenue share, profitability, revenue growth, market share	R&D intensity is positively correlated with new products` revenue share, no significant correlation was found with profitability and market share
Brito et. al (2009)	62 brazilian firms from chemical sector	investments in innovation (PINTEC research)	profitability (ROA, EBITDA margin) and growth (revenue growth)	investments in innovation is posiitively correlated with growth, no relationship was found with profitability
Silva et. al. (2014)	37 brazilian listed firms	R&D intensity	future performance of firms (stock market)	innovative intensity was not significant to explain future returns
Santos et. al. (2013)	Samples of 1608 brazilian firms in 2000, 231 in 2003 and 277 in 2005	investments in innovation (PINTEC research)	financial performance (ROA, ROS, ROE and EBITDA margin)	investments in innovation do not explain financial performance of the firms

As the empirical evidence of innovation and superior performance remains inconclusive, the aim of this study is to deepen the understanding of innovation-financial performance relationship of the Brazilian firms. In light of finding the link between these variables, we propose the following hypotheses:

H1: A firm's investment in innovation has a positive effect on its innovation performance

H2: A firm's investment in innovation has a positive effect on its financial performance

3 METHOD

This study aims to investigate the relationship between innovation and its impact on financial performance of Brazilian firms. In this context, we used two independent data sources to operationalize our model: Valor Economico database and Pintec research. As innovation and financial performance are topics of complex analysis, we chose to use a multilevel mediation model in order to understand the relationships among the variables of this study.

3.1 Multilevel Model

Our previous research on published studies demonstrated the inconsistency of results when it comes to investigate the innovation-performance relationship. One of the main reasons behind this inconsistency is related to the usage of data from different periods and different sources in their research. Moreover, the use of linear regression may be inappropriate in environments where economic conditions vary significantly (B.-W. Lin *et. al.*, 2006).

In this context, we carefully considered the characteristics of our data sources in order to choose the adequate statistical model in which we will rely on. The scope of our data includes two different sources of secondary data, PINTEC and Valor Economico, with different measurement intervals, hierarchal structures and levels of aggregation, therefore, we decided to use the multilevel model in this study.

Compared to traditional statistical linear models, multilevel analysis is seen as a superior technique to address problems where structural relationships have a strong influence on the generated outcome (b addition, this model also allows the researcher to

deepen his or her understanding of the industry-firm relationship, particularly in longitudinal and aggregated data. These variances are not captured by ANOVA as it assumes their effects are generated independently (Goldszmidt *et. al.*, 2006; Misangyi *et. al.*, 2006).

This work explores the innovation-innovation performance-financial performance relationship. For this matter, we consider a three-level model with firms (j) and industries (k) and their relationship (jk) at level 3, firms (j) at level 2 and years (i) at level 1.

Level 1: $\pi = \propto_{0jk} + E_{ijk}$

where π is the explanatory variable a firm j, $\propto_{0jk}$ is the mean performance of firm j and E_{ijk} is the deviation of this firm's average performance in year i.

Level 2: $\propto_{0jk} = \beta_{00k} + r_{0jk}$

where β_{00k} is the mean performance of firm in industry k and r_{j0k} is the deviation of performance of firm j from this mean (firm effect).

Level 3: $\beta_{00k=} \gamma_{00k} + s_{00k}$

where γ_{00k} is the mean performance of all the industries in the sample, and s_{00k} is the deviation of industry k to the grand-mean.

3.2 Valor Economico Database

The financial database used in this work refers to the data of the Valor Economico newspaper. This publication refers to the 1000 largest Brazilian firms in financial terms, published every year by Valor Economico newspaper in a special edition to its readers

with public availability on its website, all the information related to these firms follow the percepts of the Brazilian national accounting system.

In order to incorporate the findings from previous studies (Andreassi and Sbragia, 2001; Brito *et. al.*, 2009), which reinforced the influence of innovation over periods greater than one year, this work chose to used data from the companies from different sectors in the period from 2009 to 2015.

3.3 PINTEC Database

PINTEC is the innovation research published by Brazilian Institute of Geography and Statistics (IBGE) since 2000. In this work, we use the editions published in 2008, 2011 and 2014.

As outlined by IBGE, the focus of PINTEC relies on "the factors that influence the innovative behavior of the companies, their strategies, their efforts, their incentives, their obstacles and their results obtained from innovation" (IBGE, 2011). For this matter, the research is structured in eight main sections: (i) Innovative Activities; (ii) Financing Sources; (iii) Internal R&D Activities; (iv) Impact of Innovations; (v) Information sources; (vi) Cooperation for Innovation; (vii) Government Support; and, (viii) Patents and Other innovation methods. For the matter of this work, we will use data from items (i), (iii) and (iv) in our model.

It is important to highlight two relevant points regarding PINTEC. The first lies in its methodological approach, PINTEC uses in its methodology the innovation concept supported by Oslo's Manual (OECD, 2005), which is the same concept adopted by the Statistical Office of the European Community (Eurostat, 2010). This procedure

assures the standardization of innovation construct, following the same concept used by international standards and publications.

The second one refers to the confidential aspect of its data. As it relies in sensitive data, the access of PINTEC database is given only by authorization of IBGE, after a cross-reference made between PINTEC and the CNPJs (National Corporate Taxpayers' Registry) obtained from the secondary data source, which in our case was provided by Valor Economico database. In addition, the institute also demanded the researchers to work physically inside its offices in the city of Rio de Janeiro. The results are approved for publications only after a careful analysis made by IBGE's technicians.

3.4 Methodological Procedure

Following the definition of the data sources of this study, the next step was to prepare these datasets accordingly to our research objective.

3.4.1 Procedures on Valor Economico Database

Once we had access to financial data from Valor Economico, the first step was to narrow the sample from 2009 to 2015 and to remove all incomplete data from this sample, which resulted in data of 415 Brazilian firms with full information over this period, as it is described in Table 3.

Table 3. Sample analyzed from Valor Economico

Sector	Number of Firm
Food and Beverage	31
Metallurgy and Mining	30
Retail Business	27
Transportation and Logistics	26
Chemistry and Petrochemicals	22
Construction and Engineering	22
Specialized services	21
Real State	21
Agrobusiness	18
Vehicles and Parts	16
IT & Telecom	16
Electricity	15
Water and Sanitation	14
Building Materials and Decoration	14
Medical services	13
Oil and Gás	13
Pharmaceutical and Cosmetics	13
Textile, Leather and Apparel	12
Wholesale and External Trade	12
Electrical Engineering	12
Paper And Cellulose	10
Mechanical Engineering	9
Education	8
Communication and graphics	7
Plastics and Rubber	6
Sugar and alcohol	5
Environmental services	1
Tobacco	1
Total	415

Following the procedure, we calculated each of the financial variable used in this study: return on assets (ROA), EBITDA margin and net revenue variation.

3.4.2 Final Sample: Matching Valor Economico Database with PINTEC Research

After the treatment on Valor Economico database, the next step was to send this file to IBGE where, in order to maintain the confidentiality of the sample, it encrypted the CNPJ (National Corporate Taxpayer Registry) of the firms and merged it with the associated

PINTEC research from years of 2008, 2011 and 2014, following the rationale described in table 4.

After the merge, we separated the sample by each of the dependent variable analyzed in this research. The outliers were then identified by a winsorization approach, where the observations with three or more standard deviations were replaced in our sample. Lastly, for each of the dependent variable applied in this study, ROA, net revenue variation (growth rate) and EBITDA margin, we had three different final samples, with 384, 367 and 379 firms respectively, as it is summarized on table 4.

Table 4. Final sample overview

DV: ROA		DV: Growth Rate		DV: Mg EBITDA	
Nº Sectors	23	Nº Sectors	23	Nº Sectors	23
Nº Firms	384	Nº Firms	367	Nº Firms	379

PINTEC (year of publication)	Valor Economico
2008	2009, 2010
2011	2011, 2012, 2013
2014	2014, 2015

For each of the dependent variable analyzed, we aggregated the mean, standard deviation and median from 2009 to 2015 as described below.

Table 5. Descriptive Analysis of the Sample

DV: Growth			
Year	Mean	Std Deviation	Median
2009	-7,174%	69,404%	-26,104%
2010	29,791%	32,044%	20,273%
2011	14,041%	17,454%	12,357%
2012	12,170%	17,718%	10,804%
2013	12,402%	14,795%	12,034%
2014	10,293%	20,845%	7,505%
2015	5,565%	20,138%	5,629%

DV: ROA

Year	Mean	Std Deviation	Median
2009	7,505%	9,312%	6,786%
2010	7,250%	10,724%	5,995%
2011	5,626%	8,837%	4,791%
2012	5,362%	8,165%	4,990%
2013	4,814%	8,469%	4,263%
2014	4,895%	9,702%	4,463%
2015	0,783%	14,804%	3,136%

DV: EBITDA Mg

Year	Mean	Std Deviation	Median
2009	12,895%	12,019%	10,461%
2010	13,922%	12,718%	12,184%
2011	14,376%	14,202%	11,142%
2012	13,895%	13,063%	10,490%
2013	13,109%	13,053%	10,055%
2014	14,185%	13,084%	10,179%
2015	10,567%	19,927%	9,471%

3.4.3 Variables of the Study

After obtaining our final sample, the next procedure was to operate the variables of the study, as it is described below in table 6.

Table 6. Description of Variables

Dimension	Variable	Description	Source
Investments in Innovation	A	Total expenditures in internal R&D divided by firm revenue	PINTEC, VALOR
	B	Total expenditures in external R&D divided by firm revenue	PINTEC, VALOR
	C	Total expenditures in acquisition of external knowledge divided by firm revenue	PINTEC, VALOR
	D	Total expenditure in training divided by firm revenue	PINTEC, VALOR
	E	Total expenditure in technological innovations divided by firm revenue	PINTEC, VALOR
	F	Total expenditure with project divided by firm revenue	PINTEC, VALOR
Innovation Performance	I	Total revenue from new products (new or improved) divided by the firm revenue	PINTEC, VALOR
Financial Performance	ROA	Net income for the period divided by total assets	VALOR
	MgEbtida	Net income for the period divided by firm EBITDA	VALOR
	RevGrowth	Net revenue growth for the period	VALOR

Source: elaborated by the author

In order to obtain the value of our first variable, i.e. innovation, we summed up the variables from (A) to (F) divided by firm total revenue. This procedure gave us the amount of innovation that each of the firm invested over the period of our research. Innovation performance variable was obtained directed from PINTEC, we also divided this amount by firms total revenue, lastly, the financial performance variables of this study were all taken from Valor Economico database.

Regarding the sectors and its influence over the analysis, this study follows the criteria adopted to Santos *et. al.* (2014), where the main purpose of the research was to analyze the aggregated relationship of investments in innovation and the financial performance of the firms. Hence, we did not made any separated analysis on this matter, except the division of the total financial amounts by firm revenue in order to smooth the influence of size and sector in our sample.

At our final stage, using statistical software provided by IBGE, we ran three models where we could test the relationship between investments in innovation with innovation performance, as well as to test the relationship of innovation performance with each dependent variable investigated in this study: net revenue growth, ROA and EBITDA margin.

Figure 4. Model 1: Innovation, Innovation Performance and Growth

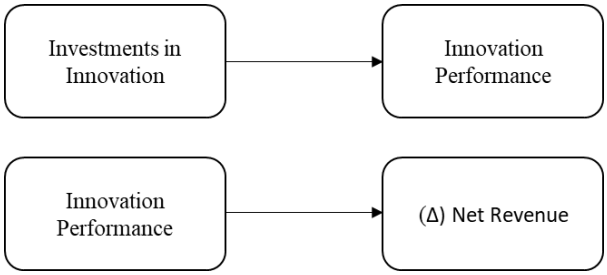


Figure 5. Model 2: Innovation, Innovation Performance and ROA

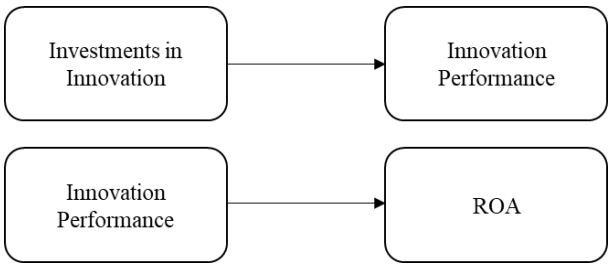
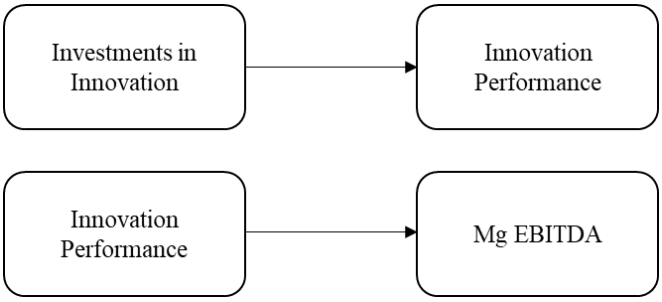


Figure 6. Model 3: Innovation, Innovation Performance and Mg EBITDA



4 RESULTS AND DISCUSSIONS

This section summarizes the results obtained from our models. For each of the dependent variable, we will outline the main findings and discuss the potential implications and outcomes in our analysis. All the results obtained in our models are demonstrated in standardized coefficients, which means that the estimated coefficient of our model corresponds to a change in percentage (%) in the dependent variable that is caused by the 1% change in the independent variable.

Table 7 – Investments in Innovation, Growth and Innovation Performance

	Invest Innovation > Innovation Performance				**Invest Innovation > Growth**			
	Beta	**Std. Error**	**Z**	**p-value**	**Beta**	**Std. Error**	**Z**	**p-value**
Investments in Innovation	**0,557**	**- 0,160**	**3,413**	**0,001**	**- 0,295**	**- 0,170**	**- 1,772**	**0,076**
2010	0,285	- 1,950	0,146	0,884	36,814	- 3,010	12,226	-
2011	- 0,903	- 1,920	- 0,470	0,638	20,946	- 2,900	7,226	-
2012	- 1,029	- 1,910	- 0,539	0,590	18,983	- 2,880	6,586	-
2013	- 1,562	- 1,900	- 0,823	0,410	19,166	- 2,860	6,712	-
2014	6,019	- 1,860	3,238	0,001	16,980	- 2,780	6,103	-
2015	5,774	- 1,840	3,141	0,002	12,271	- 2,730	4,499	-
Constant	13,329	- 2,700	4,932	-	- 6,129	- 2,260	- 2,716	0,007
var(sector)	2,125	- 0,220	9,495	-	0,600	- 1,120	0,538	0,591
var(firm)	2,921	- 0,050	59,179	-	- 12,592	- 1,310	- 9,589	-
var(Residual)	2,982	- 0,020	158,493	-	3,417	- 0,020	201,094	-

Table 7 describes the estimation of our first model, where we investigate whether investing in innovation has a positive and significant impact in growth and innovation performance of the firms. From the results obtained, we found that investments in innovation and growth are negatively correlated (Beta= -0,295), however, this part of the model could not prove itself significant (p-value > 0,05) in statistical terms.

In the same model we could find a positive and significant relationship between Investments in innovation with innovation performance (p-value < 0,05). From the results described above, one standard deviation in innovation spending increases .557 the innovation performance of the firms, an extremely high rate of correlation observed in this result.

Table 8 – Investments in Innovation, ROA and Innovation Performance

	Invest Innovation > Innovation Performance				Invest Innovation > ROA			
	Beta	Std. Error	Z	p-value	Beta	Std. Error	Z	p-value
Investments in Innovation	**0,603**	**- 0,150**	**3,919**	**-**	**- 0,054**	**- 0,060**	**- 0,904**	**0,366**
2010	- 0,230	- 1,950	- 0,118	0,906	- 0,246	- 0,730	- 0,337	0,736
2011	0,061	- 1,980	0,031	0,976	- 1,736	- 0,740	- 2,338	0,019
2012	- 0,513	- 1,980	- 0,260	0,795	- 2,043	- 0,740	- 2,754	0,006
2013	0,013	- 1,970	0,007	0,995	- 2,522	- 0,740	- 3,415	0,001
2014	6,235	- 1,910	3,266	0,001	- 2,450	- 0,720	- 3,418	0,001
2015	6,336	- 1,890	3,355	0,001	- 6,530	- 0,710	- 9,201	-
Constant	12,273	- 2,600	4,726	-	7,026	- 0,820	8,601	-
var(sector)	2,045	- 0,230	8,795	-	0,373	- 0,490	0,768	0,442
var(firm)	2,871	- 0,050	57,216	-	2,066	- 0,050	41,100	-
var(Residual)	2,996	- 0,020	161,072	-	2,014	- 0,020	105,923	-

Similar conclusion could be reached from table 8, where we test whether investments in innovation affects innovation performance and profitability, where the latter was identified in this case as the return on assets (ROA) of the firms. From the table above, no positive and significant relationship was obtained from investments in innovation with ROA (Beta = -0,054; p-value > 0,05).

Notwithstanding, we do found a significant and positive relationship between investments in innovation by the firms with their innovation performance (Beta=0,603; p-value < 0,05). Once more, the rate of correlation between these variables was high,

where .603 increase in innovation performance could be obtained for each standard deviation of investments in innovation.

Table 9 – Investments in Innovation, EBITDA and Innovation Performance

	Invest Innovation > Innovation Performance				Invest Innovation > EBITDA			
	Beta	**Std. Error**	**Z**	**p-value**	**Beta**	**Std. Error**	**Z**	**p-value**
Investments in Innovation	**0,603**	**- 0,150**	**3,922**	**-**	**- 0,074**	**- 0,080**	**- 0,975**	**0,329**
2010	- 0,435	- 1,950	- 0,223	0,824	1,269	- 0,900	1,404	0,160
2011	0,275	- 1,980	0,139	0,890	1,014	- 0,920	1,103	0,270
2012	- 0,371	- 1,980	- 0,187	0,851	0,632	- 0,920	0,688	0,492
2013	0,040	- 1,980	0,020	0,984	0,342	- 0,920	0,373	0,709
2014	6,202	- 1,910	3,240	0,001	1,066	- 0,890	1,200	0,230
2015	6,258	- 1,900	3,299	0,001	- 2,429	- 0,880	- 2,755	0,006
Constant	12,300	- 2,590	4,740	-	13,662	- 1,960	6,963	-
var(sector)	2,042	- 0,230	8,769	-	2,040	- 0,190	10,769	-
var(firm)	2,865	- 0,050	56,398	-	2,358	- 0,050	48,142	-
var(Residual)	2,997	- 0,020	160,123	-	2,225	- 0,020	116,847	-

The last model in our study demonstrates that the relationship between investments in innovation and EBITDA did not prove it positively correlated nor significant (Beta = -0,07; p-value > 0,05).

Following the same relationship found in the last results, the second part of our last model did prove it positively correlated and significant for the innovation spending-innovation performance relationship, with .603 beta rate and p-value <.05.

From all the results obtained, we could not empirically demonstrate that investments in innovation has a positive and significant impact on firm's financial performance. However, when it comes to analyze the relationship between investments in innovation of the firms with their innovation performance, all the three models proved

positive and significant, with results varying from .557 to .603, which makes us accept our first hypothesis and reject the second one.

At first glance, these results seems illogical as it implies that innovation do lead to new revenue for the firms. However, these new revenue do not lead to higher growth or profitability, which means that the relationship between investments in innovation and financial performance could not be ascertained while the relationship between investments in innovation and innovation performance were very clear and positive.

While illogical, these results are also theoretically exposed and empirically supported by some of the studies we related in this work (Crossan and Apaydin, 2010; Hult *et. al.*, 2003). Nationwide, is also supported by Andreassi and Sbragia (2001), where it could demonstrate that investments in innovation – in their research innovation was a proxy of R&D – lead to an increase into the participation of new products over the total revenue of a firm.

Other empirical studies related to investigate this relationship also yields mixed results in the literature. While some studies (Freel and Robinson, 2004; Bowen *et. al.* 2010) contributed to highlight the importance of innovation to create differentiated financial results, others publications (Greve, 2003; Balkin *et. al.* 2000) could not demonstrated it significance. Besides, when it comes to analyze the innovation-performance relationship using data from Brazilian firms, the present study is consistent with the latest publications in this topic (Santos *et. al*, 2014; Silva *et. al.* 2015).

However, the lack of significance related to innovation and superior financial performance found in the first part of our model deserves further discussion. Several reasons could explain the results obtained in this study.

One of the potential reasons lie in the sector influence over the firms. As we did not treat the sectors differently on our model, the size and industry of some firms might have influence the result of the model (Damanpour, 1991; Brito 2009). In addition, when it comes to analyze the relationship between innovation and financial performance, innovation itself could be a necessary, yet not sufficient, condition to lead firms to superior performance.

Market readiness, learning aptitude and commercialization orientation are often cited by authors as sources of competitive advantage and superior performance by firms (Lin et. al. 2006; Morgan *et. al.* 2009). Cho and Pucik (2005) also pointed that quality is key to mediate that effect of innovation on profitability of firms. Notwithstanding, neither of these variables alone, quality and innovation, is sufficient to create superior financial performance on firms.

Still, the lack of significance in our model between innovation and financial performance deserves a further attention in our analysis. Bowen *et. al.* (2010) describes that causality and intertemporal effects are a main issue when it comes to identify whether innovation causes superior performance or it occurs in the other way around.

Additionally, as outlined by Santos *et. al.* (2014), innovation constructs reflects innovation efforts, which means that in innovation studies, inputs and outputs are not necessarily associated. For instance, patents are the most common outputs related to innovation (Silva *et. al.*, 2015). This may be an important limitation in our study since PINTEC research do not consider patents as an innovation output.

In addition, this study uses Brazilian data that are not supposed to be generalized without proper context. Brazilian economy has passed through some hard

oscillations into the period investigated in this work, which could lead to distortions in investments patterns and financial performance of the companies used in our sample.

Finally, as this study tries to establish a relationship between investments in innovation and financial results, we should consider that this link could be too extreme in scientific terms. As stated by Ray *et. al.* (2003), when it comes to analyze the link between two variables, the dependent one fits better when it is closer related to the independent variable. Therefore, in our case, innovation performance seems to be the appropriated variable to test the effect of investments in innovation made by firms.

5 CONCLUSION

This study investigates the relationship between innovation, innovation performance and its impact on financial performance of Brazilian firms. In order to accomplish this objective, we used databases from two independent sources, PINTEC and Valor Economico, through a multilevel model.

The results obtained from our research indicate that investments in innovation leads to a positive and significance increase of innovation performance of the firms, measured by the increased participation of new products' revenue share of the firms. Nonetheless, the same study could not assert the impact of innovation performance on the financial performance of the firms, measured in this work by growth and profitability. Thus, we were did not find support for our first hypotheses, but could accept the second one.

The non-significant effect of innovation investments in growth while there is a clear effect of innovation investments in revenue share of new products is intriguing. If innovation investments promote the sales of new products one could expect that there should be some effect in overall sales growth. One possible reason is that we operationalized sales growth as year to year change in sales. Growth is not a continuous and steady phenomenon, but rather happens in spurs (Penrose, 1959, p. 213). Higher growth in one year, may be compensated by lower growth in adjacent years. Geroski et al (1997) also concluded that growth rates vary in a random and unpredictable way. The fact that we operationalized growth as annual growth rates may have caused such a high variability that it was hard to find significant effects. Operationalizing growth as the average compounded growth rate (at firm level) as done in Porto and Brito (2010) in a multilevel method could be an alternative to explore this.

This work have also has other limitations, such as its sample definition, the influence of moderators on the final output, and, the limitations of the databases used in this research. As stated in the earlier section, sectors and firm size might have influenced the results obtained in our model (Brito *et. al.*, 2009). In this research we have 23 different sectors involved while the work of Brito et al (2009) was focused in only one sector. It could well be that the relationship between investments in innovation and financial performance is moderated by the sector. In our model we tested the average effect across all sectors. However, the highly positive and significant relationship found in the investments in innovation-innovation performance relationship confirmed the assumption that innovation spending do make firms more innovative.

The topic of is study far from any conclusion, the results obtained suggests the need for further research in this scope. First, we do recommend to test the same hypotheses of this work for each of the sectors considered in Valor Economico publication, the lack of sector treatment in this work should lead to important bias in our final output.

Secondly, the size of firms and the treatment of its numbers would be better if we used logarithmic terms. For this matter, further research should considered the use of this method to smooth the impact of size on the sample. Third, timing plays an important role in the innovation-performance relationship (Bowen *et. al.*, 2010). In this context, one should consider use different periods and approaches, such as intertemporal analyses and longitudinal studies of each of the publications of PINTEC.

Finally, as moderators plays an important role in innovation-financial performance relationship (Cho and Pucik, 2005), future research must consider include new forms of measurement and variables to investigate this relationship.

6 REFERENCES

ALBERNATHY, W.J.; UTTERBACK, J.M. Patterns of Industrial Innovation. Technology Review, Volume: 80, Issue: 7, Publisher: McGraw-Hill/Irwin, Pages: 40-47; 1978

ANDREASSI, Tales; SBRAGIA, Roberto. Relações entre indicadores de P&D e de resultado empresarial. Revista de Administração da Universidade de São Paulo, v. 37, n. 1, 2002.

BARNEY, J. B. Firm resources and sustained competitive advantage. Journal of Management, v. 17, n. 1, p. 99-120, 1991.

BARNEY, J.; CLARK, D. N. Resource-Based Theory. New York: Oxford, 2007.

BRANDENBURGER, A. M.; STUART JR., H. W. Value-based business strategy. Journal of Economics & Management Strategy, v. 5, n. 1, p. 5-24, 1996.

BEAVER, Graham; PRINCE, Christopher. Innovation, entrepreneurship and competitive advantage in the entrepreneurial venture. Journal of Small Business and Enterprise Development, v. 9, n. 1, p. 28-37, 2002.

BLOCH, C. Assessing recent developments in innovation measurement: the third edition of the Oslo Manual. Science and Public Policy. 2007 Feb 1;34(1):23-34.

BRITO, Eliane Pereira Zamith; BRITO, Luiz Artur Ledur; MORGANTI, Fábio. Inovação e o desempenho empresarial: lucro ou crescimento?. RAE electron., São Paulo , v. 8, n. 1, June 2009

BRITO, R. P. de.; BRITO, L. A. L. Vantagem Competitiva, Criação de valor e seus efeitos sobre o Desempenho. RAE-Revista de Administração de Empresas, v. 52, n. 1, jan-fev, 2012

BOWEN, F. E., ROSTAMI, M., & STEEL, P. (2010). Timing is everything: A meta-analysis of the relationships between organizational performance and innovation. Journal of Business Research, 63(11), 1179-1185.

CAMISÓN, César; VILLAR LÓPEZ, Ana. An examination of the relationship between manufacturing flexibility and firm performance: The mediating role of innovation.

International Journal of Operations & Production Management, v. 30, n. 8, p. 853-878, 2010.

CHEN, Chung-Jen; HUANG, Yi-Fen. Creative workforce density, organizational slack, and innovation performance. Journal of Business Research, v. 63, n. 4, p. 411-417, 2010.

CHO, H.-J. and PUCIK, V. (2005), Relationship between innovativeness, quality, growth, profitability, and market value. Strat. Mgmt. J., 26: 555–575

CHRISTENSEN, C.M.; BOWER, J.L. Disruptive Technologies: Catching the Wave, Harvard Business Review; January-February 1995

CHRISTENSEN, Clayton M. The Innovator's Dilemma: When New Technologies Cause Great Firms to Fail. Boston, MA: Harvard Business School Press, 1997

COZZARIN, Brian P. Innovation quality and manufacturing firms' performance in Canada. Economics of Innovation and New Technology, v. 13, n. 3, p. 199-216, 2004.

COMBS, J. G., RUSSEL Crook, T., & SHOOK, C. L. (2005). The dimensionality of organizational performance and its implications for strategic management research. In Research methodology in strategy and management (pp. 259-286). Emerald Group Publishing Limited.

CROSSAN, Mary M.; APAYDIN, Marina. A multi-dimensional framework of organizational innovation: A systematic review of the literature. Journal of management studies, v. 47, n. 6, p. 1154-1191, 2010.

DAMANPOUR, Fariborz. Organizational innovation: A meta-analysis of effects of determinants and moderators. Academy of management journal, v. 34, n. 3, p. 555-590, 1991.

DAMANPOUR, Fariborz. Organizational size and innovation. Organization studies, v. 13, n. 3, p. 375-402, 1992.

DA SILVA, RB, KLOTZE MC, FIGUEIREDO AC, da Motta LF. Innovative intensity and its impact on the performance of firms in Brazil. Research in International Business and Finance. 2015 May 1;34:1-6.

EVANGELISTA, Rinaldo; VEZZANI, Antonio. The economic impact of technological and organizational innovations. A firm-level analysis. Research Policy, v. 39, n. 10, p. 1253-1263, 2010.

FREEL, M. S., & ROBSON, P. J. (2004). Small firm innovation, growth and performance: Evidence from Scotland and Northern England. International Small Business Journal, 22(6), 561-575.

FREEMAN, C. Economics of Innovation. Aldershot: Edward Elgar Publishing, 1990

GATIGNON, Hubert et al. A structural approach to assessing innovation: Construct development of innovation locus, type, and characteristics. Management Science, v. 48, n. 9, p. 1103-1122, 2002.

GALBRAITH, J.R. Designing the Innovating Organization. Organizational Dynamics, 10(3): 5-25; 1982

GEROSKI, P. A.; MACHIN, S. J.; WALTERS, C. F. Corporate growth and profitability. The Journal of Industrial Economics, v. 45, n. 2, p. 171-189, 1997.

GREWAL, Rajdeep; SLOTEGRAAF, Rebecca J. Embeddedness of organizational capabilities. Decision Sciences, v. 38, n. 3, p. 451-488, 2007.

GOLDSZMIDT RG, BRITO LA, de Vasconcelos FC. Country effect on firm performance: A multilevel approach. Journal of Business Research. 2011 Mar 1;64(3):273-9.

GOPALAKRISHNAN, Shanthi. Unraveling the links between dimensions of innovation and organizational performance. The Journal of High Technology Management Research, v. 11, n. 1, p. 137-153, 2000.

GRUPP, Hariolf; MAITAL, Shlomo. Perceived innovation of Israel's largest firms:: an empirical study. Technovation, v. 20, n. 3, p. 129-138, 2000.

HARHOFF, D. (1999). Innovation objectives, managerial education and firm performance—an exploratory analysis. In The dynamics of innovation (pp. 133-160). Springer, Berlin, Heidelberg.

HELFAT, Constance E.; PETERAF, Margaret A. The dynamic resource-based view: Capability lifecycles. Strategic management journal, v. 24, n. 10, p. 997-1010, 2003.

HILL, Charles WL; DEEDS, David L. The importance of industry structure for the determination of firm profitability: a neo-Austrian perspective. Journal of Management Studies, v. 33, n. 4, p. 429-451, 1996.

HULT GT, HURLEY RF, KNIGHT GA. Innovativeness: Its antecedents and impact on business performance. Industrial marketing management. 2004 Jul 1;33(5):429-38.

JAMES, Sharon D.; LEIBLEIN, Michael J.; LU, Shaohua. How firms capture value from their innovations. Journal of management, v. 39, n. 5, p. 1123-1155, 2013.

LIEBERMAN, Marvin B.; MONTGOMERY, David B. First-mover advantages. Strategic management journal, v. 9, n. 1, p. 41-58, 1988.

LIEBERMAN, Marvin B.; MONTGOMERY, David Bruce. First-mover (dis) advantages: Retrospective and link with the resource-based view. Graduate School of Business, Stanford University, 1998.

LIN, B. W., LEE, Y., & Hung, S. C. R&D intensity and commercialization orientation effects on financial performance. Journal of Business Research, 59(6), 679-685, 2006

MADSEN TL, LEIBLEIN MJ. What factors affect the persistence of an innovation advantage?. Journal of Management Studies. 2015 Dec 1;52(8):1097-127.

MARKIDES, C. What is Strategy and How Do You Know if You Have One? Business Strategy Review, Volume 15, Issue 2, Summer 2004.

MARKIDES, C. Strategic Innovation. Sloan Management Review, Spring 1997.

MAZUR, Karolina; INKÓW, Monika. Methodological aspects of innovation performance measurement in the IT sector. Management, v. 21, n. 2, p. 14-27, 2017.

MINTZBERG, H. Crafting Strategy. Harvard Business Review, July – August 1987

MINTZBERG H. Strategy Formation: Schools of Thought, Perspectives on Strategic Management. Harper Business, Volume: 1968, pages 105-236; 1990

MISANGYI VF, ELMS H, GRECKHALMER T, LEPINE JA. A new perspective on a fundamental debate: A multilevel approach to industry, corporate, and business unit effects. Strategic Management Journal. 2006 Jun 1;27(6):571-90.

MOL, Michael J.; BIRKINSHAW, Julian. The sources of management innovation: When firms introduce new management practices. Journal of business research, v. 62, n. 12, p. 1269-1280, 2009.

MORGAN, Neil A.; SLOTEGRAAF, Rebecca J.; VORHIES, Douglas W. Linking marketing capabilities with profit growth. International Journal of Research in Marketing, v. 26, n. 4, p. 284-293, 2009.

PENROSE, E. The Theory of the Growth of the Firm. Third. Oxford, UK: Oxford University Press, 1959. ISBN 0-19-828977-4.

PORTER, M.E. What is Strategy? Harvard Business Review; November – December 1996

PORTER, M.E. How Competitive Forces Shape Strategy. Harvard Business Review; March/April 1979

PORTER, M.E. From Competitive Advantage to Corporate Strategy. Harvard Business Review, pp 43–59; May/June 1987

PORTER, M. E. Vantagem competitiva. *Rio de Janeiro: Campus, 1989.*

PORTO, É. C.; BRITO, L. A. L. Aglomeração Industrial E Seu Efeito Na Taxa De Crescimento Das Empresas Brasileiras. REAd - Revista Eletrônica de Administração, v. 16, n. 2, p. 233 - 267, 2010.

RAY, Gautam; BARNEY, Jay B.; MUHANNA, Waleed A. Capabilities, business processes, and competitive advantage: choosing the dependent variable in empirical tests of the resource-based view. Strategic management journal, v. 25, n. 1, p. 23-37, 2004.

RUMELT, Richard P. Towards a strategic theory of the firm. Resources, firms, and strategies: A reader in the resource-based perspective, p. 131-145, 1997.

SANTOS, D. F. L., BASSO, L. F. C., KIMURA, H., & Kayo, E. K. (2014). Innovation efforts and performances of Brazilian firms. Journal of Business Research, 67(4), 527-535.

SANTOS, J. B., & BRITO, L. A. L. (2012). Toward a subjective measurement model for firm performance. BAR-Brazilian Administration Review, 9(SPE), 95-117.

SAPPRASERT, Koson; CLAUSEN, Tommy Høyvarde. Organizational innovation and its effects. Industrial and Corporate Change, v. 21, n. 5, p. 1283-1305, 2012.

SCHERER, Frederic M.; ROSS, David. Industrial market structure and market performance. 1990.

SOOD, Ashish and TELLIS, Gerard J., Do Innovations Really Payoff? Total Stock Market Returns to Innovation (2008). Marketing Science, Vol. 28, No..3, p. 442, May/Jun 2009; Marshall School of Business Working Paper No. MKT 11-09

SUBRAMANIAM, Mohan; YOUNDT, Mark A. The influence of intellectual capital on the types of innovative capabilities. Academy of Management journal, v. 48, n. 3, p. 450-463, 2005.

SCHUMPETER, J. The Theory of Economic Development. Kluwer Academic Publishers. Printed in the Netherlands; 2003

SZYMANSKI DM, Kroff MW, Troy LC. Innovativeness and new product success: Insights from the cumulative evidence. Journal of the Academy of Marketing Science. 2007 Mar 1;35(1):35-52.

TIDD, J. (2001). Innovation management in context: environment, organization and performance. International Journal of Management Reviews, 3(3), 169-183.

VINCENT, Leslie Harris; BHARADWAJ, Sundar G.; CHALLAGALLA, Goutam N. Does innovation mediate firm performance?: a meta-analysis of determinants and consequences of organizational innovation. 2004.

WALKER, Richard M.; DAMANPOUR, Fariborz; DEVECE, Carlos A. Management innovation and organizational performance: The mediating effect of performance management. Journal of Public Administration Research and Theory, p. muq043, 2010.

ZHENG, S., LI, H., Wu. (2013), Network resources and the innovation performance: Evidence from Chinese manufacturing fi rms, "Management Decision" Vol. 51, Iss. 6, pp.1207-1224, Doi:10.1108/MD-02-2012-0102.

ZHOU, Kevin Zheng; WU, Fang. Technological capability, strategic flexibility, and product innovation. Strategic Management Journal, v. 31, n. 5, p. 547-561, 2010.