The Role of Diversification on a Firm's Performance – Empirical Evidence from Portugal

by

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Master Dissertation in Finance

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September, 2017

Biographical Note

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While at FEP, Monica was part of the Finance Club, at the Market Research Department, where she could execute market analysis tasks.

In terms of professional experience, she had done two summer internships at an accounting company and at a telecommunication company, in the financial sector.

Abstract

The impact of diversification on a firm's performance has been being studied for many years. Still there are many questions on what are the specific effects of such strategy. Therefore, this dissertation intends to test if diversified firms outperform the focused ones and whether the level of diversification affects linearly the firm's performance or if there is an inverted U-shaped relationship between a firm's performance and total the level of diversification. To deepen the reliability of the results, there will also be made a distinction between the performance of related and unrelated diversifiers. The findings, based on a sample of Portuguese companies suggest that diversification affects performance positively, as diversified firms outperform the focused ones. The results do also show that unrelated diversifiers exhibit better levels of performance than the related ones. Besides that, the results point for a U-shaped relationship between a firm's ROI and its level of diversification.

JEL-codes: G32, G34, L25

Key-words: corporate diversification; Portugal; performance; relatedness; value creation; u-shaped relationship; unrelated diversification; ROI

Sumário

O impacto da diversificação no desempenho financeiro das empresas tem vindo a ser um tema bastante estudado, nos últimos anos. No entanto, persistem ainda diversas questões em torno de quais serão os efeitos desta estratégia numa empresa. Assim, o intuito desta dissertação passa por testar se as empresas diversificadas apresentam um melhor desempenho que as empresas especializadas e se o nível de diversificação afeta, de forma linear, o desempenho da empresa ou se existe uma relação de U invertido entre o desempenho da empresa e o nível de diversificação. Para aprofundar a robustez dos resultados, procedeu-se à distinção entre empresas diversificadas relacionadas e não-relacionadas. Os resultados, baseados numa amostra de empresas portuguesas, sugerem que a diversificação influencia positivamente o desempenho financeiro da empresa e que as empresas diversificadas chegam mesmo a superar as especializadas. Este estudo aponta ainda para o facto de as empresas diversificadas não-relacionadas apresentarem melhores níveis de desempenho que as relacionadas. Além disso, os resultados exibem ainda uma relação em forma de U entre o Retorno no Investimento das empresas e o índice de diversificação total.

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1. Introduction

Diversification[1] involves a set of processes, that make a single firm take control over multiple businesses, that might be, or not, related to the core activity of the main firm.

This dissertation aims to study the main differences, in terms of performance, between diversified and focused companies from Portugal.

There are many studies for this subject, however there's still controversy on whether diversification contributes for value creation. Some of them show that diversification brings some benefits for a company, while others suggest the opposite. Such contributions led to mixed results over time and for this reason, the existent literature for corporate diversification presents us a puzzle.

Back in the 1960s/1970s, a high percentage of firms diversified themselves from their core businesses, to avoid relying on a single industry. Studies have shown that the "relationships established and the levels of profitability varied between firms with different strategies of diversification" (Rumelt, 1974). Such events made room for the emergence of new studies, that attempted to understand the processes and the motivations behind such decisions. However, later, mainly in the 1980s, firms were seen getting back to their core businesses. The refocus[2] phenomena generated an interesting turning point in history. Even though some empirical studies suggest that diversified firms perform worse than the specialized ones (Lang and Stulz, 1994; Berger and Ofek, 1995; Rajan et al., 2000), there is also evidence that diversified firms unveil better levels of performance than the undiversified ones (Christensen and Montgomery, 1981; Graham et al., 2002).

Recent researches have shown that «market sentiment has swung in favor of diversified companies which is reflected in the steady decline of the conglomerate discount[3]» (BCG,

[1] Diversification is a way to expand a company from their core activity, by exploring new markets and new products (Ansoff, 1957).

[2] Refocus strategies, happen when a firm goes back to its core activity (Denis et al, 1997).

[3] Difference often found between the conglomerate value and the value of its parts. It's used as a sign of value destruction, which may be associated with the misallocation of the resources (Lang

2012), which worked as one of the motives to enroll in this topic. The other reasons are related with the fact that management and marketing disciplines usually support diversification, opposing financial scholars, whose perceptions typically contrast with the first ones, pointing to problems that arise under the agency and the internal capital market perspectives (Fama, 1980; Hoskisson and Hitt, 1990; Denis et al., 1997; Pandya and Rao, 1998). Despite that, most of the studies already conducted are centralized in the US, UK and some European countries.

The theoretical background is also somehow controversial, considering that the theories involved provide elucidations for parts of the process, and so they fail to fully unveil the motives behind the decision to diversify.

Moreover, the Portuguese market has been barely studied, so it would be interesting to study it, in the sense that it could turn out to bring valuable insights for this topic.

Most of the studies haven't dug in about the explanatory variables for performance, which may be the reason why the results obtained are at some point biased. Despite that and as far as we know, this topic hasn't been addressed yet, at least at this extent, in Portugal, which may provide us with newer perceptions regarding the role of diversification in Portugal and so it may allow us to contribute to bridge the gap among this issue.

Considering the objectives mentioned, we are looking forward to answering the following questions:

- What's the level of diversification of Portuguese firms? From the diversified ones, which firms are related[4] or unrelated diversifiers?
- Which variables can explain the operational performance (ROI)?
- What can we infer about focused and diversified firms' performance?

and Stulz, 1994; Berger and Ofek, 1995; Lins and Servaes, 1999; Rajan et al, 2000; Santalo and Becerra, 2008).

[4] Relatedness is the linkage between new businesses, resultant form diversification, and the core business of the firm. If the new ones are associated with the main one, the firm is a related diversifier, otherwise it is an unrelated diversifier (Rumelt, 1974; Bettis, 1981; Berger and Ofek, 1995).

In this study, the level of diversification will be computed through an index for total diversification, which results of the sum of the entropy indexes[5] (based on SIC measures) for the level of relatedness and unrelatedness. Finally, the sample will be composed of Portuguese companies that will be analyzed between 2006 and 2015.

The results show that for the total sample (including both focused and diversified firms), diversification has a positive impact on a firm's performance. Among the diversified firms, unrelated diversifiers unveil better levels of performance and that the effect of diversification on performance is different for each sector.

Following this introduction, a literature review will be carried on (in Chapter 2) and in Chapter 3, the hypotheses will be formulated. Then, methodology and the methods used are presented in Chapter 4. On Chapter 5 it's explained how the sample was collected, it also comprises a characterization of the sample, the research design and the descriptive statistics. Finally, results are shown on Chapter 6 and the last part of this dissertation has the main conclusions, limitations and further research suggestions (Chapter 7).

[5] The entropy measure is used to compute the total diversification. In simple terms, it's a weighted average of the firm's diversification within sectors, plus the firm's diversification across sectors (Jacquemin and Berry, 1979).

2. Literature Review

In this section, we will address the main concepts developed, the theoretical background (vast and at some point contradictory) and the most relevant perspectives and conclusions obtained.

Considering the previous research in this topic, the first conclusion is that the relationship between a firm's performance and diversification is not fully explained, creating a sort of a "puzzle".

2.1. Historical facts

Back in the 1960s/1970s, a high percentage of firms diversified to avoid relying on a single industry. Studies have shown that the "relationships established and the levels of profitability varied between firms with different strategies of diversification" (Rumelt, 1974).

Diversified firms see their specific risk reduced, considering that it is spread across industries, which may have positive repercussions on their long-term compensations (Jensen and Meckling, 1976). Later, mainly in the 1980s, firms were getting back to their core businesses. The refocus phenomena generated an interesting turning point in history. Evidence has shown that firms don't voluntarily refocus, it's yet caused by the external monitoring of managers (Denis et al., 1997).

Most of the existent literature suggests that diversification destroys value (Lang and Stulz, 1994; Berger and Ofek, 1995; Rajan et al., 2000). The conglomerate discount might be associated with inefficient capital markets, Stulz (1990), or with influence costs, that result from internal power struggles (Rajan et al., 2000). However, the overall literature shows conflicting results and interpretations (Markides and Williamson, 1994). An example of that arises with further studies which have shown that diversified companies trade at a discount before they become diversified. Thus, when they control for self-selection, the discount is lowered or it becomes a premium (Campa and Kedia, 2002).

The first categorical measures for this strategy have distinguished three levels of diversification: undiversified firms; moderately diversified firms and highly diversified

firms. These studies have also found that the influence of diversification on a firm's performance depends on the type and level of relatedness among the company's businesses (Rumelt, 1974; 1982). Even though there is lack of evidence on what would be the best type of diversification, related diversified firms tend to show better results than unrelated or conglomerate diversification (Bettis, 1981; Markides and Williamson, 1994).

Empirical studies suggest that diversified firms perform worse than the specialized ones (Lang and Stulz, 1994; Berger and Ofek, 1995; Rajan et al., 2000). Nevertheless, the impact of diversification varies across firms. The discounts (worst performance) tend to happen in industries where most of the competitors are specialized and the premium (better performance) arises when there are only a few specialized competitors in the sector (Santalo and Becerra, 2008).

Contrarily to that and in accordance with the lack of consensus among the authors, there is also evidence for the fact that diversified firms unveil better levels of performance than the undiversified ones (Christensen and Montgomery, 1981; Graham et al., 2002).

2.2. Why diversify?

The decision to diversify can be supported by four perspectives/ views, namely the transaction costs economics perspective, the market power perspective, the resource perspective, which are related with profit maximization and the agency perspective, which is of managerial nature.

2.2.1. Transaction Costs Perspective

The initial studies of the firm and market organization, introduced the concept of transaction costs, by suggesting that employment relations were more prone to engage in transaction costs, if contracted outside a company (Coase, 1937).

To mitigate transaction costs, firms can develop internal strategies, by taking advantage of the knowledge and expertise they acquire from diversifying (Hitt et al., 1997; Benito-Osorio et al., 2012).

There are multiple explanations to justify the decision to diversify. For instance, one of the studies regarding the features of firms rent-generating resources, shows that those resources are traded through market processes, which involve high contractual risks, namely license loyalties, secrecy and learning curve advantage problem. This way, engaging in a diversification strategy would be a smarter decision, to outline the risks inherent to any alternative strategy (Silverman, 1999).

However, this theory has been proven to be insufficient to explain the diversification process. Evidence shows that the costs of managing different businesses surpass the benefits of sharing capabilities. Therefore, transaction costs lead to a downward momentum in the profits of a firm (Williamson, 1975; 1985).

2.2.2. Market Power Perspective

The primary studies on diversification, were based on the belief that there's a positive relation between diversification and performance. Therefore, diversification was likely to bring market power, considering that it would consist of the sum of the market power on individual markets (Hill, 1985).

A diversified firm is more prone to make a better use of their capabilities than a specialized one, since the benefits brought by sharing capabilities promote the growth of the market power. It turns out to be a source of efficiency, Scharfstein and Stein (2000), considering that the access to external funds is facilitated for diversified firms, promoting their financial growth and the process of reallocating capital throughout the multiple businesses (Meyer et al., 1992).

However, authors are not in accordance on how market power can be influenced by diversification. Diversification makes it difficult to enter the market for certain competitors, which reduces them considerably and helps firms to get market power (Li, 2007).

Evidence turned out to show the opposite. The fact that diversification exhibits a positive association with corporate performance is more related to economies of scope[6], rather than market power (Caves, 1981; Montgomery, 1985).

2.2.3. Agency Perspective

Whenever managers benefit more than investors, the agency problem arises (Fama, 1980), along with the moral hazard problem (Amihud and Lev, 1981).

To handle this problem, managers opt to diversify, so they can solve the emergent problems regarding managerial motivations and governance's efficiency (Li, 2007). Therefore, they are more keen to diversify when their interests fail to match the capital owners' ones or when they're in the presence of information asymmetries (Aron, 1988).

Managers' decision to diversify and their unwillingness to refocus are influenced by agency problems. Therefore, most of the refocus events happen when firms are exposed to external pressures (Denis et al., 1997; Berger and Ofek, 1999).

Diversification may benefit managers, considering the power and status they get, when they're managing larger companies (Jensen, 1986; Shleifer and Vishny, 1989).

Additionally, diversification attenuates the moral hazard[7] problem with managers, by lowering the risk to which they are exposed for incentive purposes, and so it helps reducing the agency costs (Aron, 1988). However, agency problems caused by managerial motives are the reason why firms maintain low levels of diversification (Denis et al., 1997). The conflicts of interest are, hence, reduced mainly due to refocus events (Berger and Ofek, 1999).

[6] Economies of scope describe the fact that the average total cost of production is reduced, when the production of goods and/or services increases (Panzar and Willig,1981).

[7] Agency and moral hazards are also highly addressed, when attempting to explain the decision and the process of diversification. These problems are likely to arise when managers benefit more with diversification than the investors (Fama, 1980; Amihud and Lev, 1981; Aggarwal and Samwick, 2003).

2.2.4. Resource Perspective

A firm is a result of the combination of specific and hardly imitable resources and capabilities. Diversification studies show how a firm can efficiently explore their resources for its behalf, to create competitive advantage over their peers (Montgomery and Wernerfelt, 1988).

Managers decide to diversify when there's excess capacity in productive factors or resources, and they do so by entering markets where the resource requirements are equal to their capabilities (Montgomery and Hariharan, 1991; Silverman, 1999).

Diversification allows firms to exchange non-marketable resources. It helps firms to take advantage of economies of scope and scale of the resources available, which can be traded in different business segments (Kay, 1984).

This perspective gives an insight on why a firm decides to expand, by diversifying into certain segments of business (Li, 2007). The resource view is the most auspicious one, since diversification allows firms to exploit their excess capacity in resources. The level of profit and extent of diversification are therefore dependent on the resource stock (Montgomery, 1994).

A deep analysis of each one of these four perspectives, indicates that there are several limitations and it becomes difficult to select which one provides the best contribution for solving the diversification puzzle. Hence, they fail to fully unveil the motives behind the decision to diversify, considering they only provide elucidations for parts of the process.

Further investigation in this field has explored this problem, through re-building the existing framework and bringing new evidence regarding the factors that influence the decision to diversify.

2.3. Empirical Studies[8]

Jacquemin and Berry (1979) aimed to test the reliability of the existing measures for diversification level, and it showed that entropy measures are the most suitable ones at different levels of product and industry aggregation.

Bettis (1981) studied the performance differences between related and unrelated diversified firms. It concluded that related diversifiers tend to perform better. Therefore, higher levels of diversification don't affect performance negatively.

On the other hand, Berger and Ofek (1995) suggest that diversification destroys value. However, such loss can be minimized through related diversification. Additionally, the results show that diversification can bring some benefits associated with increased debt capacity and tax savings.

Other studies are focused on understanding the concept and the causes of diversification discount, suggesting that managers engage into diversification due to external causes. Contrarily to the previous study, Campa and Kedia (2002) show evidence that diversification creates value, which contributes to show how contradictory are the results among different authors.

Regarding the motivations for diversifying, Aggarwal and Samwick (2003) results show that such decision is based on changes at the private benefits level, instead of a way to reduce the exposure to risk.

Santalo and Becerra (2008) attempted to understand the performance of diversified and specialized firms and found out that the effect of diversification varies across industries and that the diversification discount arises in industries with multiple specialized companies. Their results also suggest that diversified firms perform better in industries dominated by conglomerates.

More recently, Custódio (2014) focused on the fact that q-based measures of diversification discount are biased. Therefore, measured q is lower for the merged firm,

[8] The studies chosen for this chapter represent the ones that served as a foundation for this study and are summarized in Appendix 1.

and so conglomerates are also lower. The main finding of this study was that the discount can be attenuated if the goodwill is subtracted from the book value of assets. However, alternative measures, such as market-to-sales aren't biased.

2.4. Summary

As shown, the literature for this topic is extensive and the results achieved by different authors don't necessarily coincide, and so the puzzle is not solved yet. Even though the seemingly unavoidable loss that comes from diversification is consistent with most researches, there is also evidence that such discount may have been due to other external causes. Considering that most of the studies regarding this topic are conducted in the United States, United Kingdom and some European countries, our study will use a sample of Portuguese companies. Although similar studies have already been done using a sample of Portuguese companies, none of them has explored the different impact of related and unrelated diversification.

3. Hypotheses Formulation

As stated in the previous chapters, measuring the impact of diversification on a firm's performance can be somehow challenging, considering the lack of consensus brought by the literature over time. However, we are intending to test and understand if they contribute, or not, to explain the performance of a firm.

Thus, we defined our research hypotheses as follows:

- ***H_1:*** *Diversified firms perform better than the non-diversified ones.*

Consistent with the major part of the literature, we are aiming to test if product diversification does effectively bring better levels of performance for a firm, than focused firms.

- ***H_2:*** *Diversification creates value, and after a break-point destroys it. (Inverted U-shaped relationship)*

To formulate our second hypothesis, we based our assumptions on the fact that there's an optimal level of diversification. At that point, the levels of profitability are likely to be at its best (Markides, 1995). Such inverted U-shaped relationship between diversification and performance, as shown in Figure 1, has been addressed in the literature for many times, even though the results aren't conclusive (Haans et al., 2016). To test this hypothesis, it will be added to the econometric model, presented later, a quadratic term for total diversification.

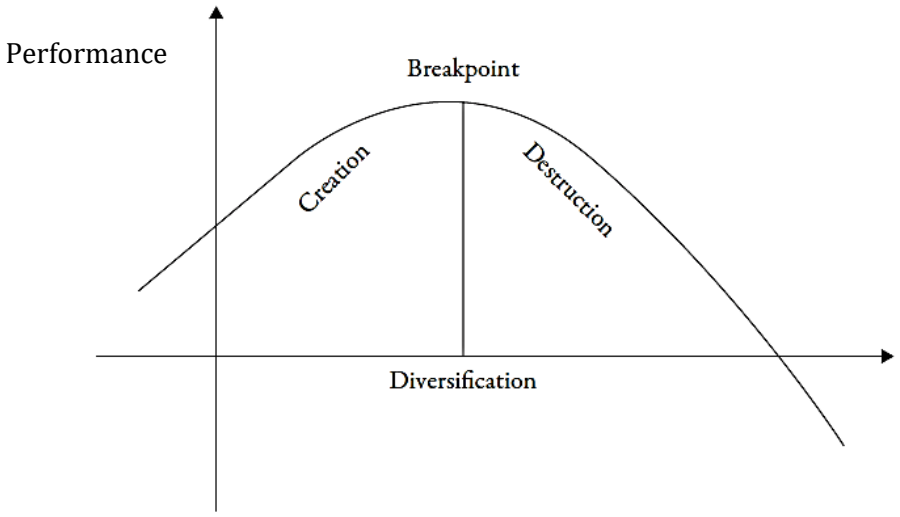


Figure 1 – Inverted U-shaped relationship between performance and diversification

- ***H_3:*** *Related diversification affects performance more positively than unrelated diversification.*

Regarding our third hypothesis, and according to other studies, a firm that diversifies into a new business that isn't related with the firm's core business is more likely to perform poorly (Rumelt, 1974). In contrast, related diversifiers seem to be the most successful ones, considering that the firm will be able to use the benefits of being related with other businesses for its behalf (Seth, 1990; Gálvan et al., 2014). Thus, the synergies created among related businesses lead us to believe that related diversification provides better results, in terms of performance, than focused firms or unrelated diversifiers (Bettis, 1981). Relatedness also contributes for reducing business risk (Gálvan et al., 2014).

4. Methodological Aspects

This chapter aims to present the sources of data and the methodology that will be implemented to test the performance levels of diversified and specialized firms.

4.1. Methodology[9]

Consistent with the steps followed by other studies, we will start by measuring the total diversification of each firm, using an entropy index. The index incorporates the number of segments in which the firm operates, as well as the share of sales verified in each segment, providing the level of diversification across the 4-digit Standard Industrial Classification (SIC)[10] industries (Jacquemin and Berry, 1979; Hitt et al., 1997; Gomez-Mejia et al., 2010; Kistruck et al., 2013).

SIC codes are implemented to divide the firm's segments and groups. Therefore, 2-digit level SIC industries regard the industry groups and the 4-digit level SIC ones are the industry segments (Jacquemin and Berry, 1979; Palepu, 1985; Akpinar and Yigit, 2016).

The total entropy index *DT*, is a result of the sum of the related and unrelated parts (Jacquemin and Berry, 1979; Robins and Wiersema, 2003; Akpinar and Yigit, 2016).

Therefore, we have that:

$$\boldsymbol{DT = DR + DU} \qquad \textbf{(1)}$$

Where:
DT – Total diversification
DR - Related diversification
DU – Unrelated Diversification

[9] The foundations for the methodology adopted in this dissertation are described in Appendix 2.

[10] The Standard Industrial Classification (SIC) is a system used for classifying industries, which was established in the United States.

The related diversification entropy index *(DR)* is used to compute the degree of relatedness among the different segments in which the firm develops its activity. This way, an industry group is composed by a set of related segments. Accordingly, the segments across groups aren't likely to be related to each other, contrarily to what happens with segments within the same industry group (Jacquemin and Berry, 1979; Montgomery and Hariharan, 1991; Akpinar and Yigit, 2016).

Measure of Relatedness:

$$DR_J = \sum_{i\&j}^{M} P_i^j \ln\left(\frac{1}{P_i^j}\right) \quad \textbf{(2)}$$

Where:

DR – Related diversification

P_j^i - Share of the segment *i* for group and *j* in the total sales of the group.

If *N* represents the segments (4-digit SIC codes) of the firm organized into *M* industry groups (2-digit SIC codes), $N \geq M$.

Similarly, the unrelated diversification entropy index *(DU)* is measured using 2-digit SIC data, as follows (Jacquemin and Berry, 1979; Montgomery and Hariharan, 1991; Akpinar and Yigit, 2016).

$$DU = \sum_{j=1}^{M} P^j \ln\left(\frac{1}{P^j}\right) \quad \textbf{(3)}$$

Where:

DU – Unrelated diversification

P^j – Share of sales in 2-digit SIC code *j*, for a firm with *M* different 2-digit SIC segments

To test if there are differences in terms of performance among diversified and specialized firms, the following panel data model will be estimated:

$$\boldsymbol{ROI} = \propto + \left(\boldsymbol{\beta_1} + \boldsymbol{\theta_1 Dummy_{DU_{it}}} + \boldsymbol{\theta_2 Dummy_{DR}}\right)\boldsymbol{DT} + \boldsymbol{\beta_2 LEV} + \boldsymbol{\beta_3 GRO} + \boldsymbol{\beta_4 SIZ} + \boldsymbol{\beta_5 TAX} + \boldsymbol{\beta_6 TAN} + \boldsymbol{\beta_7 LIQ} + \boldsymbol{\beta_8 NDTS} + \boldsymbol{\beta_9 INV} + \boldsymbol{\beta_{10} AGE} + \boldsymbol{\beta_{11} RIS} + \boldsymbol{\varepsilon} \quad \textbf{(4)}$$

- ***ROI (Return on Investment)*** is the dependent variable[11], which is a proxy for the performance of a firm.

$$\boldsymbol{ROI}^{12} = \frac{(\boldsymbol{Gains\ from\ Investment - Operational\ Costs})}{(\boldsymbol{Cost\ of\ Investment})} \quad \textbf{(5)}$$

This measure is seen as the most important financial ratio in financial statement analysis (Masa'deh et al., 2015). Additionally, ROI also captures the return on firms' annual invested capital into diversification activities, Santarelli and Tran (2013), which is important to our analysis.

The sales of diversified firms often come from different sources, considering that firms usually diversify into new business sectors, so they can attenuate the loss or reducing profit in their current industries. However, it's essential to emphasize that a lower Return on Sales (ROS) doesn't indicate that diversification activities destroy value. Hence, the implementation of ROI allows for seizing the return on firms' annual invested capital in diversification activities. It provides a direct measure for the performance of the diversification investment, since it ignores the potential effects of other revenue sources (Santarelli and Tran, 2013).

[11] A table with a summary of the variables selected and their respective expected signs is presented in Appendix 3.

[12] Gains from Investment were considered as being the total sales minus the operational costs, over the cost of investment which is the sum of equity and non-current liabilities.

- $\boldsymbol{DT_{it}}$ represents the index for total diversification of the firm, which is a result of the sum of the entropy indexes for related (*DR)* and unrelated diversifiers (*DU)*. We considered a firm as being diversified when its total diversification index was greater than zero. Otherwise, if DT is zero, the firm is focused.

- $\boldsymbol{Dummy\_DU_{it}}$ is a dummy variable which takes the value of one for the case of unrelated diversification and zero otherwise (related diversification). The interactivity of the dummy (categorical variable) with the variable DT, allows us to convert the dummy into a numeric variable, which is better for estimation purposes. This way, we will be able to distinguish the effect of related diversifiers from the unrelated ones, in terms of performance. The coefficient of the variable *DT*, which stands for the total entropy index of diversification, will be equal to ($\beta_1 + \theta_2$), when in the presence of relatedness, since Dummy_DU_{it} is going to be zero. Similarly, if there's unrelatedness, DU_{it} will be equal to one, Dummy_DR_{it} will be zero and the coefficient for DT will be equal to ($\beta_1 + \theta_1$) (Wan and Hoskisson, 2003). Considering that inferring about the effect of related and unrelated diversifiers on a firm's performance is one of the aims of this study, we will also implement in our model a dummy variable for relatedness, as shown below. To distinguish between related and unrelated diversifiers, we assumed that related diversifiers were the ones with a related diversification index greater than 0.5 (DR>0.5) and unrelated diversifiers were the ones with DU>0.5.

- $\boldsymbol{Dummy\_DR_{it}}$ is a dummy variable for related diversifiers. It follows the same assumptions as Dummy_DU. The dummy is zero when the firm is focused or an unrelated diversifier and it's one for related diversifiers. This way, in a sample composed by diversified and focused firms, after running the regression, we can infer about the way each type of firm performs according to the coefficients.

To separate the relationship between product diversification and firm performance, it's also necessary to control for other variables that also have an effect in the profitability of a firm, and those are part of the explanatory variables.

- ***LEVERAGE*** was computed as Debt/ Total Assets, which according to the financial literature has an accentuated effect on the value of the firm. Findings suggest that firms with high levels of debt tend to lose their market share to their peers (Opler and Titman,

1994). The higher the leverage in the firm's financial structure, the more unpredictable will be the earnings and the bigger will be the exposure to risk of owners and creditors (Santarelli and Tran, 2013).

- ***GROWTH_OPPORTUNITIES*** were considered as the percentage change in assets between the current year and the preceding year. This measure gives an insight regarding how open a firm is to new markets, or to expand in existing markets (Li, 2007).

- ***SIZE*** was measured as the natural logarithm of Total Assets, which is a proxy usually used for competitive position and firms' advantage (Johnson, 1997). Hence, we considered the natural logarithm of total assets, considering that size is highly skewed and extreme values tend to affect correlations with other variables (Santarelli and Tran, 2013).

- ***TAXES*** were considered as the ratio between the current year's tax and the earnings before tax. This is an important variable to incorporate in our model, since corporate taxation can influence the activity of the firm, along with the decision-making process. However, most studies show that there's a positive relationship between taxes and corporate performance (Mackiemason, 1990).

- ***TANGIBILITY*** was obtained through the ratio of fixed assets over total assets. In line with the literature, a firm that owns a significant amount of tangible assets is not prone to face financial constraints (Muritala, 2012). Therefore, tangibility is expected to positively influence the performance of a firm.

- ***LIQUIDITY*** is measured through the quick assets ratio, and it helps to capture the firm-specific features, considering that the ability of managing working capital and getting higher cash balances relative to current liabilities, are an indicator of greater skills, which translates into the ability of a firm to produce higher profits (Majumdar, 1997).

- ***Non-Debt Tax Shields (NDTS)*** represent substitutes for tax benefits of debt financing. According to most of the studies, NDTS are expected to have a negative effect on a firm's performance. However, there's evidence showing that NDTS are not relevant for determining a firm's performance (Shah & Khan, 2007).

- ***INVESTMENT*** corresponds to the ratio between the sum of net fixed assets and the book depreciation expense, over total assets. The previous results for the effect of investment on a firm's performance are controversial. Nevertheless, we are looking for a positive relationship between ROI and Investment.

- ***AGE*** is measured according to the years a firm has been operating. This variable can be divided into two components, which are the productivity and the profitability. An older firm will tend to be more productive, however it will be less profitable. Nevertheless, and in the context of this study, we will focus on the profitability component.

- ***RISK*** is computed as the ratio between EBIT (Earnings Before Interests and Taxes) and EAIT (Earnings After Interests and Taxes). Firms with highly volatile earnings are likely to face situations where cash flows are insufficient for the debt service (Johnson, 1997). However, engaging in higher levels of risk may be beneficial for the company, and so a positive sign between performance and risk is expected (Mohammed and Knapkova, 2016).

5. Sample Selection and Descriptive statistics

5.1. Sample Selection

To select a sample of panel firm-level data from 2006 to 2015, we picked a random sample of 300 firms, among the 1000 top performers firms in Portugal, in 2015. From that sample, we proceeded to choose only the Portuguese firms and ended up with a sample of 178 firms. From those, we excluded all the financial firms and selected only the 80 firms that have their accounting information available. Therefore, our sample was composed of 80 firms with headquarters in Portugal, as shown in Appendix 6.
The accounting data was collected from *Sabi* database and from the annual reports of the firms.

5.1.1. Characterization of the sample

In Table 1, there's a representation of the sectors used on our sample, based on the 2-digit SIC code system.

Sector	Firms
1. Construction	7
2. Electric	1
3. Communications	2
4. Manufacturing	32
5. Retail Trade	7
6. Sanitary service	1
7. Services	8
8. Transportation	7
9. Wholesale Trade	15
Total no. of firms	80

Table 1 – Sectors that compose the sample

As it can be seen in Table 2, most of our sample is composed by focused firms (69%) and the remaining firms are diversified, where the related diversifiers are in minority (just 9% of the sample).

	Diversified		Focused	Total
	DU	DR		
Companies	18	7	55	80

Table 2 – Types of firms

5.2. Descriptive statistics[13]

This is the simplest way to analyze data and to infer about the potential patterns, features and distribution of each one of the variables, as shown in Table 7.

To test if the difference between the means of the two types of firms (Table 3) is equal to zero (null hypothesis), we performed a t-test for equality of means, which is shown in Table 3. The p-value provided by the test, leads us to reject the null hypothesis. Therefore, we can infer that the difference is different from zero, this is, the mean of ROI for focused firms is different from the mean of diversified firms.

Independent Samples Test								
		t-test for Equality of Means						
		t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval	
							Lower	Upper
ROI	Equal means assumed	6.755	798.000	0.000	1.347	0.199	0.956	1.739
	Equal means not assumed	6.518	442.754	0.000	1.347	0.207	0.941	1.753

Table 3 – t-test for Equality of Means

Then we also made a comparison of the medians of ROI for both focused and diversified firms. To test the equality of medians, we performed a Mann-Whitney Test for the medians of ROI for both focused and diversified firms, presented in Table 4. Thus, with a significance level of 5%, we reject the null hypothesis and conclude that the medians are not the same across the two types of firm.

[13] Appendix 4 provides a matrix with the Pearson Correlation of the overall variables.

Hypothesis Test Summary		
Null Hypothesis	Test	Sig.
The medians of ROI are the same across categories of Type of firm.	Independent-Samples Mann-Whitney Test	0.000

Table 4 - Mann-Whitney Test for median comparison[14]

The same procedures were made, for related and unrelated diversified firms. In Table 5, the t-test for Equality of Means' p-value suggests that the means are equal across unrelated and related diversified firms.

Independent Samples Test								
		t-test for Equality of Means						
		t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval	
							Lower	Upper
ROI	Equal means assumed	.191	248	.849	.075	.393	-.700	.850
	Equal means not assumed	.289	223	.773	.075	.260	-.437	.587

Table 5 - t-test for Equality of Means (related and unrelated diversified firms)

To test the equality of medians, we performed the Mann-Whitney test, shown in Table 6. Thus, with a significance level of 5%, the p-value provided by the test suggests rejecting the hypothesis of equality of medians. Therefore, the medians of ROI vary across related and unrelated diversified firms.

Hypothesis Test Summary		
Null Hypothesis	Test	Sig.
The medians of ROI are the same across categories of Type of firm.	Independent-Samples Mann-Whitney Test	0.001

Table 6 - Mann-Whitney Test for median comparison (related and unrelated diversified firms)[15]

[14] Asymptotic significances are displayed. Asymptotic Sig. (2-tailed). Significance level: 5%.
[15] Asymptotic significances are displayed. Asymptotic Sig. (2-tailed). Significance level: 5%.

	Total					Focused					Unrelated					Related				
	800 Obs.					*550 Obs.*					*170 Obs.*					*70 Obs.*				
	Mean	**Median**	**SD**	**Min**	**Max**	**Mean**	**Median**	**SD**	**Min**	**Max**	**Mean**	**Median**	**SD**	**Min**	**Max**	**Mean**	**Median**	**SD**	**Min**	**Max**
ROI	0.71	0.33	2.61	-43.14	19.34	1.14	0.62	2.48	-3.34	19.34	-0.23	-0.01	3.11	-43.14	1.61	-0.17	-0.38	0.76	-3.04	2.12
DT	0.28	0.00	0.52	0.00	2.21	0.00	0.00	0.06	0.00	1.38	0.90	0.94	0.60	0.00	2.21	0.81	0.86	0.46	0.00	1.58
Leverage	0.71	0.69	0.56	0.02	14.87	0.70	0.67	0.33	0.02	3.29	0.69	0.69	0.19	0.13	1.55	0.88	0.72	1.62	0.07	14.87
Size	18.56	18.37	1.86	12.74	24.48	17.68	17.59	1.24	12.74	21.60	20.42	20.19	1.25	17.81	23.36	20.64	20.19	2.04	17.09	24.48
Tangibility	0.46	0.43	0.31	0.00	6.06	0.40	0.35	0.33	0.00	6.06	0.57	0.57	0.21	0.00	1.00	0.62	0.68	0.21	0.00	1.00
Liquidity	1.38	1.21	0.80	0.08	7.90	1.51	1.34	0.78	0.09	6.32	1.17	1.02	0.83	0.08	7.90	0.87	0.78	0.45	0.12	3.37
NDTS	-0.04	-0.03	0.08	-2.07	0.08	-0.04	-0.03	0.03	-0.41	0.00	-0.03	-0.03	0.03	-0.13	0.08	-0.05	-0.02	0.23	-2.07	0.05
Growth	0.14	0.03	0.93	-0.94	20.97	0.16	0.03	1.07	-0.94	20.97	0.08	0.01	0.50	-0.94	5.09	0.17	0.03	0.51	-0.35	2.76
Age	36.05	29.00	23.84	0.00	97.00	37.87	32.00	22.98	2.00	97.00	32.44	22.00	25.23	0.00	96.00	31.00	22.00	25.31	7.00	95.00
TAX	0.06	0.11	1.31	-18.51	19.50	0.17	0.16	1.25	-18.51	19.50	-0.15	-0.06	1.42	-12.24	6.48	-0.29	-0.21	1.36	-7.19	7.43
Investment	0.74	0.72	1.50	-0.50	43.70	0.67	0.69	0.41	-0.50	5.60	0.95	0.75	3.06	0.07	43.70	0.79	0.79	0.40	0.25	3.42
Total_Risk	1.73	1.02	3.85	-26.74	43.33	1.22	0.86	3.09	-26.74	31.28	2.80	1.49	4.71	-4.08	36.66	2.93	2.31	5.60	-9.30	43.33

Table 7 – Descriptive Statistics of the variables

6. Empirical Results

6.1. Main Model

6.1.1. Model for total diversification effect

In Table 8, the total sample was divided into three sub-samples, for focused firms and diversified firms, both related and unrelated.

Regarding our first hypothesis, the results partially suggest that total diversification explains the performance of a firm on the total sample, confirming the results obtained by Pandya and Rao (1998); Palich et al. (2000); Santalo and Becerra (2004) and on the related and unrelated diversifiers' samples. However, the coefficient for Total Diversification is only statistically significant for the unrelated diversifiers' sample.

The samples for the related and unrelated diversifiers show a strong R-squared, which suggests that these models have a high predictive power. Even on the total sample, when analyzing the interactive variables, we can infer that unrelated diversified firms outperform the related ones. However, the coefficients associated with those variables are not statistically significant. The unrelated diversifiers' sample show more statistically significant coefficients than the related sample's ones. This finding is consistent with other similar studies in this field, which also found that unrelated diversified firms show better operating performance (Michel and Shaked, 1984; Rocca and Staglianò, 2012; Nyaingiri and Ogollah, 2015).

Table 8 – Regression Analysis for the linear terms

Explanatory vars	Total	Focused	Related	Unrelated
DT	0.278		-0.009	0.193***
(dummy_DU)*DT	0.173			
(dummy_DR)*DT	-0.196			
Investment	-1.034***	-0.930***	-1.059***	-1.012***
Total_Risk	-0.002	0.004	0.001	-0.007**
Tax	0.015***	0.015	0.023	0.008
Age	0.007	0.019*	0.022***	0
Growth	-0.036	-0.026	0.068	-0.015
NDTS	-0.173	-7.272***	0.161	0.248
Liquidity	0.068	0.095*	-0.067	-0.066***
Tangibility	0.161	-0.326*	0.415*	-0.432***
Size	-0.395***	-0.357***	-0.015	-0.129**
Leverage	-0.037	0.016	-0.006	0.012
Intercept	8.36	7.084	0.088	3.566
R-sq	0.491	0.29	0.859	0.998
	overall	within	overall	within
Observations	800	550	70	180
Period		2006-2015		
Method	RE robust	FE Robust	RE	FE
ANOVA[16]	0	0	0	0
Robust Hausman	P-value= 0.08	P-value= 0.00	P-value=1	P-value = 0.00
BP-Koenker	P-value=0.00	P-value=0.00	P-value=0.50	P-value=0.47
Shapiro-Wilk[17]	P-value=0.00	P-value=0.00	P-value=0.00	P-value=0.00

Dependent Variable: ROI. *** Significant at 10%, 5% and 1% level; ** Significant at 10% and 5% level; * Significant at 10% level. RE – Random Effects Model; FE – Fixed Effects Model[18]

[16] ANOVA tables provided p-values of zero, which means the models are significant.

[17] Shapiro Wilk's test for normality, suggests that the residuals of the four regressions don't follow a normal distribution.

[18] To choose the estimation method, we used a robust version of the Hausman Test, under the null hypothesis that Random Effects Model is consistent. (More detail on the estimation method are shown in Appendix 5) Using BP-Koenker test, the total panel and the focused panel, are heteroscedastic, which is why we used a robust version of Fixed and Random Effects estimators.

6.1.2. Curvilinear model

To test our second hypothesis, we ran our generic model, including a quadratic term for the total diversification index, using GMM (Generalized Method of Moments), considering that these estimators are known to be consistent, asymptotically normal, and efficient.

Thus, our inference, shown in Table 9, consisted of deriving the model to DT, to find the first derivative and conjecture about the monotony of the function. The zero of the derivative is equal to 0.354, which is the minimum of our initial function.

Therefore, our results don't support the existence of an inverted U-shaped relationship between diversification and performance, as found by some fields of research. However, our findings are consistent with other studies that support the existence of a U-shaped relationship between diversification and a firm's performance. This means that in an initial phase, diversification destroys value and so the performance levels are likely to go down, until they reach a breakpoint (0.354), from which it will recover and begin to create value, after some time (Wan, 1998; Capar and Kotabe, 2003; Altaf and Shah, 2015). The Figure 2, attempts to represent the relationship between performance and the square of total diversification, according to our results.

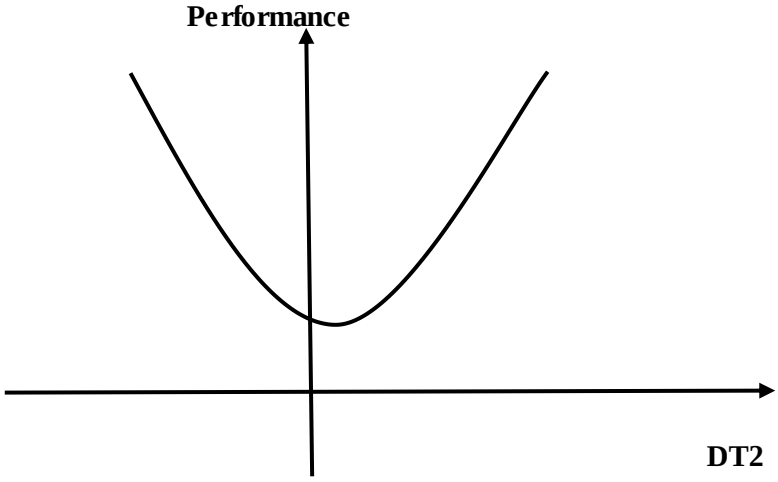


Figure 2 – Curvilinear Relationship between the square of Total Diversification and Performance.

Table 9 – Regression Analysis for the quadratic term of total diversification

Dependent Var - ROI	
Explanatory Vars	**Total**
DT	-0.214
DT2	0.302**
Investment	-0.952***
Total_Risk	0.001
Tax	0.007**
Age	0.025
Growth	-0.069**
NDTS	0.024
Liquidity	0.018
Tangibility	0.239***
Size	-0.490***
Leverage	-0.021
Intercept	9.503
Observations	800
Period	2006-2015
Method	GMM
Arellano-Bond Test[19]	
• First order	P-value= 0.676
• Second order	P-value=0.221

*** Significant at 10%, 5% and 1% level; ** Significant at 10% and 5% level;

* Significant at 10% level

6.1.3. Model for relatedness

To test our third hypothesis, we only used a panel including the related and unrelated diversified firms, since we were aiming to study the differences between related and unrelated diversifiers in terms of performance. For this purpose, we included the dummy variable for unrelated diversifiers (Dummy_DU) and for related diversifiers (Dummy_DR).

[19] Test for first order and second order correlation, which null hypothesis states that there's no serial correlation. The model containing quadratic terms doesn't show first-order, nor second-order serial correlation, considering that the p-values are greater than 1%, 5% and 10% significance levels.

The results, in Table 10, show that the coefficient for unrelated diversifiers (Dummy_DU)*DT is positive and statistically significant, which is not the case for related diversifiers (Dummy_DR)*DT, whose coefficient is negative and not statistically significant. Even though such results make us reject our third hypothesis, those are in line with the conclusions achieved by Michel and Shaked (1984); Rocca and Staglianò (2012); Nyaingiri and Ogollah (2015).

The coefficient for total diversification does also show a positive relationship with a firm's ROI, even though it is not statistically significant.

Table 10 – Regression Analysis for related and unrelated diversifiers

Dependent Var - ROI	
Explanatory Vars	**Rel./Unr.**
DT	0.114
(Dummy_DU)*DT	0.157**
(Dummy_DR)*DT	-0.239
Investment	-1.015***
Total_Risk	-0.002
Tax	0.009
Age	0.003
Growth	-0.195
NDTS	0.064
Liquidity	-0.035
Tangibility	-0.177*
Size	-0.171***
Leverage	-0.031**
Intercept	4.096
R-sq	0.996
Observations	250
Period	2006-2015
Method	FE
ANOVA	0
Robust Hausman	P-value= 0.00
BP-Koenker	P-value=0.54
Shapiro-Wilk	P-value=0.00

*** Significant at 10%, 5% and 1% level; ** Significant at 10% and 5% level;
* Significant at 10% level.

6.2. Industry Results

To make our results more robust, we also controlled for the industry effect. Table 1 shows the sectors that compose our sample. Nevertheless, our firms were grouped in five main industries, namely Distribution, Manufacturing, Services, Fuels and Transportation and Retail/Wholesale Trade.

Table 11 shows the results of our general model estimated individually for each industry[20].

In the Manufacturing industry, total diversification has a positive and statistically significant impact on a firm's ROI. In the Distribution industry, the impact is also positive, but not statistically significant. However, in this industry, related diversifiers have a positive and significant impact on a firm's ROI. In the case of Wholesale/Retail Trade and Services industries, diversification has a negative impact on performance, although only in the Wholesale/Retail trade industry the coefficient is statistically significant. Regarding the Wholesale/Retail Trade industry, there's also a positive and significant relationship between related diversification firms and performance.

For the Services industry, unrelated diversification (represented by Dummy_DU) has a positive and significant impact on a firm's performance[21].

All the industries show an R-Squared higher than 50%, suggesting the models have a high predictive power.

Analyzing the results per industry, and contrarily to what we have found before, the results suggest that related diversified firms outperform the unrelated ones, considering that two of the coefficients are significant and for the unrelated ones, there's only one significant coefficient. These results are in line with the findings provided by other studies

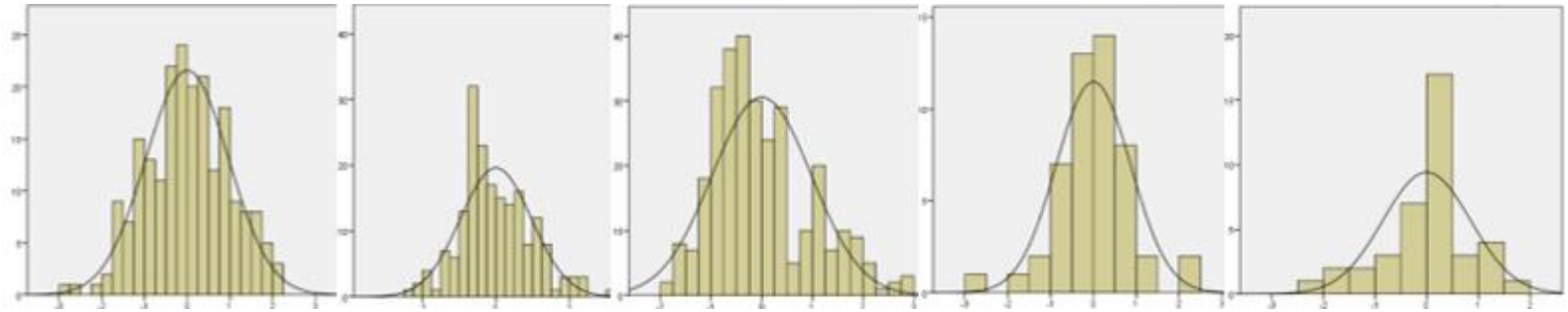
[20] In the Fuel and Transportation industry sample, the coefficient for the related diversified dummy was omitted because we only had one firm that was considered as related diversified on that sample.

[21] The Fuel and Transportation industry has very strange results which may be explained by the small number of firms on this sub-sample and by the fact that they show an abnormal behavior across the years of our sample, mainly during the period of the financial crisis.

(Bettis, 1981; Seth, 1990; Markides and Williamson, 1994; Robins and Wiersema, 1995, 2003; Bryce and Winter, 2009, Gálvan et. al, 2014).

Total diversification for the Wholesale/Retail Trade and Services industries have a negative impact on performance, although only the Wholesale/Retail trade industry's coefficient is significant. The Wholesale/Retail Trade Sector, does also show a positive and significant relationship between related diversified firms and performance.

Table 11 – Results of the regression per industry

	Distribution	Manufacturing	Wholesale/Retail Trade	Services	Fuel and Transportation
DT	0.18	0.41***	-0.20**	-0.09	56.30***
(Dummy_DU)*DT	-0.09	0.17	0.08	0.61***	0
(Dummy_DR)*DT	8.83***	0.08	0.62***	-0.60	(omitted)
Leverage	-0.08	0.26*	0.36**	-0.01	-8.73
Size	-0.12	-0.27***	-0.20***	-0.19***	-2.46***
Tangibility	-1.81***	-0.75***	-0.76***	0.58**	-37.04***
Liquidity	-0.52***	0.01	-0.09*	0.40***	-12.38***
NDTS	-7.26***	-3.53***	-7.75***	0.11	29.76
Growth	-0.02	-0.07	0.03	0.03	-0.58
Age	0.01***	0	0.01***	0.03**	0.31***
Tax	0.39**	0.02	0.04**	0.06**	0.18
Investment	-0.97***	-0.98***	-1.01***	-1.10***	6.71
Total_Risk	-0.06***	-0.01	0	0	0.08
Intercept	4.91	5.74	4.61	2.77	65.23
R-sq	0.54	0.73	0.97	0.70	0.95
Robust Hausman	1	0.49	0.73	0.10	0.80
N	210	190	300	50	40
ANOVA	0	0	0	0	0
Shapiro-Wilk	0.57	0.01	0	0.03	0.20
BP-Koenker Test	0.05	0.02	0.22	0.24	0.09
Normality Histogram					

Dependent variable:ROI. *** Significant at 10%, 5% and 1% level; ** Significant at 10% and 5% level; * Significant at 10% level. Method: RE.

7. Conclusions, Limitations and Further Research

This dissertation was meant to study the effect of diversification on the performance of Portuguese firms, in comparison to the performance of focused ones. For this purpose, we started by analyzing the direct effect of total diversification on a firm's ROI and then we proceeded to study the impact on each type of firm separately and, in the end, it was made an analysis to the industry effect.

Our findings support the hypothesis that diversification impacts performance positively, which is in accordance with previous studies (Pandya and Rao, 1998; Palich et al., 2000; Santalo and Becerra, 2004; Rocca, and Staglianò, 2012). Extending our inference to each type of firm, the results suggest that unrelated diversified firms outperform related diversified firms and focused firms. This can be justified by the fact that if a firm extends its product line and activities to different sectors, the levels of uncertainty and risk are likely to be minimized, placing the firm in a more stable place and ensuring the reliability of the cash flows (Michel and Shaked, 1984; Rocca and Staglianò, 2012; Nyaingiri and Ogollah, 2015).

We were also able to find that there's a U-shaped relationship between diversification and a firm's performance, contrarily to what we were expecting. This supports the idea that firms that diversify, in an initial phase, will experience a decline on their levels of performance. However, as they keep increasing their diversification, they will end up hitting a breakpoint, from which the levels of performance will start to improve (Wan, 1998; Capar and Kotabe, 2003; Altaf and Shah, 2015).

The results for related and unrelated diversified firms show that, controlling for relatedness, unrelated diversifiers perform better than related ones, which is consistent with previous studies in this field (Michel and Shaked, 1984; Rocca and Staglianò, 2012; Nyaingiri and Ogollah, 2015).

Analyzing the results per industry, it becomes evident that the effect of diversification on performance is different in each industry (Santalo and Becerra, 2008). Considering that the results are different for each industry, this may suggest that each industry will require different strategies for better performance. For instance, the results suggest that related

diversified firms show better performance on the Distribution industry, while the unrelated diversified firms perform better on the Services industry.

In general, our results support the idea that the advantages of diversification outweigh its disadvantages in Portuguese firms. However, further research on this topic should be made, particularly in Portugal, considering that our results were limited by the size of our sample, the time horizon and by the fact that we didn't consider any market variable, which would certainly provide interesting results regarding the market performance of diversified firms.

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Appendixes

Appendix 1. Summary of the key studies

Authors	Sample	Methods and Control Variables	Conclusions
Jacquemin and Berry (1979)	406 US firms, selected from 1961 and 1966 editions of Fortune. 1960-1965	Herfindahl Index and Entropy index of diversification. Main Vars. – Projected growth, earnings, % change in Herfindahl and Etropy index.	Evidence supports the implementation of entropy measures at different levels of product and industry aggregation.
Bettis (1981)	80 firms from Fortune 500. Data collected from Compustat. 1973-1977	Regression model using ROA (dependent var.). Control Vars. – Advertising, R&D, Plant Investment, Size, Risk, Diversification Strategy.	Related diversified firms show better levels of performance. Higher levels of diversification don't reduce ROA.
Berger and Ofek (1995)	3,659 firms from Compustat database. 1986-1991	Value loss and relatedness and excess value in diversified firms. Control vars. – multi segment indicator, log(sales), EBIT/sales, CAPEX/sales, no.of segments, related segments, log(assets).	Diversification leads to value losses, that can be minimized with related diversification. It provides higher interest tax shields and allows for tax savings.
Campa and Kedia (2002)	8,815 firms from Compustat Industry Segment. 1978-1996	Measure of excess value. Control Variables – log of Total Assets, CAPEX/sales, EBIT/sales, Leverage	External shocks induce firms to diversify. Diversification seems to potentiate the creation of value in firms.
Aggarwal and Samwick (2003)	1,602 firms from Compustat database. 1993-1998	Tobin's Q measures. Control Vars. – Incentives, performance, diversification.	Firm performance is increasing in incentives and decreasing in diversification. Diversification is positively related to incentives.
Santalo and Becerra (2008)	778 firms from Compustat database. 1993-2001	Firm fixed-effect regressions of the excess value. Control Vars. – Diversification, market share of specialized companies, log(assets), CAPEX/sales, EBIT/sales.	The diversification-performance linkage varies across industries.
Custódio (2014)	3,363 firms from Thomson Financial SDC Platinum and Compustat database. 1984-2007	Tobin's q, Deal Excess Value, and Firm Excess Value. . Control Vars. – Diversification, log(assets), CAPEX/sales, EBIT/sales.	Evidence shows that q-measures may provide biased results regarding diversification discount.

Appendix 2. Studies followed for the methodology implementation

Aurhors/ Year	Sample	Aim	Methodology and main variables	Statistical Analysis
Jacquemin and Berry (1979); Palepu (1985); Hall and John (1994).	406 US firms, selected from 1961 and 1966 editions of *Fortune*. 1960-1965; 30 firms from Standard and Poor's Compustat II. 1973-1979; 205 firms from Standard and Poor's Compustat. 1987-89	Measure the total diversification of a firm	Herfindahl Index and Entropy index of diversification. Main Variables – growth, % change in Herfindahl index. Return on sales, net profit after taxes, profitability growth rate. Return on Assets, Return on Equity.	Simple Regression, t-tests, Mann-Whitney U-test
Jacquemin and Berry (1979); Montgomerry and Hariharan (1991)	406 US firms, selected from 1961 and 1966 editions of Fortune. 1960-1965; 366 from Standard and Poor's Compustat	Measure the level of relatedness among businesses	SIC based measures; concentric measures.	Simple Regression, t-tests, Multivariate binomial logit models
Jiang and Zhihui (2005); Bashir et al (2013)	227 listed companies from Shangai Composite Index;	Measure a firm's performance	Return on Investment. Main Variables – Scale, diversification, relatedness	Simple regression, correlation, descriptive and collinearity statistics,

Appendix 3. Dependent/ independent variables and expected signs

Dependent variable	ROI (Return on Investment)	
Independent variables	**Description/ Proxy**	**Expected Sign**
LEV	Leverage (Debt/ Total Assets)	-
GRO	Growth (ΔTotal Assets/ Total Assets)	+
SIZ	Size (ln(Total Sales))	+
RIS	EBIT/EAIT	+
TAX	Tax (Current year's tax/ Earnings Before Tax)	+
TAN	Tangibility (Fixed Assets/ Total Assets)	+
LIQ	Liquidity (Current Assets/ Current Liabilities)	+
INV	Investment (Equity+Short-term Debt+Non-current Liabilities)/ Total Assets	+
NDTS	Non-Debt Tax Shield (Depreciation/Total Assets)	-
AGE	Age of the firm (Years of existence)	+
(Dummy_DU)DT_{it} **(Dummy_DR)DT_{it}**	Product of Dummy for unrelatedness(relatedness) and Total Diversification	+
DT	Total Diversification (Entropy index)	+

Appendix 4. Pearson Correlation Matrix (Bivariate Analysis)

		Lev	Size	Tang	Liq	NDTS	Gro	Age	DT	TAX	ROI	Risk	Inv
Leverage	Pearson Corr.	1	-.018	.035	-,207**	-.006	.002	-,102**	,100**	.010	.039	,168**	-.007
	N	800	800	800	800	800	800	800	800	800	800	800	800
Size	Pearson Corr.	-.018	1	,305**	-,167**	.026	-.035	.055	,621**	-,115**	-,314**	,130**	.022
	N	800	800	800	800	800	800	800	800	800	800	800	800
Tangibility	Pearson Corr.	.035	,305**	1	-,315**	-,179**	-.067	.033	,189**	-.058	-,254**	.048	,127**
	N	800	800	800	800	800	800	800	800	800	800	800	800
Liquidity	Pearson Corr.	-,207**	-,167**	-,315**	1	.000	.037	,130**	-,172**	.021	-.024	-,090*	-.002
	N	800	800	800	800	800	800	800	800	800	800	800	800
NDTS	Pearson Corr.	-.006	.026	-,179**	.000	1	.037	.059	.006	.025	.031	.019	-.012
	N	800	800	800	800	800	800	800	800	800	800	800	800
Growth	Pearson Corr.	.002	-.035	-.067	.037	.037	1	-.067	-.014	.004	.032	-.037	-.064
	N	800	800	800	800	800	800	800	800	800	800	800	800
Age	Pearson Corr.	-,102**	.055	.033	,130**	.059	-.067	1	-,108**	.020	-.025	-.034	,088*
	N	800	800	800	800	800	800	800	800	800	800	800	800
DT	Pearson Corr.	,100**	,621**	,189**	-,172**	.006	-.014	-,108**	1	-.061	-,259**	,193**	,138**
	N	800	800	800	800	800	800	800	800	800	800	800	800
Tax	Pearson Corr.	.010	-,115**	-.058	.021	.025	.004	.020	-.061	1	.012	-.010	,079*
	N	800	800	800	800	800	800	800	800	800	800	800	800
ROI	Pearson Corr.	.039	-,314**	-,254**	-.024	.031	.032	-.025	-,259**	.012	1	-,101**	-,639**
	N	800	800	800	800	800	800	800	800	800	800	800	800
Total_Risk	Pearson Corr.	,168**	,130**	.048	-,090*	.019	-.037	-.034	,193**	-.010	-,101**	1	.012
	N	800	800	800	800	800	800	800	800	800	800	800	800
Investment	Pearson Corr.	-.007	.022	,127**	-.002	-.012	-.064	,088*	,138**	,079*	-,639**	.012	1
	N	800	800	800	800	800	800	800	800	800	800	800	800

Appendix 5. Hausman Test and Lagrangian Multiplier Test

- **Hausman Test**

This a statistical hypothesis test in econometrics, which aims to choose between fixed and random effect model, considering that evaluates the consistency of an estimator when compared to an alternative, less efficient estimator which is already known to be consistent. (Hausman, 1978)

$$H = \left(\hat{b}_{FE} - \hat{b}_{RE}\right)'\left(\hat{V}_{FE} - \hat{V}_{RE}\right)^{-1}\left(\hat{b}_{FE} - \hat{b}_{RE}\right) \sim \chi_k^2$$

$\widehat{\boldsymbol{b}}_{\boldsymbol{FE}}$ - vector of estimators of the model with fixed effects;

$\widehat{\boldsymbol{b}}_{\boldsymbol{RE}}$ - vector of estimators of the model with random effects;

$\widehat{\boldsymbol{V}}_{\boldsymbol{FE}}$ - matrix of variances-covariance of the estimator $\hat{b}_{FE}$;

$\widehat{\boldsymbol{V}}_{\boldsymbol{RE}}$ - matrix of variances-covariance of the estimator $\hat{b}_{RE}$;

K - number of regression coefficients.

The null-hypothesis states that the coefficients estimated by the random effects estimator are adequate. Failing to accept the null hypothesis (if $H > \chi_k^2$ or *p-value* < 0.05) implies that there's correlation between the individual unobservable effects and independent variables, which means that the fixed effects estimator is more reliable.

- **Lagrangian Multiplier Test**

Test for Var(ui) = 0, that is, the null hypothesis states that there's no serial correlation, and so Pooled OLS estimator is consistent:

$$Cov(\varepsilon_{it,}\varepsilon_{is}) = Cov(u_i + e_{it,}u_i + e_{is}) = Cov(e_{it,}e_{is})$$

If Ti=T for all i, the Lagrange-multiplier test statistic (Breusch-Pagan, 1980) is:

$$LM = \frac{NT}{2(T-1)}\left[\frac{\hat{\mathbf{e}}'(I_N \otimes J_T)\hat{\mathbf{e}}}{\hat{\mathbf{e}}'\hat{\mathbf{e}}} - 1\right]^2 = \frac{NT}{2(T-1)}\left[\frac{\sum_{i=1}^{N}\left(\sum_{t=1}^{T}\hat{e}_{it}\right)^2}{\sum_{i=1}^{N}\sum_{t=1}^{T}\hat{e}_{it}^2} - 1\right]^2 \sim \chi^2(1)$$

$$where\ \hat{e}_{it} = y_{it} - \begin{bmatrix}\mathbf{x}_{it}' & 1\end{bmatrix}\begin{bmatrix}\hat{\boldsymbol{\beta}} \\ \hat{u}\end{bmatrix}_{Pooled},\ J_T = \mathbf{i}_T\mathbf{i}_T'$$

Therefore, if *p-value*>0.05, we fail to reject the null hypothesis and the Pooled OLS estimation method, must be used. Otherwise, we should choose the Random Effects estimator.

Appendix 6. Firms composing the sample

1. AGRIDISTRIBUIÇÃO
2. ALEXANDRE BARBOSA BORGES
3. ALTRI
4. AMORIM CORK COMPOSITES
5. ANA-Aeroportos de Portugal
6. APDL- ADMINISTRAÇÃO DOS PORTOS DO DOURO, LEIXÕES E VIANA DO CASTELO
7. BARRAQUEIRO TRANSPORTES
8. BOLAMA - SUPERMERCADOS
9. C.SANTOS - VEÍCULOS E PEÇAS
10. CABELTE-CABOS ELECTRICOS E TELEFONICOS
11. CAM - CAMIÕES AUTOMÓVEIS E MOTORES
12. CAMPOAVES - AVES DO CAMPO
13. CARNES VALINHO
14. CEREALIS - SGPS, S.A.
15. CIN - CORPORAÇÃO INDUSTRIAL DO NORTE
16. CIVIPARTS - COMÉRCIO DE PEÇAS E EQUIPAMENTOS
17. CME - CONSTRUÇÃO E MANUTENÇÃO ELECTROMECÂNICA
18. CMP - CIMENTOS MACEIRA E PATAIAS
19. COFINA
20. COLQUIMICA - INDÚSTRIA NACIONAL DE COLAS
21. Conduril
22. CONSTANTINO FERNANDES OLIVEIRA & FILHOS
23. CUF - QUÍMICOS INDSTRIAIS
24. EDP Energias de Portugal
25. EMEF - EMPRESA DE MANUTENÇÃO DE EQUIPAMENTO FERROVIÁRIO
26. EMPIFARMA - PRODUTOS FARMACÊUTICOS
27. ESEGUR - EMPRESA DE SEGURANÇA
28. ESTORIL SOL (III) - TURISMO ANIMAÇÃO E JOGO
29. EXPORPLAS - INDÚSTRIA DE EXPORTAÇÃO DE PLÁSTICOS
30. FABRICA DE TABACO MICAELENSE
31. GALP
32. GERTAL - COMPANHIA GERAL DE RESTAURANTES E ALIMENTAÇÃO
33. GLINTT
34. Ibersol
35. IMPRESA
36. INAPA PORTUGAL - DISTRIBUIÇÃO DE PAPEL
37. INPLAS - INDÚSTRIAS DE PLÁSTICOS
38. INSCO - INSULAR DE HIPERMERCADOS

39. INTRAPLÁS - INDÚSTRIA TRANSFORMADORA DE PLÁSTICOS
40. ITALAGRO - INDÚSTRIA DE TRANSFORMAÇÃO DE PRODUTOS ALIMENTARES
41. J PINTO LEITÃO
42. JEFAR - INDÚSTRIA DE CALÇADO
43. Jerónimo Martins
44. LABORATÓRIO MEDINFAR - PRODUTOS FARMACÊUTICOS
45. LAMEIRINHO - INDÚSTRIA TEXTIL
46. LITOCAR - DISTRIBUIÇÃO AUTOMÓVEL
47. LOJA DO GATO PRETO - ARTESANATO DE DECORAÇÃO
48. MAKRO - CASH & CARRY PORTUGAL, S.A.
49. MARTIFER
50. Media Capital
51. METALCERTIMA - INDÚSTRIA METALOMECÂNICA
52. Mota-Engil
53. NOVABASE
54. OGMA - INDÚSTRIA AERONÁUTICA DE PORTUGAL
55. PASCOAL & FILHOS
56. PESTANA GROUP
57. PIEDADE
58. POLITEJO - INDÚSTRIA DE PLÁSTICOS
59. PORMINHO ALIMENTAÇÃO
60. PORTUCEL
61. PROLACTO - LACTICINIOS DE S. MIGUEL
62. PROPEL
63. REDITUS BUSINESS SOLUTIONS
64. REFRIGE - SOCIEDADE INDUSTRIAL DE REFRIGERANTES
65. RIBERALVES - COMÉRCIO E INDÚSTRIA DE PRODUTOS ALIMENTARES
66. SATA INTERNACIONAL - AZORES AIRLINES
67. SEMAPA
68. SOARES DA COSTA
69. SOGRAPE
70. SOLIFERIAS - OPERADORES TURISTICOS
71. SOMAGUE - ENGENHARIA
72. SONAE
73. SUMOL + COMPAL MARCAS
74. TEGOPI - INDÚSTRIA METALOMECÂNICA
75. Teixeira Duarte
76. TOYOTA Salvador CAETANO
77. TRANSINSULAR - TRANSPORTES MARITIMOS INSULARES
78. TRECAR - TECIDOS E REVESTIMENTOS

79. VESAUTO - AUTOMÓVEIS E REPARAÇÕES

80. VIAGENS ABREU