

# The effect of incubation on business performance: A comparative study in the Centro region of Portugal

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## Abstract

**Purpose** – The role that incubators play in business performance is a topic that has been discussed in the literature. They help to create the necessary conditions for the development of entrepreneurship and business innovation, but studies on their real contribution are lacking, especially in contexts such as the Portuguese one. Business incubators have been strong drivers of entrepreneurship and innovation. The main objective of this study is to assess whether business incubation offers benefits to incubated companies compared to non-incubated ones, particularly in terms of performance.

**Design/methodology/approach** Data were collected from incubated and non-incubated companies in the central region of Portugal. These two groups of companies (incubated and non-incubated) were initially compared using the t-test and the Mann-Whitney test. Then, using linear regression models, the impact of incubation on performance variables was estimated, adjusting for the effect of control variables, when significant.

**Findings** The results suggest that in the first years of life, incubated companies present a higher level of performance than non-incubated ones, an effect that decreases as companies become more mature.

**Originality/value** – The study contributes to deepening the understanding of the role that business incubators play, providing further evidence that in their early life incubated companies outperform non-incubated ones.

**Keywords** – Business Incubators; Performance; Innovation; Entrepreneurship

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## I Introduction

The global economic crisis has led to high unemployment rates, triggering a wave of entrepreneurs looking to create an innovative business, promoting the creation of jobs through the implementation of projects that can withstand instability. In turn, the number of business incubators has grown significantly in recent years, becoming strong allies in the creation of new businesses through legal, financial, and technological support, as well as providing facilities for setting up new firms (Aerts, Matthyssens, & Vandembemt, 2007).

Industrialization plays an important role in economic growth, and the political system has to create the conditions for its development. Among these, business incubation is an institutional system that helps economies to industrialize, playing a relevant role, particularly in the creation of SMEs. The uncertain environment in which companies operate has led to the establishment of institutions that help companies to overcome their initial difficulties (Ayatse, Kwahar, & Iyortsuun, 2017) and to develop their entrepreneurial spirit.

As defined by Miller (1983, p. 771), an entrepreneurial firm is one that “engages in product market innovation, undertakes somewhat risky ventures, and is first to come up with proactive innovations, beating competitors to the punch.” In helping to develop entrepreneurial spirit, business incubators make an important contribution to the survival and growth of companies in increasingly competitive environments (European Commission, 2002).

Entrepreneurial companies perform better than those that adopt a conservative approach (Rauch, Wiklund, Lumpkin, & Frese, 2009). Several studies (Chow, 2006; Coulthard, 2007; Keh, Nguyen, & Ng, 2007; Madsen, 2007) report that entrepreneurial firms significantly improve their performance. However, other authors (Matsuno, Mentzer, & Ozsomer, 2002; Morgan & Strong, 2003; Naldi, Nordqvist, Sjöberg, & Wiklund, 2007) do not identify any impact of entrepreneurship on business performance.

The impact of incubators on the development of new projects has received increasing attention from the scientific community (Albort-Morant & Ribeiro-Soriano, 2016; Baraldi & Havensvid, 2016) as they help to create a welcoming (Bøllingtoft & Ulhøi, 2005; Markovitch, O’Connor, & Harper, 2017) and protected environment (Allen & Rahman, 1985), allowing start-ups to get the resources, services, and assistance they need (Vanderstraeten

& Matthyssens, 2012). They are an important support for identifying new business opportunities and are strategic players in the development of the first business activities (Albort-Morant & Ribeiro-Soriano, 2016; Pauwels, Clarysse, Wright, & Hove, 2016). They can facilitate initial product development (Bøllingtoft & Ulhøi, 2005; Patton, 2014), promote entrepreneurship in specific industrial sectors and regions (Schwartz & Hornych, 2010; Sofouli & Vonortas, 2007), support the development of new technologies (Roig-Tierno, Alcazar, & Ribeiro-Navarrete, 2015), identify markets (Rong, Wu, Shi, & Guo, 2015), or support the marketing of products and services (Clausen & Korneliussen, 2012; Wonglimpiyarat, 2010).

However, it has been difficult to obtain a consensus on this issue. The literature (Kellermanns, Eddleston, Barnet, & Pearson, 2008; Zahra, 2008) suggests that the institutional environment plays a relevant role, so it is essential to deepen the study of this issue in the universe of Portuguese companies, which we believe is not sufficiently addressed. This was a decisive motivation for carrying out this study.

The phenomenon of incubation in Portugal emerged in the 1990s and there has been a significant increase in the number of incubators since then, but it is still scarcely studied. In this context, it is critical to understand the role that these institutions play (Caetano, 2012). The Centro region of Portugal has witnessed, over the last decades, a social transformation, having developed its business environment. It is important to assess the extent to which business incubators have contributed to this development.

The objective of this paper is to evaluate if business incubation provides benefits, assessing whether incubated companies in the Centro region of Portugal perform better than others. To this end, and according to the literature review, a comparative analysis of return on assets (ROA) and turnover variation (TV) will be performed. For this study, two samples were collected: i) companies incubated in the Central Region Business Incubators Network (RIERC) (<https://rierc.pt>, retrieved in May, 2018) and ii) companies with similar characteristics that did not undergo any incubation process. The sample of non-incubated companies was collected through the Iberian Balance Sheet Analysis System (SABI). This was also the source of economic and financial variables of the incubated companies.

Thus, this study seeks to contribute to the existing literature by providing empirical evidence of the benefits of incubation. It concludes that incubation provides better business performance; however, as companies mature, this benefit begins to dissipate.

This paper is organized as follows. Following this introductory part, the next section is devoted to reviewing the literature on incubation issues. Section 3 presents the data, the variables, and the methodology used. Section 4 presents the results. Finally, the conclusions of this study are discussed in section 5.

## 2 Literature Review

Since 2000, there has been a steady stream of studies seeking to assess the impact of incubation on start-up performance in different contexts (Amezcuca, Grimes, Bradley, & Wiklund, 2013; Barbero, Casillas, Ramos, & Guitar, 2012; Barbero, Casillas, Wright, & Ramos, 2014; Dvouletý, Long, Blažková, Luke, & Andera, 2018; Gonzalez-Urbe & Leatherbee, 2017; Hallen, Cohen, & Bingham, 2019; Lasrado, Sivo, Ford, O'Neal & Garibay, 2016; Yu, 2020).

Research on the topic faces a number of challenges and the results obtained are not always consensual (Yu & Nijkamp, 2009). There are a number of reasons for this: i) the lack of data as, for start-ups, available data are scarce and difficult to collect (Sherman & Chappell, 1998); ii) the difficulty in defining an appropriate control group as all start-ups face a set of limitations (Hallen et al., 2019); iii) the different contexts in which they operate affect the results and the best way to evaluate them (Amezcuca et al., 2013; Dvouletý et al., 2018); and finally iv) the nature and objectives of incubators are not always coincident (Barbero et al., 2014).

The incubation process involves the provision of a set of services and activities for start-ups that should contribute to their development. However, recent studies show that incubators do not always contribute positively to the development of start-ups (Colombo & Delmastro, 2002; Lukeš, Longo, & Zouhar, 2019). They can even have a negative effect, due to the high number of events and activities in which start-ups are involved, as a result of competition for resources among start-up companies, and due to the opportunity costs of being integrated in the incubator (McAdam & Marlow, 2007; Oakey, 2007; Patton & Marlow, 2011).

In this sense, some studies report that incubation does not improve start-up performance (Chan & Lau,

2005; Oakey, 2007; Soetanto & Jack, 2016). Others also argue that incubation does not lead to better performance in the early stage of start-ups (Hughes, Ireland & Morgan, 2007; Patton, 2013). These contradictory results may originate from the heterogeneity of incubation practices (Aernoudt, 2004), differences in the socio-economic and legal context (Soetanto & Geenhuizen, 2010), or result from different performance assessments. These contradictory results are obtained in specific contexts, making it difficult to compare them through an aggregating analysis.

Another issue that remains open in the literature is that it is not clear how negative effects can be compared with positive effects. Identifying a set of services and activities alone does not explain how incubators can influence start-ups, as it is the dynamics and the behavior of entrepreneurs that can explain business performance. This justifies the concern in the literature with developing theoretical mechanisms that help to understand the true role that incubators can play (Ahmad & Ingle, 2013; Wee, 2016).

The literature review allows us to identify a set of activities and services that incubators provide to start-ups; however, there is still a lack of understanding of how incubators condition the performance of start-ups. Namely, there remains a need for research to identify the inducers that can improve initial performance and whether these mechanisms explain the differences between incubated and non-incubated start-ups.

The first business incubator appeared in the United States of America in the 1950s. This period was characterized by the economic recovery after the Great Depression of the 1930s and World War II (1939-1945). Batavia Industrial Center was the first US incubator, founded in New York, in 1959. Charles Mancuso decided to rent out part of his manufacturing and industrial facilities to small companies at low cost, some of which were starting up, with the aim of stimulating the local economy, which was going through a serious unemployment crisis, resulting from the relocation of various industrial activities (Aerts et al., 2007).

Until the 1980s and 1990s, the main concerns of incubators were centered on technological and management aspects. From then on, innovation and incentives for the creation of new companies has become relevant, with a significant increase in internationalization. Still in the 1980s, two strategies were developed: i) providing space and capacity for incubation and ii) offering resources that would allow companies to grow (Mian, 1996).

In the late 1990s, incubators provided a strong stimulus for the creation of technology-based companies (Aerts et al., 2007). The incubation sector focused on areas of information and communication technologies (ICTs) arose from 1998 onward, constituting a strong impetus for technological innovation and the development of new market niches. In more developed countries, incubators have focused on specific industrial and technological areas (information and communication technologies, environment, and biotechnology) and in developing countries their aim has been to reduce regional differences and diversify the economic fabric by seeking to create businesses and jobs (Caetano, 2012).

The incubation process involves several steps that help companies develop from their inception to their independence. Caetano (2012) refers to an incubation model consisting of five stages: i) business idea, ii) decision to move forward, iii) fundraising, iv) launch of new company, and v) company development.

Incubators are designed to minimize constraints related to knowledge and innovation processes through support in marketing, financial planning, networking that can generate synergies, providing infrastructure and funding opportunities, as well as promotion at reduced costs through participation in fairs and events (Oliveira, Terence, & Paschoalotto, 2016). Companies' perceived image also improves when they are associated with incubators, thereby attracting new customers and establishing networking, positively impacting their survival and development (Ferguson & Olofsson, 2004).

Enterprises face a number of difficulties in starting up, such as obtaining financial resources, initial investment, and finding new customers (Löfsten & Lindelöf, 2003). Colombo and Delmastro (2002) report that incubated companies have a more qualified workforce, a greater propensity for innovation, and a greater ability to participate in international R&D projects. However, they are more likely to take risks and therefore not always achieve the desired success.

In addition to the above services, incubators also provide meeting rooms, as well as other spaces and infrastructure, allowing companies to focus on their core business, unlike non-incubated companies, in which the managers spend a lot of time on bureaucratic and administrative issues and on creating infrastructure (Ramos, 2016).

Colombo and Delmastro (2002) studied 45 technology-based companies incubated in Italy and compared them with non-incubated companies of the

same nature. The authors conclude that incubators have a positive effect on growth, as incubated companies have higher employment and sales rates than non-incubated ones, and these results are maintained after incubation, allowing for better performance in incubated companies.

The first business incubator in Portugal started its activities in 1987 (AITEC Incubator - *Tecnologia de Informação*, SA). However, it was an ephemeral experience, with business incubators in Portugal appearing only in the early 1990s to accelerate the development of new businesses and reduce the unemployment rate.

At that time, technological poles, industrial parks, and university campuses disseminated, creating their own incubation infrastructures oriented toward supporting start-ups (Caetano, 2012; Santos, 2013).

In 2010, Portugal was still identified as a developing country with poor performance compared to other European countries and a low patent registration rate (Ratinho & Henriques, 2010). This insufficient capacity for innovation has conditioned the country for years; however, over time, companies have changed strategies, strengthened relationships with R&D institutions, and are increasingly concerned about the quality they have to offer, also giving added importance to technological innovation. The creation of innovative SMEs has since emerged as a lever for the country's economy (Marques, 2005). Recent years have seen creation of technology-based companies above the European average, as demand for technology from Portugal has increased considerably, according to the report by Science-Technology and Innovation in Europe (Costa, 2014).

According to Ratinho and Henriques (2010), Portuguese incubators are characterized as: promoting collaboration between local/regional authorities, universities, and private organizations; obtaining funding from public funds; welcoming companies from any sector; being located in major cities and universities; and, most importantly, having a great number of contacts with universities and technological centers.

There are current incentives and funding to support the development of innovative companies, from their origin, through incubation, to possible internationalization. In 2018, the National Incubator Network had 135 certified entities that support 3000 start-ups ([www.iapmei.pt](http://www.iapmei.pt), retrieved on October 17, 2018).

This subject requires further investigation, as a significant number of studies focus on the American reality. By focusing the study on another geographical and

institutional context, where the role of incubators may differ, we are making an additional contribution to the study of this theme. This research focuses on the impact of incubation in the Centro region of Portugal, which, despite showing some growth in recent years, still exhibits significant weaknesses in relation to the national context. In fact, in 2017 it contributed to 18.9% of national GDP, the third largest national contribution, but still only about half of the contribution made by the first region, Lisbon, which accounted for 36.0% (*Instituto Nacional de Estatística*, 2018).

### 3 Sample, Variables, and Methodology

For this study two different samples were collected. The first includes 221 companies incubated in RIERC incubators (<https://rierc.pt>, retrieved in May, 2018) in Portugal. The sample of non-incubated companies was collected through the SABI (Iberian Balance Sheets Analysis System), selecting 2,959 companies from the same geographical area and with similar activity sectors to the incubated companies (Table 1). The financial and economic data for both samples refer to 2017 and were obtained from the SABI.

According to the literature review, the following were selected as dependent variables: return on assets (ROA) and turnover variation (TV). According to Mutunga and Owino (2017), business performance can be assessed by economic performance (e.g. return on assets - ROA) and product market performance (e.g. turnover variation - TV).

ROA is widely used to measure companies' economic performance and is evaluated by the ratio between operating results and total assets (Adamowicz, Mazurek-Krasodomska, Krzeminski, & Adamowicz, 2010). TV is another relevant indicator of business performance (Löfsten & Lindelöf, 2001; Ferguson & Olofsson, 2004).

As control variables, the following variables were selected: age, intangible assets, and total assets (Haque & Arun, 2016; Khan, Yang, & Waheed, 2019; Nunes, Serrasqueiro, & Matos, 2017). Löfsten and Lindelöf (2002) report that performance depends on the age of the company. Chen, Cheng, and Hwang (2005) conclude that intangible assets are important in creating competitive advantages and for economic and financial performance. The authors identify that corporate resources (tangible assets and intangible assets) are the main source of business performance. Table 2 shows the variables used and how they are determined.

**Table 1**  
**Activity sectors of the incubated and non-incubated companies**

Activity Sector	Non-incubated companies		Incubated Companies	
	N	%	N	%
Agriculture, animal production, hunting, forestry, and fishing	10	0.3%	3	1.4%
Extractive industries	1	0.0%	0	0.0%
Manufacturing industries	194	6.6%	17	7.7%
Construction	540	18.2%	3	1.4%
Wholesale and retail trade; repair of motor vehicles and motorcycles	499	16.9%	12	5.4%
Transport and storage	174	5.9%	1	0.5%
Accommodation, catering, and similar	1	0.0%	0	0.0%
Information and communication activities;	232	7.8%	74	33.5%
Financial and insurance activities	2	0.1%	0	0.0%
Real estate activities	127	4.3%	2	0.9%
Consulting, scientific, technical, and similar activities	724	24.5%	93	42.1%
Administrative and support service activities	130	4.4%	10	4.5%
Education	52	1.8%	2	0.9%
Human health and social support activities	249	8.4%	2	0.9%
Artistic, show, sports and recreational activities	17	0.6%	2	0.9%
Other service activities	7	0.2%	0	0.0%

**Table 2**  
**Variables under study**

Denomination	Expression
Return on Assets (ROA)	Operating results / Assets
Turnover Variation (TV)	$((\text{Turnover 2017} - \text{Turnover 2016}) / \text{Turnover 2016}) \times 100$
Incubated Company (Inc)	Dichotomous variable with the value 1 if the company is incubated and 0 if it is not incubated
Age	Company age
% of Intangible Assets (IA)	Intangible assets / Total assets
Total Assets (TA)	Total assets

The comparison between incubated and non-incubated companies was carried out initially by the t-test and the Mann-Whitney test. Then, linear regression models were estimated, assessing the impact of incubation

on the dependent variables and adjusting for the effect of the control variables, when significant. In this study, a significance level of 5% was considered. The significance of the variables was evaluated by estimating consistent heteroscedastic standard errors. All significant variables were kept in the model, as well as those with a p-value close to 5% (considered marginally significant). The moderating effect of each control variable was assessed by the significance of the interaction term (product) between the binary incubation variable and the control variable. All statistical analyses were performed using SPSS version 24 software and Macro RLM for robust standard error estimation (Darlington & Hayes, 2016).

The generic model adopted was as follows:

$$Y_i = \beta_0 + \beta_1 Inc_i + \beta_2 Age_i + \beta_3 IA_i + \beta_4 TA_i + \beta_5 Inc \times Age_i + \beta_6 Inc \times IA_i + \beta_7 Inc \times TA_i + \varepsilon_i$$

where Y represents one of the dependent variables, ROA or TV. The model aims to estimate the effect of incubation (Inc) on performance variables, adjusting for the control variables (Age, IA, and TA), also considering the moderating effect that they can have (Inc × Age, Inc × IA, and Inc × TA).

## 4 Presentation and Discussion of Results

### 4.1 Data description

Table 3 provides a description of the samples collected for the two groups of companies under study. As shown in Table 3, the mean ROA and TV values are significantly higher for the incubated companies (p<0.005), suggesting that profitability is higher in this group of firms. Significantly higher values in incubated companies were also found for intangible assets (p<0.005).

In contrast, age and total assets have significantly lower mean values in incubated businesses (p<0.005), which indicates that in the incubated group the companies are younger and smaller.

### 4.2 Estimated regression models

The following tables present the estimated models. Table 4 presents the regression model for ROA, while Table 5 reproduces the estimated regression model for TV.

The estimated model for ROA is given by:

$$\widehat{ROA}_i = 22.891 + 13.142 Inc_i - 0.551 Age_i - 0.107 IA_i - 0.002 TA_i - 0.944 Inc \times Age_i$$

According to the estimated model, regardless of age and whether or not they are incubated, the companies with greater intangible assets or total assets tend to have lower ROA (negative association). The results obtained support the findings of a study on Polish companies by Adamowicz et al. (2010), who, over the years studied, found a reduction in ROA as companies increased their assets. These companies were making investments, which led to an increase in total assets, not accompanied by a similar increase in operating profit, so there was a decrease in ROA. Also, Baixauli and Mónica-Milo (2010) report a decrease in ROA due to increased investment in assets; however, the authors consider that investment should improve this long-term performance indicator.

Regarding intangible assets, Zago, Mello, and Rojo (2015) found that an increase in these decreases profitability, causing a negative influence on ROA. Decker, Ensslin, Reina, and Reina (2013) conducted a study to understand how intangible assets condition the profitability of companies, noting that there is a positive relationship between them and ROA, thus contradicting the results observed in this study.

Table 3  
Description of the samples with respect to the variables used in the analysis

Dependent variables	Incubated companies		Non-incubated companies		p-value
	n=221		n=2,959		
	Mean	Standard deviation	Mean	Standard deviation	
ROA (%)	24.87	37.86	14.66	23.53	<0.005
TV (%)	88.56	143.52	38.62	65.54	<0.005
Age	6.33	4.78	12.79	7.86	<0.005
Total assets	298.31	520.04	515.54	1075.11	<0.005
Intangible assets	8.61	19.65	1.91	8.93	<0.005

**Table 4**  
**Regression model for the dependent variable ROA**

	Coefficients	Robust standard errors	p-value
Intercept	22.891	1.138	<0.005
Inc	13.142	5.244	0.012
Age	-0.551	0.062	<0.005
IA	-0.107	0.031	0.001
TA	-0.002	0.000	<0.005
Inc x Age	-0.944	0.441	0.032
R <sup>2</sup>	0.060		

**Table 5**  
**Regression model for the dependent variable TV**

	Coefficients	Robust standard errors	p-value
Intercept	55.862	3.086	<0.005
Inc	82.456	21.164	<0.005
Age	- 1.505	0.187	<0.005
TA	0.005	0.002	0.050
IncxAge	- 5.842	1.759	0.001
R <sup>2</sup>	0.064		

The authors report that intangible assets add value to the company, as investment in R&D creates new products that are difficult to replicate. Nascimento, Oliveira, Marques, and Cunha (2012) found no evidence of any relationship between intangible assets and ROA.

Regarding age, the present study found evidence that this variable is negatively associated with ROA; that is, older companies tend to have a lower ROA. It is also concluded that this effect is more pronounced in incubated companies, since for incubated companies ( $Inc = 1$ ) the estimated coefficient for *Age* equals  $-1.495$  ( $-0.551 - 0.944$ ) while for non-incubated ones ( $Inc = 0$ ) it equals  $-0.551$ . Majumdar (1997) argues that older companies benefit from learning and experience effects yet achieve lower profitability values. The author says that more mature companies get too comfortable and fail to seize opportunities, unable to react to changes in the market. Thus, younger, proactive companies can achieve better levels of performance. Also, Loderer and Waelchli (2010) observed a negative effect of age on the profitability of firms resulting from the absence of

proactivity. Additionally, Guarana (2012) observed that the higher the age, the lower the profitability.

Based on the estimated model, we verified that the effect of incubation depends on age; that is, incubated companies have higher profitability when they are young. However, this effect decreases as the company matures. In fact, due to the interaction effect, the coefficient of the incubation variable (*Inc*) decreases as the age of the company increases. Table 4 reproduces the estimated regression model for the dependent variable TV.

$$\widehat{TV}_i = 55.862 + 82.456 Inc_i - 1.505 Age_i + 0.005 TA_i - 5.842 Inc \times Age_i$$

For TV, the model indicates that regardless of age and whether or not they are incubated, the companies with higher total asset values tend to have higher TV values (positive association); however, this variable is only marginally significant. This relationship is understandable, since an increase in assets can mean a higher volume of investment in equipment, an increase in production, and consequently an increase in turnover as well.

Regarding age, similarly to what is evidenced in the ROA model, there is a negative relationship with TV; that is, older companies tend to have lower TV values. Moreover, this effect is most felt in incubated companies (due to the presence of the interaction term). These results are not validated by Mian (1997) in that he states that throughout the years in which he conducted his study, there was a trend of sales growth; that is, age had a positive impact on TV. Löfsten and Lindelöf (2002) also used age as a control variable for sales, but its effect was not statistically significant. Majumdar (1997) noted that older companies are more productive, which implies a greater number of sales and consequently an increase in turnover.

Regarding the effect of incubation, as also found for ROA, the estimated model indicates that the effect of incubation depends on age; that is, young incubated companies tend to have greater TV, but as the years go by the positive effect of incubation decreases. This may be explained by the fact that when the company reaches maturity it converges with the other companies present in the market; that is, the incubation is no longer relevant. Pena (2004) verifies that incubated companies have higher sales growth. Also, Löfsten and Lindelöf (2001, 2002) found significant differences in TV between incubated and non-incubated companies, verifying that non-incubated companies have a lower turnover growth rate. Mian (1996,

**Table 6**  
**Companies older than 10 years - performance comparison between incubated and non-incubated companies**

Dependent variables	Incubated companies		Non-incubated companies		p-value
	Mean	Standard deviation	Mean	Standard deviation	
ROA (%)	13.84	20.30	10.66	14.86	> 0.050
TV (%)	43.54	82.39	29.84	50.09	> 0.050

1997) mentions that incubated companies show higher sales growth during the incubation years. The author points out that incubators have a positive impact on business performance; however they advise caution, since, despite efforts to obtain a sample of the entire population, this was not feasible, and it is possible that the responses arose mainly from companies that were successful. Also, Lasrado et al. (2016) report that incubation has a significant effect on sales growth. Ferguson and Olofsson (2004) found in their study that incubated companies tend to have lower sales values compared to non-incubated ones; however they have better sales growth rates.

Overall, we can observe in both models a benefit of incubation; that is, both the ROA and TV values are higher for the incubated companies. However, as companies age, this benefit decreases. Furthermore, it is worth noting that if we select in our sample only companies aged 10 years or more, there is no significant difference between incubated and non-incubated companies, either for ROA or TV; that is, the effect of incubation on ROA and TV is lost (Table 6).

## 5 Conclusion

This paper clearly underpins the idea that business incubators are a powerful structure that must be supported and encouraged as an important component in fostering companies and as drivers for the proliferation of new entrepreneurs. Business incubation emerges as an instrument for revitalizing regions, driving economic growth, and reducing unemployment rates. Governmental support is crucial in boosting this phenomenon, which has developed significantly since the 1960s. In Europe, business incubation emerged in the 1970s; however, in Portugal, the first business incubators only appeared in the 1990s (Caetano, 2012). The first business incubators offered basic

services such as low-cost spaces and management support. Over time, these incubators have evolved, specializing in different areas and offering various services depending on their typology.

In this study, performance differences between incubated and non-incubated companies in the central region of Portugal were analyzed. The literature review suggests that incubated companies have advantages over non-incubated ones, namely in terms of sales growth rate and number of employees, as well as better relationships with universities (Colombo & Delmastro, 2002; Löfsten & Lindelöf, 2003). The services of commercial assistance, supervision, sharing of specialized services, and consultancy provided by incubators create value and enhance the ability of companies to finance themselves, register patents, and create alliances. The directors of these (incubated) companies are usually younger and have higher educational levels (Andino, 2005).

In economic terms, the Centro region of Portugal is a far cry from the wealthiest regions (North and Lisbon regions). Companies located in central Portugal have a turnover of 62 billion euros, while, for example, Lisbon accounts for 167 billion euros (<https://www.pordata.pt/en/What+are+NUTS>, retrieved on October 17, 2018). The less developed regions of Portugal need instruments to boost their economies in order to combat regional asymmetries. Incubators play an important role in the development of new well-structured companies that contribute to the growth of the economy.

This study provides evidence that there are indeed benefits in business incubation, as incubated companies perform better in terms of return on assets and turnover growth. However, this difference disappears with the age of the company. This may be due to the increasing obstacles in terms of management skills, a shortage in market knowledge and marketing skills to access the market, and financial obstacles such as a lack of cash flow and lack of investment capital.

This study is relevant as studies addressing the benefits of incubation are scarce. The number of business incubators has grown [e.g. in the Centro region of Portugal, in the RIERC (<https://rierc.pt>, retrieved in May, 2018), there are 18 business incubators with more than 500 incubated companies]. Nowadays there are a growing number of companies seeking help to develop their activity, namely young people looking to create

their own jobs and turn their ideas and research into successful businesses.

This investigation focused on the performance of RIERC (<https://rierc.pt>, retrieved in May, 2018) incubated companies. Throughout the study we tried to understand how business incubation is a benefit for newly created companies. Both business incubation as well as, more specifically, comparisons of incubated and non-incubated companies, has not been widely discussed in Portugal, thus opening the door for nationwide studies in future investigations. In fact, access to a wider database would enrich this study, making it more representative of the Portuguese reality. This paper focuses on analyzing two performance variables. It would therefore be interesting to complement this analysis with other profitability variables. The results in this investigation are based on cross-sectional data, which is another limitation of the study. It would be relevant to make an assessment of the impact of incubation by considering panel data. Another limitation of this study is the exclusively economic-financial approach used to analyze company performance. Future research could analyze other aspects of the impact of incubation such as its contribution to social welfare, sustainable development, and wealth creation in the region.

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The authors have no conflict of interest to declare

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