

Business Incubators, Tenant Firms and New Companies: Evidence from Portugal



Gonçalo Rodrigues Brás and Miguel Torres Preto

Abstract Business incubators (BIs) are important entities in the entrepreneurial ecosystem and, as such, can make a significant contribution to regional development. The aim of this exploratory work is to describe the business incubation activity in Portugal and thus fill the current gap in the literature. Due to the limited data and few institutional sources, we adopt a methodology driven by the challenge of identifying the situation of BIs and new firms within the entrepreneurial setting in Portugal. The study, using data gathered in 2015, reveals the asymmetrical distribution of BIs across Portuguese districts and the mismatch between the number of BIs and the number of new firms. Policy makers can use the district patterns of business incubation activity identified in this research to develop an integrated BI network that addresses the business particularities of Portuguese districts. This framework can lead to new lines of research. These include the study of the wide range of services provided by BIs to tenant firms in Portugal, the analysis of factors influencing the spatial distribution of Portuguese BIs, and the comparative analysis of the performance of specialized and non-specialized BIs in the Portuguese territory.

Keywords Business incubators · Tenant firms · Regional development · Firm dynamics · Business incubation typologies · Portugal

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1 Introduction

It is widely acknowledged that the factors contributing to the economic growth and development of nations are heterogeneous. In the context of endogenous growth theory, the innovation system of a given country has a decisive influence on its economic development (Nelson 1993). Institutions that support entrepreneurship, such as business incubators (BIs) or science parks, are an integral part of the national innovation system; this includes other agents that promote research and development activities, such as universities, research centers, government agencies, policies and other mixed or hybrid structures (Carlsson et al. 2002).

These structures fall into what Mason and Brown (2014) term entrepreneurial ecosystems, which formally and informally coalesce to connect, mediate and govern the performance within the local entrepreneurial environment. According to the management literature, entrepreneurial ecosystems are a critical tool for creating resilient economies based on entrepreneurial innovation (Spigel 2017). In Portugal, BIs can make a significant contribution to regional development just as they have in south-eastern Spain (Mas-Verdú et al. 2015). Indeed, the role of BIs and science parks should be highlighted due to their increasing relevance in recent years (Barbero et al. 2014).

In 1999, 23 BIs were established in Portugal (European Commission 2002) and, according to Caetano (2012), the number increased to 65 in 2011; it is also known that 91 BIs were certified by the “Compete 2020” Program in 2016. However, the lack of any official source in Portugal to confirm the total number of active BIs in the Portuguese territory is a barrier to knowledge about their dispersion across the country and to an understanding of their regional impact on development. This raises two points:

- (1) To measure BIs’ contribution to regional development is crucial to have the institutional knowledge about the total number and location of Portuguese BIs.
- (2) As the internal and/or external network is one of the assets provided by BIs to tenant firms (Bøllingtoft 2012; Bergek and Norrman 2008), surely it is time for BIs in Portugal to know their own industry so that they can build a macro network system of BIs.

The aim of this exploratory and descriptive study is to act as the starting point for further research into these domains. Indeed, Rubin and Babbie (2010) note that exploratory and descriptive studies do not test hypotheses, and our research seeks to define objectives rather than to establish and confirm specific hypotheses.

Given the lack of any aggregated and institutional data on the business incubation sector in Portugal, the overall objective of this exploratory research is to map the BI activity in all Portuguese districts. In addition, our goals are to: (I) understand the main types of BI in Portugal; (II) identify the prevalence of specialized incubators in each Portuguese district; (III) define the average number of tenant firms per BI in each Portuguese district; (IV) diagnose the sectoral prevalence of tenant firms per

Portuguese district; (V) measure the survival rate of tenant firms in Portugal; and (VI) calculate the average number of employees per tenant firm.

The next step in our research work is to diagnose whether the number of BIs per Portuguese district is suitable for the total number of new firms (data from 2015) and, more specifically, to know the number of new firms in the most representative economic activities. We compare the relative distribution of incubators to that of new companies generally and those in specific industries, in order to determine whether the number of incubators is adjusted to the business dynamics of each Portuguese district.

As regards methodology, we collected a wide range of primary and secondary information about both BIs and tenant firms between January 2016 and June 2016.

The remainder of the paper is structured in the following four sections: literature review, the Portuguese context, empirical study and remarks. The literature review describes the state of the art on BIs. This is followed by an overview of the demography of firms that might justify more in-depth knowledge about the Portuguese BI network. Section 4 describes the methods and then presents and discusses results. The final section sets out the main findings and conclusions, before addressing some limitations and implications for the future.

2 Literature Review

This section describes some of the main characteristics related to BIs. From a theoretical framework, we emphasize their role and concept on the entrepreneurial ecosystem, their internal resources and some services provided to the tenant firms. We present the state of the art of the relationship between BIs and regional development and a theoretical review of BI typologies.

2.1 Role and Concept of BIs

BIs are used as an instrument to promote innovation and entrepreneurship (Aerts et al. 2007), and they can make a significant contribution to regional development (Mas-Verdú et al. 2015). According to Aernoudt (2004), their purpose is to ensure the survival of firms and create conditions for growth during the initial stage of their existence.

BIs are organizations that create value through the provision of spaces and/or utilitarian services for start-ups and companies to assure their sustainable development (Tötterman and Sten 2005). Hughes et al. (2007) define BIs as organizations hosting small and new enterprises with the objective of making them competitive in the market. The more detailed definition given by the Small Business Encyclopedia (2016) states that a BI is “an organization designed to accelerate the growth and

success of entrepreneurial companies through an array of business support resources and services that could include physical space, capital, coaching, common services, and networking connections.”¹

2.2 Resources of BIs and Services Provided to Tenant Firms

It is important to distinguish the resources used by BIs, i.e. the (limited) means used to achieve their objectives, from the services they provide to tenant firms. According to Somsuk and Laosirihongthong (2014), BIs use the following resources: (i) human resources, made up of the management and operational teams, emphasizing specific knowledge and experience; (ii) technological resources (products, laboratories, capabilities and technological competencies); (iii) financial resources, especially funding; and (iv) organizational resources related to planning, coordination, monitoring, systematization of routines and establishing relationships within the institution.

As the purpose of the incubator is to contribute not only to firm survival, but also to the growth of tenant firms (Allen and Rahman 1985), these resources should be facilitators of the latter’s sustainable development, and the set of services provided should foster their continuous improvement (Schwartz and Göthner 2009). In fact, BIs use their resources to provide tenant firms with three broad groups of services (Bøllingtoft 2012; Bergek and Norrman 2008): (i) infrastructures, (ii) business services, and (iii) networking. When analyzing these groups of services in more detail, Aerts et al. (2007) define 21 specific services. Whether the scope of the services provided by BIs is limited or broad, according to Lai and Lin (2015), they are vital for new companies.

The specificity of the services offered differs greatly from one BI to another. This specificity together with the organization, objectives and activities (Aernoudt 2004), gives the BI its identity and allows us to differentiate and classify different types of incubator.

2.3 Typologies of BIs And Tenant Characteristics

Profit is the most basic premise that distinguishes BIs; quite simply, profit-oriented BIs are distinct from non-profit BIs, also known as public BIs (Grimaldi and Grandi 2005). However, the typologies of incubators described by authors vary. For instance, Grimaldi and Grandi (2005) defined four categories of BIs: (i) Business Innovation Centers (BICs), (ii) University Business Incubators (UBIs), (iii) Independent Private Incubators (IPIs), and (iv) Corporate Private Incubators (CPIs).

¹Accessed on 16 February 2016.

Becker and Gassmann (2006) distinguish between non-profit and for-profit business incubators (fast-profit incubators, market incubators, leveraging incubators, and in-sourcing incubators). In order to obtain a consistent classification of BIs in Portugal, we follow Grimaldi and Grandi (2005) and classify BIs according to the nature of tenant activities they host.

Entrepreneurs in BIs of all typologies face difficult conditions that can lead to tenant failures. Based on the study by Sternberg (1988) of the 133 tenant firms of BIs in Germany, Seeger (1997) reports a failure rate of 29.4% over a 7-year time span (1986–1993), whether or not the firms were incubated; on the other hand, the study by Schwartz (2009) for the years 1990–1993 reports a failure rate of 29.8% in post-incubated firms (or graduated firms). Although these survival rates for Germany were considered high, when Rothaermel and Thursby (2005) examined, over a 6-year period (between 1998 and 2003), 79 start-up firms incubated in the Advanced Technology Development Center at the Georgia Institute of Technology, they presented a 48% survival rate for tenant and post-incubated firms.

Tenant firms in BIs must be incubated within a limited time period. According to Schwartz (2009), the average incubation period for five BIs located in Germany is 44 months, but the European Commission (2002) reports an incubation period of 35 months (on average) and 6.2 jobs per tenant firm.

2.4 BIs and Regional Development

The overall purpose of BIs is to contribute to the sustainable development of tenant firms so that they become successful. Moreover, Phan et al. (2005:179) “argue that science parks and incubators are important links in the entrepreneurial value chain at the national or environmental level of analysis”, while the OECD (1999) confirms that BIs have become a policy instrument to foster innovation and regional development. However, a meta-analysis study by Tamásy (2007) concluded that BIs actually make a very modest contribution to regional economic development.

There are therefore many contradictions in the literature about the impact of BIs on regional development. However, our emphasis goes to the theoretical contributions of Phan et al. (2005) which identified multiple levels of analysis of the impact of BIs on regional development: types of incubated firm, organizational level of incubator, and spatial context in which incubators are embedded. In recent years, Portugal has been tackling the challenge of raising its regional capacities to compete at a global level, whilst also striving to improve its scientific and technological capacity, notably in the areas of Lisbon and Porto (Noronha 2011).

In these particular circumstances, under the framework of the knowledge spillover theory of entrepreneurship (Acs et al. 2009, 2013), BIs are important for the promotion and creation of new technology-based firms (Lindelof and Lofsten 2003), and could therefore also make a relevant contribution to regional development in Portugal.

3 Portuguese Context

It is acknowledged that SMEs are responsible for most of the employment and wealth generated in a country (Wennekers and Thurik 1999; Stokes and Wilson 2010). This is particularly relevant in Portugal due to the weight of SMEs in the corporate sector, which was equivalent to 99.9% of all firms in Portugal (INE 2012). These companies suffer from particular vulnerabilities and difficulties, above all in the first years of life, and as a result many of them are dissolved in this phase (Stokes and Wilson 2010).

According to INE (2012), the survival rate of Portuguese firms fell 10.2 points (p.p.²) between 2006 and 2010. In fact, Portugal has one of the lowest survival rates of younger firms in the European Union. Eurostat and OECD data show that the closure rate of Portuguese firms, between 1998 and 2012, increased in all activity sectors: (i) extractive industry (5.7 p.p.), (ii) manufacture (9.0 p.p.), (iii) construction (13.2 p.p.), (iv) traditional trade (12.5 p.p.), and (v) accommodation and catering (17.2 p.p.).

As a result of the SMEs' recognized impact in the economy and their evident fragility in the first years of life, they have been the focus of increasing attention at the global level, namely, through government incentives, assistance mechanisms, and other policy instruments (Özdemir and Şehitoğlu 2013).

New forms of entrepreneurship support have emerged that have proved more effective than traditional knowledge transfer systems and have a greater effect on society than previous methods (Coenen and López 2010). As entities of knowledge transfer and units that promote resources and services at the individual or company level, BIs establish a close link between entrepreneurs and companies (Porter and Kramer 2011) so can provide significant support for Portuguese start-ups.

4 Empirical Study

4.1 Methods

The purpose of the fieldwork was to map and locate BIs and tenant firms/projects in a national database. The first step was to collect information about the national BIs (designation, full address, district, email, telephone) from the various sources. Secondly, the tenant firms/projects incubated in the abovementioned BIs were identified and, whenever possible, their name, address, email, business start date, telephone number, activity sector and average number of employees per year were incorporated in the database.

In order to fulfill our objective, we first had to gather a wide range of information about the BIs and tenant firms.

²Percentage points.

For the BIs, secondary data were gathered systematically in four stages: first, BIs found in the first collection of data on BIs in Portugal (Caetano 2012) were added to our database; second, BIs belonging to institutional associations per geographical location were also added to our database; third, BIs were identified from a Google search using specific keywords and incorporated in database; and, fourth, harmonization of the BIs gathered in the previous stages in a single database.

The secondary data for the tenant firms were also gathered in four stages: first, tenant firms in the SABI database were added to our database; second, tenant firms referred to in the BI websites were added to our database; third, harmonization of the tenant firms gathered in the first and second stages; and, fourth, BIs for which there was still no information on tenant firms at this stage were contacted to obtain the list of tenants.

In terms of geography, the 20 Portuguese districts³ were considered as units of analysis rather than NUTS 3 due to ease of data collection and comparability.

4.2 Results

4.2.1 BIs

During the fieldwork, 174 active BIs were identified in the national territory, and the locations of three more (one of which is a virtual BI) were not determined. Of the universe of identified BIs, 124 have at least one tenant company or project; in other words, it was not possible to obtain information about the incubation activity of 50 BIs based in Portugal.

It should be noted that some co-working spaces were included in the study. We opted not to remove these units not only because they represent a small portion of BIs, but also because they are similar to some Portuguese BIs, particularly those that provide to tenant firms little or nothing more than physical space. Overall, it was found that a large proportion of BIs in Portugal (almost 40%) are concentrated in the districts of Lisbon and Porto and that the total number of BIs in the districts of Lisbon, Porto and Aveiro together account for 50% of the universe.

Regarding the typology of active BIs in Portugal, we followed the criteria proposed by Grimaldi and Grandi (2005) and classified the typologies of BIs according to the nature of tenant firms or the kind of projects they host. Based on the nature of tenant firms/hosted projects in Portugal, six categories of BIs were formed: (i) biotechnology, (ii) design/creative industries, (iii) energy, (iv) natural resources, (v) technology and (vi) undifferentiated (without specialization).

In accordance with the data collected, roughly two thirds of the BIs operating in Portugal host tenant firms/projects from any activity sector (undifferentiated BIs).

³Archipelago of Madeira and archipelago of Azores are not Portuguese districts but are administered as autonomous districts, corresponding to the districts of the mainland. Therefore, Madeira and Azores were considered like the other 18 Portuguese districts for our analysis.

BIs hosting technology-based firms/projects account for approximately 22% of the total number of BIs operating in Portugal.

The BIs focusing on design/creative industries, biotechnology, natural resources and energy constitute approximately 6%, 3%, 2% and 1% respectively of the universe of incubators in activity in Portugal.

Table 1 provides data on the Portuguese district where incubators are based and their typology.

It can be seen from Table 1 that BIs in Portugal mainly host firms/projects from different areas of activity; in other words, undifferentiated BIs predominate.

The other types of BIs specialize in areas such as biotechnology, energy, technology base, design/creative industries or natural resources and are designated specialized incubators. Table 2 shows the weight of these BIs in the overall business incubation activity by Portuguese district.

Two main aspects stand out from Table 2: (i) Portuguese districts with a high relative and numerical prevalence of specialized incubators in the business incubation activity; and (ii) Portuguese districts without specialized incubators.

On one hand, districts with higher population density and bigger presence of universities exhibit strong weight of the specialized incubators (e.g. Porto, Coimbra and Lisbon). On the other hand, districts more far from the biggest metropolitan areas of Lisbon and Porto and maybe with less specific knowledge typically do not have specialized incubators (e.g. Beja, Guarda, Vila Real, and Viseu).

4.2.2 Tenant Firms

Apart from characterizing the BI universe, conclusions can also be drawn from the hosted firms/project, i.e. tenant firms. Out of the universe of 174 identified BIs in Portugal, it was only possible to gather data on 124 BIs with at least one registered tenant firm.

In aggregate terms, each BI registers a total of approximately 19 tenant firms; however, when the three largest outliers are excluded, the average number goes down to roughly 17 tenant firms. Overall, the number of tenant firms per incubator varies greatly (even excluding districts with data for only one BI), and this is also visible at the district level, from 2 tenant firms in Beja to 26 tenant firms in Braga.

In addition to the incubation activity of companies by district, the nature of some tenant firms could also be identified by consulting the SABI database. In the set of 2359 tenant firms accessed, it was possible to determine the classification of economic activities used by Statistics Portugal (INE, CAE—Rev3) for 648 tenant firms; due to the size of the sample, we grouped the tenant firms in accordance with the economic activity used by Statistics Portugal—Fig. 1.

Figure 1 shows us the clear predominance of tenant firms from section M (professional, scientific and technical activities) and section J (information and communication activities), which are responsible for around 50% of the tenant firms registered. The number of tenant firms in section G (wholesale and retail trade; repair of motor vehicles and motorcycles) also stands out (around 15.4% of

Table 1 BI typologies by Portuguese districts

Districts	Typologies of BIs							
	Undifferentiated BIs	Technology BIs	Biotechnology BIs	Energy BIs	Design/creative industries BIs	Natural resources BIs		
Aveiro	14	3			1			1
Beja	7							
Braga	7	3						
Bragança	1	1						
Castelo Branco	6	1						
Coimbra	5	2	2					
Évora	3	2						
Faro	4	1						
Guarda	2							
Leiria	3	2						
Lisbon	24	10		2	5		1	
Portalegre	5		1					
Porto	12	7	2		4		1	
Azores	3	1						
Madeira	1	1						
Santarém	2	1						
Setúbal	6	2			1			
Viana do Castelo	2	1						
Vila Real	2							
Viseu	3							
Unknown location	2	1						
Total	114	39	5	2	11		3	

Source: Prepared by the authors

Table 2 Relative weight of specialized BIs per Portuguese district

Portuguese districts	Specialized BIs (1)	Total number of BIs (2)	Ratio (1)/(2) (%)
Porto	14	26	54
Bragança	1	2	50
Madeira	1	2	50
Coimbra	4	9	44
Lisbon	18	42	43
Évora	2	5	40
Leiria	2	5	40
Santarém	1	3	33
Setúbal	3	9	33
Viana do Castelo	1	3	33
Braga	3	10	30
Aveiro	5	19	26
Azores	1	4	25
Faro	1	5	20
Portalegre	1	6	17
Castelo Branco	1	7	14
Beja	0	7	0
Guarda	0	2	0
Vila Real	0	2	0
Viseu	0	3	0

Source: Prepared by the authors

the total), although the overwhelming majority of these are in trade and specialized trade.

With regard to the number of workers per tenant firm, the data reveals that each BI employs an average of six workers (including partners). This figure is based on the 576 tenant firms providing information on the average number of employees in 2014 (3259 workers in total) and is in line with the benchmark of 6.2 workers per tenant firm presented by the European Commission (2002) for a set of 14 EU countries (including Portugal).

Although limited by the restriction to the SABI database and the small number of ex-tenant firms (354 companies), conclusions can also be drawn on the average number of years of activity until dissolution, extinction, insolvency or sale. It is impossible to know whether the firm was incubated or ex-incubated when extinguished, but it is estimated that the companies survive on average over 6 years.

The average survival time is influenced by a small number of companies with survival rates significantly higher than average, and it is therefore more meaningful to examine the survival rate of tenant firms (whose last home was the incubator to which they belonged) as this provides a more comprehensive picture of the sustainability of tenant firms or ex-tenant firms.

According to the data, about two-thirds of the tenant firms reach the third year of activity but this goes down to approximately 30% after 7 years—Fig. 2. Moreover,

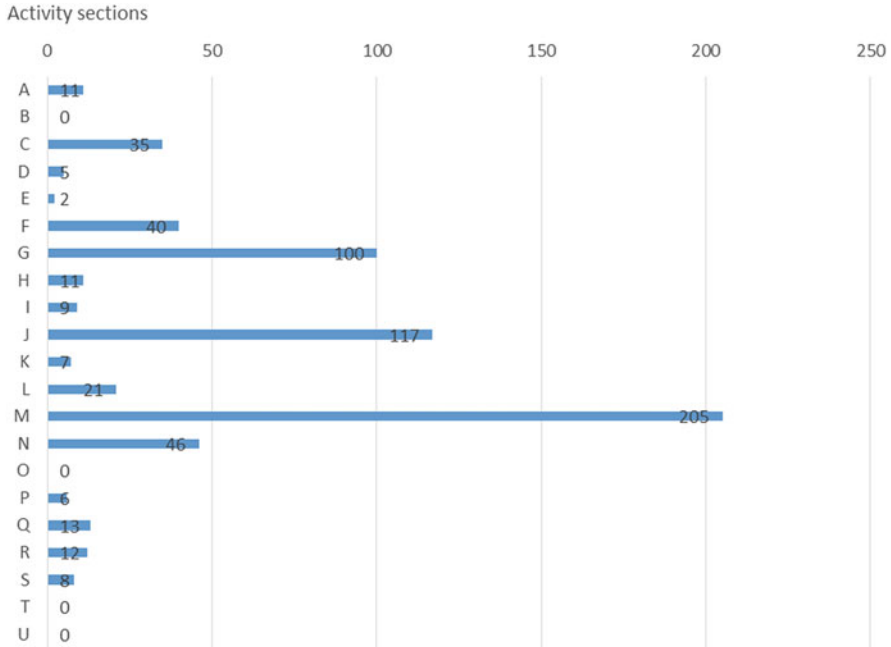


Fig. 1 Number of tenant firms per economic activity section (A—agriculture, forestry and fishing; C—total manufacturing; D—electricity, gas, steam and air conditioning supply; E—water supply; sewerage, waste management and remediation activities; F—construction; G—wholesale and retail trade; repair of motor vehicles and motorcycles; H—transportation and storage; I—accommodation and food service activities; J—information and communication; K—financial and insurance activities; L—real estate activities; M—professional, scientific and technical activities; N—administrative and support service activities; P—education; Q—human health and social work activities; R—arts, entertainment and recreation; S—other service activities). Source: Prepared by the authors

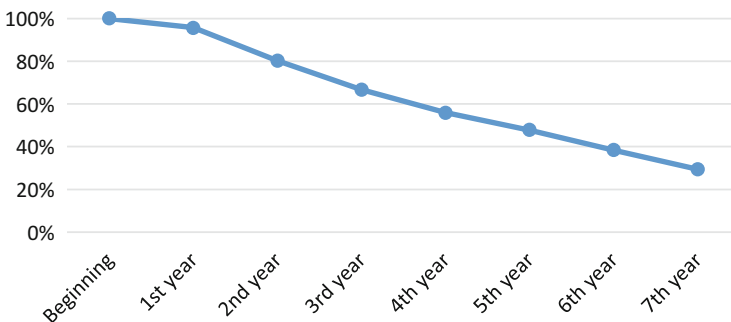


Fig. 2 Tenant firms’ survival rate. Source: Prepared by the authors

84% of all the ex-tenant companies were dissolved, extinguished, declared insolvent or liquidated after the seventh year of activity.

4.2.3 BIs and New Firms

Turning to an analysis of the identified BIs in relation to the flow of new companies in 2015 from a geographical perspective. Portuguese districts are used as the unit of analysis.⁴

In order to understand the suitability of the number of BIs for the new companies established in 2015 per Portuguese district, the following results were obtained: (i) the ratio of new companies (2015) to total number of BIs, (ii) the ratio of new companies from economic activity sections M and J to the total number of BIs, and (iii) the relative distribution of new companies (and of new companies in economic activity sections M and J) to BIs.

The first ratio comprises the number of new companies in a given district (constituted in 2015) to the total number of BIs in that district. We have ordered the ratios in quintiles and Fig. 3 shows the geographical capacity (per Portuguese district) to support new companies in accordance with the available number of BIs in those regions.

The data show that the “white” districts (e.g. Portalegre, Castelo Branco, Beja, and Évora) had an average of one BI for less than 93 companies constituted in 2015. In other words, these districts may have a more effective installed capacity, i.e. fewer new companies per BI. Due to the smaller ratio than in other districts, it may indicate that they have an appropriate number of BIs or even that they have more BIs than can be justified by the small number of new firms.

In contrast, the “red” districts (e.g. Leiria, Faro, Madeira, and Santarém) had an average of just one BI for at least 298 companies. That is, the response of BIs in these districts could be insufficient given the large flow of new companies.

The ratios are ordered by quintiles to show the pattern within the Portuguese territory. Portuguese districts with a hypothetically better fit between the number of BIs and the number of new companies can be seen above the first quintile and below the fourth quintile.

We can also see the relative distribution of each variable at the district level when comparing the number of BIs with that of new companies. In other words, among the number of incubators found, the relative percentage of BIs located in a given district can be compared to the relative percentage of new companies set up in each district. We can determine from the simple comparison of relative distributions (BIs and new companies) which districts have a suitable concentration of BIs for the number of new companies (constituted in 2015) and which do not. That is, it is important to

⁴The data on the constitution of new companies were obtained through the ‘Racius’—Business Information Platform.

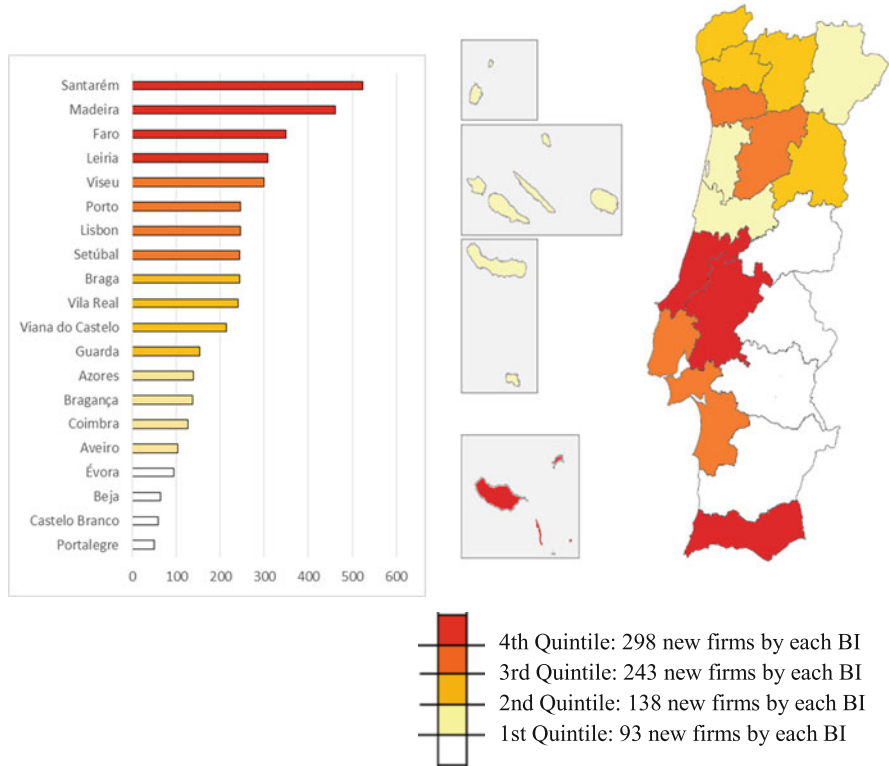


Fig. 3 Ratio of new companies (2015) to total number of BIs (per Portuguese district). Source: Prepared by the authors

realize the extent to which the spatial distribution of incubators across the country is appropriate for the dispersion of new companies (constituted in 2015)—Fig. 4.

Figure 4 shows that the districts of Lisbon and Porto; although they have a large proportion of the BIs in Portugal (approximately 40%), this is still not enough to meet the needs of the new companies in those districts. With this, we are not saying that every new company need to be incubated in order to succeed. Our intention is just to identify those districts where differential between the relative distribution of BIs and the relative distribution of new companies is high. In contrast, the relative concentration of BIs in the remaining Portuguese districts, especially Aveiro, is almost twice that of new companies formed in 2015. Theoretically, the installed capacity of business incubation in districts with a positive differential (the relative distribution of BIs covers or exceeds the relative distribution of new firms) might provide an effective response to the new business needs; on the other hand, this response capacity of districts with a negative differential may be insufficient; however, further analysis is required. To determine the effectiveness of the number of BIs in relation to new companies per Portuguese district, it is necessary to understand whether every new firm is likely to be able to belong to a BI.

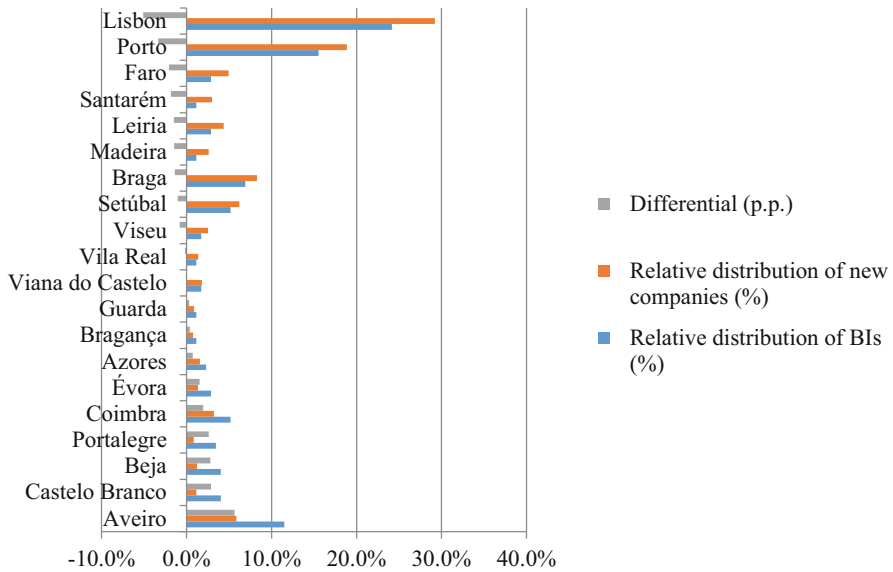


Fig. 4 Relative distribution of new companies (2015) and relative distribution of BIs. Source: Prepared by the authors

As we already know that most of the tenant firms belong to sections M (professional, scientific and technical activities) and J (information and communication activities), we now focus on the new companies in these sections, as these are the ones most likely to be incubated. We analyze the ratio of new companies in M and J sections in each district (constituted in 2015) to the total number of BIs located in that district. The ratios are ordered in quintiles to show the pattern within the Portuguese territory. Theoretically, the number of BIs will be better adjusted to the number of new companies in sections M and J in the Portuguese districts above the first quintile and below the fourth quintile—Fig. 5.

Figure 5 shows that the “white” districts (e.g. Beja, Portalegre, Azores, and Castelo Branco) had an average of one BI for less than 15 new companies in sections M and J. In other words, we can conclude that the ratio of installed capacity of business incubation to the number of companies set up in 2015 in sections M and J in these districts may be appropriate. The adequate or even excessive number of BIs in relation to that of new companies in sections M and J seems to be clear due to the small number of these companies in the districts.

In contrast, the “red” districts (e.g. Santarém, Leiria, Lisbon, and Madeira) had an average of at least one BI for 61 companies in sections M and J. That is, theoretically the response of business incubation in these districts to the high rate of new companies in sections M and J set up in 2015 may be insufficient.

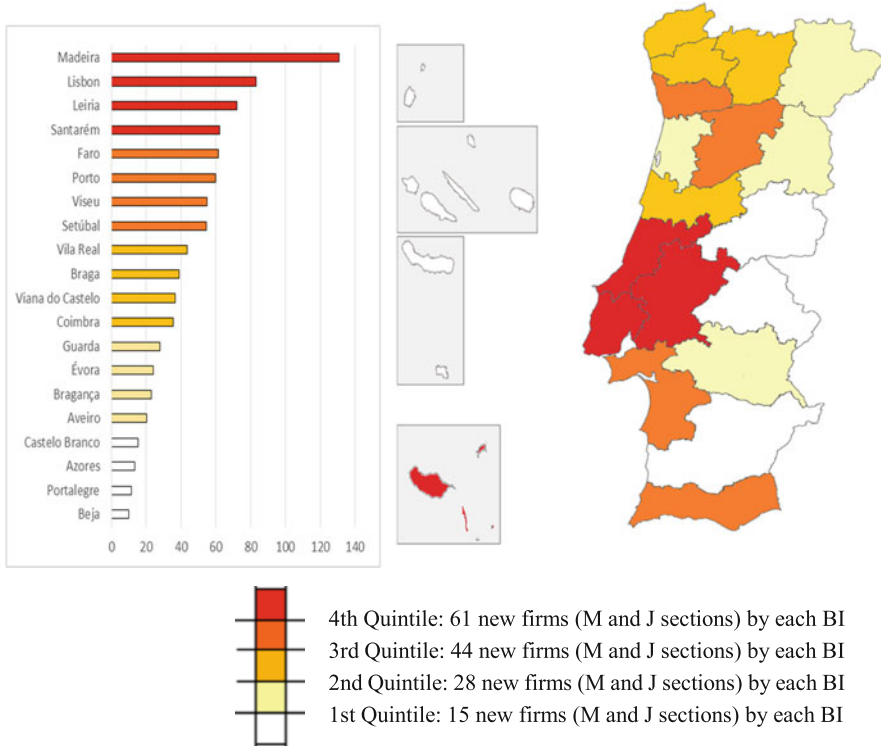


Fig. 5 Ratio of new companies (2015) in sections M and J to total number of BIs (per Portuguese district). Source: Prepared by the authors

A comparison of the relative distributions (BIs and new companies in sections M and J) allows us to conclude which districts have a more “appropriate” concentration of incubators for the number of new enterprises in sections M and J (constituted in 2015) and which do not. It is important to determine whether the spatial distribution of BIs across the country is suitable given the dispersion of new companies that are most likely to be incubated—Fig. 6.

Figure 6 shows that Lisbon has the highest deficit, i.e. the largest difference between the relative distribution of new companies (sections M and J in 2015) and the relative distribution of BIs. This suggests that there are not enough incubators to cope with the large numbers of new companies of this kind. At the other extreme, the relative concentration of BIs in the district of Aveiro is more than double that of new companies with a high probability of being incubated (sections M and J), suggesting an excess of installed capacity of business incubation due to the small number of new enterprises (sections M and J) in that district.

Overall, the results confirm the differential between the relative distribution of the number of BIs and that of new firms in M and J sections (constituted in 2015).

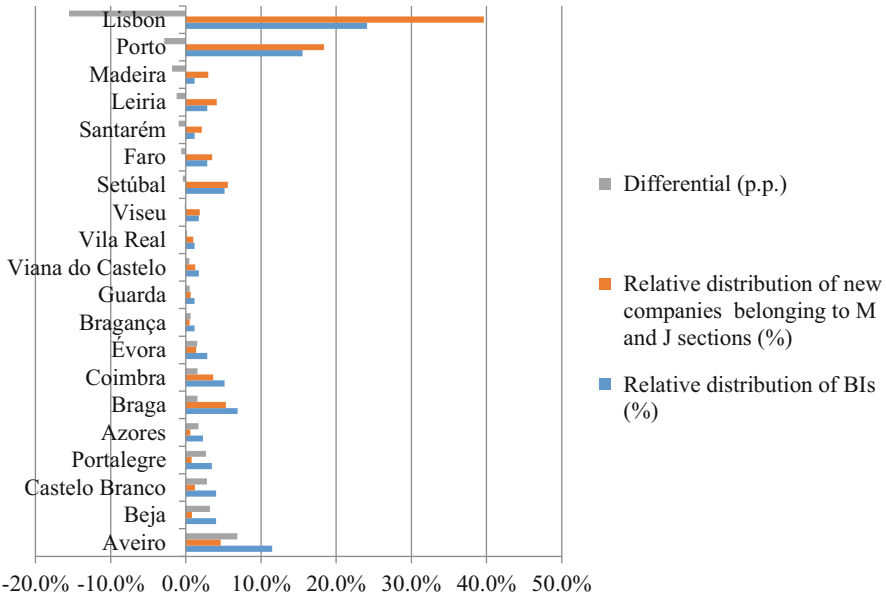


Fig. 6 Relative distribution of new companies (Sections M and J—2015) and relative distribution of BIs. Source: Prepared by the authors

4.3 Discussion

The ratios analyzed above can be used to discuss business incubation’s capacity (number of BIs) to deal with the flow of potentially incubating start-ups. On one hand, the above differential sheds light on the suitability of the relative concentration of BIs in each district to the flow of new firms in sections M and J in that district; on the other hand, the ratios reveal the average number of new firms in sections M and J per incubator per Portuguese district.

Crossing the referred differential with the ratios allows us to identify districts with a potential deficit (or surplus) of BIs due to the flow of new firms that are likely to be incubated (firms in sections M and J), and hence to show some patterns of business incubation activity in Portugal. For instance, a negative differential and a high ratio theoretically leads to the assumption that some districts do not have enough BIs to support the new companies most likely to be incubated (from sections M and J). Conversely, a positive differential and a low ratio leads to the assumption that some Portuguese districts have sufficient, or in some cases, a surplus of BIs to support the flow of start-ups—Fig. 7.

The X and Y axes of Fig. 7 are respectively segmented by reference lines—the mean value for the designated ratio⁵ and the zero value on the differential. The case

⁵44.01 new firms in M and J sections (constituted in 2015) per BI (national average).

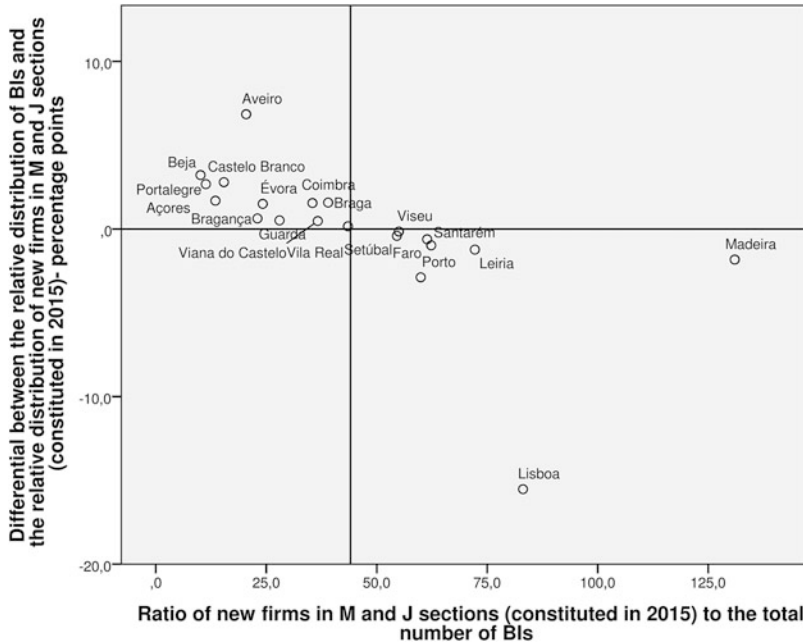


Fig. 7 Adjustment of number of BIs to number of new firms in sections M and J (constituted in 2015). Source: Prepared by the authors

of the aggregated districts in the fourth quadrant hypothetically means there are insufficient BIs to absorb new companies likely to be incubated (new firms in M and J sections). In contrast, the districts in the second quadrant of Fig. 7 are expected to have enough BIs—or even a surplus in some cases—to absorb new companies likely to be incubated (new firms in M and J sections). To complement the dual analysis above, we analyze Portuguese districts using four dimensions (Table 3):

- (I) ratio of new firms (constituted in 2015) to the total number of BIs (Ratio)⁶
- (II) ratio of new firms in M and J sections (constituted in 2015) to the total number of BIs (Ratio M and J)
- (III) differential between the relative distribution of BIs and the relative distribution of new firms (Dif)
- (IV) differential between the relative distribution of BIs and the relative distribution of new firms in M and J sections (constituted in 2015) (Dif M and J)

In addition to this analytical approach, other variables could be related to the adjustment of the number of BIs to the number of new companies per Portuguese district, such as demographical, geographical, cultural variables, but this is not our focus here.

⁶214.58 new firms (constituted in 2015) per BI (national average).

Table 3 Classification of business incubation activity in Portuguese districts using four dimensions (2015)

	(Dif M and J) < 0	(Dif M and J) > 0	
(Dif) < 0; (Ratio M and J) > 44.01; (Ratio) > 214.58	Lisboa; Porto; Madeira; Leiria; Santarém; Faro; Setúbal and Viseu (1st Group)		
(Dif) < 0; (Ratio M and J) < 44.01; (Ratio) > 214.58		Vila Real; Braga	2 nd Group
(Dif) < 0; (Ratio M and J) < 44.01; (Ratio) < 214.58		Viana do Castelo	
(Dif) > 0; (Ratio M and J) < 44.01; (Ratio) < 214.58		Guarda; Bragança; Évora; Coimbra; Açores; Portalegre; Castelo Branco; Beja and Aveiro (3rd Group)	

Source: Prepared by the authors

Based on this analysis of the four dimensions, some conclusions can be drawn on the abovementioned adjustment. The first group contains Portuguese districts where the gap between the relative distribution of the number of BIs and that of new firms is always negative (both for firms generally and firms in sections M and J), and in which the ratios between the new companies and the total number of BIs are always higher than the average values of 44.01 firms in sections M and J per BI, and 214.58 firms per BI. It can be concluded from the negative differentials found and the positioning in relation to the average ratios that the first group of districts may have a lack of BIs given the flow of new companies there.

The Portuguese districts in the second group (Table 3) have differentials close to zero, that is, an adjustment of the relative number of BIs to the relative concentration of new companies in these districts, and simultaneously ratios near to the average values for Portugal (number of new companies per BI). According to these criteria, the relative concentration of the number of BIs in the districts in the second group is a good match for the relative flow of new enterprises, and the average number of new firms per BI in these districts is close to the national average.

The districts in the third group (Table 3) show positive differentials, i.e. the regional concentration of BIs is greater than the relative flow of new companies. Cumulatively, the ratios in these districts are always lower than the national average. This suggests that the number of BIs in these districts is greater than the relative number of new firms. This is complemented by the fact that the average number of new companies per BI in those districts is always lower than the national average: 44.01 new companies in M and J sections per BI, and 214.58 new companies per BI.

5 Remarks

It is important to note some of the constraints of the research work, to outline the main findings, to mention the limitations to the execution of the research work and to highlight future lines of research in the field of business incubation in Portugal.

There was little information about the mapping of BIs in Portugal at the beginning of this work. Furthermore, no recent information was available about business incubation activity in Portugal. In fact, Caetano (2012), identified 65 active BIs in Portugal in 2011. We found that there are over 170 BIs in Portugal and that the actual number may be as high as 200. The lack of institutional information about business incubation activity in Portugal might be problematic. Policy makers should be aware of BIs' role as a specific pillar of entrepreneurial ecosystem (Stam 2015), which network engagement is relevant to promote the creation of social capital for the viability of tenant firms compared to other forms of support (Tötterman and Sten 2005).

Concerning to the data, the figures obtained reveal a huge disparity in the number of BIs operating from district to district. Due to the nature of tenant firms, it was also possible to identify the main typologies of BIs in Portugal, notably that there is a predominance of BIs that do not target specific kinds of firm/project (undifferentiated BIs) and BIs hosting technology-based firms/projects.

It was also found that a significant proportion of tenant firms (about 50% of the total) were from professional, scientific and technical activities) and information and communication activities. In addition to the average number of tenant firms per BI at national and district levels, we also identify a possible latent maladjustment in some Portuguese districts, namely between the number of BIs and the number of new companies (constituted in 2015).

The limitations that arose when conducting this study include the following: limited sources of information, possible outdated sources of information (SABI database and BI websites), the nature of information collected (usually limited and not always consistent) and the impossibility of obtaining data about some identified BIs. The difficulty in acquiring information about business incubation activity in Portugal suggest there is scope for future research in this field.

Although we believe that the actual figures for BIs operating in Portugal do not greatly exceed the ones we have advanced, we are aware that little is known about the extent of activities or services provided by the BIs to the tenant firms/projects. Based only on our observation and knowledge about some BIs, we were able to confirm: first, a great asymmetry of services provided to tenant firms in Portuguese BIs; and, second, some BIs provide a wide range of services to tenant firms while others offer little more than physical space.

There is clearly a real lack of knowledge about this subject and it would therefore be desirable to benchmark the operational capacity of Portuguese BIs. Ideally, this information could form the basis of a potential certification process for BIs at the

national level. Harmonizing the incubation services provided, Portugal would ensure the provision of quality services and foster their ongoing improvement.

It is important to understand the main factors that explain the spatial distribution of BIs in the districts of Portugal. Furthermore, we could ascertain whether greater specialization of BIs would be appropriate in Portugal by comparing the performance of the undifferentiated and specialized BIs and in line with the existing regional clusters.

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