WP4/05 SEARCH WORKING PAPER

Do Business Incubators and Technoparks affect regional development?

A comparative study in the EU27 and the NC16 countries

Panagiotis Liargovas

January 2013

SEARCH
SHARING KNOWLEDGE ASSETS: INTERREGIONALLY COHESIVE NEIGHBORHOODS

EUROPEAN COMMISSION
European Research Area

SEVENTH FRAMEWORK PROGRAMME

Funded under Socio-economic Sciences & Humanities

The research leading to these results has received funding from the European Community's Seventh Framework Programme (FP7/2010-2.2-1) under grant agreement n° 266834

Do Business Incubators and Technoparks affect regional development? A comparative study in the EU27 and the NC16 countries

Panagiotis Liargovas

ICBSS

Abstract

This working paper deals with the incubation phenomenon (i.e. business incubators and technoparks in the EU27 and NC16. The indisputable importance of incubators has been the focus of much research since the mid 1980s placing emphasis on a number of main topics and research questions. One of the most important questions regarding the role of incubators and the incubation process relates to their effectiveness as a regional and local development strategy that might achieve economic growth and social cohesion among the peripheries of developed countries. This is important as regional development and cohesion is the umbrella concept used by the EU and member states to support the increasing amount of funds directed towards the development of incubators. It is widely acknowledged that incubators are a technology transfer mechanism and a means of promoting entrepreneurship and the commercialization of new knowledge and innovations. The associational positive impacts of business incubators are usually measured by their contribution to job and wealth creation, outcomes resulting from accelerating the value-added process inherent in supporting small and medium sized enterprises (SMEs) which are the vehicle of an economy's growth potential. Recent research findings bring the spatial context into the analysis of the critical determinants for incubators' success, suggesting that it is favourable environments that will benefit most from the presence of business incubators. In line with this view, we argue that incubators might contribute to regional performance, subject to the existing regional endowments base. In other words, the operation of business incubators might enhance regional performance through the generation of multiplier effects but we might anticipate that these multiplier effects will be higher the more endowed a region is. This study analyzes empirically the incubation activity in EU27 and NC16 countries by bringing into the analysis three dimensions, namely the type of incubators, the intensity of their activity and the spatial context within which incubators are embedded. We estimate three intensity indicators for business incubators and technoparks activity and use both a uniform and a weighted rank order of the EU27 and NC16 member countries to illustrate regional differences in the intensity of incubation activity within the EU. Exploratory analysis reveals that a region's endowments base differentiates its ability to benefit from additive effects generated by the presence and operation of business incubators.

1. Introduction

Incubators are important in both the developed and the developing countries of the world for two reasons; first, they have a direct effect on firm and job creation and second, they create wealth. The European Union, one of the leaders in incubation activity, has widely recognized both these effects viewed at the national, regional or even the local level in various documents (e.g. EC, 2002).

Researchers and policy makers have changed their view as regards endogenous development processes. They recognize the need to replace the rather traditional measures favoring large scale investments that demand enormous capital stocks and the support of governments towards regions lagging in industrial development (Meyer-Krahmer, 1985) with alternative measures favoring new firms and the evolution of existing to promote endogenous development processes effectively (Armstrong and Taylor, 1986). More specifically, support towards the establishment of SMEs is referred to as a crucial instrument for achieving local and regional development as they actually form niches / clusters of economic activity with a vital role towards industrial restructuring and the support of the innovative activity of firms in an economic system (Nijkamp et al., 1988). According to Peck et al. (1996) incubators affect regional and local development strategies that might achieve economic growth and social cohesion among the peripheries of developed countries. However, they also point to the need to integrate other aspects related to the operation of business incubators into the analysis of their development and performance. Westhead and Storey (1994) studied UK science parks and found that the percent of new jobs generated by off science parks businesses is higher than that generated by businesses in science parks. Also, Siegel et al. (2003) reported virtually identical mean employment growth rates of firms located off and on science parks. Further, little, if any, differences in terms of technological sophistication and technology transfer are reported between businesses operating inside and outside science parks in different countries (Colombo and Delmastro, 2002; Westhead, 1997; Westhead and Storey, 1994; Phillips, 2002).

Tamasy (2007) compared incubators from the U.S. (Luger and Goldstein 1991), Germany (Sternberg et al. 1997) and the UK (Westhead and Storey 1994) and

suggested that successful incubators are linked with favorable environmental conditions while in the case of an unfavorable environment, incubators are linked with superior leadership and planning. According to Tamasy (2007), variations in the performance of incubators can be explained by similar variations in the external environment. As she argues, the importance of the regional context has been implicit in the study of business incubators success yet a theoretical basis for including it in studies evaluating the effectiveness of incubation activity is still lacking. With the same line of argument, Daskalopoulou et al. (2010) undertook a comparative study of business incubators and technological parks among the EU member countries and suggested that incubators might contribute to regional performance subject to the existing regional endowments base and economic development level.

Therefore, the above recent evidence suggests that in order to understand the incubation phenomenon it is necessary to bring together the multiple facets of the phenomenon under a more inclusive and comprehensive theoretical framework.

We argue here that incubators shape interactions at the micro-, meso-, and macro-level of actors, agents and processes, and are bounded by the pre-existing resources and endowments that can be found and mobilized at the micro-, meso-, and macro-levels.

The next section of this paper reviews the relevant literature by emphasizing on (a) the theories of business incubators (b) the links between business incubators and regional development. Section 3 presents a methodological approach. Section 4 makes an analytical presentation of incubation activity in the EU27 and NC16. Section 5 is devoted to an exploratory analysis of the regional variations in incubation activity across the EU27 and NC16 member countries. Section 6 concludes the paper with some preliminary evidence on the relative intensity of business incubators and technoparks activity among the EU and NC member countries as well as some policy proposals.

2. Incubators and economic development: review of the literature

2.1. Theories of business incubators

The literature regarding business incubators is quite limited due to the fact that this is a rather new phenomenon. According to Mian (1994; 1996) much of the research

regarding incubators and the incubation process is actually 'atheoretical' providing mainly exploratory and descriptive findings of the incubator-incubation phenomenon. In the relevant literature, one recognizes the multifaceted nature of the incubator – incubation phenomenon by distinguishing among the various theoretical strands used to analyze this phenomenon. According to Hackett and Dilts (2004) there are five different theoretical approaches namely (1) the '*theory of economic development through entrepreneurship*', (2) the '*structural contingency theory*', (3) the '*interdependent co-production modeling*' theory, (4) the '*network theory*', and (5) the '*virtual incubation: middleman, enclave and collective theories*'.

Brooks (1986) utilizes the 'theory of economic development through entrepreneurship' by focusing on the ability of business incubators to respond to market failures in the sense of reducing the time gap between the birth of a business idea and the actual establishment of a new firm. Within the same line of argument, Williamson (1978) utilizes the transactions costs framework to suggest that unless the initial costs of establishment are rapidly and drastically reduced a new firm cannot hope to gain competitive market advantage (Plosila and Allen, 1985; Lumpkin and Ireland, 1988). The main problem with this approach relates to the difficulty in getting measurable in terms of economic development results. One such effort relates new employment with the presence of incubators. However, empirical findings suggesting that the contribution of incubators to employment generation is not negligible but nevertheless small in magnitude come as a contrast to such expectations (Allen and Rahman, 1985; Campbell, 1989).

Taking on a different view, Ketchen et al. (1993) utilize the 'structural contingency theory' to link the external environment characterizing the locality / region hosting the incubator with the internal environment that focuses on the organizational form of business incubators. Empirical findings suggesting that the regional context matters and indeed it may be responsible for diversity in the observed results are again findings that cannot be explained within this framework.

On the other hand, Rice (2002) uses the theory of production as a basis for analyzing the value added that is produced by incubators ending-up with a co-

production modeling approach where the incubator manager and the tenant firm, together, enter the value added process of production.

Lynn et al. (1996) support under the 'network theory approach' that the commercialization of new ideas and innovations is more likely to occur within an innovative community rather than in a single organism. They explain how firm level relationships and the exchange of information and knowledge among incubated firms can bring about positive effects (Hansen et al., 2000; Lichtenstein, 1992; Nohria and Eccles, 1992). Networks, as a mechanism of promoting the creation of social capital can play a more critical role for the viability of start-ups compared to other forms of support, such as financial capital (Totterman and Sten, 2005).

Finally, the virtual incubation approach summarizes the middleman, enclave and collective theories. Gans and Stern (2003) emphasize on the spatial positioning of middlemen enterprises in a specific cluster (enclave theory), while Greene and Butler (1996) suggest that virtual incubators are the result of group-based endeavors as opposed to individual endeavors by a number of different people who find their entrepreneurial space to be in-between the firms they represent and the market.

The above alternative approaches lead us to the conclusion that there are several ways of approximating the performance of incubators and evaluating their impact as contributing to the development goals of a local economy. Hackett and Dilts (2004) suggest that an inclusive theorization of the role of incubators and the incubation process might not result from an advanced list of critical success factors based on which the impact of incubators might be measured. Rather, they argue that attention should be shifted from 'what' are the important factors to 'how', 'why' and 'in what context' these factors are interrelated (Hackett and Dilts, 2004: 74). The 'who', 'where' and 'when' triptych that Hackett and Dilts (2004: 74) suggest could be thought of as a rather integrative approach to the role of incubators. This approach is in line with a study by Peters et al (2004) who suggest that the wider macro environment is an important determinant of incubator performance despite that its role does not pertain empirical research in the field.

1.2. Incubators and regional development

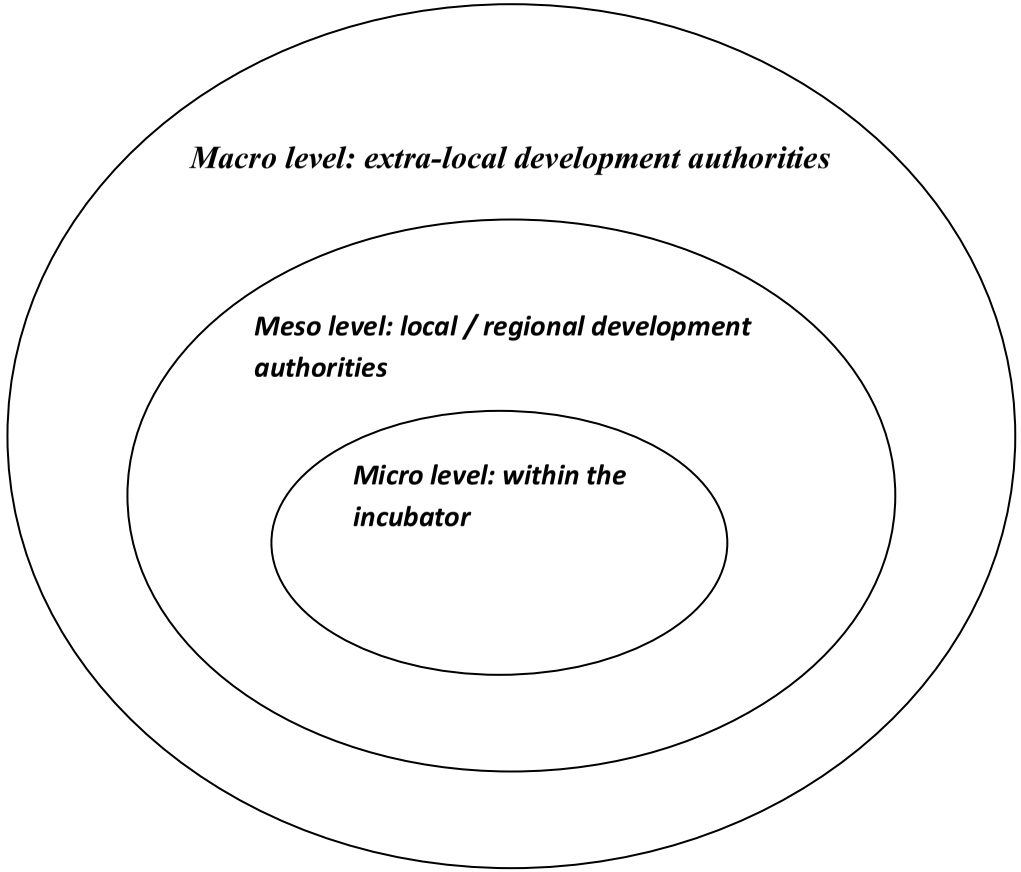
According to Phan et al. (2005), fruitful theoretical contributions regarding the assessment of the economic impact of incubators should consider multiple levels of analysis, including not only the type of incubated firms and the organizational level of incubators, but also the spatial context in which incubators are embedded and in which economic outcomes arise. Tamasy (2007), also focuses on the importance of the regional context in the study of business incubators success. Petrou et.al proposed a theoretical framework of analyzing the interrelationship between incubators, their host communities and the macro environment. The underlying assumption is that unless a field of interactions is created incubators might not contribute to regional / local processes of growth and development. These interactions actually involve the connections, links and networks that will be formed as a result of a community hosting an incubator. Regional endowments will be activated and engaged in the processes evolving from within the incubators. Thus, their proposed framework builds upon the notion of competitive advantage as conceptualized by Porter (1990) to suggest that unless a national / regional innovation system is assumed the positive effects of entrepreneurship support institutes such as incubators might not be thoroughly analyzed in all its aspects. This framework actually emphasizes the role of "territorial capital" as defined by OECD (2001). The European Union has come to acknowledge the crucial role that territorial capital can play in designing and effectively implementing regional development policies. In a recent report on the territorial state and the perspectives for the European Union member countries it is acknowledged that: "Each Region has a specific 'territorial capital' that is distinct from that of other areas and generates a higher return for specific kinds of investments than for others, since these are better suited to the area and use its assets and potential more effectively." (EC, 2005: 1).

Based on the notion of territorial capital and the way in which such capital might be exploited and augmented in an innovation system, both at the national and the regional levels, Petrou et al. (2010) utilize a three-dimensional context, namely the macro-, meso- and micro-level of interactions, suggesting that host communities hold differential levels of capability to generate multiplier effects by the operation of incubators (Figure 1). The macro-level field of interactions involves the possible links between the incubator and development institutions and actors

operating beyond the region, i.e. at the national level. Policy makers and administrative agencies are the actors referred to here. The meso-level field of interactions involves the possible links between the incubator and the local / regional development agencies, business chambers etc. Institutions able to connect the incubator with development processes applying to and beyond the community / region are referred to here. The micro-level field of interactions involves the links within the incubator. This involves the processes evolving within the incubator, i.e. networks of relations within the incubated firms.

The role of the external environment as a prerequisite for incubators' success has recently been studied in Tamasy (2007) who compares available evidence from the U.S. (Luger and Goldstein 1991), Germany (Sternberg et al. 1997) and the UK (Westhead and Storey 1994) to suggest that favorable environmental conditions will most likely enhance the successful performance of incubators. In the case of an unfavorable environment, successful incubators should be linked with superior leadership and planning.

Figure 1. A three dimensional context



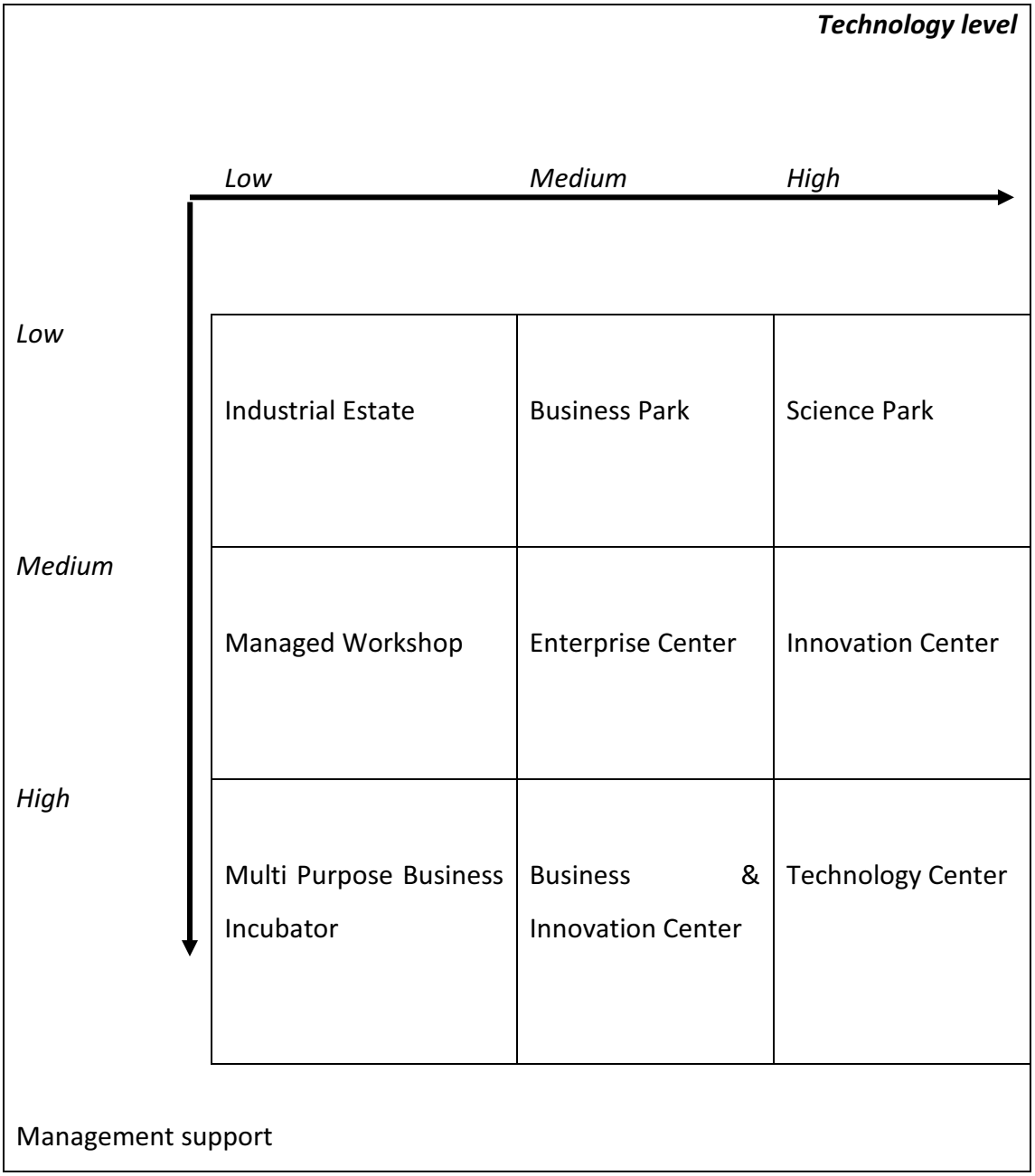
3. Methodological approach: A three dimensional approach

Our methodology is based on the above described three dimensional approach. In particular, the type of incubators supported is assumed to approximate macro-level interactions, the spatial context, i.e. country specific parameters are assumed to approximate the meso-level of interactions and finally the intensity of the incubation activity is assumed to approximate the micro-level of interactions.

The type of incubators, i.e. first versus third generation incubators can provide us with information on the type of start-ups supported, the involvement of the public authorities in the establishment and operation of incubators as well as on the organizational forms assumed by the incubators. In general terms, business incubators fall into the first generation of incubators while technological parks represent the third generation of incubators. An analysis of countries supporting one or the other type of incubators can provide us with information on the country's catching up level with evolution in the field. The above typology (i.e. first vs third generation of incubators) is in line with available research regarding the various types of incubators (see indicatively KTU, 2001).

In a 2002 report, the EU adopted a typology of business incubators as a broad framework of distinguishing between the different incubator modalities and between these and other SME promotion structures that include a physical space element (Figure 2). Business incubators as positioned towards the bottom left-hand corner of the matrix, provide a high degree of management support to tenants but can little cater for technology-based enterprises. On the other hand, technology centers are positioned towards the bottom right-hand corner of the matrix assuming both a high level of management support and a highly specialized technology focus. In that sense technology centers are defined as incubators operating on the basis of highly selective admission criteria, which provide 'hands-on' management support and have a highly specialized technology focus (EC, 2002).

Figure 2. A typology of business incubators.



Source: EC (2002).

The second dimension involving the intensity of incubation activity can provide us with information regarding the volume of output that is anticipated by the operation of incubators. In this case the intensity of incubation activity serves a dual purpose. First, it is used so as to account the observed activity of incubators amongst different countries, a fact that ensures the analytical validity of the obtained empirical results. On the other hand, the intensity of incubation activity

allows us to approximate micro-level differentiation in the operation of incubators. Here, we approximate the intensity of incubation activity by three intensity ratios, namely the number of tenant firms per incubator, the number of employees per incubator and the number of employees per tenant, as indicators of a higher impact probability. In this sense, the higher the number of employees per tenant, the higher the number of jobs created whereas the higher the number of tenants, the higher the probability of firms graduating from an incubator.

The third dimension involves the spatial context in which incubators are embedded and in accordance with the relevant literature in the field refers to the role of favorable environments as opposed to less favorable ones. While acknowledging the regional differences existing at the national level, here we are interested in the differences between EU27 and NC16 member countries. The wider socio-economic development level of a region might give us a more informative view on the ability of regions to benefit from incubation activity in their context. Thus, at an aggregate level, we approximate the wider socio-economic development of each member country by its wealth, i.e. by its per capita GDP which can give us a more informative view on the ability of regions to benefit from incubation activity in their context.

The endowment effects hypothesis suggests that there is a two-way relationship between the successful operation of an incubator and the development of a region serving as a host community. In particular, it is assumed here that the more endowments a region can bring into the operation of an incubator the more successful results are likely to occur. On the other hand, a successful incubator encompassing the wealth of endowments that a region has to offer is more likely to excel and generate multiplicative / additive effects for the regional community. The idea that underlies this proposition is that path-dependent processes of regional development might be directed towards the realization of non-linear effects subject to that a region understands its disadvantages and utilizes available resources towards overcoming these drawbacks. This is after all the ultimate goal set by nations, states, regions and localities that compete with each in an increasingly globalized world where internationalization of trade and free market conditions

have caused the traditional development patterns built upon regional comparative advantages to fade away.

The proposed conceptualization has two major advantages. The first one relates to that it allows for the indirect identification of the areas of interface analyzed above. If incubators do indeed generate additive effects by fostering links, networks and interactions at all levels of actors involved in their operation then the produced amount of knowledge, information and excellence cannot but impact upon their future development. Thus, an area's development level would most likely interfere with and determine the results of an incubator's operation. The second contribution of the proposed conceptualization regards the fact that it enables analysis of the existing interfaces at different spatial levels, a fact that is crucial for the in depth understanding of this relationship and the generation of useful policy level knowledge and information. In other words, the operation of business incubators might enhance regional performance through the generation of additive effects and we might anticipate that these additive effects will be higher the more endowed a region is.

Nonetheless, it is acknowledged that to operationalize these three levels of interaction and perform the analysis at the different spatial levels is a challenging task requiring a wealth of knowledge and information as regards the possible links and networks developed at all three levels. Here we perform an exploratory study at the national level under the assumption that each country can be conceived as a region in a globalized world. It follows that a number of approximations are also necessary as it regards the three different levels of interactions assumed here.

4. The development of business incubators and technoparks in the EU27 and NC16

In this part we analyze the development of business incubators and technoparks in 43 countries, from which, 27 are EU member states (EU27), 6 are eastern European neighboring countries (ENC-East), namely Armenia, Azerbaijan, Belarus, Georgia, Moldova, Ukraine 9 are southern European neighboring countries (ENC-South),

namely Algeria, Egypt, Israel, Jordan, Lebanon, Libya, Morocco, Syria, Tunisia and finally Russia. Our purpose is to draw more conclusions with respect to the position of each country and in particular the regional variations among them. Data comes from the Science Park and Innovation Center Association's (SPICA) Directory for 2010 as well as domestic sources. As SPICA suggests, a business incubator (business and innovation centre) is '*a physical facility aimed at promoting economic development of its community by supporting start-up companies and their business development*'. This centre provides basic services such as: start-up consulting and planning; consulting in business development (legal, marketing, etc); consulting for/and or access to financing; shared office services and office and/or workshop/laboratory rooms for lease on flexible terms. On the other hand, '*a science park [with the understanding that the terms technology park or research park can be used as synonyms] is an organisation managed by specialised professionals, whose main aim is to increase the wealth of its community by promoting the culture of innovation and the competitiveness of its associated businesses and knowledge-based institutions*'. To enable these goals to be met, a science park stimulates and manages the flow of knowledge and technology amongst universities, R&D institutions, companies and markets; it facilitates the creation and growth of innovation-based companies through incubation and spin-off processes and provides other value-added services together with high quality space and facilities. These two are operational definitions and are used in the context of the present study as reference with regard to the statistical data used which are also drawn from the Directory of the SPICA and the associated lists under these two definitions.

In 2010, a total number of 1,390 business incubators were recorded for the EU27 member countries, (Table 1) and 159 for NC16. The average number of business incubators per member country is 51.5 for the EU27 member countries and 10.6 for the NC16. In the EU case this figure presents quite high variation across member countries. The lowest number of business incubators in EU member countries is reported for Malta with 1 business incubator in 2010 (followed by Estonia and Luxembourg). Two countries, namely Germany and the UK, followed by Poland account for the largest share of the activity reported in this group of

countries in all three indicators considered here. Germany reports the highest number of business incubators, with a total number of 375 business incubators in 2010, i.e. 29% of the total number of incubators in the group. The UK follows in the second position with a total of 220 business incubators, to account for 16% of incubators in this group. Together, the two countries account for 38% of the number of business incubators reported for the whole EU region. The lowest number of business incubator for the NC16, is 1 for Egypt and Azerbaijan, while Russia reports the highest number of business incubators, with a total number of 52 business incubators in 2010, i.e. 33% of the total number of incubators in the NC16 group. Israel follows in the second position with a total of 23 business incubators, to account for 14% of incubators in this group. It should be noted however that there are no incubators at all in Libya.

In the EU27, tenants amount to 24,411 firms, while employment amounts to 172,128 persons. Similarly to the great variation observed as regards the total number of incubators, the number of tenant firms and the number of employees among EU member countries, also present high levels of variation. Malta and Slovakia report the lowest number of tenant firms (only 2). Again Germany and the UK carry the bulk of the reported activity (followed by Poland) with Germany accounting for 29% of tenant firms and 49% of employees in the group. For the UK, the corresponding figures are 27% and 19% respectively. In the NC16, tenants amount to 3,641, while employment amounts to 16,318 persons. Egypt (followed by Azerbaijan) reports the lowest number of tenant firms (only 8). Russia and Ukraine carry the bulk of the reported activity with Russia accounting for 62% of tenant firms and 38% of employees in the group. For Ukraine, the corresponding figures are 14% and 30% respectively. (Table 1).

Table 1. Distribution of business incubators, tenants and employees in EU27 and NC16 member countries, 2010.				
	Country	**Incubators**	**Tenants**	**Employees**
1	Austria	90	1610	9210
2	Belgium	131	151	627
3	Bulgaria	42	320	2724
4	Cyprus	4	120	668
5	Czech Republic	21	231	1685
6	Denmark	8	169	844
7	Estonia	2	20	300
8	Finland	58	982	4575
9	France	66	343	13253
10	Germany	375	7000	85000
11	Greece	5	44	140
12	Hungary	25	484	1908
13	Ireland	19	63	218
14	Italy	45	235	1670
15	Latvia	5	58	510
16	Lithuania	6	117	650
17	Luxembourg	2	15	66
18	Malta	1	4	6
19	Netherlands	3	24	70
20	Poland	127	4464	9840
21	Portugal	23	388	466
22	Romania	14	70	800
23	Slovakia	16	269	1230
24	Slovenia	3	4	15
25	Spain	38	246	1348
26	Sweden	41	380	1305
27	UK	220	6600	33000
Desrciptive Statistics				

	Average	51,5	904,1	6375,1
	St Deviation	82,3	1912,1	17119,3
	Minimum	1,0	4,0	6,0
	Maximum	375,0	7000,0	85000,0
	Total EU27	**1390.0**	**24411.0**	**172128.0**
	ENC East			
1	Armenia	2	33	650
2	Azerbaijan	1	10	12
3	Belarus	6	52	381
4	Georgia	3	14	125
5	Moldova	*2*	21	98
6	Ukraine	20	492	4914
	ENC South			
7	Algeria	2	15	102
8	Egypt	1	8	85
9	Israel	23	256	550
10	Jordan	8	57	801
11	Lebanon	3	93	550
12	Libya	0	0	0
13	Morocco	11	120	840
14	Syria	4	64	80
15	Tunisia	21	160	987
16	Russia	52	2246	6143
Desrciptive Statistics				
	Average	9,9	227,6	1019,9
	St Deviation	13,6	552,8	1803,4
	Minimum	0	0	0
	Maximum	52,0	2246,0	6143,0
	Total NC16	**159.0**	**3641.0**	**16318.0**

Source: SPICA Directory.

As regards technoparks, most of the activity is concentrated in the EU, which accounts for 91% of the number of technoparks, 95% of the number of tenant firms and 81% of the total number of employees in the whole region (Table 2.). The ENC South accounts for about 5% of the total number of technoparks and 17% of the number of employees.

In the EU, the average number of technoparks per member country is 11.4 although this figure also presents quite high variation across EU member countries. Malta, Cyprus and Slovakia do not report any technopark in 2010. The bulk of the activity as regards all three indicators is reported for the UK, Spain and Germany. The UK accounts for the largest share of technology parks in the EU as it reports the operation of 56 parks, i.e. 18% of the total number of technology parks in the EU27 and 16.6% of the total group of countries (EU27+NC16). As regards the number of tenants in the EU27, these amount to a total of 18,420 firms. Spain (followed by Sweden) accounts for the largest share of tenant firms as it reports 5,539 firms, i.e. 32% of the total number of tenant firms in the EU, while employment amounts to 38,.418 persons in the EU. Similarly to the great variation observed as regards the total number of technological parks, the number of tenant firms and the number of employees among EU member countries also present high levels of variation. The lowest number of tenant firms in technoparks is reported by Hungary with only 10 tenants. As regards the number of employees, the lowest number is reported for Luxembourg with 91 employees and the highest number of employees is reported again for Spain with a total number of 145,155 employees, i.e. 38% of the total number of employees in the EU. (Table 2).

As regards technoparks in NC16, it should be noted that the performance of neighboring countries is very poor. Only ten countries report technoparks in 2010: Armenia, Belarus, Ukraine, Algeria, Egypt, Israel, Jordan, Morocco, Tunisia and Russia. Their total number in 2010 amounts to 30 parks. Russia and Israel (with 6 and 5 technoparks respectively) account for most of the activity as regards all three indicators. The number of tenants amounts to 963 firms, while employment amounts to 87,050 persons. (Table 2). The lowest number of tenant firms in technoparks is reported by Jordan with only 3 tenants while the highest number of

tenants is reported for Ukraine with a total number of 342 tenant firms and Russia with a total number of 140 tenants. As regards the number of employees, the lowest number is reported for Armenia with 450 employees and the highest number of employees is reported for Egypt with a total number of 30.000 employees, followed by Israel. (Table 2).

Table 2. Distribution of technoparks, tenants and employees in EU27 and NC16 member countries, 2010.

	Country	Technoparks	Tenants	Employees
1	Austria	9	287	2819
2	Belgium	4	122	4410
3	Bulgaria	1	20	200
4	Cyprus	0	0	0
5	Czech Republic	19	249	1238
6	Denmark	5	247	5230
7	Estonia	1	29	300
8	Finland	20	1659	26950
9	France	4	220	12720
10	Germany	40	1880	30000
11	Greece	5	83	384
12	Hungary	2	10	1058
13	Ireland	1	80	3000
14	Italy	24	25	250
15	Latvia	1	25	250
16	Lithuania	2	35	276
17	Luxembourg	1	25	91
18	Malta	0	0	0
19	Netherlands	5	1000	20000
20	Portugal	1	26	250
21	Poland	24	718	24737

22	Romania	4	68	256
23	Slovakia	0	0	0
24	Slovenia	2	15	200
25	Spain	47	5539	145155
26	Sweden	29	4558	72144
27	UK	56	1500	28500
Desrciptive Statistics				
	Average	11,4	682,2	14089,6
	St Deviation	15,7	1376,1	30755,9
	Minimum	0	0	0
	Maximum	56,0	5539,0	145155,0
	Total EU	307,0	18420,0	380418,0
	ENC East	**7**	**414**	**4150**
1	Armenia	1	13	450
2	Azerbaijan	0	0	0
3	Belarus	3	59	490
4	Georgia	0	0	0
5	Moldova	*0*	0	0
6	Ukraine	3	342	3210
	ENC South	**17**	**409**	**77400**
7	Algeria	4	88	20000
8	Egypt	3	71	30000
9	Israel	5	65	21000
10	Jordan	1	3	600
11	Lebanon	0	0	0
12	Libya	0	0	0
13	Morocco	1	130	4300
14	Syria	0	0	0
15	Tunisia	3	52	1500

16	Russia	6	140	5500
Desrciptive Statistics				
	Average	2.8	80.7	9673.5
	St Deviation	4.1	120.8	19689.9
	Minimum	0	0	0
	Maximum	17.0	409.0	77400.0
	Total NC16	**47.0**	**1,372.0**	**164,450.0**

Source: SPICA Directory.

5. The potential outcome of incubation activity in the EU27 and NC16

In this section we undertake an exploratory analysis of incubation activity in the EU27 and NC16 member countries in an attempt to identify differences in the ability of regions to generate multiplier effects by the operation of incubators. Lack of available data, at the aggregate member state level, calls for a rather qualitative analysis of the observed incubation activity. To that extent, we utilize the three-dimensional context described in section 3 in order to approximate potential differences in the ability of regions to benefit from incubators. These dimensions refer to the type of incubators supported, the intensity of incubation activity and the spatial context.

Data on the different types of incubators, i.e. information on the first dimension of the analysis undertaken here, are directly available by the SPICA category and summarized in Tables 1 and 2 presented above. Information on the intensity of incubation activity, i.e. information on the second dimension of our analysis, is derived here through the estimation of three indicators. Based on available data, the following intensity indicators are estimated for each EU27 and NC16 member country (1) – (3):

Intensity indicators:

$$\frac{\textit{Number of tenant firms}}{\textit{Number of incubators}} \quad (1)$$

$$\frac{\textit{Number of employees in tenant firms}}{\textit{Number of incubators}} \quad (2)$$

$$\frac{\textit{Number of employees in tenant firms}}{\textit{Number of tenant firms}} \quad (3)$$

The above ratios can be used to illustrate differences in the scale of incubators' operation and can better capture variations among countries. In order to analyze the potential performance of business incubators as capable of generating regional multiplier effects, given the environment within which they operate, i.e. in order to provide information on the third dimension of the analysis undertaken here, we have, at a second stage, weighted these intensity indicators using per capita GDP as a proxy for a country's ability to benefit in the long-run by the presence and operation of business incubators. Intensity indicators are weighted by a 1.3 factor in the case of countries with a per capita GDP that is higher than the EU27+NC16 average while a 0.7 factor is used in the case of countries with a per capita GDP that is lower than the EU27+NC16 average. These weighting factors are somewhat arbitrary chosen but the aim here is to illustrate the role of the wider developmental level of countries, without imposing weighting factors that would completely alter their categorization, especially since these factors can not be drawn by information on the relative performance of business incubators among the EU member countries[1]. Thus, assuming that an impact factor of 1 can be attributed to the operation of business incubators in general, a higher than 1 impact is to be expected

[1] It is important to note that the same factors could have been used in the case of other equally important proxies such as human capital, the level of R&D expenditures, etc.

in the case of most developed countries and a smaller than 1 impact is to be expected in the case of the less developed EU member countries. The development 'distance' between the two groups of member countries might be proxied by the distance in their weighted impact factors.

Table 3 lists the uniform and weighted intensity indicators regarding business incubators activity. The first three columns present the uniform business incubators intensity indicators (UBI-1, UBI-2, UBI-3) and the next three columns present the weighted business incubators intensity indicators (WBI-1, WBI-2, WBI-3). The last column lists the weighting factors used. Basic descriptive statistics of these intensity indicators are presented in Table 4.

As shown in Table 3, in 2010 there are on average 13.5 tenants per incubator, 83.4 employees per incubator and 7 employees per tenant in the EU27 and NC16 together. However, important variations are observed between countries while it is even more interesting that the relative position of leaders and followers in incubation activity seems to change when the intensity of incubation activity is considered.

As regards the EU27 group of countries, analysis show that Germany and the UK, the two leaders in terms of absolute numbers, seem to lose ground in favor of Poland when the intensity of incubation activity is considered. Nonetheless, the UK still holds a high position as it is ranked second (along with Cyprus). Variation in terms of this intensity indicator is manifested as Belgium holds the last position among the EU member countries with an average of only 1.2 tenants per business incubator whereas Poland presents an average of 35.1 tenants per business incubator. (Table 7). For NC16 the average figure for tenants/incubator is 14.5. Georgia holds the last position with an average of only 4.7 tenants per business incubator whereas Russia keeps its lead with an average of 43.2 tenants per business incubator. Next ranks Lebanon with 31 tenants per business incubator.

As regards the employees per business incubator ratio, on average 83.4 employees correspond to each business incubator in the EU27 and NC16. (Table 3). In the EU, Belgium and Germany hold the lowest and highest values respectively.

Belgium holds the last position among the EU member countries with only 5 employees per business incubator whereas Germany holds the leading position with an average of 226.7 employees per business incubator. Few EU countries are close to the average value of this intensity indicator. In the NC16 case, the average number of employees per business incubator is 96.1. Azerbaijan with only 12 employees per business incubator and Armenia with 325 employees per business incubator hold the lowest and highest values respectively.

The last intensity indicator estimated refers to the ratio of employees per tenant firm. As regards this ratio, on average 7 employees correspond to each tenant firm hosted in the business incubators of the EU27 and NC16. (Table 3). In the EU, the lowest value in terms of this indicator is reported for Portugal with an average of 1.20 employees per tenant firm while France holds by far the highest position with an average of 38.64 employees per tenant firm. It is important that many countries are close to the average score of this intensity indicator (Table 3). In the case of NC16, the average number of employees per tenant firm is 7.2. The lowest value in terms of this indicator is reported for Azerbaijan with an average of 1.20 employees per tenant firm while Armenia holds by far the highest position with an average of 19.7 employees per tenant firm. A general observation as regards all three indicators is that the ENC East countries develop interactions and links within them (e.g. networks of relations within the incubated firms) to a much greater extend compared to both the EU27 and ENC-South.

Table 3. Uniform and weighted intensity indicators: business incubators activity, 2010

	Uniform intensity indicators			**Weighted intensity indicators**			**Weighting Factor**
	Tenants/ incubator	Employees/ incubator	Employees/ tenant	Tenants/ incubator	Employees /incubator	Employees/ tenant	
Country	**UBI-1**	**UBI-2**	**UBI-3**	**WBI-1**	**WBI2**	**WBI3**	
EU	17.6	123.8	7.1				
Austria	17.9	102.3	5.7	23.3	133.0	7.4	**1.3**
Belgium	1.2	4.8	4.2	1.5	6.2	5.4	**1.3**

Bulgaria	7.6	64.9	8.5	5.3	45.4	6.0	**0.7**
Cyprus	30.0	167.0	5.6	39.0	217.1	7.2	**1.3**
Czech Republic	11.0	80.2	7.3	7.7	56.2	5.1	**0.7**
Denmark	21.1	105.5	5.0	27.5	137.2	6.5	**1.3**
Estonia	10.0	150.0	15.0	7.0	105.0	10.5	**0.7**
Finland	16.9	78.9	4.7	22.0	102.5	6.1	**1.3**
France	5.2	200.8	38.6	6.8	261.0	50.2	**1.3**
Germany	18.7	226.7	12.1	24.3	294.7	15.8	**1.3**
Greece	8.8	28.0	3.2	11.4	36.4	4.1	**1.3**
Hungary	19.4	76.3	3.9	13.6	53.4	2.8	**0.7**
Ireland	3.3	11.5	3.5	4.3	14.9	4.5	**1.3**
Italy	5.2	37.1	7.1	6.8	48.2	9.2	**1.3**
Latvia	11.6	102.0	8.8	8.1	71.4	6.2	**0.7**
Lithuania	19.5	108.3	5.6	13.7	75.8	3.9	**0.7**
Luxembourg	7.5	33.0	4.4	9.8	42.9	5.7	**1.3**
Malta	4.0	6.0	1.5	2.8	4.2	1.1	**0.7**
Netherlands	8.0	23.3	2.9	10.4	30.3	3.8	**1.3**
Poland	35.1	77.5	2.2	24.6	54.2	1.5	**0.7**
Portugal	16.9	20.3	1.2	11.8	14.2	0.8	**0.7**
Romania	5.0	57.1	11.4	3.5	40.0	8.0	**0.7**
Slovakia	16.8	76.9	4.6	11.8	53.8	3.2	**0.7**
Slovenia	1.3	5.0	3.8	1.7	6.5	4.9	**1.3**
Spain	6.5	35.5	5.5	8.4	46.1	7.1	**1.3**
Sweden	9.3	31.8	3.4	12.0	41.4	4.5	**1.3**
UK	30.0	150.0	5.0	39.0	195.0	6.5	**1.3**
ENC East	18.3	181.8	9.9				
Armenia	16.5	325.0	19.7	11.6	227.5	13.8	**0.7**
Azerbaijan	10.0	12.0	1.2	7.0	8.4	0.8	**0.7**
Belarus	8.7	63.5	7.3	6.1	44.5	5.1	**0.7**

Georgia	4.7	41.7	8.9	3.3	29.2	6.3	**0.7**
Moldova	10.5	49.0	4.7	7.4	34.3	3.3	**0.7**
Ukraine	24.6	245.7	10.0	17.2	172.0	7.0	**0.7**
ENC South	10.6	54.7	5.2				
Algeria	7.5	51.0	6.8	5.3	35.7	4.8	**0.7**
Egypt	8.0	85.0	10.6	5.6	59.5	7.4	**0.7**
Israel	11.1	23.9	2.1	14.5	31.1	2.8	**1.3**
Jordan	7.1	100.1	14.1	5.0	70.1	9.8	**0.7**
Lebanon	31.0	183.3	5.9	21.7	128.3	4.1	**0.7**
Libya				0.0	0.0	0.0	**0.7**
Morocco	10.9	76.4	7.0	7.6	53.5	4.9	**0.7**
Syria	16.0	20.0	1.3	11.2	14.0	0.9	**0.7**
Tunisia	7.6	47.0	6.2	5.3	32.9	4.3	**0.7**
Russia	43.2	118.1	2.7	30.2	82.7	1.9	**0.7**

Source: Author's calculations based on SPICA Directory

Table 4. Descriptive Statistics of uniform and weighted intensity indicators: business indicators activity 2010.

	UBI-1	**UBI-2**	**UBI-3**	**WBI-1**	**WBI2**	**WBI3**
Average	13.5	83.4	7.0	11.9	73.0	6.2
St dev	9.6	71.8	6.4	9.6	73.1	7.6
Min	1.2	4.8	1.2	0.0	0.0	0.0
Max	43.2	325.0	38.6	39.0	294.7	50.2

Source: Author's calculations based on SPICA Directory

Table 5 lists the uniform and weighted intensity indicators regarding technology parks activity. The first three columns present the uniform technology

parks intensity indicators (UTPI-II1, UTP-II2, UTP-II3) and the next three columns present the weighted technology parks intensity indicators (WTP-II1, WTP-II2, WTP-II3). Again the last column lists the weighting factors used. Basic descriptive statistics of these intensity indicators are presented in Table 6.

As shown in Tables 5 and 6, in 2010 there are on average 43.8 tenants per technology park, 1504 employees per technology park and 54 employees per tenant in the whole region EU27 & NC16. However, important variations are observed between countries while it is even more interesting that the relative position of leaders and followers in technology parks activity seems to change when the intensity of incubation activity is considered.

As regards the EU27 group of countries, analysis show that Spain and the UK, the two leaders in terms of absolute numbers, seem to lose ground in favor of Netherlands and Sweden when the intensity of incubation activity is considered. Nonetheless, Spain still holds a high position as it is ranked third. Medium variation in terms of this intensity indicator is manifested, as Italy holds the last position among the EU member countries with an average of only 1 tenant per technopark whereas Netherlands presents an average of 200 tenants per technopark. For NC16 the average figure for tenants/incubator is 38. Jordan holds the last position with an average of only 3 tenants per business incubator whereas Morocco presents an average of 130 tenants per business incubator.

As regards the employees per technopark ratio, on average 1504 employees correspond to each business incubator in the EU27 and NC16 (Table 5). Italy and Netherlands hold the lowest and highest values respectively. Italy holds the last position among the EU member countries with only 10 employees per technopark whereas Netherlands holds the leading position with an average of 4.000 employees per technopark. In the NC16 case, the average number of employees per technopark is 2.720. Belarus with only 163 employees per technopark and Egypt with 10.000 employees per technopark hold the lowest and highest values respectively.

The last intensity indicator estimated refers to the ratio of employees per tenant firm. As regards this ratio, on average 54 employees correspond to each

tenant firm hosted in the technoparks of the EU27 and NC16 member countries (Table 5). In the EU case, the lowest value in terms of this indicator is reported for Luxembourg with an average of 4 employees per tenant firm while UK holds by far the highest position with an average of 190 employees per tenant firm. It is important that many countries are close to the average score of this intensity indicator (Table 5). In the case of NC16, the average number of employees per tenant firm is 132.6. The lowest value in terms of this indicator is reported for Belarus with an average of 8 employees per tenant firm while Egypt holds by far the highest position with an average of 423 employees per tenant firm. A general observation as regards all three indicators is that the ENC South countries are more labour intensive compared to EU27 and ENC East countries.

Table 5. Uniform and weighted intensity indicators: technopark activity, 2010

	Uniform intensity indicators			**Weighted intensity indicators**			**Weighting Factor**
	Tenants/ technopark	Employees/ technopark	Employees/ tenant	Tenants /techno park	Employees/ technopark	Employees/ tenant	
Country	**UTP-1**	**UTP-2**	**UTP-3**	**WTP-1**	**WTP2**	**WTP3**	
EU	**60.0**	**1239.1**	**20.7**				
Austria	31.9	313.2	9.8	41.5	407.2	12.8	**1.3**
Belgium	30.5	1102.5	36.1	39.7	1433.3	47.0	**1.3**
Bulgaria	20.0	200.0	10.0	14.0	140.0	7.0	**0.7**
Cyprus							**1.3**
Czech Republic	13.1	65.2	5.0	9.2	45.6	3.5	**0.7**
Denmark	49.4	1046.0	21.2	64.2	1359.8	27.5	**1.3**
Estonia	29.0	300.0	10.3	20.3	210.0	7.2	**0.7**
Finland	83.0	1347.5	16.2	107.8	1751.8	21.1	**1.3**
France	55.0	3180.0	57.8	71.5	4134.0	75.2	**1.3**
Germany	47.0	750.0	16.0	61.1	975.0	20.7	**1.3**
Greece	16.6	76.8	4.6	21.6	99.8	6.0	**1.3**

Hungary	5.0	529.0	105.8	3.5	370.3	74.1	**0.7**
Ireland	80.0	3000.0	37.5	104.0	3900.0	48.8	**1.3**
Italy	1.0	10.4	10.0	1.4	13.5	13.0	**1.3**
Latvia	25.0	250.0	10.0	17.5	175.0	7.0	**0.7**
Lithuania	17.5	138.0	7.9	12.3	96.6	5.5	**0.7**
Luxem-bourg	25.0	91.0	3.6	32.5	118.3	4.7	**1.3**
Malta							**0.7**
Netherlands	200.0	4000.0	20.0	260.0	5200.0	26.0	**1.3**
Portugal	26.0	250.0	9.6	18.2	175.0	6.7	**0.7**
Poland	29.9	1030.7	34.5	20.9	721.5	24.1	**0.7**
Romania	17.0	64.0	3.8	11.9	44.8	2.6	**0.7**
Slovakia							**0.7**
Slovenia	7.5	100.0	13.3	9.8	130.0	17.3	**1.3**
Spain	117.9	3088.4	26.2	153.2	4014.9	34.1	**1.3**
Sweden	157.2	2487.7	15.8	204.3	3234.0	20.6	**1.3**
UK	26.8	508.9	19.0	34.8	661.6	24.7	**1.3**
ENC East	**59.1**	**592.9**	**10.0**				
Armenia	13.0	450.0	34.6	9.1	315.0	24.2	**0.7**
Azerbaijan							**0.7**
Belarus	19.7	163.3	8.3	13.8	114.3	5.8	**0.7**
Georgia							**0.7**
Moldova							**0.7**
Ukraine	114.0	1070.0	9.4	79.8	749.0	6.6	**0.7**
ENC South	**24.1**	**4552.9**	**189.2**				
Algeria	22.0	5000.0	227.3	15.4	3500.0	159.1	**0.7**
Egypt	23.7	10000.0	422.5	16.6	7000.0	295.8	**0.7**
Israel	13.0	4200.0	323.1	16.9	5460.0	420.0	**1.3**
Jordan	3.0	600.0	200.0	2.1	420.0	140.0	**0.7**
Lebanon							**0.7**
Libya							**0.7**
Morocco	130.0	4300.0	33.1	91.0	3010.0	23.2	**0.7**

Syria							**0.7**
Tunisia	17.3	500.0	28.8	12.1	350.0	20.2	**0.7**
Russia	23.3	916.7	39.3	16.3	641.7	27.5	**0.7**

Source: Author's calculations based on SPICA Directory

Table 6. Descriptive Statistics of uniform and weighted intensity indicators: technoparks activity 2010.

	UTP-1	UTP-2	UTP-3	WTP-1	WTP-2	WTP-3
Average	43.8	1503.8	53.8	48.7	1531.9	46.0
St dev	47.5	2093.3	95.8	59.8	1929.8	87.2
Min	1.0	10.4	3.6	1.4	13.5	2.6
Max	200.0	10000.0	422.5	260.0	7000.0	420.0

Source: Author's calculations based on SPICA Directory

Tables 7 and 8 bring together the second and third dimension of the analysis undertaken here for the business incubators and technoparks activity, respectively. Based on the intensity scores, the uniform rank position of the EU27 and NC16 member countries is drawn and is reported under the uniform score column per each intensity indicator (uniform rank position columns, Tables 7 and 8). The rank position of countries based on the weighted intensity indicators is drawn then and is presented under the weighted column per each intensity indicator (weighted rank position columns, Tables 7 and 8).

As shown in Table 7 five countries can be considered the leaders in business incubation activity when the tenants per incubator ratio are considered. More specifically Russia, Poland, Lebanon, Cyprus and the UK hold the first five positions in terms of the uniform tenants per incubator ratio. In other words, the leading countries in terms of this indicator are two developed and three less developed nations. In terms of the employees per incubator ratio the five leading countries are

Armenia, Ukraine, Germany, France, and Lebanon (Table 7). Again, the leading countries in terms of this indicator are two developed and two less developed countries showing quite high scores, which however are far below the Armenia's score, which is the leader. In terms of the employees per tenant ratio the five leading countries are France, Armenia, Estonia, Jordan and Germany (Table 7). Simmilarly, two developed and three less developed countries seem to be the world leaders in terms of this intensity indicator.

Based on the above, we can see that high level intensity of the business incubators' activity in terms of at least two indicators analyzed here can be reported for four countries namely France, Germany, Armenia and Lebanon. Medium level intensity might be assumed in the case of countries, which report mixed intensity levels, i.e., high intensity in terms of at least one indicator, e.g. Russia, Poland, Cyprus, Ukraine, Estonia and Jordan. Finally, low-level intensity is observed in the case of countries, which report low intensity in two out of the three or in all three of the indicators, e.g. Belgium, Slovakia, Ireland, Malta, Georgia, etc (Table 7).

This picture however changes when the weighted indicators are considered. Interestingly when the country's level of development is brought into the analysis the resulting categorization of countries significantly changes (Table 7). The most developed countries are the ones in which the most important effects are to be expected. This group of countries now includes UK, Cyprus, France and Germany with Armenia being the only less developed country expected to experience higher effects a fact that is due to the high intensity of incubation activity reported in this country. The leading position of countries such as Lebanon, which presents high uniform intensity scores, cannot hold also in the case of the anticipated multiplier effects. This country now falls into the group of countries presenting medium intensity scores while no actual changes are observed in the case of countries presenting low intensity scores. Indicative of the unbiased nature of the per capita GDP weight is the fact that the position of countries that are quite low in the rank order, e.g. Belgium, Slovakia, Ireland, Malta, Georgia, does not change as a result of accounting for their level of economic development.

Table 7. Ranked position of EU27 & NC16 countries - business incubators' intensity indicators, 2010						
	Uniform intensity indicators			Weighted intensity indicators		
	Tenants/ incubator	Employees/ incubator	Employees /tenant	Tenants/ incubator	Employees /incubator	Employees /tenant
Country	**UBI-1**	**WBI-1**	**UBI-2**	**WBI-2**	**UBI-3**	**WBI-3**
Russia	1	3	9	12	36	37
Poland	2	5	18	18	37	38
Lebanon	3	9	5	9	18	29
Cyprus	4	2	6	4	20	10
UK	5	1	8	5	23	13
Ukraine	6	10	2	6	8	12
Denmark	7	4	11	7	24	14
Lithuania	8	12	10	13	21	31
Hungary	9	13	21	21	30	36
Germany	10	6	3	1	5	2
Austria	11	7	12	8	19	9
Finland	12	8	17	11	26	17
Portugal	13	15	36	37	41	41
Slovakia	14	16	19	19	27	34
Armenia	15	17	1	3	2	3
Syria	16	19	37	38	40	40
Latvia	17	23	13	14	10	16
Israel	18	11	34	33	38	35
Czech Republic	19	24	16	17	13	22
Morocco	20	25	20	20	15	23
Moldova	21	26	26	31	25	33
Estonia	22	27	7	10	3	4
Azerbaijan	23	28	38	39	42	42

Sweden	24	14	32	27	35	27
Greece	25	18	33	29	34	30
Belarus	26	31	23	25	12	21
Netherlands	27	20	35	34	35	32
Egypt	28	32	15	17	7	8
Bulgaria	29	33	22	24	11	18
Tunisia	30	34	27	32	17	28
Luxembourg	31	21	31	26	28	19
Algeria	32	35	25	30	16	25
Jordan	33	36	14	15	4	5
Spain	34	22	30	23	22	11
Italy	35	29	29	22	14	6
France	36	30	4	2	1	1
Romania	37	38	24	28	6	7
Georgia	38	39	28	35	9	15
Malta	39	40	40	42	39	39
Ireland	40	37	39	36	32	26
Slovenia	41	41	41	40	31	24
Belgium	42	42	42	41	29	20

Source: Author's calculations based on SPICA Directory

Table 8 presents the uniform and weighted ranked position of EU27 and NC16 as regards technoparks. As shown in Table 8 five countries can be considered the leaders in technoparks activity when the tenants per technopark ratio are considered. More specifically Netherlands, Sweden, Morocco, Spain and Ukraine hold the first five positions in terms of the uniform tenants per incubator ratio. If we consider the weighted ranked position, Finland and Ireland take the position of Morocco and Ukraine. In terms of the employees per incubator ratio the five leading countries are Egypt, Algeria, Morocco, Israel, and Netherlands (Table 8). Again, the weighted ranked position of the three leading countries Egypt, Israel and Netherlands, does not change. But Morocco and Algeria are replaced by France and

Spain. In terms of the employees per tenant ratio the five leading countries are Egypt, Israel, Algeria, Jordan and Hungary (Table 8). With the exception of Hungary which is replaced by France, the remaining countries keep their leading positions even if we consider the weighted rankings.

Table 8. Uniform and weighted intensity indicators: technopark activity, 2010

	Uniform intensity indicators			**Weighted intensity indicators**		
	Tenants /techno park	**Employees/ technopark**	**Employees/ tenant**	**Tenants /techno park**	**Employees/ technopark**	**Employees/ tenant**
Country	**UTP-1**	**WTP-1**	**UTP-2**	**WTP2**	**UTP-3**	**WTP3**
Netherlands	1	1	5	3	16	12
Sweden	2	2	9	8	20	19
Morocco	3	6	3	9	12	16
Spain	4	3	7	5	14	9
Ukraine	5	7	12	14	28	28
Finland	6	4	10	10	18	17
Ireland	7	5	8	6	8	7
France	8	8	6	4	6	5
Denmark	9	9	13	12	15	10
Germany	10	10	16	13	19	18
Austria	11	11	22	19	26	23
Belgium	12	12	11	11	9	8
Poland	13	16	14	15	11	15
Estonia	14	17	23	23	22	24
UK	15	13	19	16	17	13
Portugal	16	18	25	25	27	27
Latvia	17	19	24	24	25	26
Luxembourg	18	14	30	28	34	32

Egypt	19	21	1	1	1	2
Russia	20	22	15	17	7	11
Algeria	21	23	2	7	3	3
Bulgaria	22	24	26	26	23	25
Belarus	23	25	27	29	29	30
Lithuania	24	26	28	31	30	31
Tunisia	25	27	20	21	13	20
Romania	26	28	33	33	33	34
Greece	27	15	31	30	32	29
Czech Republic	28	30	32	32	31	33
Armenia	29	31	21	22	10	14
Israel	30	20	4	2	2	1
Slovenia	31	29	29	27	21	21
Hungary	32	32	18	20	5	6
Jordan	33	33	17	18	4	4
Italy	34	34	34	34	24	22

Based on the above, we can see that high level intensity of the technoparks' activity in terms of at least two indicators analyzed here can be reported for four countries namely Egypt, Israel, Algeria and Morocco. Medium level intensity might be assumed in the case of countries, which report mixed intensity levels, i.e., high intensity in terms of at least one indicator, e.g. Netherlands, Sweden, Spain, Ukraine, Hungary and Jordan. Finally, low-level intensity is observed in the case of countries, which report low intensity in two out of the three or in all three of the indicators, e.g. Italy, Slovenia, Czech Republic, Romania, Greece, etc (Table 8).

This picture however changes when the weighted indicators are considered. Interestingly when the country's level of development is brought into the analysis the resulting categorization of countries significantly changes (Table 8. The most developed countries are the ones in which the most important effects are to be expected. This group of countries now includes Israel, Spain and France with Egypt

being the only less developed country expected to experience higher effects a fact that is due to the high intensity of incubation activity reported in this country. The leading position of countries such as Algeria and Morocco, which present high uniform intensity scores, cannot hold also in the case of the anticipated multiplier effects. These countries now fall into the group of countries presenting medium intensity scores while no actual changes are observed in the case of countries presenting low intensity scores. Indicative of the unbiased nature of the per capita GDP weight is the fact that the position of countries that are quite low in the rank order, e.g. Italy, Greece and the UK does not change as a result of accounting for their level of economic development.

6. Conclusions and policy proposals

The contribution of this paper is twofold; on the theoretical level, a conceptualization of the incubators – regional growth relationship that builds upon the notion of territorial capital is offered. On the empirical basis a comparative analysis of business incubators and technoparks in EU27 and NC16 is undertaken.

While acknowledging that available data can only be indicative of the wider context pertaining the development of incubators in each of the EU27 and in particular in NC16 member countries, some illustrative conclusions might be drawn. The first one regards to the leading position of the European Union countries, which in 2010 represented 89.7% of the total number of business incubators in the whole region and 86.7% of the total number of technoparks in the region. The second conclusion refers to the central position held by Northern Europe countries (e.g. Germany, UK etc) as regards the development of business incubators and technoparks and the associated indicators of tenant firms and employees. The third conclusion regards the NC countries and Russia, which seem to place emphasis on the development of business incubators, in contrast to technoparks. The fourth conclusion regards the ability of ENC-East to develop interactions and links within the incubators, as well as the labour intensiveness of the ENC-South. Finally, the last conclusion relates to the differential ability of countries to generate multiplier effects. The exploratory analysis undertaken here reveals that the intensity of incubation activity might be further accelerated within more favorable environments

whereas in less favorable environments more effort might be needed. Thus, the relative position of countries is indeed subject to their position with regard to their existing base of endowments. For example, high level intensity of the incubators' activity in terms of at least two indicators is exhibited by France, Germany, Armenia and Lebanon. When the weighted indicators are considered, the group of countries includes UK, Cyprus, France and Germany with Armenia being the only less developed country expected to experience higher effects. Simmilarly, in the case of technoparks, high level intensity in terms of at least two indicators is exhibited by Egypt, Israel, Algeria and Morocco. When the weighted indicators are considered, the group of countries includes Israel, Spain and France and Egypt. In other words, the proposed analytical framework suggests that less developed regions might benefit the most and have an opportunity to converge towards the more developed areas of the world as a result of their ability to accelerate growth through knowledge intensive growth processes. Therefore, to the extent that the outcome of business incubators and technological parks refers primarily to the diffusion and commercialization of knowledge and innovations, a chance is offered to less developed regions to benefit the most towards converging to more developed countries, states and regions subject to that they accelerate knowledge and innovation production and diffusion patterns.

The main policy implication of this comparative research in the EU27 and NC16 member countries is that different countries place emphasis at different instruments, depending on their endowments. Therefore, the successful performance of technoparks, which are the focus of Northern European countries, requires a richer background as regards knowledge creation and the institutional environment to support the generation, diffusion and commercialization of knowledge. On the other hand, Eastern and Southern European countries seem to reasonably place increased emphasis on the development of business incubators. Obviously, the latter require fewer endowments compared to technoparks.

A second policy implication relates to the types of entrepreneurship fostered by the different types of incubators. Entrepreneurship itself seems to be different in these two groups of countries. Northern European countries in contrast to Eastern and Southern European neighboring countries require Intensive knowledge, and

probably more innovative entrepreneurship. Therefore, EU and/or national entrepreneurial measures should be implemented in relation to a country' s development level and the need for less developed countries to pursue more competitive development paths (Baumol, 1990, Acs and Armington, 2006; Acs and Szerb, 2007; Acs and Amoros, 2008).

Finally, the ability of different EU and NC member countries to accelerate their growth rates and converge, so as to be able to cope with the current goals set by the EU, is another issue that is relevant to the analysis of such regional development measures. Nevertheless, the need to account for regional and industry specific characteristics when designing and implementing regional development measures and initiatives is also long established. Liargovas (1998) points to the limited effectiveness of homogenous policy measures in favor of SMEs when these measures refer to copying successful instruments for SMEs in advanced countries, without appropriate modifications that would account for the situations prevailing in less developed countries. In a European document (EC 2009), the European Commission released evidence from a public consultation involved in the discussion on how to best improve the effectiveness of public innovation support mechanisms in the EU. The consultation study reveled that enterprises share a "…high degree of dissatisfaction with existing innovation support measures "while the vast majority of "..innovation support providers would admit that there is a need to improve existing support mechanisms" EC, 2009 p. 4-5.

References

Zoltan Acs & José Amorós, 2008. "Entrepreneurship and competitiveness dynamics in Latin America," Small Business Economics, Springer, vol. 31(3), pages 305-322, October.

Acs, Z., & Armington. C. (2006). Entrepreneurship, Geography, and American Economic Growth. Cambridge University Press, New York, NY.

Zoltan Acs & Laszlo Szerb, 2007. "Entrepreneurship, Economic Growth and Public Policy," Small Business Economics, Springer, vol. 28(2), pages 109-122, March.

Allen, D.N. & Rahman, S. (1985). Small business incubators: a positive environment for entrepreneurship. *Journal of Small Business Management*, *23 (3)*, 12-22.

Armstrong, H.W. & Taylor, J. (1986). Regional policy: dead or alive?. *Economic Review, 4*, 2-7.

William J. Baumol, Entrepreneurship: Productive, Unproductive, and Destructive, *Journal of Political Economy*, 98 (5), Part 1 (Oct., 1990), 893-921.

Brooks, O.J. (1986). Economic development through entrepreneurship: incubators and the incubation process. *Economic Development Review*, *4 (2)*, 24-29.

Campbell, C. (1989). Change agents in the New Economy: business incubators and economic development. *Economic Development Review, 7 (2)*, 56-59.

Colombo, M.G. & Delmastro, M. (2002). How effective are technology incubators? Evidence from Italy. *Research Policy*, *31 (7)*, 1103-1122.

Daskalopoulou, I., Liargovas, P. & Petrou, A. (2010). A comparative study of business incubators and technoparks in the EU. *International Journal of Innovation and Regional Development, forthcoming.*

EC (2002). *Benchmarking of Business Incubators*. Final Report. Centre for Strategy and Evaluation Services, European Commission, Enterprise Directorate – General.

EC (2009). Making public support in the EU more effective: lessons learned from a public consultation for action at Community level. Commission of the European Communities, Commission Staff Working Document SEC(2009) 1197.

Gans, J.S. & Stern, S. (2003). The product market and the market for “ideas”: commercialization strategies for technology entrepreneurs. *Research Policy*, *32*, 333-350.

Greene, P.G. & Butler, J.S. (1996). The minority community as a natural business incubator. *Journal of Business Research, 36*, 51-58.

Hackett, S.M. & Dilts, D.M. (2004). A systematic review of business incubation research. *Journal of Technology Transfer*, *29*, 55-82.

Hansen, M.T., Chesbrough, H.W., Nohria, N. & Sull, D.N. (2000). Networked incubators: hothouses of the New Economy. *Harvard Business Review*, *78 (5)*, 74-84.

Ketchen, D.J.J., Thomas, J.B. & Snow, C.C. (1993). Organizational configurations and performance: a comparison of theoretical approaches. *Academy of Management Journal*, *36 (6)*, 1278-1313.

KTU (2001). *Management of Business Incubators*. Kaunas University of Technology Innovation Centre.

Liargovas, P. (2008) "The White Paper on Growth, Competitiveness and Employment and the Greek Small and Medium Sized Enterprises", *Small Business Economics*, 11(3) November, 201-214.

Lichtenstein, G.A. (1992). *The Significance of Relationships in Entrepreneurship: A Case Study of the Ecology of Enterprise in Two Business Incubators*. Unpublished dissertation, Philadelphia: University of Pennsylvania.

Lindelof, P. & Lofsten, H. (2004). Theory and Methods for the Choice of Indicators for Incubators. Institute for Management, Innovation and Technology, No. issue 62. IMIT: Goteborg, Sweden.

Lindholm-Dahlstrand, A. & Klofsten, M. (2002). *Growth and Innovation Support in Swedish Science Parks and Incubators. New Technology-Based Firms at the New Millennium*. Oxford: Elsevier, pp. 31-46.

Lindholm-Dahlstrand, A. (1999). British and Swedish science parks and incubators for small technology-based firms. In: During, W., Oakey, R. & Mukhtar, S-M. (Eds), *New Technology-Based Firms in the 1990s*. Volume VI, Elsevier Science.

Link, A.N. & Link, K. (2003). On the growth of science parks. *Journal of Technology Transfer*, *28*, 81-85.

Link, A.N. (2002). *From seed to harvest: The growth of research triangle park*. Research Triangle Park: The Research Triangle Foundation of North Carolina.

Luger, M.I. & Goldstein, H.A. (1991). *Technology in the Garden. Research Parks and Regional Economic Development.* Chapel Hill, London: University of North Carolina Press.

Lumpkin, J.R. & Ireland, R.D. (1988). Screening practices of new business incubators: the evaluation of critical success factors. *American Journal of Small Business*, *12 (4)*, 59-81.

Lynn, L.H., Reddy, N.M. & Aram, J.D. (1996). Linking technology and institutions: The Innovation Community Framework. *Research Policy*, *25*, 91-106.

Meyer-Krahmer, F. (1985). Innovation behavior and regional indigenous potential. *Regional Studies, 19*, 523-534.

Mian, S.A. (1994). US university-sponsored technology incubators: an overview of management, policies and performance. *Technovation*, *14 (8)*, 515-528.

Mian, S.A. (1996). Assessing value added contributions of university technology business incubators to tenant firms. *Research Policy*, *25*, 325-335.

Nijkamp, P., Van Der Mark, R. & Alsters, T. (1988). Evaluation of regional incubator profiles for small and medium sized enterprises. *Regional Studies*, *22 (2)*, 95-105.

Nohria, N. and Eccles, R.G. (Eds) (1992). *Networks and Organization.* Boston, MA: Harvard Business School Press.

OECD (2001). *OECD Territorial Outlook*. Paris: OECD.

Peck, F., Stone, I. & Esteban, M. (1996). Technology parks and regional development in the southern European periphery: The Andalucia case. *European Urban and Regional Studies, 3 (1)*, 53-65.

Peters, L., Rice, M. & Sundararajan, M. (2004). The role of incubators in the entrepreneurial process. *Journal of Technology Transfer*, *29*, 83-91.

Petrou, A. Liargovas, P. & Daskalopoulou I. (2010). *Entrepreneurship Incubators and Economic Growth. An Across-Countries Empirical Analysis.* New York: Nova Science Publishers.

Phan, P.H., Siegel, D.S. & Wright, M. (2005). Science parks and incubators:

observations, synthesis and future research. *Journal of Business Venturing, 20 (2)*, 165-182.

Phillips, R.G. (2002). Technology business incubators: how effective as technology transfer mechanisms?. *Technology in Society, 24*, 299-316.

Plosila, W. & Allen, D.N. (1985). Small business incubators and public policy: implications for States and local development strategies. *Policy Studies Journal*, *13*, 729-734.

Porter, M.E. (1990). *The Competitive Advantage of Nations*. London: Macmillan.

Rice, M.P. (2002). Co-production of business assistance in business incubators: an exploratory study. *Journal of Business Venturing, 17*, 163-187.

Siegel, D.S., Westhead, P. & Wright, M. (2003). Assessing the impact of university science parks on research productivity: exploratory firm-level evidence from the United Kingdom. *International Journal of Industrial Organization, 21*, 1375-1379.

Sternberg, R., Behrendt, H., Seeger, H. & Tamasy, C. (1997). *Bilanz eines Booms – Wirkungsanalyse von Technologie und Gründerzentren in Deutschland*. 2nd Edition. Dortmund, Germany: Dortmunder Vertrieb für Bau- und Planungsliteratur.

Tamasy, C. (2007). Rethinking technology-oriented business incubators: developing a robust policy instrument for entrepreneurship, innovation and regional development?. *Growth and Change, 38(3)*, 460-473.

Totterman, H. & Sten, J. (2005). Start-ups: business incubation and social capital. *International Small Business Journal, 23 (5)*, 487-511.

Westhead, P. & Storey, D.J. (1994). *An Assessment of Firms Located on and Off Science Parks in the UK*. London: HMSO.

Williamson, O.E. (1978). Markets and Hierarchies: Analysis and Antitrust Implications. New York, NY: The Free Press.


AQR
IREA

Utrecht University

SEED CENTER
SOUTH & EAST EUROPEAN DEVELOPMENT CENTER

CRENoS

LSE

WU

Brunel
UNIVERSITY
LONDON

Université
Jean
Monnet
SAINT-ETIENNE

UNIVERSITAS
QUINQUEECCLESIENSIS

Leibniz
Universität
Hannover

UNIVERSITY OF TARTU

STATE UNIVERSITY
HIGHER SCHOOL OF ECONOMICS

Cadi Ayyad University

ICBSS
BSEC
AIKEMEII

IEMed.
Institut Europeu de la Mediterrània

האוניברסיטה העברית בירושלים
The Hebrew University of Jerusalem

TÜBİTAK