Analysis of business incubators in Galicia through the «Integral Model of economic profitability»

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ABSTRACT: One of the economic policies used by governments for local and regional development is the encouragement of entrepreneurship through business incubators, which contribute to the creation of companies and employment, increase business survival rates and the payment of taxes and social contributions to public administration. However, they are consumers of external resources and have a high dependence on the Public Sector. In this study we analyse the net contribution of these business initiative centres in Galicia (Spain) through the use of the «Integral Model of profitability of business incubators» based on structural equations.

JEL Classification: R38; R53.

Keywords: business incubators; resources; creation of companies; employment; structural equations.

Análisis de los viveros de empresas en Galicia a través del «Modelo integral de rentabilidad económica»

RESUMEN: Una de las políticas económicas utilizadas por los diversos gobiernos para el desarrollo local y regional es el fomento del emprendimiento a través de los viveros de empresas, que contribuyen a la creación de empresas, de puestos de trabajo, incrementar las tasas de supervivencia empresarial y el pago de impuestos y cotizaciones sociales a las administraciones públicas. Pero como contrapartida son consumidores de recursos ajenos, con gran dependencia del sector público. En este estudio se pretende analizar la contribución neta de estos centros de iniciativas empresariales en Galicia (España), mediante la utilización

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del «Modelo integral de la rentabilidad de los viveros de empresas» basado en ecuaciones estructurales.

Clasificación JEL: R38; R53.

Palabras clave: vivero de empresas; recursos; creación de empresas; empleo; ecuaciones estructurales.

1. Introduction

For years, the European Commission has been supporting the work of the entrepreneur. Those who are not able to find employment can opt for entrepreneurship, which can mean in practise an increase in the perspectives of improvement (European Commission, 2003). The importance of entrepreneurship was already highlighted by Schumpeter throughout his work (1912, 1934, 1939, 1947), who linked entrepreneurship, innovation and economic development, building an entire «Theory of Economic Development» where the entrepreneur would play a key role (Liñán, 2004). Along these lines Petit (2007) highlighted that entrepreneurship accelerates the appearance of new initiatives and promotes the growth and economic development of countries. The new businessman acts as an instrument to invigorate the economies with creativity and innovation, according to Peñaherrera and Cobos (2012).

Innovation as well as the entrepreneur are born in a society that conditions their function as the «Institutional Economic Theory: North's perspective in the field of business creation» indicates, (Díaz, *et al.,* 2005, Aidis *et al.,* 2008; Thornton *et al.,* 2011; Veciana and Urbano, 2008; Welter, 2005) and which requires an ecosystem that promotes innovation and entrepreneurship (Lakala, 2001). Therefore, innovation and business spirit have become one of the main promoters of economic growth, with business incubators being one of the measures that help to reach the aforesaid objective (Lakala, 2002). Business incubators have been established as a support for economic development (Ratinho and Henriques, 2010). Besides, they contribute in an efficient way to employment generation and creation of wealth (Amirahmadi and Saff, 1993; Phan *et al.,* 2005), and their impact on economic growth and regional development has been investigated in different economies (OECD, 1997, 1999, Al-Sultan, 1998; Cabral and Dahab, 1998; Kihlgren, 2003; Vaidyanathan, 2008; Watkins-Mathys and Foster, 2006). That explains why state and local governments worldwide have promoted the establishment of incubating facilities (Schwartz, 2013). Nevertheless, incubators are idiosyncratic regarding regional context (Hannon and Chaplin, 2003), although their main economic objectives are totally comparable and measures for success should be quite similar (Ratinho and Henriques, 2010; Schwartz and Göthner, 2009).

2. Objectives of the article

The new efforts of investigation should be focused not only on the investigated units of analysis, but also on the process of incubation (Hackett and Dilts, 2004). And precisely because of the need to search for new lines of investigation, the objective of this article is to analyse the economic profitability of business incubators in the case of Galicia (Spain).

To do so, we will review the literature starting from what business incubators are, their contributions and limitations, to studying the profitability analysis of business incubators thoroughly. Business incubators are highly dependent on public assistance (Vaquero and Ferreiro, 2012). There are even authors that question their efficacy as Tamásy (2007), who indicates that incubation programmes are perceived as an approach from an unproductive policy and suppose a loss of money driven by the politician.

To analyse profitability, the contribution of business incubators in Galicia will be quantified, measured by means of business creation, employment generation, business survival rate and occupation rate. But as resources and grants are needed to reach the objectives, whether the investment is profitability or not will be analysed once they are quantified using the econometric model based on structural equations. We will finish off with some conclusions and proposals for the future.

3. Literature review

3.1. Concept and development of business incubators

There are many definitions of business incubators as those used by Smilor and Gill (1986); Martínez (1987); Camacho (1998); Quintas *et al.,* (1992); Velasco (1995); Juncar *et al.,* (1995); Amirahmadi and Saff (1993); *UK Business Incubation* (2000); Barrow (2001); Rice (2002); Hackett and Dilts (2004); Hansson *et al.* (2005); NBIA (2006); UKBI (2007); Bergek and Norman (2008); *European Business Incubation Centres Network* (2009); Ferreiro and Vaquero (2010), among others. By looking for the common denominators, we could make an initial approach to the concept of business incubators as institutions that have as their objective the creation of competitive companies with high survival rates, allow sustainable employment generation and contribute to local and regional development, by offering a space and range of services for a limited yet sufficient time.

The origin of business incubators, according to Aerts *et al.* (2007), is located in the US with the installation of the first incubator in Batavia (New York) in 1959. This phenomenon spread very quickly across the US. Due to the crisis of the 70s, business incubators started to become important tools of industrial politics, the *Small Business Administration* (US) created the first incubator promotion programme. Since 1985 there has been a big boost of business incubators with the creation of the *National Business Incubator Association* (NBIA).

In Europe, business incubators are mainly set up in England supported by the *British Steel Corporation* and the EU, which establishes a series of measures destined to start up initiatives that encourage the creation and maintaining of companies and generate new jobs (Rice, 2002).

Initially, business incubators only offered a physical space where companies could be installed (Gatewood *et al.,* 1985; Peterson, 1985; Allen, 1985). This was partly motivated by the sensitiveness of the entrepreneur to the price of rent (Gómez y Galiana, 1998), infrastructure being a basic function common to all kinds of incubators (Allen and McCluskey, 1990). This way Jenssen and Havnes (2002) observe that countries with a long tradition of incubators are still offering basic and elemental services. In 2005, Chan and Lau stated that the provision of space had been identified by the entrepreneur as the most beneficial characteristic of business incubators.

Nevertheless, an incubator is much more than the provision of physical space as its essence is to help to create viable-sustainable companies, develop competitive capacities and take advantage of synergies between entrepreneurs/users. Ideas that have been developed by Markley and McNamara (1994) when they expounded that the companies in incubators benefit from the assistance services and opportunities of the network. On the other hand, incubators must also implement different mechanisms of support as the needs of the companies change whilst they are developing (Vohora *et al.,* 2004). Blanco *et al.* (2014) determined that 92.9% of business incubators in Spain have an advisory service. In the work of Bruneel *et al.* (2012) we can observe how in third-generation incubators, besides space, there is support to entrepreneurs such as coaching and a bigger access to venture capital. The creation of the network is another positive aspect highlighted by Álvarez *et al.* (2012) and Sá and Lee (2012).

3.2.   The importance of business incubators and their limitations

Lewis (2001) considered that they have become a tool to promote the creation of new businesses. This explains that in the year 2002 in the US there were 900 incubators that had helped to create more than 19,000 companies and subsequently, 245,000 jobs (Scaramutzzi, 2002). The NBIA (2006) found that the number of incubators had increased to 5,000, of which 1,400 were located in North America and had experienced an increase of 169% in the last five years.

However, the phenomenon of business incubators is a policy of economic promotion used in many countries of the world and Europe is not unaware of this. According to Fernández *et al.* (2011), Germany is the country with the most incubators on this continent followed by France and the UK. According to Schwartz and Hornych (2010), there were about 400 business incubators operating in Germany at the end of 2009, the first one opening in Berlin. In Spain, 300 incubators were estimated, Cataluña being the Autonomous Community with the highest number of incubators followed by Andalucía, Madrid and Valencia (Vaquero and Ferreiro, 2015).

The creation of business incubators generates positive results and the following are worth highlighting:

i. *Creation of companies* as credited (European Commission, 2002; Lakala, 2002; Uribe and De Pablo, 2009 and Vaquero and Ferreiro, 2011, 2014).

ii. *Employment generation*, through the creation of businesses (Autio and Klofsten, 1998; Rice, 2002; European Commission, 2002; Lakala, 2002; Uribe and De Pablo, 2009 and Vaquero and Ferreiro, 2011, 2014).

iii. *Social Cohesion.* The creation of companies avoids economic dislocation (Thierstein and Wilhelm, 2001).

iv. *Growth and economic development.* They stimulate economic boost in the area where they are developed (Hughes *et al.,* 2007; Thierstein and Wilhelm, 2001 and Allen and Weinberg, 1998, among others) and enable the generation of wealth. (Vaquero y Ferreiro, 2014).

v. *Increase the capacities of entrepreneurs.* As Scillitoe and Chakrabarti (2010) reflect.

vi. *Development of networks*. Work and business collaboration within the network is strengthened (Totterman and Sten, 2005; McAdam and McAdam, 2008; Bollingtoft, 2012). However, Ebbers (2013) does not find any relationship between *networking* and the contracts received by entrepreneurs.

vii. *Improvement of business survival rates.* As stated by Colombo and Delmastro (2002) and Ferreiro (2014).

viii. *Increase in tax collection.* As Vaquero and Ferreiro (2012) conclude through the Tax Balance method.

Nevertheless, there are authors that observed limitations or deficiencies in business incubators. Thus, Nueno (1996) finds a large number of companies that exist under poor conditions in the incubators thanks to grants controlled by politicians. Urbano and Veciana (2001) denounce an excessive dependence on political cycles. Tamásy (2007) also questioned the efficacy of this kind of assistance. Vaquero and Ferreiro (2010) consider that the occupation rates of incubators and the ratio that measures the relation: number of companies/staff that work in the Galician incubators are low.

4. Methodology and model of analysis

4.1. Methodological review

Allen and Weinberg (1988) analysed state investment in business incubators. Markley and McNamara (1995) investigated the fiscal-economic impacts of business incubators on Milltown. Colombo and Delmastro (2002) studied the effectiveness of technological incubators in the case of Italy. Hackett and Dilts (2007) observed the incubation results from 53 incubators that operate in the US.

Aerts *et al.* (2007) established a model of lineal regression that lay down a link between practice in companies and the performance of the incubators. Bergek and Norman (2008) present a «framework» model based on the selection of entrepreneurship initiatives, support to the companies and mediation. Jang (2009) asked whether the public sector should stop financing technological incubators in the US. Ratinho and Henriques (2010) analyse the main characteristics of incubators in Portugal. Schwartz (2013) compared the characteristics of a series of incubators selected from different countries, such as Germany, Sweden, the US, the UK and Israel. Blanco *et al.* (2014) create a ranking of incubators in Spain using a methodology of multi-criteria techniques.

4.2. Methodology proposed

Once the literature was reviewed in search of an economic model that allows us to analyse the profitability of the resources used in business incubators and not having found one, we propose a methodology which lets us see the relationship and the effects between the different variables of the incubators based on a model of structural equations or structural analysis of covariance (Arbuckle, 2007; Byrne, 2010). The structural equation model allows us to determine whether an ensemble of observed variables justifies a structure of factors and if we can confirm a series of models of regression executed in a systematic way. This way, the structural equation model makes the intensity and sign of the hypothetic relationship between an amount of variables possible. Based on the structure and nature of the variables, we can point out several types of structural equation models (Manzano and Zamora, 2009).

The specific model for business incubators will be called «Integral Model of economic profitability of business incubators» and combines two methods. On the one hand, Tax Balance, which is based on the analysis of the profitability of public resources invested in business incubators with the objective of tax income (Vaquero and Ferreiro, 2012); and on the other hand, Consumed Resources — Generated Wealth (Vaquero and Ferreiro, 2013), where consumed resources (economic, human and physical ones) are related to the generation of value, measured with indicators, such as the creation of companies and employment, survival and occupation rates. In this case, we are focused on the influence of global resources (public and private ones) of Galician incubators on the other variables and the relationships of the model in a statistic scenario (2009[1]), as well as a dynamic one (data projected for five years since 2009), whose variables can be observed in Table 1.

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[1] Although there is more recent information about some of the variables for all of the business incubators, the disposal of rigorous and complete information regarding the six variables used in the econometric model and for all the incubators correspond to the year 2009.

Table 1.   Scenarios of the model of economic profitability of business incubators. Static (2009) and dynamic (2009-2013) analysis.

	Description	*Variables*
Static 2009	It starts as an independent variable of the contribution of global resources invested in 2009 and its degree of influence on the rest of the variables is analysed.	1. Global resources (public and private) invested 2009. 2. Incubator staff 2009. 3. Incubator space 2009. 4. Creation of businesses 2009. 5. Employment generation 2009. 6. Tax income 2009.
Dynamic 2009-2013	It would be the previous scenario with dynamic data projected during the stay of the businesses in the incubators in the year 2009 until they leave the incubator.	1. Global resources (public and private) invested 2009-2013. 2. Incubator staff 2009-2013. 3. Incubator space 2009-2013. 4. Creation of businesses 2009-2013. 5. Employment generation 2009-2013. 6. Tax income 2009-2013.

Source: Compiled by author.

However, this model presents some limitations. In the first place, the information obtained has been based on what was declared in the surveys answered by the entrepreneurs (56.1%) and business incubators (100%), giving the lack of, at least in Galicia, any official source or association that indicates something as basic as the number of total incubators in Galicia and their location. Therefore, obtaining the information needed at the time of testing the model supposed a great effort, although disposing of this information related to the incubators now constitutes a strong point. A second restriction is that the model is focused on 3 resource variables (economic budget, space and staff of the incubators) against 3 contributions (companies created, employment and contribution to public administration) over time (survival rates). Nevertheless, there are other variables that influence the contribution of the incubators and are not used in this model, such as the diffusion of the entrepreneurial culture, assistance to companies that do not need space in the incubators, etc. A third limitation is temporal and was measured for the 2009- 2013 period, which means that during other periods the results could be different.

5. Empirical analysis and results

5.1. Contribution of business incubators to the Galician economy

The main objective of incubators is the creation of employment and new companies that last over time. In 2013, there were 22 incubators in Galicia distributed around the community that created 1,044 companies and 3,394 jobs (Table 2).

Long-term survival rates are another fundamental objective of incubation, although there is a lack of investigation on the survival of companies, which determines the efficacy of incubators (Phan *et al.,* 2005; Schwartz, 2009; Sherman and Chappell, 1998). On the other hand, survival rates can change according to location (Bergek and Norman, 2008). Galician business incubators present an average failure rate of 9.2%. These data are in line with several researches concluding that business incubators become new businesses with a smaller number of bankruptcies. (Fry, 1987; Kuratko and LaFollette, 1987; Lumpkin and Ireland, 1988; Markley and McNamara, 1995; Udell, 1990).

The occupation rate in the year 2013 was very different, with some incubators having an occupation of 100% (Chamber of Commerce of Vigo, OTRI-UDC) and others, like CIE Seara, with just 28.6%, making an average of 71%. This indicates that there could be an oversupply of space for entrepreneurs.

Table 2.   Indicators in matters of creation of companies, employment and abandonment and occupation rates (2013).

Incubator	Companies generated (accumulated)	Employment generated (accumulated)	Abandonment rate (accumulated)	Occupation rate
Chamber of Commerce of A Coruña	18	81	7.3%	62.0%
Chamber of Commerce of Ferrol	24	50	12.1%	92.0%
Chamber of Commerce of Lugo	12	15	8.4%	-
Chamber of Commerce of Ourense - Fernando Fontán	33	67	15.4%	91.0%
Chamber of Commerce of Pontevedra - Eladio Portela	16	21	7.9%	83.3%
Chamber of Commerce of Santiago de Compostela	68	124	9.8%	71.2%
Chamber of Commerce of Vigo	72	181	11.9%	100.0%
Chamber of Commerce of Vilagarcía de Arousa	18	42	13.0%	41.0%
CEDE [I]-FEUGA [II]	49	104	14.3%	
CEI [III] NODUS. Lugo Council	30	91	12.6%	52.0%
CIE [IV] A Granxa - Fernando Conde Montero-Ríos	85	245	10.9%	59.1%
CIE of Terras do Avia	6	22	6.0%	57.0%
CIE of Coles Council	21	52	6.0%	80,.0%

Table 2. *(cont.)*

Incubator	Companies generated (accumulated)	Employment generated (accumulated)	Abandonment rate (accumulated)	Occupation rate
CIE of Ourense Council	13	29	6.9%	91.0%
CIE Mans	46	155	7.9%	55.0%
CIE Seara	3	8	0.0%	28.6%
CIE Tecnópole	311	1,065	9.9%	60.7%
CME[V] Iglexario A Coruña	18	42	5.5%	85.0%
Foundation of Businessmen Confederation in Lugo	61	461	6.7%	71.0%
Business Incubator of Businessmen Confederation in Ferrol	8	21	7.5%	60.0%
OTRI-University of A Coruña	28	90	12.9%	100.0%
UNINOVA-University of Santiago de Compostela	104	428	8.5%	81.0%
Total /average (rates)	**1,044**	**3,394**	**9.2%**	**71.0%**

[I] Business Experience and Development Centre.
[II] Business Foundation - Galician University.
[III] Business and Innovation Centre.
[IV] Business Initiative Centre.
[V] Regional Business Centre.

Source: Compiled by author.

5.2. Resources of Galician incubators

In 2011, there were 65 employers working in Galician business incubators, 28% of whom carry out administrative tasks. The economic resources used in 2009 rose to 2.2 million Euros. In Table 3, the structure of incomes and outcomes of Galician incubators is shown. We can see that the fees of entrepreneurs suppose an average of 33.9% against the 66.1% of the grants, making the strong dependence on the public sector clear (2/3 of the budget employed). There are also notable differences depending on the incubator. Regarding the structure of expenses, 47.8% of the total corresponds to staff, followed by operative expenses with 28.9% and 23.3% of amortizations.

Table 3.   Incomes and expenses of Galician business incubators (2009)[2].

Incubator	Incomes[1]		Expenses			
	Entrepre- neurs	Grants and contri- butions	Staff	Operative expenses	Amortiza- tion	Total
Chamber of Commerce of A Coruña	12,000	71,265	40,800	42,465	11,667	94,932
Chamber of Commerce of Ferrol	22,140	54,060	44,000	32,200	25,000	101,200
Chamber of Commerce of Lugo	7,200	32,800	20,000	20,000	10,000	50,000
Chamber of Commerce of Ourense-Fernando Fontán	18,360	26,640	25,000	20,000	21,996	66,996
Chamber of Commerce of Ponteve- dra-Eladio Portela	4,620	49,380	48,000	6,000	8,333	62,333
Chamber of Commerce of Santiago de Compostela	49,386	54,614	84,000	20,000	17,367	121,367
Chamber of Commerce of Vigo	45,600	37,400	58,000	25,000	23,837	106,837
Chamber of Commerce of Vil- lagarcía de Arousa	2,808	7,192	5,000	5,000	5,833	15,833
CEDE-FEUGA	20,232	21,768	22,000	20,000	23,333	65,333
CEI NODUS. Lugo Council	17,568	172,432	110,000	80,000	100,000	290,000
CIE A Granxa- Fernando Conde Montero-Ríos	168,724	72,768	122,829	118,662	118,192	359,683
CIE of Terras do Avia	2,448	42,552	22,000	23,000	8,333	53,333
CIE of Coles Council	0	24,600	6,600	18,000	7,500	32,100

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[2]   Profit and loss account of Galician business incubators (Spain) available corresponds to the year 2009, which was obtained through surveys.

Table 3. *(cont.)*

Incubator	Incomes[I]		Expenses			
	Entrepre-neurs	Grants and contri-butions	Staff	Operative expenses	Amortiza-tion	Total
CIE Mans	148,200	9,800	125,000	33,000	23,333	181,333
CIE Seara	8,086	70,340	68,522	9,904	31,821	110,247
CIE Tecnópole	14,735	196,515	121,250	90,000	98,835	310,085
Foundation of Businessmen Confederation in Lugo	40,702	104,298	118,000	27,000	25,300	170,300
Business Incuba-tor of Business-men Confedera-tion in Ferrol	12,840	26,090	25,000	13,930	1,360	40,290
OTRI-University of A Coruña	7,875	50,533	30,000	28,408	16,667	75,075
UNINOVA-Uni-versity of Santiago de Compostela	133,000	148,660	110,660	171,000	66,667	348,327
Total	**750,949**	**1,462,816**	**1,379,139**	**834,626**	**672,040**	**2,885,805**

[I] The sum of incomes given by the entrepreneurs finance staff and operative expenses, as the amortizations are a depreciation of the investments which does not demand annual payment, although it is part of the global expense..
[II] The amortizations of the investments financed with public funds are computed.

Source: Ferreiro (2014).

5.3. Profitability of Galician incubators measured through the «Integral Model of economic profitability of business incubators»

In this part, the model proposed will be contrasted with empirical data through static and dynamic analysis.

5.3.1. Static analysis

In Table 4, we observe the different variables to use, whilst in Table 5 the values of the variables are pointed out. This way, Public Administration would have contributed more than 2 million euros[3], which represents 73.2% of the total resources.

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[3] The amortizations of the investments financed with public funds are computed.

Most of them are destined to offer space (measured in squared metres) and assistance (measured through staff), so that entrepreneurs can develop their activity more easily. Tax collection, without including VAT, is 3.4 times the public resources invested in a year by public administration, as well as creating 249 companies and 868 jobs in a year. These data indicate the high profitability of business incubators in a year.

Table 4.   Description of the variables used in the static analysis (year 2009).

Concept	Description
Ri_tot_09	Total resources (public and private) invested in business incubators in 2009.
Staff_09	Staff working in incubators
M_2_09	Existent space in incubators
Companies_09	Total existent businesses in business incubators
Employment_tot_09	Existent employment in companies located in incubators and employment created by the actual incubator
T_fisc_inc_09	Total Public Administration collection from companies and employment generated in business incubators

Source: Compiled by author.

Table 5[4]**.**   Results of the variables analysed in the static analysis (year 2009).

Incubator	R i app_09	Ri_tot_09	Staff_09	M-2 _09	Companies _09	Employ- ment_tot _09	T_fisc_inc _09
Chamber of Commerce of A Coruña	82,932	94,932	2.5	440	11	66	491,561
Chamber of Commerce of Ferrol	79,060	101,200	3.0	850	8	23	167,321
Chamber of Commerce of Lugo	42,800	50,000	1.0	242	4	8	57,826
Chamber of Commerce of Ourense-Fernando Fontán	48,636	66,996	1.0	796	15	36	318,201

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[4]   CIE Seara is not included in Table 6 for the analysis due to the fact that it does not perform any activity as a result of an administrative problem. This explains the difference in the total resources in Table 3 (2,885,805 €) and Table 6 (2,775,558 €).

Table 5. *(cont.)*

| Incubator	R i app_09	Ri_tot_09	Staff_09	M-2 _09	Companies _09	Employ- ment_tot _09	T_fisc_inc _09
Chamber of Commerce of Pontevedra-Eladio Portela	57,713	62,333	2.0	171	5	9	56,340
Chamber of Commerce of Santiago	71,980	121,367	4.0	550	30	62	445,006
Chamber of Commerce of Vigo	61,237	106,837	3.0	610	19	53	429,602
Chamber of Commerce of Vilagarcía de Arousa	13,025	15,833	0.3	207	3	9	63,018
CEDE-FEUGA	45,101	65,333	1.0	693	8	21	146,682
CEI NODUS. Lugo Council	272,432	290,000	6.0	2,060	8	30	233,840
CIE A Granxa-Fernando Conde Montero-Ríos	190,960	359,683	4.0	4,500	29	91	697,929
CIE de Terras do Avia	50,885	53,333	3.0	300	3	14	89,311
CIE Coles Council	32,100	32,100	0.3	299	5	5	27,894
CIE Ourense Council	215,776	230,201	2.1	604	8	20	123,683
CIE Mans	33,133	181,333	5.0	1055	13	53	380,340
CIE Tecnópole	295,350	310,085	10.0	3,108	35	164	1,837,688
Foundation of Businessmen Confederation in Lugo	129,598	170,300	4.0	746	15	53	323,904
Business Incubator of Businessmen Confederation in Ferrol	27,450	40,290	1.0	231	4	13	94,446

Table 5.   *(cont.)*

Incubator	*R i app_09*	*Ri_tot_09*	*Staff_09*	*M-2 _09*	*Companies _09*	*Employ-ment_tot _09*	*T_fisc_inc _09*
OTRI-University of A Coruña	67,200	75,075	0.6	230	7	45	395,213
UNINOVA-University of Santiago de Compostela	215,327	348,327	5.0	1,900	19	93	684,928
Total	**2,032,695**	**2,775,558**	**59.0**	**19,592**	**249**	**868**	**7,064,734**
Average	**101,635**	**138,778**	**3.0**	**980**	**12**	**43**	**353.237**

Source: Compiled by author.

In Diagram 1, we can see the significant relationship among the variables in such a way that the first ones correspond to the resources of the incubators (economic, physical and staff) and the last three correspond to the contributions measured in terms of companies, employment and tax collection. In Table 6, we can check the

Diagram 1.   Static Analysis of the Integral Model of economic contribution of business incubators.
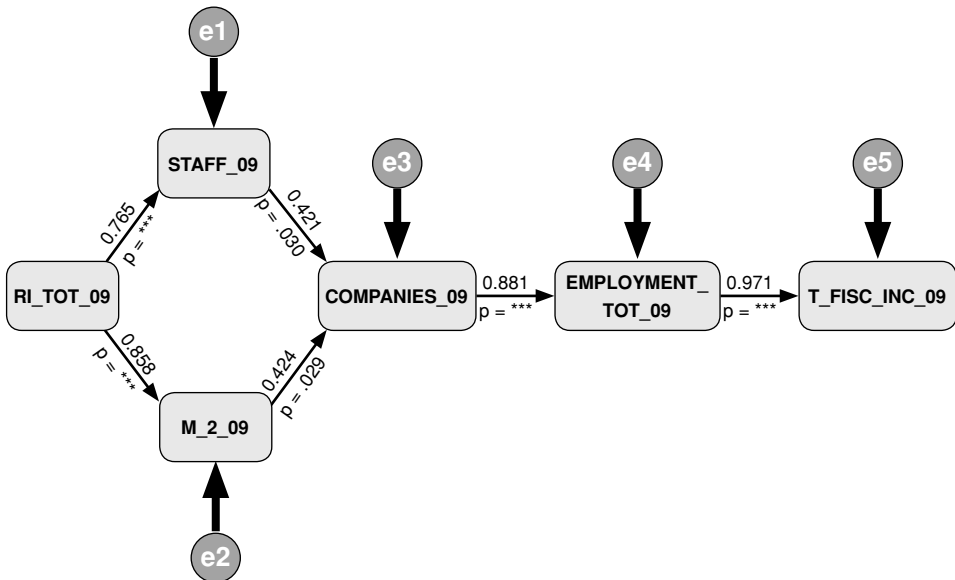
Source: Compiled by author.

liability of the model. These results are in line with the investigation of Vaquero and Ferreiro (2012) when they studied the economic contribution of the incubators through the method of «Tax Balance» and concluded that the investment in them was highly profitable for the public sector. The same is derived from the method of «consumed resources and generated wealth» (Vaquero and Ferreiro, 2013), when a positive relationship between consumed resources and the contribution of business incubators to the Galician economy is established.

Table 6. Statistics of the «Integral model of economic profitability of business incubators». Static analysis (2009).

Statistic	*Values*	*Interpretation and criterions of goodness of fit*
χ^2 (Chi-square)	16,908	p = 0.050. Significant if it is higher than 0.05
Degrees of freedom	9,000	Degree of freedom
Relation Chi-square/ degrees of freedom	1,879	Lower than 3
Goodness of Fit Index (GFI)	0.806	Higher or equal to 0.95
Comparative Fit Index (CFI)	0.989	Higher or equal to 0.95
Root Mean Square Error of Approximation (RMSEA)	0.215	Lower than 0.08

Source: Compiled by author.

5.3.2. Dynamic analysis

As noted, it is necessary to make a dynamic analysis to the extent that the average time entrepreneurs are installed is 37 months (Ferreiro, 2014) with survival rates that reach 90% in the fourth year since the creation of the companies. Therefore, they are generating wealth and consuming resources for more than a year. Based on data from 2009, we look at the next five years based on a discount rate of 5%, which is that used by the European Commission and Vaquero and Ferreiro (2012) to analyse the profitability of these kinds of projects.

Table 7. Description of the variables used in the dynamic analysis.

Concept	*Description*
NPV_res_tot	Net Present Value (€) 2009 of the estimation of total economic resources (public and private) invested in incubators during the stay of the companies since 2009.
Total staff	Estimation of human resources of the incubator dedicated to attend the companies of the incubators during their stay since 2009.

Table 7.   *(cont.)*

Concept	Description
M2	Estimation of physical resources of the incubator dedicated to the companies of the incubators during their stay since 2009.
Companies_5 years	Total companies created for a maximum period of five years since 2009.
Employment_tot_5 years	Total employment created for a maximum period of five years since 2009.
NPV_ fisc _ inc _5years	Total collection of Public Administration from the companies and the employment generated in business incubators for five years.

Source: Compiled by author.

In Table 8, we can see that the value of tax collection is 29,429,906 Euros for a 5 year period, with a public investment of 5,866,401 Euros, which represents 5 times the quantity invested. All this, with the creation of 405 companies and 1,416 jobs, shows the economic profitability of Galician incubators.

Table 8.   Results of the variables in the dynamic model 2009-2013.

Incubators	Van_rec _pub	NPV_res _total	Total staff	M²	Compa- nies 5 years	Employ- ment_ tot_ 5 years	Npv_fisc_ inc_ 5 years
Chamber of Commerce of A Coruña	355,877	407,373	4.1	718	18	107	2,071,806
Chamber of Commerce of Ferrol	213,298	273,031	4.9	1,387	13	38	694,551
Chamber of Commerce of Lugo	78,824	92,084	1.6	395	7	13	242,614
Chamber of Commerce of Ourense- Fernando Fontán	208,706	287,493	1.6	1,298	24	59	1,288,755
Chamber of Commerce of Pontevedra- Eladio Portela	106,290	114,799	3.3	279	8	15	236,961
Chamber of Commerce of Santiago	132,566	223,520	6.5	897	49	101	1,861,663
Chamber of Commerce of Vigo	112,779	196,760	4.9	995	31	86	1,775,211

Table 8. *(cont.)*

Incubators	*Van_rec _pub*	*NPV_res _total*	*Total staff*	*M²*	*Compa- nies 5 years*	*Employ- ment_ tot_ 5 years*	*Npv_fisc_ inc_ 5 years*
Chamber of Commerce of Vilagarcía	23,989	29,160	0.5	338	5	15	259,340
CEDE-FEUGA	121,680	176,265	1.6	1,131	13	34	601,400
CEI NODUS. Lugo Council	735,003	782,400	9.8	3,361	13	49	965,455
CIE A Granxa-Fernando Conde Montero-Ríos	515,197	970,401	6.5	7,341	47	148	2,905,195
CIE of Terras do Avia	137,285	143,890	4.9	489	5	23	375,192
CIE Coles Council	59,118	59,118	0.4	488	8	9	117,183
CIE Ourense Council	582,148	621,068	3.4	986	13	33	519,590
CIE Mans	89,391	489,225	8.2	1,721	21	86	1,599,679
CIE Tecnópole	1,267,405	1,330,636	16.3	5,071	57	268	7,657,969
Foundation of Businessmen Confederation in Lugo	348,553	458,020	6.5	1,217	24	86	1,370,483
Business Incubator of Businessmen Confederation in Ferrol	73,595	108,019	1.6	376	7	21	396,766
OTRI-University of A Coruña	123,761	138,264	1.0	375	11	73	1,620,380
UNINOVA-University of Santiago de Compostela	580,936	939,761	8.2	3,100	31	152	2,869,713
Total	**5,866,401**	**7,841,287**	**96**	**31,963**	**405**	**1,416**	**29,429,906**

Source: Ferreiro (2014).

Diagram 2 and Table 9 show the significant relationships between variables and the goodness of the model in its dynamic scenario, which improves the results of the static model and therefore, confirms the work of Galician incubators. The variable resources play a highly relevant role in the creation of wealth in Galicia, with tax incomes that overcome 5 times the amount invested, as well as the creation of companies and employment generation.

Diagram 2. Dynamic scenario of the «Integral Model of economic contribution of business incubators».
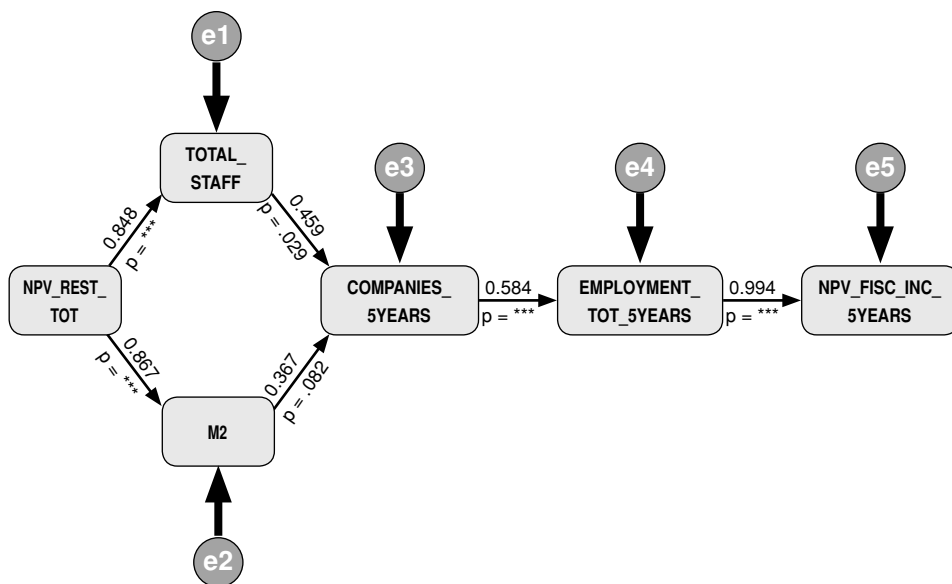
Source: Compiled by author.

Table 9. Statistics of the «Integral Model of economic profitability of business incubators». Dynamic analysis (2009-2013).

Statistic	*Values*	*Interpretation and criterions of goodness of fit*
χ^2 (Chi-square)	5,481	p = 0.050. Significant if it is higher than 0.05
Degrees of freedom	7,000	Degrees of freedom
Relation Chi-square/ degrees of freedom	0.783	Lower than 3
Goodness of Fit Index (GFI)	0.904	Higher or equal to 0.95
Comparative Fit Index (CFI)	0.00	Higher or equal to 0.95
Root Mean Square Error of Approximation (RMSEA)	0.00	Lower than 0.08

Source: Compiled by author based on the surveys carried out on Galician incubator managers.

6. Conclusions

Since the contribution of Schumpeter until the current day, there have been numerous authors that have concluded the importance the figure of the entrepreneur has on economic growth.

To support entrepreneurship, it has been verified that business incubators are a useful tool that has extended all over the world because of their contribution to the creation of companies, employment generation, a decrease in business failure rates, local and regional development and an increase in tax collection.

Another conclusion is that, after an extent review of the literature, no model has been found that could completely analyse the resources consumed in business incubators and their contribution to the economy. Therefore, a method relating the variable resources (economic, physical and human ones) with the contributions of the incubators has been modelled, measured in terms of the creation of companies, jobs and tax collection, and based on structural equations. This has been named «Integral Model of economic profitability of business incubators».

In the quantitative analysis, we conclude that incubators provided in Galicia, up until the year 2013, 1,044 companies, 3,394 jobs, an average failure rate of 9.2% and an average occupation of 71%. It is also confirmed that the incomes obtained by the entrepreneurs are 26% of the total resources that incubators need, which ascend to 2,885,805 Euros per year for the total of Galician incubators, making them highly dependent on public assistance.

At this point, we must check if the resources are well invested. To do so, the «integral model» was tested on Galician incubators in its static (year 2009) and dynamic (2009-2013) version with results for this period of 405 companies, 1,416 jobs and a tax collection of 29,429,906 Euros, 5 times the public investment. This model shows significant relationships between its variables and statistic parameters proving the strength of such model as can be seen in Diagrams 1 and 2, and Tables 6 and 9.

This model, applied to business incubators in Galicia and the accreditation of the results, is not exempt of limitations. To the difficulties of getting information through surveys and visits to the centres, we must add the absence of specific official data regarding these centres of business initiatives. Another restriction is the fact that it is a quantitative model, in which it is not collected the contribution of the enterprising culture or any other parameters as, for example, the growth of the consumption in the territory derived from the greater entrepreneurial activity, focusing on six variables which are the consumed resources (economic, personal and space) and the contributions measured in terms of creation of businesses, jobs and tax collection. Furthermore, some temporal limitations exist as it is applied to the period 2009-2013, highly conditioned by an environment of crisis. Finally, it has the limitation of the existence of geographical restrictions, as the result obtained in Galicia does not have to manifest neither in the same direction nor intensity in other regions of the world.

As a final conclusion, business incubators are useful tools that contribute to the economy in terms of creation of companies, job generation, low business failure rates and high tax collection. This has been proved in the incubators of Galicia using the «Integral Model of profitability of business incubators» based on structural equations, with a coherent conceptual design, tested for the year 2009 and for the 2009-2013 period, and with statistic results that show the efficiency of the model.

As future lines of investigation, it is recommended to apply this model in other regional areas of the world and, in the future, in Galicia to contrast whether the good results observed from the «Integral Model of economic profitability of business incubators» are ratified for the 2009-2013 period.

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