Measuring the Performance of Academic Spin-Offs. Analysis of the Optimal Methods Predicting Ventures Development[1]

Christian Corsi
University of Teramo
Campus di Coste Sant'Agostino
Via R. Balzarini 1, 64100 Teramo
Italy

Antonio Prencipe[2]
University of Teramo
Campus di Coste Sant'Agostino
Via R. Balzarini 1, 64100 Teramo
Italy

Abstract

The performance measurement of academic spin-offs is a very crucial topic in the entrepreneurship studies due to the necessity of full understanding and evaluation of the development processes characterizing this kind of venture, aimed at improving the management and policy actions too. Based on a sample of 405 Italian spin-offs, this paper aims to identify and test the optimal methods for the measurement of academic spin-offs performance. The results reveal that the number of ventures created by university is the most adequate measure of academic spin-offs performance, followed by the asset evaluation, whereas profitability measures result inefficient. This evidence reflects the high-risk and start-up nature of academic spin-offs and the policy approaches to their management, poorly selective about the validity of business projects. This leads to the preference for indirect measures of performance, more closely related to the key actors in their development, such as universities.

Keywords: Academic spin-offs performance, Performance measurement, Technology transfer, Academic entrepreneurship

1. Introduction

The employment of a systematic and suitable methodology of performance measurement plays a basic role in the entrepreneurship studies (Murphy et al., 1996). This claim comes from a circumstance where the absence of tools and appropriate approaches to performance measurement prevents or hinders an optimal theoretical development of the phenomenon under investigation, as well as of managerial models of reference aimed to the effective conduct of corporate growth prospects related to its business processes. However, in entrepreneurship studies it is necessary to take into account several limiting factors that may affect the validity and the efforts made in the evaluation of the different degrees of success of new small businesses (Chakravarthy, 1986), primarily due to the difficulty to obtain reliable data, but above all to the capacity to develop models and analytical approaches that ensure maximum comparability (Kunkel andHofer, 1991); these aspects have long limited the investigation in this research field (Brush and Vanderwerf, 1992; Chandler and Jansen, 1992). Furthermore, the purpose of an empirical study about the optimal dynamic performance is important to recognize the multidimensional nature of the performance construct (Chakravarthy, 1986; Wiklund, 2006; Wiklund and Shepherd, 2005), which could be managed effectively and efficiently if the researcher collected both objective and perceptual measures of firm performance (Walter et al., 2006) enabling it to investigate the phenomenon in a comprehensive way oriented to the peculiar characteristics of the company typology under consideration.

[1]Although the research has been carried out jointly, paragraphs 2.1, 3.1 and 4.1 have been prepared by Antonio Prencipe; paragraphs 2.2, 3.2, 3.3 and 4.2 by Christian Corsi; paragraphs 1 and 5 by Christian Corsi and Antonio Prencipe.

[2]Corresponding author. E-mail address: aprencipe@unite.it; Tel.: +39 3408017130; Postal address: Università degli Studi di Teramo, Campus di Coste Sant'Agostino, Via R. Balzarini 1, 64100 Teramo (Italy).

Based on this approach, the study aims to investigate and determine the best methods designed to identify the performance measures of a type of company currently much discussed in the entrepreneurship research, that is to say the academic spin-off (Mustar et al., 2006, 2008; Lerner, 2010; Kenney and Patton, 2011; Fini et al., 2011; Baldini, 2010; Sternberg, 2014; Pazos et al., 2012; Rasmussen et al., 2014; Iacobucci and Micozzi, 2014; Wright, 2014; Ortín-Ángel and Vendrell-Herrero, 2014; Audretsch, 2014). More precisely, academic spin-offs, also called university spin-offs (USO), are start-ups with peculiar features, which cannot be fully comparable to other types of companies as collegiate start-ups or more commonly technology based start-ups (Bigliardi et al., 2013). Academic spin-offs generally originate and develop within clusters and technology parks, especially in the field of biotechnology, medical and information technology; whose activities are vital for technology and knowledge transfer from universities to industry (Muscio, 2010; Rossi, 2010; Lai, 2011; Nielsen and Cappelen, 2014) also thanks to the support of Technology Transfer Offices (TTOs), established to assure professional commercialization of knowledge within the universities (Algieri et al., 2013; Siegel et al., 2003; Chapple et al., 2005; Ho et al., 2014). Scholars usually emphasize the relevance of generation and dissemination of knowledge from universitiesas a fundamental flywheel and a stimulus to technological innovation and economic development (Muller et al., 2004); for this reason, most governments are directing the creation and evolution of knowledge intensive companies and find academic entrepreneurship predominantly encouraging (Wright et al., 2008).

The importantrole played by universities in the growth of the spin-off phenomenon is widely recognized and accepted in different countries (Rasmussen and Borch, 2010; del Palacio Aguirre et al., 2006; Sijde and Tilburg, 2000; Rasmussen et al., 2014). Well-known are the successful cases of spin-off companies in the Silicon Valley and the Boston area in the US, as well as Cambridge and Oxford in the United Kingdom (Gibson and Smilor, 1991; Kassiciehetal, 1997). In continental Europe, the literature has focused extensively on academic entrepreneurship, especially in Germany, widely known for its tradition of technological innovation (Beibst and Lautenschlager, 2004; Spielkamp et al., 2004; Van Gelderen et al., 2004), which highlights that the academic entrepreneurship is a phenomenon still not widely disseminated in Europe and particularly in Italy. Moreover, though the relevance of academic spin-offs is widely recognized by both points of view of the positive economic externalities and with reference to those claiming the dissemination of knowledge, there is little evidence in the literature about studies that have proposed a general model for the evaluation of their performance (Bigliardi, Galati and Verbano, 2013). This evidence acquires additional value if one considers that counting on available data and reliable measurements to evaluate the intensity and dimensions of output spin-out processes is a crucial precondition for the assessment of potential costs and benefits arising from such activities (Lockett et al., 2005; Renault, 2006; Czarnitzki et al., 2013).

Indeed, as referred to the academic spin-offs, the literature (Siegel et al., 2007; Colombo et al., 2010; Huynh and Patton, 2014) displays several performance measures evaluating the effectiveness of the spin-off ventures originated from universities – some very heterogeneous among themselves – in order to assess the impact of factors at various levels (Djokovic and Souitaris, 2008; O'Shea et al., 2005; Di Gregorio and Shane, 2003; Muscio, 2008; Clarysse and Moray, 2004; Druilhe and Garnsey, 2004; Nicolaou and Birley, 2003a) but none of these studies is concerned with identifying the optimal measures to conduct a performance analysis about the effectiveness of the spin-out processes originating from university.The aim of this paper is to fill this knowledge gap, through an analysis of the major systemic performance measures used in studies about academic spin-offs in order to identify those that more than others optimally capture the results achieved by this type of start-up, thus providing a benchmark for future research in the field.

2. Theoretical Development

2.1. Literature Review of the Academic Spin-off Performance Measurement

Although spin-off performance has been only partially explored in the past because of the relative novelty of the spinout phenomenon, recent studies are increasingly investigating this aspect of the entrepreneurship field (Djokovic and Souitaris, 2008). The analysis moment concerning the performance measurement of academic spin-offs has a central role in studies about the spin-out processes from universities, as they are the basic drivers assessing the degree of effectiveness and efficiency of activities related to the academic entrepreneurship (Siegel et al., 2007; Colombo et al., 2010; Bigliardi, et al., 2013; Huynh and Patton, 2014). In addition, it is important to recognize the multidimensional nature of the performance construct (Chakravarthy, 1986).

Certainly, the methods and drivers used to carry out the (widely understood) performance measurements of the academic spin-offs are several, as are the underlying purposes of the different studies conducted in the field (Lindelöf and Löfsten, 2004; Roberts, 1991; Nicolaou and Birley, 2003b; Degroof and Roberts, 2004; Mustar, 1997; Shane and Stuart, 2002). However, given the preponderance of certain fields of study and methods of analysis in literature - which lead to a reiteration of the drivers (variables) chosen for carrying out this type of research - it is possible to outline common threads about the performance measurement of academic spin-offs. Generally, the literature distinguishes three main categories of drivers aimed at measuring the effectiveness of the spinout practices within the university:

1. The number of spin-offs generated by the university;
2. The growth rate of spin-off;
3. Financial performance results from the spin-off in terms of profitability.

The first type mentioned above is definitely the most common one and is widely employed in literature (Link and Scott, 2005; Baldini, 2010; Fini et al., 2011; Lautenschläger et al., 2014; Pazos et al., 2012; Lockett et al., 2003; Lockett and Wright, 2005; O'Shea et al., 2005; Powers and McDougall, 2005; Vinig and Van Rijsbergen, 2010; Fini et al., 2009; Di Gregorio and Shane, 2003) in order to estimate the impact that some determinants have on the degree of start-up gemmation from universities and measure the effectiveness of technological transfer processes through the creation of new academic firms. This method of performance measurement can be effective if the spin-off is considered as an academic result directly related to political decision-making within the university (Siegel et al., 2007; Lockett et al., 2005; Audretsch, 2014) - which acts as a parent organization - whose role is therefore central in the creation and operational-management life of the spin-off: researchers frequently maintain that spin-off-focused policy schemes enable underperforming spin-offs to remain in operation (Callan, 2001; Rothaermel and Thursby, 2005); instead, findings suggest that the stronger the link between spin-off and university, the less likely the probability of firm failure. Nevertheless, it must be noted that such type of measurement is more related to the university capability of generating start-ups than to the specific features of academic spin-offs (Corsi and Prencipe, 2014; Pazos et al., 2012; Di Gregorio and Shane, 2003).

The practices show that the parties interested in measuring the effectiveness of the spin-out processes are more inclined to consider the academic spin-off as a suitable instrument of economic and innovation progress in the local area (Gilsing et al., 2010) and investigate the aspects related to the growth of academic spin-off companies in order to better understand the development aspects of their processes.This perspective is embraced by that portion of literature focused on the second macro-driver aimed to the performance measurement of the spin-off (Visintin and Pittino, 2014; Colombo et al., 2010; Delmar, 1997; Wennberg et al., 2011), also based on the concept of growth as the most appropriate dimension of performance in new ventures (Weinzimmer et al., 1998). Generally, the methodological approach used to measure the growth of academic spin-offs consists in adopting multidimensional measures (Delmar, 1997; Wennberg et al., 2011) referring to two main drivers: sales growth and asset growth. The first measure is the most preferred and more frequently used in studies about the evolution of high tech start-ups and the entrepreneurship field in general (Ardishvili et al., 1998; Hoy et al., 1992; Covin and Slevin, 1991; Lumpkin and Dess, 1996). The sales growth is an easy to use indicator and easily applicable to (almost) all types of firms, as well as moderately immune to capital intensity and degree of integration (Delmar et al., 2003). In addition, it is argued that the sales growth constitutes a suitable indicator among different conceptualizations of the company (Davidsson and Wiklund, 2001) and it is broadly and widely fostered by the entrepreneurs themselves (Barkham et al., 1996). However, this indicator has been criticized in growth studies on this type of companies, as sales are sensitive to inflation and currency exchange rates; further, for high-technology start-ups (that is most of the spin-offs), there is a high probability that measures most closely linked to the corporate asset will grow before any sales occur (Delmar et al., 2003).

Other scholars (Murphy et al., 1996; Huynh and Patton, 2014; Hemer and Karlsruhe Fraunhofer, 2006; Ensley and Hmieleski, 2005; Roberts, 1991; Steinkühler, 1994; Corsi et al., 2014; Corsi and Prencipe, 2014), albeit to a much more limited extent than those observed in previous approaches (Wennberg et al, 2011), adopted as drivers of academic spin-offs performance some financial measures, essentially in terms of profitability (Chandler and Jansen, 1992; Kathuria, 2000), as net profit, net worth, return on sales (Roberts, 1991), return on assets (Garg et al., 2003) as well as return on equity and current ratio (Corsi et al., 2014, Corsi and Prencipe, 2014); which are used intensively as financial performance indicators in strategic management research (Walter et al., 2006).

Conversely, it was observed that (Ittner and Larcker, 2003; Campbell, 2008; Nicolai and Kieser, 2002) it is difficult to access financial information in the early stage of a new venture, given that spin-offs usually do not achieve any profits in the first years of life. In addition, George et al. (2002) find that science-based spin-offs tend to be more innovative but do not necessarily achieve greater financial performance; on the same line, Ensley and Hmieleski (2005), who compared the performance of university-based start-ups to independently started ventures and found lower performance regarding net cash flow and revenue growth in the university-based ventures. Overall the above stated empirical evidence enhance the sustenance from parent organization - considering that spin-off companies have a high survival rate (AUTM, 2002; Degroof and Roberts, 2004) - which could be counterproductive in terms of actual benefits for their development, including from the standpoint of performance evaluation (Djokovic and Souitaris, 2008).

2.2. Influential Factors of Academic Spin-Offs Performance

Based on this observation and study of the existing literature about the empirical approaches followed in measuring academic spin-offs performance - with specific reference to drivers influencing it - it is possible to test the major measures in order to identify those which most likely capture the effectiveness of the spin-out processes and the results achieved through these processes. To this end, it is first necessary to identify the factors and determinants influencing the academic spin-offs performance with the aim to obtain an effective evaluation of the output attained by them.

The literature has observed that the academic entrepreneurship-related performance is highly dependent on the context (Wennberg et al., 2011). Several contextual factors have been recognized as significant if start-ups emerging from a non-commercial setting are to be developed (Vohora et al., 2004). Usually, scholars (Di Gregorio and Shane, 2003; Grandi and Grimaldi, 2005) link the elements influencing the performance dynamics of academic spin-offs to different groups of contextual factors in order to investigate the phenomenon through a more widespread approach. First of all, these factors are related to the institutional mechanisms fostering entrepreneurship (O'Shea at al., 2007; Siegel et al., 2004; Stuart and Ding, 2006) such as government regulations, financial and non-financial programs, acting as stimulus in new ventures development.

The second group of contextual factors is associated to university policies (Link and Scott, 2005; Shane, 2002; Lockett and Wright, 2005; Lautenschläger et al., 2014; Rasmussen, Mosey and Wright, 2014, Mustar and Wright, 2010) such as spin-off regulations system, business plan competitions and university business incubators. To this regard, it has been noted (Rasmussen and Borch 2010; Lockett and Wright 2005; O'Shea et al., 2007; Rasmussen et al., 2014) that universities are the main players in the growth processes of new high-tech ventures, especially in the early stages of their entrepreneurial life (Rasmussen et al., 2014). An important facilitating mechanics connected to the university environment is the establishment of technology transfer offices (TTO) (Siegel et al., 2007; Carayol and Matt, 2004; Muscio, 2008), which have a key role in enabling an easier diffusion of technology and knowledge from university research to industry (O'Shea et al., 2008).

On the other hand, the third group of contextual factors refers to the external determining element of the academic spin-off processes (Fini et al., 2011; Wright et al., 2006; O'Shea et al., 2007; Feldman and Desrocher's, 2004) such as the accessibility to venture capital, the mechanisms supporting entrepreneurship provided by external actors, the presence of science parks, the proximity to universities, as well as the opportunities offered by the industrial environment. More specifically, in the literature it has been noted (Feldman, 2001; Sternberg, 2009; Etzkowitz, 2004; Audretsch and Stephan, 1996; Varga, 2009; Siegel et al., 2007) that the features linked to geographical proximity and cluster processes play an important role in the collaboration between the local area and the academic spin-off ventures as to the technology transfer process from universities, providing equally tangible and intangible assets, as well as its core features. Consequently, it is also essential to observe the role expected by the local context in which universities are located (Boschma, 2005; Hewitt-Dundas, 2013). Finally, the fourth type of influencing factors of academic spin-offs is associated with technology aspects (Shane, 2001; Lowe, 1993; Lehoux et al., 2014), e.g. the potential for the commercialization of ideas and technology generated, as well as their adequacy and the generation of value to customers for a sustainable development of the spin-out processes.

3. Research Design

3.1. Method

In order to evaluate the optimal performance measurement of academic spin-off companies, we carried out an empirical analysis by testing the major determining factors of academic entrepreneurship on the main spin-off success measures employed in literature via the investigation of a sample of Italian academic spin-offs. To this end, the empirical investigation followed a two-phase progression: the first phase is characterized by a univariate analysis while the second one consists in a multivariate analysis realized by means of the *Statistical Package for Social Science* software (SPSS). In detail, the univariate analysis involved descriptive statistics computed for the sample and for the whole set of variables employed in the empirical study.

With the aim to organize the data to be employed in the multivariate analysis, we first carried out a correlation study between the independent variables by identifying significant associations among them, which could bias and invalidate the successive analysis detecting issues of nonsense correlation (Aldrich, 1995; Cohen et al., 2013; Pazos et al., 2012; Chesbrough, 2003a). Furthermore, we used the variance inflation factor (VIF) for all the independent variables - an index estimating how much the variance (the square of the estimate's standard deviation) of a valued regression coefficient is improved thanks to the collinearity - in order to evaluate the rigorousness of multicollinearity in an ordinary least square regression analysis (Hair et al., 1998; Bruin, 2006; Neter et al., 1996; Pazos et al., 2012; Walter and Ritter, 2006; Powers and McDougall, 2005). Concerning the multivariate analysis, in order to evaluate the best performance measures of academic spin-offs, linear regression models have been developed – one for each performance measure - with the aim to assess the effect of the contextual variables, arising directly from the factors supporting academic entrepreneurship, on academic spin-off performance (the latter is measured through variables extensively employed in literature). Multiple linear regressions have been employed to determine factors of academic spin-off performance measures and, with the aim to assess the parameters of the models conceptualized, the *Ordinary Least Square* (OLS) has been employed along with SPPS Statistics. *Ordinary Least Square* (OLS) constitutes one of the approaches of analysis extensively used in the empirical practice, especially in the field of social sciences. More specifically, the literature shows that the OLS regression estimators can be an optimal method to evaluate the spin-off performance (Caldera and Debande, 2010; Adams et al., 2009; Chesbrough, 2003a; Hunt and Lerner, 2012; Chesbrough, 2003b; Matricano et al., 2012); furthermore, the *Ordinary Least Square* (OLS) has introduced desirable theoretical properties (Linearity, Unbias, Efficiency and Consistency) which can be considered more appropriate to evaluate the success measurement of the spin-out processes from universities.

It is important to emphasize that this study is about to investigate the significance of the impact of factors supporting the development of academic spin-offs on their performance (there are many studies about this topic), but focusing exclusively on the outcomes of the spin-out processes, using as determinants the major factors mentioned in the literature and assuming that these can establish positive relations with the explicative performance variables.

3.2. Sample and Data Collection

In order to identify the optimal performance measures of academic spin-off activity, a sample of Italian academic spin-offs extracted from NETVAL database (www.netval.it) and university websites at 31st December 2013 was primarily investigated: from the 747 companies identified, the inactive spin-offs (34) were excluded, along with the sold-off and cancelled ones (193) and those for which no financial statements or comparable data were available (115). Thus, we analysed a sample of 405 active Italian ventures, equal to 54.21% of the population identified.
Secondary data were collected using several sources, mainly linked to the evaluation of financial statements and other historical corporate files (Infocamere, AidaBvdep). These statistics are mainly functional to the measurement of the output performance of the spin-out processes. Other information concerning the contextual factors affecting the academic spin-offs performance was collected by extracting data from the records stored in the Italian National Institute of Statistics (ISTAT), in the Statistical Office of the European Communities (EUROSTAT) and in the PATIRIS database. Finally, in order to improve the evaluation of the infrastructural support - at various level of analysis - on the academic spin-off performance, additional data regarding 167 national business incubators were collected from institutional websites of universities, MIUR (Ministry of Education, University and Research), business incubators and regional authorities.

3.3. Variable Definition and Measurement

Dependent Variables

To perform our analysis, we used different variables, one for each model developed. Following the main orientation in literature (Pazos et al., 2012; Fini et al., 2011; Baldini, 2010; Lautenschläger et al., 2014; Lockett and Wright, 2005; Vinig and Van Rijsbergen, 2010; Fini et al., 2009) as for Model [1] (see next section for more details about this model and the others here mentioned) we used the number of spin-offs originated from the universities (N_USO). Then, based on the idea that new high-technology ventures are more sensitive to the asset measure of performance (Delmar et al., 2003), as for Model [2] a measure of business dimension was employed deriving from the natural logarithm of total assets of each spin-off sampled (AssetLN_ASO). Then, as measure of profitability of the spin-out processes, three dependent variables were used at company level, for the last models: the return on equity index (%ROE) for the Model [3] (Corsi and Prencipe, 2014; Corsi et al., 2014), the return on sales index (%ROS) for the Model [4] (Roberts, 1991) and the return on assets index (%ROA) for the Model [5] (Garg et al., 2003).

Independent Variables

These variables were employed to estimate the direct and linear outcome of contextual determining factors on academic spin-offs performance. With this purpose, the prominence of research and development within the university environment was primarily evaluated. In line with the extent literature (Link and Scott, 2005; Degroof and Roberts, 2004; Powers and McDougall, 2005; Lockett and Wright, 2005), we used the annual university-wide R&D expenditure (Uni_R&Dexp) and the university R&D staff (Uni_R&Dstaff). Secondly, following Pazos et al. (2012), Fini et al. (2011) and O'Shea et al. (2005) the infrastructural entrepreneurial support of university was evaluated by the number of university-affiliated business incubators (NUnincub). Furthermore, in line with Fini et al. (2009) the direct involvement of university in the academic spin-offs processes was measured by a variable stating the equity participation rate of university in the spin-off venture (%Uni_equity).

In addition, with the aim to evaluate the impact of local context determining factors, we employed the number of public funding incubators in each region where academic spin-offs are located (NPublic_incub) and, with a particular focus on the financial support provided by these entities, we used the number of incubators participated by banking institutions in each region (NBank_incub) in order to measure, as with the university context, the impact of local context incubation services on spin-off performance. Furthermore, in order to determine the degree of competitiveness and entrepreneurial vivacity of the local context, an index (CompEntrep_index) was developed resulting from the combination of two standardized items, the first one comprising the presence of high-growth companies, the second one to the ability of a context to develop business services (Cronbach's alpha of 0.77). Following Fini et al. (2011), the degree of innovativeness in the local context was assessed by incorporating three standardized items (Employment in technology and knowledge-intensive sector, high-tech patent applications to the EPO by priority year, people with tertiary education (ISCED) and/or employed in science and technology) to get scale-free values (Cronbach alpha of 0.98) and to generate an index which was labeled "Innovation_index". Finally, with the aim to evaluate the prominence of the basic resources for the research activity and, consequently, the knowledge spillovers in the local context (Baldini, 2010), in line with Fini et al. (2011), a variable was used expressing the public R&D expenditure in the region (Public_R&Dexp), concurrently with a variable determining the amount of personnel and researchers employed in R&D activities (LocalR&D_staff), in line with Audretsch and Keilbach (2004).

4. Results

4.1. Univariate Analysis

Table 1 illustrates the descriptive statistics concerning the totality of variables included in the study. Based on the 405 ventures investigated, the results show that the amplitude of the asset value of academic spin-offs measured by the natural logarithm of total assets indicates an average of 11.7708 with a variance in the sample of 1.8796 and a standard deviation of 1.3710, showing a low dispersion through this type of performance measurement. As the sample variance of "N_USO" variable (217.0359) is about six times higher than the sample mean of 33.65, a moderate dispersion occurs among the Italian universities in terms of quantity of academic spin-offs located.

Regarding the profitability variables, these show negative mean values with a high dispersion in the sample; there is a great variability in the financial performance of the Italian academic spin-offs but these generally show difficulties in achieving adequate levels of profitability: the variable concerning the return on equity index displays a mean of -2450.89 with a standard deviation of 49805.84; the variable relating to the return on sales shows a mean of -11934.4996 and a standard deviation of 176928.1974; finally, the variable linked to the return on assets measures a mean of -11.7050 with a standard deviation of 317.2312, showing that the variables result less dispersed than the three profitability performance measures.

With reference to the variables concerning the contextual determining factors of academic spin-offs performance, it must be remarked that the values estimated in the sample show a moderate dispersion, mainly for the "Uni_R&Dexp" and "Uni_R&DStaff", then point out the prominent variation in the resources and supporting instruments of the academic entrepreneurship within the university environment.

Analogous observations may be made as to the variables labeled "CompEntrep_index" and "Innovation_index", which are indicative of the different entrepreneurial conditions in the various local areas; nonetheless, the variable "LocalR&D_staff" displays a small sample variance, lower than 1 (as the standard deviation: 0.4002), thus confirming to be the least dispersed variable among those employed in the empirical study.

We presume to achieve accurate estimates about the effect of the independent variables on the performance measurement of academic spin-offs by taking into account the high degree of dispersion of the profitability variable and the variable "N_USO" (though to a lesser extent), but also of the independent variables. The low dispersion of the variable "AssetLN_ASO" should not invalidate the estimates due to the usefulness of the asset measures in predicting the new high-tech venture performance.

Table 2 shows the correlation matrix of the totality of variables employed in the empirical study. Reasonably, the variables linked to the university resources and supporting instruments of the spin-out activities, as well as to the local context determining factors, are positively correlated. In consideration of the high correlation between "Uni_R&Dexp" and "Uni_R&DStaff" (r = 0.975), as well as between "Public_R&Dexp" and "LocalR&D_staff"(r = 0.911), these may significantly invalidate the estimation of the models; these variables were used as alternative measures of prominence of the university and local context resources in the estimation of the models. For this reason, we selected for the analysis the variable "Uni_R&Dexp" and "Public_R&Dexp". Furthermore, the correlation matrix shows a high correlation between "NPublic_incub" and "NUnincub (r = 0.815); hence, in light of the comparable nature of university and public incubators in terms of support to new ventures (university is a semi-public institution and the associated resources used in its supporting programs of academic spin-offs are partially public), only the variable "NUnincub" was used in the estimation of models developed - as we thought its more potential effect on academic entrepreneurship performance was due to the proximity to this fostering mechanism - eliminating, thus, the variable "NPublic_incub".

In order to control the magnitude of multicollinearity as a problematical issue, the variance inflation factor (VIF) test was calculated on the explanatory variables of the models (Table 3), denoting a VIF score not exceeding 3.60, which is not close to the rule of thumb "threshold" value of 10 (Hair et al., 1998). Furthermore, the "tolerance" level - showing the percent variance in the predictor that cannot be accounted for by the other predictors - displays a value higher than 0.10 (Bruin, J. 2006), hence pointing out the lack of redundant variables in the models developed (Neter et al., 1996). Thus, it can be stated that multicollinearity is not a deleterious factor for the multivariate analyses.

4.2 Multivariate Analysis

With the aim to test the better performance measurement of the academic spin-offs activities, the following five models were developed to identify the impact of the selected determining factors on academic entrepreneurship processes:

Model [1] $N\_ASO_i = \beta_0 + \beta_1 Uni\_R\&Dexp_i + \beta_2 NUnincub_i + \beta_3 \%Uni\_sharecapital_i + \beta_4 NBank\_incub_i + \beta_5 NPublic\_incub_i + \beta_6 CompEntrep\_index_i + \beta_7 Innovation\_index_i + \beta_8 Public\_R\&Dexp_i + \mathcal{E}_i$

Model [2] $AssetLN\_ASO_i = \beta_0 + \beta_1 Uni\_R\&Dexp_i + \beta_2 NUnincub_i + \beta_3 \%Uni\_sharecapital_i + \beta_4 NBank\_incub_i + \beta_5 NPublic\_incub_i + \beta_6 CompEntrep\_index_i + \beta_7 Innovation\_index_i + \beta_8 Public\_R\&Dexp_i + \mathcal{E}_i$

Model [3] $\%ROE_i = \beta_0 + \beta_1 Uni\_R\&Dexp_i + \beta_2 NUnincub_i + \beta_3 \%Uni\_sharecapital_i + \beta_4 NBank\_incub_i + \beta_5 NPublic\_incub_i + \beta_6 CompEntrep\_index_i + \beta_7 Innovation\_index_i + \beta_8 Public\_R\&Dexp_i + \varepsilon_i$

Model [4] $\%ROS_i = \beta_0 + \beta_1 Uni\_R\&Dexp_i + \beta_2 NUnincub_i + \beta_3 \%Uni\_sharecapital_i + \beta_4 NBank\_incub_i + \beta_5 NPublic\_incub_i + \beta_6 CompEntrep\_index_i + \beta_7 Innovation\_index_i + \beta_8 Public\_R\&Dexp_i + \varepsilon_i$

Model [5] $\%ROA_i = \beta_0 + \beta_1 Uni\_R\&Dexp_i + \beta_2 NUnincub_i + \beta_3 \%Uni\_sharecapital_i + \beta_4 NBank\_incub_i + \beta_5 NPublic\_incub_i + \beta_6 CompEntrep\_index_i + \beta_7 Innovation\_index_i + \beta_8 Public\_R\&Dexp_i + \varepsilon_i$

with $1 \leq i \leq N$ (N=spin-off companies)

where N_ASO indexes, AssetLN_ASO indexes, %ROE indexes, %ROS indexes, %ROA indexes denote the dependent variables; β_0 indexes, the constants β_1,β_2, β_3, β_4, β_5, β_6, β_7, $\beta_8$denote the regression coefficients; Uni_R&Dexp, NUnincub, %Uni_sharecapital, NBank_incub, NPublic_incub, CompEntrep_index, Innovation_index, and Public_R&Dexp indexes the independent variables; while $\varepsilon_i$denotes the error for the i–*th* academic spin-off.

Table 4 and table 5 show the outcomes of the multiple linear regression analysis linked to the estimation of the Model [1]. In particular, it can be observed that this model shows a high value of adjusted R^2 (72,1%) so revealing the accuracy of the model in predicting the performance - in terms of return on ventures generated by each university - of the academic spin-offs sampled. As to the results of the model's estimated coefficients, it can be noted that five variables out of seven are statistically significant - at 0.00% - (only the "Nunincub" and "%Uni_sharecapital" are not statistically significant); in addition, five variables are practically significant in the expected direction (only the standardized coefficients of the "Nunincub" and "%Uni_sharecapital" denote lower beta values, though still sufficiently positive). Overall, there are three variables ("Uni_R&Dexp", "CompEntrep_index", "Public_R&Dexp") recording standardized coefficients that are statistically and concretely significant in the expected directions (only estimates with a significance level below 10% were considered valid).
Following the studies of the estimated model, Table 6 and Table 7 show the multiple linear regression results of the Model [2]. In detail, it can be noted that a low predictability of the model (the value of adjusted R^2 is 3%) captures the performance output - in terms of total assets - of the academic spin-off processes. As to the results of the estimated standardized coefficients, they show that three variables out of seven are statistically significant: "Uni_R&Dexp" (at 9.7%), "Innovation_index" (at 1.5%) and "Public_R&Dexp" (at 5%). Additionally, four variables out of seven are positive and factually significant: "Uni_R&Dexp" and "Public_R&Dexp" to a greater extent compared to "%Uni_sharecapital" and "CompEntrep_index". Generally, two variables ("Uni_R&Dexp" and "Public_R&Dexp") are statistically and concretely significant in the expected directions.

Table 8 and Table 9 display the results of the multiple linear regression analysis related to the estimation of the Model [3]. As it can be noticed, this model reveals very low results of adjusted R^2, which registered a negative value (-0.2%) - although the R^2 is barely positive (1.5%) - which indicates the incapacity of the model to effectively predict the performance results - in terms of return on equity - of the activities related to academic entrepreneurship. Negative observations also regard the estimated coefficients of the model: only one variable out of seven is statistically significant ("Public_R&Dexp"at 6.7%); while five variables out of seven are positive and practically significant to a lower extent ("%Uni_sharecapital", "Uni_R&Dexp", "CompEntrep_index", "Innovation_index" and "NBank_incub"). Overall, there are no variables that are statistically and practically significant in the expected directions.

Relating to the outcomes of the multiple linear regression analyses of the Model [4] (Table 10 and Table 11), the results are comparable – in some aspects – to those observed in the Model [3]. Indeed, even in such circumstances, the model shows negative values of adjusted R^2 (-0.8%), so emphasizing an unexpected prediction about the direction of the model and its inadequacy in evaluating the impact of determining factors on the performance of academic spin-offs in terms of return on sales. Further, as to the results of the estimated standardized coefficients, there are no statistically significant variables and only one variable denoted a low positive and factual significance (Innovation_index), confirming a low efficiency and effectiveness of the model.

Finally, the results of the multiple linear regression analysis linked to the estimation of the Model [5] are exposed in Table 12 and Table 13. As can be noted, the adjusted R^2 shows a positive low value (1.1%), revealing the model's poor accuracy in predicting the performance of the university start-up in terms of return on assets, though employing measures of profitability relatively more than other models.

In terms of statistical significance as per the estimated standardized coefficients, only "CompEntrep_index" conforms to this assumption (at 0.5%), while in terms of practical significance there are no variables that record sufficiently positive estimated coefficients. Globally – as in the previous model - there are no variables that are statistically and practically significant in the expected directions.

In light of the results obtained from the empirical evidence outlined above, it can be argued that the best measure to optimally capture the performance of academic spin-offs –by revealing the impact of some relevant determining factors on the success of the spin-out process –is the number of academic ventures created by each university (Model [1]). This is in line with the predominance of this performance measure in the literature, confirming its validity and effectiveness. Following, as discrete measure of performance, academic entrepreneurship linked to the total assets of the sampled companies (Model [2]); while all profitability measures (Model [3], Model [4] and Model [5]) fail to reveal the performance outcomes of the academic start-ups' activities. Table 14 summarizes the effectiveness and efficacy of the five models developed for this type of study (in order of relevance).

5. Conclusion and Implications

In this study we have explored the best measures of academic spin-off performance, through two main steps of investigation: the first one has analysed the literature about the success evaluation of the spin-out processes from universities, which has enabled to identify the most used performance measures within studies of this kind; as for the second one, five models have been developed in order to estimate the impact of the major fostering factors of the effectiveness of academic entrepreneurship on the selected performance measures: number of ventures created by university, natural logarithm of total assets, return on equity, return on sales and return on assets.

The results of the multivariate analysis enable to consider the number of start-ups generated by university as the most adequate performance measure capturing the performance outcomes of the academic spin-offs in the Italian context. As noted in the "Results" section, this evidence is consistent with the main approaches followed by scholars about the effectiveness of entrepreneurial processes gemmed from universities, confirming the validity of the prominence of university spinout activities in the performance evaluation of its ventures (Lawton, Smith and Ho, 2006; Di Gregorio and Shane, 2003; Harrison and Leitch, 2010; Rolfo and Finardi, 2014).

Similarly, the performance measure linked to the assets of the sampled companies seems to show a good predictability of the effectiveness of the academic spin-offs processes, though at lower strength compared to the previous one. This evidence raises some remarks and doubts - referring to the measure linked to the numerosity of spin-offs created by the university- about the value of the assets as a performance indicator, especially in terms of firm growth, for high-technology start-ups and for the start-up of new activities in established firms (Delmar et al., 2003); this key driver is considered by the literature as fundamental for the measurement of this type of firms (Ardishvili et al., 1998; Delmar, 1997). In order to emphasize this aspect, it can be observed that asset measures are more direct performance indicators of academic spin-off effectiveness (at company level) than the number of firms created by university, which is only an indirect indicator, at university level.

As a matter of fact, this type of performance measure is more closely linked to the university capability to generate start-ups than to the specific characteristic of academic spin-offs (Corsi and Prencipe, 2014). In order to clearly understand the different results about the efficiency of the two different measures here observed and capture the effectiveness of university spin-out processes - given the nature and issues related to the creation of spin-offs, that are highly sensitive to several types of market failures, particularly at the early stage (Roberts and Malone, 1996; Shane, 2004; Steffenson et al., 2000; Oakey et al., 1996) - it would be interesting to take into account the significant contribution coming from external inputs, primarily relating to the parent organization (Smith and Ho, 2006). Thus, it can be stated that the assets measures – though highly precise and more direct than those relating to the number of ventures created by university - are less sensitive to the direct effects of the contextual determining factors of academic spin-offs performance, which are mediated by the fostering role of universities, inhibiting - in part - their capacity to capture the academic spin-offs performance to a larger extent.
With reference to the profitability measures of academic entrepreneurship performance, the results show the absolute inefficiency of this approach in the evaluation of the spin-out activities, concerning all measures adopted in this study: return on equity, return on sales and return on assets.

The reasons for this negative evidence are partly similar to those regarding the assets measure, but in addition it is important to take into account that the high-risk nature, the early-stage high costs and the protracted period of "marketability" of academic start-ups make the policy makers involved in the management of the spin-out activities more inclined to consider the academic spin-offs as an appropriate mechanism of endogenous regional development (Gilsing et al., 2010), with limited or no emphasis on the validity of the entrepreneurial in terms of profitability (Mustar et al., 2008; Degroof and Roberts, 2004; Clarysse et al., 2005; Siegel, 2013). Furthermore, with particular regard to the sales measures, scholars noted that their growth is not always related to an effective business performance, which reveals that these measures are probably more closely linked to the assets of the new technology ventures growth before any sales will occur (Delmar et al., 2003).

In conclusion, the study here conducted gives an important contribution to the evaluation of the optimal performance measurement of the academic entrepreneurship, providing the basis for future studies in the field and improving the approaches followed in literature about the analysis of the success of spin-out processes from universities. Nevertheless, some limitations are detectable: first of all, the models developed employ only some of the determining factors - amongthe most recurring in the literature - of the effectiveness of academic spin-offs activities (independent variables), not considering other important ones like the micro-determinants, mainly associated to the role of founders and founding teams during the spin-off firm creation (Nicolaou and Birley, 2003a; Djokovic and Souitaris, 2008), alongside with factors linked to the impact of networks involving parent organization and industry on spin-off performance (Djokovic and Souitaris, 2008; Lindelöf and Löfsten, 2004, Grandi and Grimaldi, 2003). Hence, future studies may benefit from the use of additional factors of the academic entrepreneurship performance and as well, develop models of analysis that better adapt to the specificity of the performance measures analysed, by selecting success factors that are more appropriate to the specific case. In addition, similar considerations can be made as to the performance measure of academic ventures: in this study, we did not use the totality of the performance measures available in this field. For example, although we employed total assets, further evidence about the effectiveness of the spin-out processes may emerge from measures more specifically linked to the employment variation. It has been noted (Delmar et al., 2003) that employment is a much more direct indicator of organizational complexity compared to other performance measures such as sales, and it may be desirable to place more emphasis on the managerial effects of performance (Churchill and Lewis, 1983; Greiner, 1972).

In this regard, the current study also aims to be somewhat useful to the development of new theoretical perspectives on the success of academic entrepreneurship and its managerial and political implications.

References

Adams, R., Almeida, H., & Ferreira, D. (2009). Understanding the relationship between founder–CEOs and firm performance. Journal of Empirical Finance, 16(1), 136-150.

Aldrich, J. (1995). Correlations genuine and spurious in Pearson and Yule. Statistical Science, 364-376.

Algieri, B., Aquino, A., & Succurro, M. (2013). Technology transfer offices and academic spin-off creation: the case of Italy. The Journal of Technology Transfer, 38(4), 382-400.

Ardishvili, A., Cardozo, S., Harmon, S., & Vadakath, S., (1998). Towards a theory of new venture growth. Paper presented at the 1998 Babson Entrepreneurship Research Conference, Ghent, Belgium.

Audretsch, D. B. (2014). From the entrepreneurial university to the university for the entrepreneurial society. The Journal of Technology Transfer, 39(3), 313-321.

Audretsch, D. B., & Keilbach, M. (2004) "Entrepreneurship and regional growth: an evolutionary interpretation", Journal of Evolutionary Economics, vol. 14, no. 5, pp. 605-616.

Audretsch, D. B., & Stephan, P. E. (1996). Company-scientist locational links: The case of biotechnology. The American Economic Review, 641-652.

AUTM (Association of University Technology Managers) (2002). AUTM licensing survey. North- brook, Ill: AUTM.

Baldini, N. (2010). University spin-offs and their environment. Technology Analysis & Strategic Management, 22(8), 859-876.

Barkham, R., Gudgin, G., Hart, M., & Hanvey, E. (1996). The Determinants of Small Firm Growth, vol. 12. Athenaeum Press, Gateshead, Tyne and Wear, UK.

Beibst, G., Lautenschlager, A. (2004). Determinants of regional high-tech growth by university-based startups. In: Dowling, M, Schmude, J, ZuKnyphausen-Aufsess, D (eds) Advances in interdisciplinary European entrepreneurship research (pp. 45–56). Munster.

Bigliardi, B., Galati, F., & Verbano, C. (2013). Evaluating performance of university spin-off companies: Lessons from Italy. Journal of technology management & innovation, 8(2), 178-188.

Boschma, R. (2005). Proximity and innovation: a critical assessment. Regional studies, 39(1), 61-74.

Brush, C. G., & Vanderwerf, P. A. (1992). A comparison of methods and sources for obtaining estimates of new venture performance. Journal of Business venturing, 7(2), 157-170.

Callan, B., (2001). Generating Spin-Offs: Evidence From the OECD. Science Technology Industry Review. Special Issue on Fostering High Tech Spin-Offs: A Public Strategy for Innovation 26, 13–56.

Campbell, D. (2008). Nonfinancial Performance Measures and Promotion-Based Incentives. Journal of Accounting research, 46(2), 297-332.

Carayol, N., & Matt, M. (2004). Does research organization influence academic production?: Laboratory level evidence from a large European university.Research Policy, 33(8), 1081-1102.

Chakravarthy, B. S. (1986). Measuring strategic performance. Strategic management journal, 7(5), 437-458.

Chandler, G. N., & Jansen, E. (1992). The founder's self-assessed competence and venture performance. Journal of Business venturing, 7(3), 223-236.

Chapple, W., Lockett, A., Siegel, D., & Wright, M. (2005). Assessing the relative performance of UK university technology transfer offices: parametric and non-parametric evidence. Research Policy, 34(3), 369-384.

Chesbrough, H. W. (2003a). "Open innovation: The new imperative for creating and profiting from technology". Harvard Business Press.

Chesbrough, H. W. (2003b). The governance and performance of Xerox's technology spin-off companies. Research Policy, 32(3), 403-421.

Clarysse, B., & Moray, N. (2004). A process study of entrepreneurial team formation: the case of a research-based spin-off. Journal of Business Venturing, 19(1), 55-79.

Clarysse, B., Wright, M., Lockett, A., Van de Velde, E., & Vohora, A. (2005). Spinning out new ventures: a typology of incubation strategies from European research institutions. Journal of Business venturing, 20(2), 183-216.

Cohen, J., Cohen, P., West, S. G., & Aiken, L. S. (2013). Applied multiple regression/correlation analysis for the behavioral sciences. Routledge.

Colombo, M. G., D'Adda, D., & Piva, E. (2010). The contribution of university research to the growth of academic start-ups: an empirical analysis. The Journal of Technology Transfer, 35(1), 113-140.

Corsi, C., & Prencipe, A. (2014). Success determinants of academic spin-offs in a dual perspective of analysis: university and local context. In: Proceedings Electronic International Interdisciplinary Conference 2014.

Corsi, C., Di Bernardino, D., & Prencipe, A. (2014). Regional Context and Academic Spin off: Effective or Critical Cooperation?. In: Proceedings of the 13th International Conference of the Society for Global Business and Economic Development. Managing the "Intangibles": Business and Entrepreneurship Perspectives in a Global Context, Ancona 16-18 July, 2014 AnconaUniversitàPolitecnicadelle Marche, Economics Faculty "Giorgio Fuà".

Covin, J. G., & Slevin, D. P. (1991). A conceptual model of entrepreneurship as firm behavior. Entrepreneurship theory and practice, 16(1), 7-25.

Czarnitzki, D., Rammer, C., & Toole, A. A. (2013). University spin-offs and the "performance premium". Small Business Economics, 1-18.

Davidsson, P., & Wiklund, J. (2001). Levels of analysis in entrepreneurship research: Current research practice and suggestions for the future. Entrepreneurship theory and Practice, 25(4), 81-100.

Degroof, J. J., & Roberts, E. B. (2004). Overcoming weak entrepreneurial infrastructures for academic spin-off ventures. The Journal of Technology Transfer, 29(3-4), 327-352.

del Palacio Aguirre, I., Parellada, F. S., & Campos, H. M. (2006). University spin-off programmes: How can they support the NTBF creation?. International Entrepreneurship and Management Journal, 2(2), 157-172.

Delmar, F., (1997). Measuring growth: methodological considerations and empirical results. In: Donckels, R., Miettinen, A. (Eds.), Entrepreneurship and SME Research: On its Way to the Next Millennium, pp. 199–216.

Delmar, F., Davidsson, P., & Gartner, W. B. (2003). Arriving at the high-growth firm. Journal of business venturing, 18(2), 189-216.

Delmar, F. (1997). Measuring growth: methodological considerations and empirical results. In: Donckels, R., Miettinen, A. (Eds.), Entrepreneurship and SME Research: On its Way to the Next Millennium. Ashgate, Aldershot, England, pp. 199–216.

Di Gregorio, D., & Shane, S. (2003). Why do some universities generate more start-ups than others?. Research policy, 32(2), 209-227.

Djokovic, D., & Souitaris, V. (2008). Spinouts from academic institutions: a literature review with suggestions for further research. The Journal of Technology Transfer, 33(3), 225-247.

Druilhe, C., & Garnsey, E. (2004). Do academic spin-outs differ and does it matter?. The Journal of Technology Transfer, 29(3-4), 269-285.

Ensley, M. D., &Hmieleski, K. M. (2005). A comparative study of new venture top management team composition, dynamics and performance between university-based and independent start-ups. Research Policy, 34(7), 1091-1105.

Etzkowitz, H. (2004). The evolution of the entrepreneurial university.International Journal of Technology and Globalisation, 1(1), 64-77.

Feldman, M. P. (2001). The entrepreneurial event revisited: firm formation in a regional context. Industrial and corporate change, 10(4), 861-891.

Feldman, M. P., & Desrochers, P. (2004). Truth for its own sake: academic culture and technology transfer at Johns Hopkins University. Minerva, 42(2), 105-126.

Fini, R., Grimaldi, R., & Sobrero, M. (2009). Factors fostering academics to start up new ventures: an assessment of Italian founders' incentives. The Journal of Technology Transfer, 34(4), 380-402.

Fini, R., Grimaldi, R., Santoni, S., & Sobrero, M. (2011). Complements or substitutes? The role of universities and local context in supporting the creation of academic spin-offs. Research Policy, 40(8), 1113-1127.

Garg, V. K., Walters, B. A., & Priem, R. L. (2003). Chief executive scanning emphases, environmental dynamism, and manufacturing firm performance. Strategic Management Journal, 24(8), 725-744.

George, G., Zahra, S. A., & Wood Jr, D. R. (2002). The effects of business–university alliances on innovative output and financial performance: a study of publicly traded biotechnology companies. Journal of Business Venturing, 17(6), 577-609.

Gibson, D. V., Smilor, R. W. (1991). The role of the research university in creating and substaining the U.S. technopolis, In: Brett AM, Gibson DV, Smilor RW (eds) University spin-off companies: economic development, faculty entrepreneurs, and technology transfer (pp. 31–70). Rowman& Littlefield, Savage.

Gilsing, V. A., Van Burg, E., & Romme, A. G. L. (2010). Policy principles for the creation and success of corporate and academic spin-offs. Technovation, 30(1), 12-23.

Greiner, L. E. (1972). Evolutions and revolutions as organizations grow. Harvard Business Review, 50(4), 37-46.

Grimaldi, R., & Grandi, A. (2005). Business incubators and new venture creation: an assessment of incubating models. Technovation, 25(2), 111-121.

Harrison, R. T., & Leitch, C. (2010). Voodoo institution or entrepreneurial university? Spin-off companies, the entrepreneurial system and regional development in the UK. Regional Studies, 44(9), 1241-1262.

Hemer, J., & Karlsruhe Fraunhofer-Institut für System-und Innovationsforschung. (2006). Erfolgsfaktoren für Unternehmensausgründungen aus der Wissenschaft. Fraunhofer-IRB-Verlag.

Hewitt-Dundas, N. (2013). The role of proximity in university-business cooperation for innovation. The Journal of Technology Transfer, 38(2), 93-115.

Ho, M. H. C., Liu, J. S., Lu, W. M., & Huang, C. C. (2014). A new perspective to explore the technology transfer efficiencies in US universities. The Journal of Technology Transfer, 39(2), 247-275.

Hoy, F., McDougall, P.P., & Dsouza, D.E., (1992). Strategies and environments of high growth firms. In: Sexton, D.L., Kasarda, J.D. (Eds.), The State of the Art of Entrepreneurship (pp. 341–357). PWS-Kent Publishing, Boston.

Hunt, R. A., & Lerner, D. A. (2012). Reassessing the entrepreneurial spinoff performance advantage: a natural experiment involving a complete population. Frontiers of Entrepreneurship Research, 32 (12), 2.

Huynh, T., & Patton, D. (2014). The Performance of University Spin-Offs: The Impact of Entrepreneurial Capabilities and Social Networks of Founding Teams during Start-Ups. In: The United States Association for Small Business and Entrepreneurship (USASBE), 9-12 January 2014, Fort Worth, Texas.

Iacobucci, D., & Micozzi, A. (2014). How to evaluate the impact of academic spin-offs on local development: an empirical analysis of the italian case. The Journal of Technology Transfer, 1-19.

Ittner, C. D., & Larcker, D. F. (2003). Coming up short on nonfinancial performance measurement. Harvard business review, 81(11), 88-95.

Jordan, D. A. (2012). Universities, Knowledge Transfer, and Regional Development: Geography, Entrepreneurship, and Policy – Edited by Attila Varga. Growth and Change, 43, 358–359.

Kassicieh, S. K., Radosevich, H. R., & Banbury, C. M. (1997). Using attitudinal, situational, and personal characteristics variables to predict future entrepreneurs from national laboratory inventor. IEE Transactions on Engineering Management, 44(3), 248–257.

Kathuria, V. (2000). Productivity spillovers from technology transfer to Indian manufacturing firms. Journal of International Development, 12(3), 343-369.

Kenney, M., & Patton, D. (2011). Does inventor ownership encourage university research-derived entrepreneurship? A six university comparison. Research Policy, 40(8), 1100-1112.

Kunkel, S., & Hofer, C. W. (1991, August). Why study the determinants of new venture performance: A literature review and rationale. In Academy of Management Proceedings.

Lai, W. H. (2011). Willingness-to-engage in technology transfer in industry–university collaborations. Journal of Business Research, 64(11), 1218-1223.

Lautenschläger, A., Haase, H., & Kratzer, J. (2014). Contingency factors on university spin-off formation: an empirical study in Germany. Journal of Entrepreneurship and Public Policy, 3(1), 160-176.

Lawton Smith, H., & Ho, K. (2006). Measuring the performance of Oxford University, Oxford Brookes University and the government laboratories' spin-off companies. Research Policy, 35(10), 1554-1568.

Lehoux, P., Daudelin, G., Williams-Jones, B., Denis, J. L., & Longo, C. (2014). How do business model and health technology design influence each other? Insights from a longitudinal case study of three academic spin-offs. Research Policy, 43(6), 1025-1038.

Lerner, J. (2010). Boulevard of broken dreams: why public efforts to boost entrepreneurship and venture capital have failed and what to do about it. Princeton University Press.

Lewis, V. L., & Churchill, N. C. (1983). The five stages of small business growth. Harvard business review, 61(3), 30-50.

Lindelöf, P., & Löfsten, H. (2004). Proximity as a resource base for competitive advantage: University–industry links for technology transfer. The Journal of Technology Transfer, 29(3-4), 311-326.

Link, A. N., & Scott, J. T. (2005). Opening the ivory tower's door: An analysis of the determinants of the formation of US university spin-off companies. Research Policy, 34(7), 1106-1112.

Lockett, A., & Wright, M. (2005). Resources, capabilities, risk capital and the creation of university spin-out companies. Research Policy, 34(7), 1043-1057.

Lockett, A., Siegel, D., Wright, M., & Ensley, M. D. (2005). The creation of spin-off firms at public research institutions: Managerial and policy implications. Research Policy, 34(7), 981-993.

Lockett, A., Wright, M., & Franklin, S. (2003). Technology transfer and universities' spin-out strategies. Small Business Economics, 20(2), 185-200.

Lowe, J. (1993). Commercialization of university research: a policy perspective. Technology Analysis & Strategic Management, 5(1), 27-37.

Lumpkin, G. T., & Dess, G. G. (1996). Clarifying the entrepreneurial orientation construct and linking it to performance. Academy of management Review, 21(1), 135-172.

Matricano, D., Guadalupi, L., Tutore, V. A., Andreottola, F., & Sorrentino, M. (2012). The Creation of Academic Spin-offs: Evidences from Italy. DSI Essays Series, 27.

Müller, C., Fujiwara, T., & Herstatt, C. (2004). Sources of bioentrepreneurship: the cases of Germany and Japan. Journal of Small Business Management, 42(1), 93-101.

Murphy, G. B., Trailer, J. W., & Hill, R. C. (1996). Measuring performance in entrepreneurship research. Journal of business research, 36(1), 15-23.

Muscio, A. (2008). Il trasferimento tecnologico in Italia: Risultati di un'indagine sui dipartimenti universitari. L'IndustriaNumeroSpeciale, 245–268.

Muscio, A. (2010). What drives the university use of technology transfer offices? Evidence from Italy. The Journal of Technology Transfer, 35(2), 181-202.

Mustar, P. (1997). How French academics create hi-tech companies: the conditions for success or failure. Science and Public Policy, 24(1), 37-43.

Mustar, P., & Wright, M. (2010). Convergence or path dependency in policies to foster the creation of university spin-off firms? A comparison of France and the United Kingdom. The Journal of Technology Transfer, 35(1), 42-65.

Mustar, P., Renault, M., Colombo, M. G., Piva, E., Fontes, M., Lockett, A., & Moray, N. (2006). Conceptualising the heterogeneity of research-based spin-offs: A multi-dimensional taxonomy. Research policy, 35(2), 289-308.

Mustar, P., Wright, M., & Clarysse, B. (2008). University spin-off firms: lessons from ten years of experience in Europe. Science and Public Policy, 35(2), 67-80.

Neter, J., Kutner, M., Nachtsheim, C., &Wasserman,W. (1996). Applied linear statistical models (Vol. 4). Chicago: Irwin.

Nicolai, A., & Kieser, A. (2002). Trotz eklatanter Erfolglosigkeit: die Erfolgsfaktorenforschung weiter auf Erfolgskurs. BETRIEBSWIRTSCHAFT-STUTTGART-, 62(6), 579-596.

Nicolaou, N., & Birley, S. (2003a). Academic networks in a trichotomous categorisation of university spinouts. Journal of Business Venturing, 18(3), 333-359.

Nicolaou, N., & Birley, S. (2003b). Social networks in organizational emergence: The university spinout phenomenon. Management Science, 49(12), 1702-1725.

Nielsen, C., & Cappelen, K. (2014). Exploring the Mechanisms of Knowledge Transfer in University-Industry Collaborations: A Study of Companies. Students and Researchers. Higher Education Quarterly.

O'Shea, R. P., Chugh, H., & Allen, T. J. (2008). Determinants and consequences of university spinoff activity: a conceptual framework. The Journal of Technology Transfer, 33(6), 653-666.

Oakey, R. P., Hare, P. G., & Balazs, K. (1996). Strategies for the exploitation of intelligence capital: evidence from Hungarian research institutes. R&D Management, 26(1), 67-82.

Ortín-Ángel, P., & Vendrell-Herrero, F. (2014). University spin-offs vs. other NTBFs: Total factor productivity differences at outset and evolution.Technovation, 34(2), 101-112.

O'Shea, R. P., Allen, T. J., Chevalier, A., & Roche, F. (2005). Entrepreneurial orientation, technology transfer and spinoff performance of US universities. Research Policy, 34(7), 994-1009.

O'Shea, R. P., Allen, T. J., Morse, K. P., O'Gorman, C., & Roche, F. (2007). Delineating the anatomy of an entrepreneurial university: the Massachusetts Institute of Technology experience. R&D Management, 37(1), 1-16.

Powers, J. B., & McDougall, P. P. (2005). University start-up formation and technology licensing with firms that go public: a resource-based view of academic entrepreneurship. Journal of Business Venturing, 20(3), 291-311.

Rasmussen, E., & Borch, O. J. (2010). University capabilities in facilitating entrepreneurship: A longitudinal study of spin-off ventures at mid-range universities. Research Policy, 39(5), 602-612.

Rasmussen, E., Mosey, S., & Wright, M. (2014). The influence of university departments on the evolution of entrepreneurial competencies in spin-off ventures. Research Policy, 43(1), 92-106.

Renault, C. S. (2006). Academic capitalism and university incentives for faculty entrepreneurship. The Journal of Technology Transfer, 31(2), 227-239.

Roberts, E., (1991). Entrepreneurs in High Technology, Lessons fromMIT and Beyond. Oxford University Press, Oxford.

Rodeiro Pazos, D., Fernández López, S., Otero González, L., & Rodríguez Sandiás, A. (2012). A resource-based view of university spin-off activity: new evidence from the Spanish case. Revista Europea de Dirección y Economía de la Empresa, 21(3), 255-265.

Rolfo, S., & Finardi, U. (2014). University Third mission in Italy: organization, faculty attitude and academic specialization. The Journal of Technology Transfer, 39(3), 472-486.

Rossi, F. (2010). The governance of university-industry knowledge transfer.European Journal of Innovation Management, 13(2), 155-171.

Rothaermel, F. T., & Thursby, M. (2005). Incubator firm failure or graduation?: The role of university linkages. Research policy, 34(7), 1076-1090.

Shane, S. (2002). Selling university technology: patterns from MIT.Management Science, 48(1), 122-137.

Shane, S. (2004). Academic entrepreneurship: University spinoffs and wealth creation. Edward Elgar Publishing.

Shane, S., & Stuart, T. (2002). Organizational endowments and the performance of university start-ups. Management science, 48(1), 154-170.

Shane, S. (2001). Technology opportunities and new firm creation. Management Science, 47, 205–220.

Siegel, D. S. (2013). Academic entrepreneurship: lessons learned for university administrators and policymakers. Creating Competitiveness: Entrepreneurship and Innovation Policies for Growth, 116.

Siegel, D. S., Veugelers, R., & Wright, M. (2007). Technology transfer offices and commercialization of university intellectual property: performance and policy implications. Oxford Review of Economic Policy, 23(4), 640-660.

Siegel, D. S., Waldman, D. A., Atwater, L. E., & Link, A. N. (2004). Toward a model of the effective transfer of scientific knowledge from academicians to practitioners: qualitative evidence from the commercialization of university technologies. Journal of Engineering and Technology Management, 21(1), 115-142.

Siegel, D. S., Waldman, D., & Link, A. (2003). Assessing the impact of organizational practices on the relative productivity of university technology transfer offices: an exploratory study. Research policy, 32(1), 27-48.

Sijde, P. V. D., & Tilburg, J. V. (2000). Support of university spin-off companies.The International Journal of Entrepreneurship and Innovation, 1(1), 13-13.

Spielkamp, A., Egeln, J., Gottschalk, S., & Rammer, C. (2004). Spin-offs in Germany-conceptual considerations and empirical evidence. In: Dowling M., Schmude J., ZuKnyphausen-Aufsess, D. (eds), Advances in interdisciplinary European entrepreneurship research, Munster, pp. 153–181.

Steffensen, M., Rogers, E. M., & Speakman, K. (2000). Spin-offs from research centers at a research university. Journal of Business Venturing, 15(1), 93-111.

Steinkühler, R.-H. (1994). Technologiezentren und Erfolg von Unternehmensgründungen. Deutscher Universitäts-Verlag, Wiesbaden.

Sternberg, R. (2009). Regional dimensionsofentrepreneurship. Now Publishers Inc.

Sternberg, R. (2014). Success factors of university-spin-offs: Regional government support programs versus regional environment. Technovation,34(3), 137-148.

Stuart, T. E., & Ding, W. W. (2006). When do scientists become entrepreneurs? The social structural antecedents of commercial activity in the academic life sciences. American Journal of Sociology, 112(1), 97-144.

Van Gelderen, M., Brand, M., Van Praag, M., Ombach, M., & Bodewes, W., (2004), "Some advances in the explanation of entrepreneurial intentions", In: Dowling M., Schmude J., ZuKnyphausen-Aufsess D. (eds), Advances in interdisciplinary European entrepreneurship research (pp. 27–44). Munster.

Vinig, T., & van Rijsbergen, P. (2010). University technology transfer: comparative study of US, European and Australian universities. Handbook of Research on High-Technology Entrepreneurs, 179.

Visintin, F., & Pittino, D. (2014). Founding team composition and early performance of university—Based spin-off companies. Technovation, 34(1), 31-43.

Vohora, A., Wright, M., & Lockett, A. (2004). Critical junctures in the development of university high-tech spinout companies. Research policy, 33(1), 147-175.

Walter, A., Auer, M., & Ritter, T. (2006). The impact of network capabilities and entrepreneurial orientation on university spin-off performance. Journal of Business Venturing, 21(4), 541-567.

Weinzimmer, L. G., Nystrom, P. C., & Freeman, S. J. (1998). Measuring organizational growth: Issues, consequences and guidelines. Journal of management, 24(2), 235-262.

Wennberg, K., Wiklund, J., & Wright, M. (2011). The effectiveness of university knowledge spillovers: Performance differences between university spinoffs and corporate spinoffs. Research Policy, 40(8), 1128-1143.

Wiklund, J. (2006). The sustainability of the entrepreneurial orientation–performance relationship. Entrepreneurship and the growth of firms, 141-155.

Wiklund, J., & Shepherd, D. (2005). Entrepreneurial orientation and small business performance: a configurational approach. Journal of business venturing, 20(1), 71-91.

Wright, M. (2014). Academic entrepreneurship, technology transfer and society: where next?. The Journal of Technology Transfer, 39(3), 322-334.

Wright, M., Birley, S., & Mosey, S. (2004). Entrepreneurship and university technology transfer. The Journal of Technology Transfer, 29(3-4), 235-246.

Wright, M., Clarysse, B., Lockett, A., & Knockaert, M. (2008). Mid-range universities' linkages with industry: Knowledge types and the role of intermediaries. Research Policy, 37(8), 1205-1223.

Wright, M., Lockett, A., Clarysse, B., & Binks, M. (2006). University spin-out companies and venture capital. Research Policy, 35(4), 481-501.

Table 1: Summary Statistics

Variables	Definition	Data source	N.	Mean	Standard Deviation	Variance	Min.	Max.
N_USO	Spin-offs created by university	Collected by authors	405	33.6469	14.7321	217.0359	1.0000	56.0000
AssetLN_ASO	Natural log of total assets for academic spin-off i	Infocamere - AIDA - Collected by authors	405	11.7708	1.3710	1.8796	8.6721	16.2451
%ROE	Return on equity index for academic spin-off i	Infocamere - AIDA	405	-2450.8927	49805.8478	2480622478.5811	-1002283.3333	4325.1799
%ROS	Return on sales index for academic spin-off i	Infocamere - AIDA	405	-11934.4996	176928.1974	31303587033.1620	-3377800.0000	183.8286
%ROA	Return on assets index for academic spin-off i	Infocamere - AIDA	405	-11.7050	317.2312	100635.6095	-6363.0737	63.8617
NUnincub	Number of incubators affiliated with university	Collected by authors	405	7.3432	3.2040	10.2656	1.0000	14.0000
%Uni_sharecapital	Percentage share of universities in the academic spin-off i	Infocamere - AIDA	405	3.9033	6.8247	46.5763	0.0000	100.0000
Uni_R&DStaff	Personnel in R&D activities of the University	ISTAT	404	5469.7705	3431.7015	11776575.3566	948.2000	12337.3000
Uni_R&Dexp	Intramural expenditures in R&D of the University (thousands of Euros)	ISTAT	404	399479.8878	225208.1752	50718722160.7142	89855.9787	779350.4456
CompEntrep_index	Indicator of the degree of competitiveness and entrepreneurial vivacity in the region	ISTAT - Collected by authors	405	1377999021.6811	4350918018.4131	18930487602951900000.0000	-209665.0000	15082622814.0000
Innovation_index	Indicator of the degree of innovativeness in the region	EUROSTAT - Collected by authors	405	417017819.2784	2205927986.5049	4866118281645470000.0000	-277116.0000	12060392082.0000
Public_R&Dexp	Total of R&D expenditure in the government sector	EUROSTAT	405	346.8390	147.1626	21656.8437	75.0000	828.5000
LocalR&D_staff	Total of R&D personnel and researchers in the region	EUROSTAT	404	1.4131	0.4002	0.1601	0.4600	3.0200
NPublic_incub	Number of public-funded incubators	Collected by authors	405	9.1605	5.0268	25.2687	0.0000	18.0000
NBank_incub	Number of incubators affiliated with financial institutions	Collected by authors	405	2.7531	2.2882	5.2359	0.0000	7.0000

Source: Authors' own elaboration.

Table 2: Correlation Matrix

	N_USO	AssetLN_ASO	%ROE	%ROE	%ROE	NUnincub	%Uni_sharecapital	Uni_R&Dstaff	Uni_R&Dexp	CompEntrep_index	Innovation_index	Public_R&Dexp	LocalR&D_staff	NPublic_incub	NBank_incub
N_USO	1.000	0.178**	-0.025	-0.087*	-0.013	0.059	0.079	0.684**	0.606**	0.073	-0.252**	0.492**	0.430**	0.295**	0.391**
AssetLN_ASO	0.178**	1.000	-0.035	0.009	0.049	-0.013	0.043	0.138**	0.124**	0.037	-0.065	0.154**	0.129**	0.102*	0.087*
%ROE	-0.025	-0.035	1.000	0.011	-0.017	-0.059	-.018	-0.048	-0.052	0.058	-0.007	-0.014	0.007	-0.082*	-0.056
%ROS	-0.087*	0.009	0.011	1.000	0.004	-0.044	0.001	-0.105*	-0.090*	0.021	0.012	-0.051	-0.030	-0.087*	0.009
%ROA	-0.013	0.049	-0.017	0.004	1.000	0.039	0.030	0.049	0.055	-0.158**	0.009	-0.025	-0.040	0.042	0.020
NUnincub	0.059	-0.013	-0.018	0.001	0.030	1.000	-0.075	0.261**	0.273**	-0.232**	0.098*	0.110*	-0.128**	0.815**	0.647**
%Uni_sharecapital	0.079	0.043	-0.018	0.001	0.030	-0.075	1.000	0.035	0.051	0.114*	0.169**	0.021	0.054	-0.128**	-0.081
Uni_R&Dstaff	0.684**	0.138**	-0.048	-0.105*	0.049	0.261**	0.035	1.000	0.975**	-0.320**	0.141**	0.448**	0.396**	0.432**	0.679**
Uni_R&Dexp	0.606**	0.124**	-0.052	-0.090*	0.055	0.273**	0.051	0.975**	1.000	-0.356**	0.285**	0.446**	0.386**	0.433**	0.639**
CompEntrep_index	0.073	0.037	0.058	.021	-0.158**	-0.232**	0.114*	-0.320**	-0.356**	1.000	-0.060	0.180**	0.284**	-0.263**	-0.104*
Innovation_index	-0.252**	-0.065	-0.007	0.012	0.009	0.098*	0.169**	0.141**	0.285**	-0.060	1.000	0.199**	0.164**	-0.044	0.103*
Public_R&Dexp	0.492**	0.154**	-0.014	-0.051	-0.025	0.110*	0.021	0.448**	0.446**	0.180**	0.199**	1.000	0.911**	0.303**	0.448**
LocalR&D_staff	0.430**	0.129**	0.007	-0.030	-0.040	-0.128**	0.054	0.396**	0.386**	0.284**	0.164**	0.911**	1.000	-0.003	0.365**
NPublic_incub	0.295**	0.102*	-0.082*	-0.060	0.042	0.815**	-0.128**	0.432**	0.433**	-0.263**	-0.044	0.303**	-0.003	1.000	0.657**
NBank_incub	0.391**	0.087*	-0.056	-0.082	0.020	0.647**	-0.081	0.679**	0.639**	-0.104*	0.103*	0.448**	0.365**	0.657**	1.000

Source: Authors' own elaboration.
*Significance at 5% level (1-tailed).
** Significance at 1% level (1-tailed).

Table 3: Collinearity Test

	CollinearityStatistics	
	Tollerance	VIF
Nunincub	0.467	2.140
%Uni_sharecapital	0.925	1.082
Uni_R&Dexp	0.360	2.777
CompEntrep_index	0.643	1.556
Innovation_index	0.857	1.167
Public_R&Dexp	0.630	1.588
NBank_incub	0.278	3.594

Source: Authors' own elaboration.

Table 4: Summary Model [1]

Model	R	R^2	Adjusted R^2	Standard Deviation
1	0.852	0.726	0.721	7.748

Source: Authors' own elaboration.

Table 5: Coefficients Estimation of the Model [1]

	No Standardized Coefficients		**Standardized Coefficients**	**t**	**Sig.**
	B	**Standard Deviation Error**	**Beta**		
(Costant)	4.151	1.647		2.520	0.012
Nunincub	0.254	0.177	0.055	1.438	0.151
%Uni_sharecapital	0.149	0.059	0.069	2.538	0.012
Uni_R&Dexp	5.702E-05	0.000	0.876	19.964	0.000
CompEntrep_index	9.721E-10	0.000	0.289	8.796	0.000
Innovation_index	-3.517E-09	0.000	-0.530	-18.630	0.000
Public_R&Dexp	0.024	0.003	0.244	7.349	0.000
NBank_incub	-1.444	0.320	-0.225	-4.514	0.000

Source: Authors' own elaboration.

Table 6: Summary Model [2]

Model	R	R^2	Adjusted R^2	Standard Deviation
2	0.216	0.047	0.030	1.352

Source: Authors' own elaboration.

Table 7: Coefficients Estimation of the Model [2]

	No Standardized Coefficients		**Standardized Coefficients**	**t**	**Sig.**
	B	**Standard Deviation Error**	**Beta**		
(Constant)	11.129	0.287		38.716	0.000
Nunincub	-0.011	0.031	-0.025	-.355	0.723
%Uni_sharecapital	0.010	0.010	0.048	0.937	0.349
Uni_R&Dexp	8.281E-07	0.000	0.136	1.661	0.097
CompEntrep_index	1.334E-11	0.000	0.042	0.692	0.490
Innovation_index	-8.045E-11	0.000	-0.129	-2.442	0.015
Public_R&Dexp	0.001	0.001	0.122	1.966	0.050
NBank_incub	-0.009	0.056	-.016	-0.169	0.866

Source: Authors' own elaboration.

Table 8: Summery Model [3]

Model	R	R^2	Adjusted R^2	Standard Deviation
3	0.123	0.015	-0.002	49922.101

Source: Authors' own elaboration.

Table 9: Coefficients Estimation of the Model [3]

	No Standardized Coefficients		**Standardized Coefficients**	**t**	**Sig.**
	B	**Standard Deviation Error**	**Beta**		
(Constant)	13277.859	10613.730		1.251	0.212
Nunincub	-1655.198	1139.490	-0.106	-1.453	0.147
%Uni_sharecapital	119.283	378.627	0.016	0.315	0.753
Uni_R&Dexp	0.013	0.018	0.061	0.729	0.466
CompEntrep_index	4.459E-07	0.000	0.039	0.626	0.532
Innovation_index	4.323E-07	0.000	0.019	0.355	0.723
Public_R&Dexp	-39.213	21.340	-0.115	-1.838	0.067
NBank_incub	1248.098	2061.567	0.057	0.605	0.545

Source: Authors' own elaboration.

Table 10: Summary Model [4]

Model	R	R^2	Adjusted R^2	Standard Deviation
4	0.102	0.010	-0.008	177874.763

Source: Authors' own elaboration.

Table 11: Coefficients Estimation of the Model [4]

	No Standardized Coefficients		**Standardized Coefficients**	**t**	**Sig.**
	B	**Standard Deviation Error**	**Beta**		
(Constant)	26678.167	38820.555		0.687	0.492
Nunincub	-696.443	4149.588	-0.013	-0.168	0.867
%Uni_sharecapital	-51.373	1361.396	-0.002	-0.038	0.970
Uni_R&Dexp	-0.065	0.067	-0.083	-0.962	0.337
CompEntrep_index	-3.903E-07	0.000	-0.010	-0.150	0.881
Innovation_index	3.258E-06	0.000	0.039	0.703	0.483
Public_R&Dexp	-9.818	78.598	-0.008	-0.125	0.901
NBank_incub	-1629.135	7540.467	-0.021	-0.216	0.829

Source: Authors' own elaboration.

Table 12: Summary Model [5]

Model	R	R^2	Adjusted R^2	Standard Deviation
5	0.167	0.028	0.011	315.940

Source: Authors' own elaboration.

Table 13: Coefficients estimation of the Model [5]

	Not Standardized Coefficients		**Standardized Coefficients**	**t**	**Sig.**
	B	**Standard Deviation Error**	**Beta**		
(Constant)	-0.542	67.171		-0.008	0.994
Nunincub	-0.528	7.211	-0.005	-0.073	0.942
%Uni_sharecapital	2.480	2.396	0.053	1.035	0.301
Uni_R&Dexp	-3.393E-05	0.000	-0.024	-0.291	0.771
CompEntrep_index	-1.267E-08	0.000	-0174	-2.811	0.005
Innovation_index	-1.015E-09	0.000	-0.007	-0.132	0.895
Public_R&Dexp	0.017	0.135	0.008	0.129	0.897
NBank_incub	3.039	13.047	0.022	0.233	0.816

Source: Authors' own elaboration.

Table 14: Summary of the Usefulness about the Estimated Models

Measure of academic spin-off performance	**Information about the effectiveness of the model estimated**		**Evaluation of the performance measure**
	Adjusted R^2	**Standardized coefficients**	
Number of ventures created by university	72,1%	3 variables out of 7 are statistically and practically significant in the expected directions (+)	Very good
Natural logarithm of total assets	3%	2 variables out of 7 are statistically and practically significant in the expected directions (+)	Good
Return on Assets	1.1%	0 variables out of 7 are statistically and practically significant in the expected directions (+)	Not sufficient
Return on Equity	-0.2%	0 variables out of 7 are statistically and practically significant in the expected directions (+)	Not sufficient
Return on Sales	-0.8%	0 variables out of 7 are statistically and practically significant in the expected directions (+)	Not sufficient