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Do Academic and Private Entrepreneurs differ? An empirical analysis of the micro-foundation of Entrepreneurial Orientation

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DO ACADEMIC AND PRIVATE ENTREPRENEURS DIFFER? AN EMPIRICAL ANALYSIS OF THE MICRO-FOUNDATION OF ENTREPRENEURIAL ORIENTATION

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Esame finale anno 2008

Alla Rella
e a coloro che intraprendono,
sempre.

This is ten percent Luck, twenty percent Skill, fifteen percent concentrated Power of Will, five percent Pleasure, fifty percent Pain and a hundred percent reason to Remember the Name
(Fort Minor, 2005)

TABLE OF CONTENTS

CHAPTER 1

INTRODUCTION

1.1 Overview

My Doctoral Thesis focuses on the study of individual behaviour as it relates to organizational affiliation. My objective is to study the Entrepreneurial Orientation of individuals proving the existence of a set of antecedents to that measure and assess a structural model of its micro-foundation. Relying on the developed measurement model, I address the issue whether some Entrepreneurs experience different behaviours as a result of their academic affiliation, comparing a sample of 'Academic Entrepreneurs[1]' to a control sample of 'Private Entrepreneurs[2]' affiliated to a matched sample of Academic Spin-offs and Private Start-ups.

Despite the great attention devoted to the behavioural dimensions in the social sciences, very few contributions focus on the study of individuals in the entrepreneurship domain (Baum, Locke & Smith, 2001; Shane, 2004). The Entrepreneurial Orientation concept (Miller, 1983) represents one of the few behavioural dimensions which has received a substantial amount of theoretical and empirical attention by scholars in the entrepreneurship literature (Covin & Slevin, 1989; Lumpkin & Dess, 1996; Wiklund & Shepherd 2003; Covin, Green, & Slevin, 2006).

The aim of this Doctoral Thesis is to simultaneously provide a multidimensional characterization of Entrepreneurial Orientation, proposing a set of antecedents for the construct, and assess the influence of multiple organizational affiliations on the individual behaviours. Building on the Theory of the Planned Behaviour, proposed by Ajzen (1991), I

[1] I define 'Academic Entrepreneur' an individual who is a founder and shares some equity in an 'Academic Spin-off' and is employed (either Fully or Pro-tempore) in a University or in a Public Research Centre (please refer to Chapter 2 for a more detailed characterization).

[2] I define 'Private Entrepreneur' an individual who is a founder and shares some equity in a 'Private Start-up' and has no ongoing formal relationship with Universities or Public Research Centers (please refer to Chapter 2 for a more detailed characterization).

present a model of causal antecedents of Entrepreneurial Orientation on constructs extensively used and validated, both from a theoretical and empirical perspective, in sociological and psychological studies. I focus my investigation on five major domains: *(a) Situationally Specific Motivation (encompassing Risk Taking and Self Efficacy), (b) Personal Traits and Characteristics (encompassing Passion and Tenacity), (c) Individual Skills (encompassing Technical, Procedural and Organizational Skills), (d) Perception of the Business Environment (encompassing Government, Context and University Support, Market Dynamism and Industry Opportunities) and (e) Entrepreneurial Orientation Related Dimensions (encompassing Entrepreneurial Orientation, Attitude toward Entrepreneurship, Subjective Norms and Perceived Entrepreneurial Control).*

First, I test the Entrepreneurial Orientation construct (Strategic Posture Scale) proposed by Covin and Slevin (1989), assessing the overall validity and the robustness of the scale. Second, I check if the data support the notion of Entrepreneurial Orientation as a three-component latent structure (Innovativeness, Proactiveness and Riskiness) that may be represented by means of a second-order factor. Third, I assess the nomological validity of the Entrepreneurial Orientation construct through the analysis of the causal relationships between Entrepreneurial Orientation and a set of its antecedents. Finally, I test a multi-group model, distinguishing between Academic Entrepreneurs and Private Entrepreneurs, aiming at assessing whether the academic affiliation influences the Entrepreneurial Behaviours.

I rely on a sample of 200 Entrepreneurs, affiliated to a matched sample of 72 Academic Spin-offs and Private Start-ups. Firms are matched by Industry, Year of Establishment and Localization and they are all located in the Emilia Romagna region, in northern Italy. I've gathered data by face-to-face interviews and used a Structural Equation Modeling technique (Lisrel 8.80, Joreskog, K., & Sorbom, D. 2006) to perform the empirical analysis.

The results show that Entrepreneurial Orientation is a multi-dimensional micro-founded construct which can be better represented by a Second-Order Model[3]. The t-tests on the latent means reveal that the Academic Entrepreneurs differ from the Private ones in terms of: Risk taking, Passion, Procedural and Organizational Skills, Perception of the Government, Context and University Supports[4]. The Structural models also reveal that the main differences between the two groups (Academic and Private) lay in the regression paths from Technical Skills, Perceived Context Support, and Perceived University Support to the Entrepreneurial Orientation Related Dimensions[5].

This study contributes to the extant literature in three different ways. First, it addresses Academic Entrepreneurship at the individual level providing a robust modelization of the predictors of Entrepreneurial Orientation. Second, through a sequence of multi-group nested models it empirically shows that some Academics' Entrepreneurial related Behaviours are influenced by their affiliation to Academia. Third, it relies on a sample of Entrepreneurs affiliated to a matched sample of firms in the same region. The match procedure allows control for some dimensions, and the regional focus of the study guarantees that all firms are regulated by the same legislation and all individuals are exposed to similar environmental influences.

The remainder of this Chapter is organized as follows: Section 1.2 defines the research focus, Section 1.3 presents the theoretical framework and Section 1.4 assesses the developed model. Section 1.5 provides a detailed characterization of the research design and of the data collection. Section 1.6 describes the three essays composing the Doctoral Thesis.

[3] Please refer to Paper II in Chapter 4
[4] Please refer to Paper I in Chapter 3 and Paper III in Chapter 5
[5] Please refer to Paper III in Chapter 5

1.2 Research Focus

Over the past thirty years, different scholars have studied 'Academic Entrepreneurship' (Louis & Bluemental, 1989, Shane, 2004, Mustar, Renault, Colombo, Piva, Fontes, Lockett, Wright, Clarysse, Moray, 2006). Other scholars have studied 'Private entrepreneurship' (Miller, 1983, Eisenhardt & Schoonhoven, 1990, Baum et al., 2001) Though, very few, have addressed the possible differences between the two. A better understanding of this point is not only of intellectual interest but also of relevance for policy makers and managers (Lacetera, 2008). The few scholars, who have addressed this topic, normally refer to the firm as the level of analysis (Ensley & Hmieleski, 2005). Building on these findings, it seems that micro dimensions, such as Entrepreneurial Behaviours, might be interesting domains to be explored in order to look for some diversities and/or similarities between these two types of Entrepreneurs. This position is supported by Baron (2004), who argues: "Given the impressive success of cognitive approach in other fields (e.g. psychology, education), there are grounds for predicting that it may also yield positive results when applied to the field of entrepreneurship" (p.237). This statement is also reinforced by Lockett and Wright (2005) who suggest that in the stream of entrepreneurial studies additional research should be focused on individuals in order to investigate the relevance of academic founders' incentives, motivations and capabilities in developing successful academic ventures.

1.3 Theoretical Framework

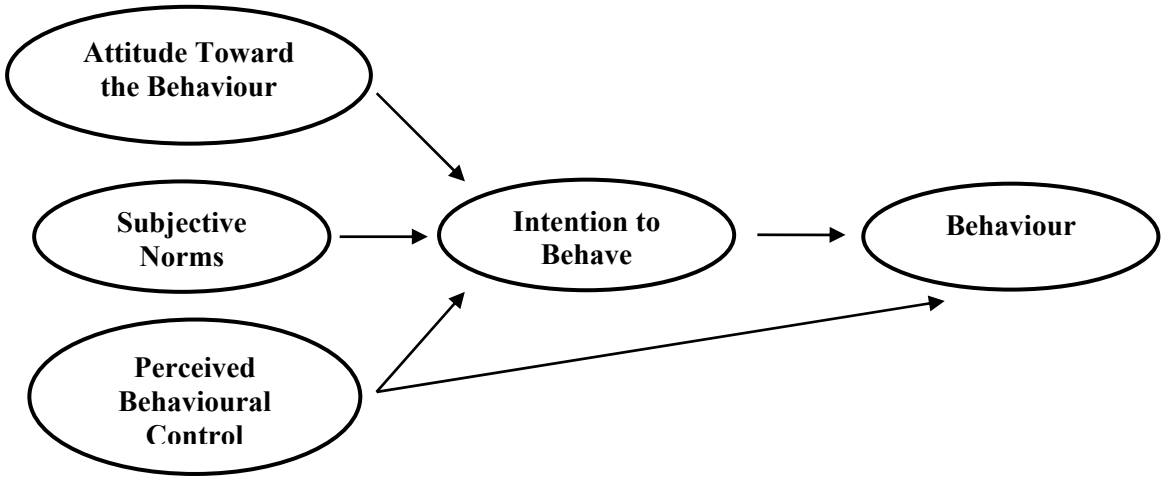
As previously mentioned, this Doctoral Thesis is focused on the study of organizational effects in influencing individual behaviours. This is coherent with a scientific debate characterized by the idea that individuals both define and are defined by the social groups and organizations in which they participate (Saegert & Winkel, 1990). Individuals can

have multiple affiliations. The behaviours and perceptions of the individual are differently influenced by the membership in different work organizations (Ashforth & Mael, 1989). Individuals who are employed in Public Institutions might develop a Public service oriented motivation (March & Olsen, 1989; Perry, 2000). It can be argued that actors construct beliefs and behaviours based on what is appropriate in light of their environment and the norms of behaviour of those around them. Therefore, I expect that the Attitudes, the Perceptions and the Behaviours of Academic Entrepreneurs might be influenced by their University affiliation.

In order to test this assumption I've identified the Entrepreneurial Orientation concept (Miller, 1983) as one of the entrepreneurship related behavioural dimensions which can be suitable with the purpose of this study. Entrepreneurial Orientation represents, in fact, one of the behavioural dimensions in the entrepreneurship research where a cumulative body of knowledge is developing (Rauch, Wiklund, Lumpkin & Freese, 2004).

In the existing literature it has also been emphasized that Entrepreneurial Behaviours can not be considered under a complete volitional control. In studying behaviours the role of intentions has been showed to be predominant. Therefore, intention models offer us a significant opportunity to increase our ability to understand and predict Entrepreneurial Orientation (MacMillan & Katz, 1992). A widely accepted theoretical approach, which strongly emphasises these behavioural dimensions, is the Theory of the Planned Behaviour, proposed by Ajzen (1991). This theory is a well-established and validated psychological theory (Locke, 1991) which represent one of the most influential attitude theories in the entrepreneurship literature (Kolvereid & Bullvåg, 1996; Wiklund & Sheperd, 2003; Isaksen, 2006). The theory encompasses five specific domains: Attitude towards the Behaviour, Subjective Norms, Perceived Behavioural Control, Intention to Behave and Behaviour (see Figure 1).

Figure 1.1: Theory of the Planned Behaviour (TPB) (Ajzen, 1991)



Attitude towards the Behaviour refers to attitudes developed from the beliefs people hold about the object of the attitude. Subjective Norms, instead, are related to the approval or disapproval that important referent individuals (or groups) have in relation to the enactment of a given behaviour. Perceived Behavioural Control can be seen as the person's belief related to how easy (or difficult) the enactment of the behaviour is likely to be. Central to this theory is the role of intentions and their power in predicting the focal behaviour (Ajzen, 1991).

In order to address the theoretical issues mentioned above, I apply the Theory of the Planed Behaviour to Entrepreneurial Related Behaviours developing a structural model aimed at assessing the micro-foundation of Entrepreneurial Orientation. In the next paragraph a more detailed description of the selected micro-dimensions and of the three stages model are provided.

1.4 Process modeling

For the empirical assessment of Entrepreneurial Orientation I rely on the contribution of Covin and Slevin (1989), who propose a widely used nine items scale, encompassing three underlying dimensions (Innovativeness, Proactiveness and Riskiness). Among the direct

antecedents of Entrepreneurial Orientation I include the following dimensions: (a) Attitude toward Entrepreneurship, (b) Subjective Norms and (c) Perceived Entrepreneurial Control. Among the indirect predictors of Entrepreneurial Orientation I include the following dimensions: (a) Situationally Specific Motivation [encompassing Self Efficacy (Baum et al., 2001) and Risk Taking (Gomez-Mejia & Balkin,1989)], (b) Individual skills [encompassing Technical Skills (Gupta & Govindarajan, 2000), Procedural Skills (Gupta & Govindarajan, 2000) and Organizational Skills (Roberts & Fusfeld, 1981)], (c) Personal traits [encompassing Passion (Locke, 1993) and Tenacity (Gartner, Gatewood, & Shaver, 1991)], as well as the Perceptions of (d) Environmental Supports [encompassing Government Support, Context Support and University Support (Fini & Grimaldi, 2007)] and Environmental Heterogeneity [encompassing Market Dynamism (Miller & Friesen, 1982) and Industry Opportunity (Miller, 1987)]. In Figure 1.2 I report the conceptual model[6].

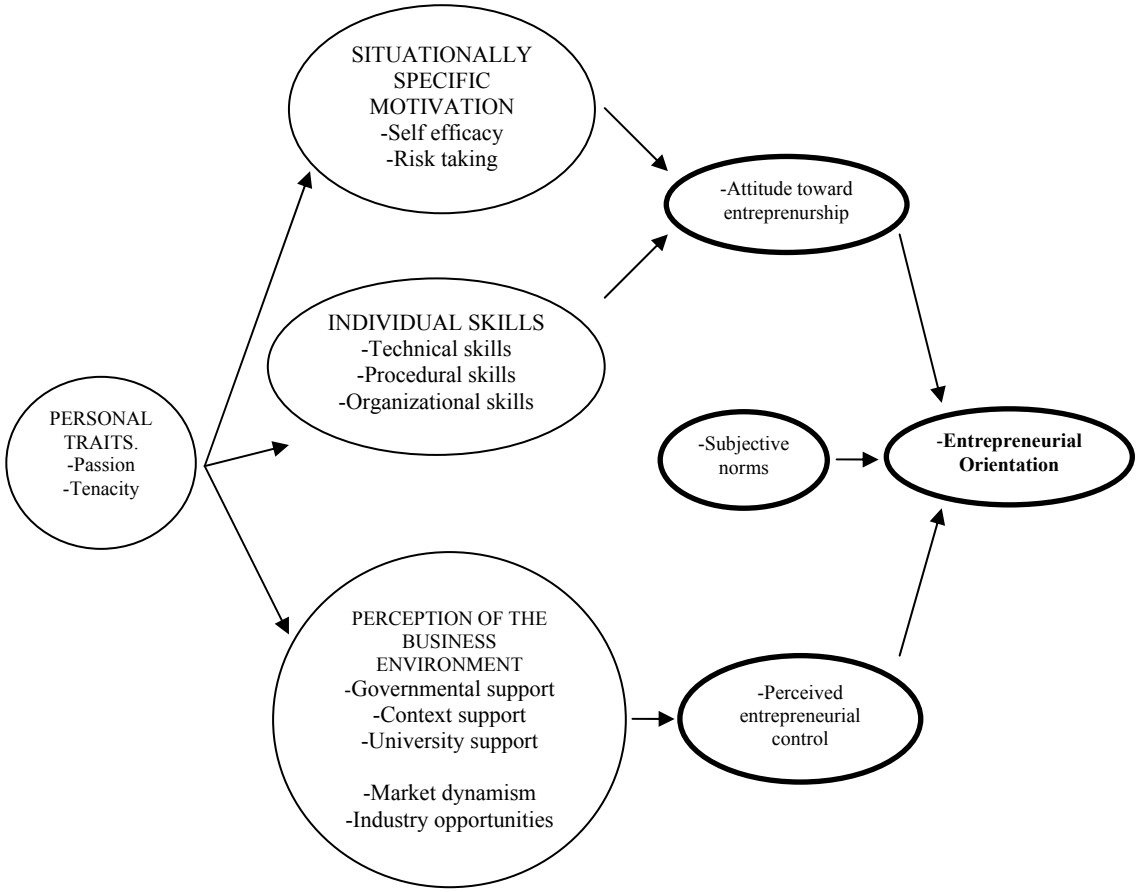
1.5 Research design

1.5.1 The Research setting

The study is situated in the Emilia Romagna region. Emilia Romagna is one of the leading regions in Italy in terms of economic growth and innovation development. It has been also identified by the European Commission as one of the leading regions in Europe for its growth in Academic Spin-offs and, more generally, for its proactive role in supporting research-to-industry technology transfer. Located in the north of Italy, Emilia Romagna has an area of about 22,100 sq. km and a population of 4.1 million, with an annual per capita GDP of 28,684 € which is among the highest in Europe (the European average is 22,400 €) (Eurostat, 2005).

[6] A more detailed specification of the causal paths is reported in Chapter 4 (Paper II).

Figure 1.2: Conceptual model of the micro foundation of Entrepreneurial Orientation



One of the peculiar characteristics of the Emilia Romagna production system is represented by several clusters of Small-Medium Enterprises operating in specific sectors and concentrated in specific geographical areas: industrial machinery (especially the packaging sector), the agricultural and food sector (including well-known products such as Parmigiano Reggiano cheese, traditional balsamic vinegar, Parma ham), the mechanical area (which includes Ducati, Ferrari, Lamborghini and Maserati), the ceramic industry (the district in Sassuolo is the world leader for both tile production and related machinery), the bio-medical sector (specifically the districts of Ferrara and Medolla). With 3.7 researchers for every 1,000 inhabitants and an R&D expenditure rate (over GDP) of 0.61 Emilia Romagna is among the top three Italian regions for R&D workforce (the national average is of 2.8 reserachers/1000 inhabitants) and expenses (the average national R&D expenditure is 0.54) (Istat, 2003). In November 2003, Emilia Romagna has adopted its first program for industrial research,

innovation and technology transfer (PRRIITT)[7], aimed at fostering applied research through new collaborations between public researchers and industry, the creation of new research labs by industry and the creation of Academic Spin-offs. It also is the first example of an Italian region with its own law concerning innovation. This program, which allocated around 160 million€ of public money to support innovation in different forms between 2003 and 2005, has given emphasis to new research-based venture creation. More precisely, the program includes the activation of a regional venture capital fund of about 13 million€ (10 million€ of which is directly provided by the regional government) and 1 million€ in direct funding assigned to newly-established high tech start-ups. This regional initiative followed legislative changes at the national level aimed at creating the conditions necessary for an effective commercialization of research results of Academic Spin-offs.

The national Law 297 of 27th August 1999 reformulated rules and practices in support of scientific and technological research, the diffusion of technologies and labor mobility for researchers. This law was meant to provide financial benefits in support of the creation of new Academic Spin-offs. Following this important national law, the majority of Italian universities and Public Research Centers adopted, within their organizations, Spin-off regulations to set rules on duties and rights for the parties involved, to define the practices to be followed and to allocate specific tasks to those Universities administrators, who are in charge of technology transfer activities. After an initial period of reluctance, now Italian Universities are increasingly adopting measures to favor the Spin-off creation. Emilia Romagna's Universities have been among the first Italian Public Research Institutions in formalizing a Patent (1996) and Spin-off regulation (2002) (Baldini, Grimaldi, & Sobrero, 2004) (see appendix A for a list of the existing Universities and Public Research Centers Support Mechanisms).

[7] http://first.aster.it/dossier/dossier.php Misura 2 (Azione A e B) of PRRIITT (Programma regionale per la ricerca industriale, l'innovazione e il trasferimento tecnologico). Misura 2 refers to the infrastructural and organizational support (Azione A) and to the financial support (Azione B) in order to foster the creation of new entrepreneurial activities.

1.5.2 The questionnaire

Based on the theoretical and empirical research on the foundation of entrepreneurship I've constructed a survey to collect data directly from Entrepreneurs. The survey is structured in two main parts (Part 1 and Part 2): the first one is dedicated to gather information at firm level, while the second one is aimed at gathering information at individual level. Part 1 encompasses four sections, one aimed at collecting general information relating to the firm (e.g. company name, year of establishment, social capital composition, industrial sector, etc.), a second aimed at collecting data on companies' financial and innovative performance (e.g. turnover, number of employees and collaborators, number of new products, services and processes introduced since the start up, number of requested and obtained patents, number of commercial and technological collaborations, etc.), a third one gathering data on the sources and amount of financing and the fourth one focusing on company's existing network and relationships with institutions.

I have structured the individual level survey (Part 2) into six sections: in the first one I gather demographical information and personal traits (gender, education, employment); in the second I gather information about psychological attributes (passion for corporate work, tenacity, occupational risk, financial risk, gambling risk, self efficacy); in section three I collect information about individual skills (technical and organizational skills, patenting, serial entrepreneurship, previous employment); in section four I focus on the Entrepreneurial Orientation and some related dimensions, in the fifth one I address the perception of the market dynamics, the industry opportunities and the perceived corporate strategy; finally, the last section is devoted to investigate the perceived support (and obstacles) coming from the government, the local context and university. The questionnaire has been validated by a panel of 10 expertises (professors and managers of incubators and technology transfer offices) and 10 entrepreneurs. Almost all the constructs included in the questionnaire have been used and

validated in previous research[8] (see Appendix D for the Italian version of the two questionnaires)[9]

1.5.3 The Sample

I include in the analysis all new ventures based on the transfer of knowledge generated within the five Universities settled in Emilia Romagna, namely: the University of Bologna, the University of Ferrara, the University of Modena and Reggio Emilia, the University of Parma and Catholic University of Milan at Piacenza; and the three Public Research Centres: CNR, ENEA and INFM. The estimated number of Academic Spin off in Emilia Romagna is 89 firms.

My definition of Academic Spin-off includes companies which have either the University/Research Centre or at least one academic/researcher (full, associate, assistant professor; senior, young researcher; lecturer; research fellow; PhD student; technician) among the founders. Such a definition encompasses situations where: a) there is a formal commitment of the University/Research Centre (the Spin-off has passed through the University/Research Centre Spin-off regulation approval, or University/Research Centre is involved as one of the shareholders); b) there is no formal commitment of the Public Research Organization (except for individuals who decide to share equity). I do not include in my definition those firms based on a university technology license established by surrogate Academic Entrepreneurs (Radosevich, 1995).

The regional population of Academic Spin-offs have been matched to a sample of Private Start-ups in terms of: industry, year of establishment and localization (Ateco codification) (see Appendix B for the firm level descriptive statistics and Appendix C for the list of firms included in the study).

[8] Composite Reliability indexes are available in each of the three papers (Please refer to Chapters 3, 4 and 5).
[9] Both questionnaires are available and translated in English (Please refer to Chapters 3, 4 and 5).

Information about the regional Academic Spin-offs have been gathered through the regional Universities websites, Research Centres websites, Regional Technology Transfer Offices, and University Technology Transfer Offices (where available). For each venture I have been able to retrieve: name, telephone and e-mail for the relevant people. Information for the matched samples have been gathered through the data bases of the local Chamber of Commerce.

Data have been gathered through face-to-face interviews which lasted, on average, one hour and a half. For the Academic Spin-offs, I started the data collection in November 2006 ending it at the beginning of February 2007, with a total number of 72 Academic Spin-offs visited and 132 Entrepreneurs interviewed (104 'Academic Entrepreneurs' with a current affiliation with Public Research Institutions). The overall firm level response rate is 81% (72/89) and the overall individual-level response rate is 32% (132/407).

Almost all the high-tech industries are significantly represented in the region except for the Aerospace, Biotechnological and Pharmaceutical industries, which turned out to be under-represented especially in the Private Start-up sample. Because of that, it has been impossible to match 8 of the Academic Spin-offs affiliated to those industries. Three Academic Spin-offs remained unmatched because the selected Private firms decided not to participate at the study (and because it was impossible to replace them). The matched procedure ended up with 72 Academic Spin-offs and a corresponding sample of 61 Private Start-ups. For the Private Start-ups I started the data collection at the beginning of March 2007 ending it at the beginning of May 2007 with a total number of 61 Private Start-ups visited and 68 individuals interviewed (63 'Private Entrepreneurs' with no formal relationships with Public Research Institutions). This corresponds to an overall individual level response rate of 33% (68/207).

1.6 Research Outputs

In the following section I present a brief description of the three research essays which represent the core of this Doctoral Thesis. For each paper, I report the title, the co-authors, the extended abstract and the conferences/journals where it has been presented or submitted.

Paper I: Exploring Characteristics and Behaviours of Individuals: a comparative analysis of Academic and Private Entrepreneurs (with Rosa Grimaldi and Maurizio Sobrero)

This paper presents an empirical investigation of personal characteristics of founders of high tech Start-ups. Among the individual-level characteristics that we investigate there are: Entrepreneurial Orientation Related Dimensions, Situationally Specific Motivation, Personal Traits, Individual Skills and Founders' Perception of the Business Environment. We compare a sample of 104 Academic Entrepreneurs to a control sample of 63 Private Entrepreneurs affiliated to a matched sample of 72 Academic Spin-offs and Private Start-ups to detect any similarities/differences in individual characteristics and behaviours. We provide descriptive statistics of the Entrepreneurs and their companies. In order to explore individual-level characteristics, we use scales which have been extensively used in sociological and psychological studies on individuals. We run Confirmatory Factor Analysis to validate these scales. Empirical evidence shows that Academic Entrepreneurs have a higher instruction level and a higher number of patents applications. Very few of them, in comparison to their private counterparts, have created more than one company. Academic Entrepreneurs take fewer Risks and have less Passion for Corporate Work. They also have fewer Procedural Skills but a higher level of Organizational Skills. Academic founders perceive the external Support (from the Government, from the local Context in which their companies are settled and from Universities) to be higher than Private Entrepreneurs. There are no major differences in terms of Entrepreneurial Orientation Related Dimensions, Tenacity and Self Efficacy, Technical

Skills and perception of Market Dynamism and Industry Opportunity. Policy implications are discussed.

This paper has been presented at: (a) Technology Transfer Society, T2S Conference 2007, University of California, Riverside, USA; (b) FIRB 2007 annual meeting (11th-12th november), Politecnico di Torino, Italy; (c) The Dynamics of Science-Based Entrepreneurship, 2008, March 31st – April 2nd, Sestri Levante, Italia.

This paper has been accepted for a possible inclusion in the Journal of Technology Transfer's Special Issue on Academic Spin offs;

Paper II: A multidimensional model of Entrepreneurial Orientation (with Gian Luca Marzocchi)

The purpose of this paper is twofold. First, it tests the validity and robustness of the Entrepreneurial Orientation construct; second, it attempts to assess the nomological validity of measure through the analysis of the causal relationships between Entrepreneurial Orientation and a set of its antecedents. We rely on a sample of 200 Entrepreneurs, affiliated to a matched sample of 72 Academic Spin-offs and Private Start-ups. The firms have been matched in terms of Industry, Year of Establishment and Localization. They are all located in the Emilia Romagna region in northern Italy. Data has been gathered through face-to-face interviews. In our contribution, Entrepreneurial Orientation is operationalized through the Strategic Posture Scale (Covin and Slevin, 1989) which encompasses three underlying dimensions: Innovativeness, Proactiveness and Riskiness. Other than examining internal consistency for the construct, however, no attempt has been made to investigate the validity of the items in the scale and to test for a second-order factorial structure. It is our aim to assess that Entrepreneurial Orientation exhibits a three-component structure (Innovativeness, Proactiveness and Riskiness) that may be represented by means of a second-order factor. We

use Confirmatory Factor Analysis to correct for measurement error in assessing Entrepreneurial Orientation and to test its convergent and discriminant validity.

Despite an increasing interest in methodological practices in the field of entrepreneurship, no previous attempts have been sought to provide a multidimensional characterization of Entrepreneurial Orientation and to propose a set of antecedents for that measure. In the attempt to fill this gap, we build our measurement model on scales extensively used and validated in sociological and psychological studies. Our measures assume individuals as units of analysis and propose a comprehensive model of the antecedents of the Entrepreneurial Orientation. We investigate six major domains: (a) Personal traits, (b) Situationally Specific Motivation, (c) Individual Skills, (d) Support coming from the External Environment, (e) Market Dynamism and Industry Opportunity, (f) Entrepreneurial Orientation Related Dimensions. The statistical analysis are performed through a Structural Equation Modeling technique (Lisrel 8.80, Joreskog, K., & Sorbom, D. 2006). The measurement models show that Entrepreneurial Orientation is a multi-dimensional micro-founded construct which is influenced by Personal traits, Situationally Specific Motivation, Individual Skills, and partially by the Perception of the Business Environment.

This paper has been submitted to the Academy of Management conference, 2008, Entrepreneurship division;

This paper has been accepted for a possible inclusion in the Organizational Research Method's Special Issue on Research Methods in Entrepreneurship.

Paper III: Does the multiple affiliation of Academic Entrepreneurs influence their behaviours? An empirical study (with Rosa Grimaldi, Gian Luca Marzocchi and Maurizio Sobrero)

The study of the individual behaviours as a result of group membership represents a central issue in the management literature. The purpose of this paper is to test the differences in individual behaviours between a sample of 92 Academic Entrepreneurs and 63 Private Entrepreneurs, affiliated to a matched-pair sample of 52 Academic Spin-offs and Private Start-ups. We develop a two-stages measurement model of Entrepreneurial Orientation and its antecedents. Our results show that Entrepreneurial Orientation is a multi-dimensional micro-founded construct which is influenced by individual behaviours related to three macro domains: Situationally Specific Motivation, Individual Skills, and Perception of the Business Environment. Our results show that the differences in the behaviours lay in Self Efficacy, Risk Taking, Procedural Skills, and in the Support coming from the Context and University. The proposed model reveals that Academics' Entrepreneurial Behaviour is mainly influenced by the availability of Technical Skills and by the Perception of a Supportive Environment. On the contrary, Private Entrepreneurs are mostly driven by Self Efficacy while their perception of the External Support negatively impacts the Entrepreneurial Behaviour. Managerial implications are discussed.

This paper has been submitted to the 2008 DRUID Conference, Copenhagen, June 17-20, 2008.

1.7 Remainder

This Doctoral Thesis is organized as follows: Chapter 2 encompasses the description of both the population and the sample of Entrepreneurs, the descriptive statistics for the 200 interviewed entrepreneurs and the statistical difference tests (sample vs. population). Chapter

3 includes the paper (I) titled: **'*Exploring Characteristics and Behaviours of Individuals: a comparative analysis of Academic and Private Entrepreneurs*'** in which I address the issue of differences/similarities in the behaviours between the two types of Entrepreneurs. Chapter 4 encompasses the paper (II) titled: '***A multidimensional model of Entrepreneurial Orientation'*** in which I develop a multidimensional measurement model for assessing individual Entrepreneurial Orientation. Chapter 5 includes the paper (III) titled: '***Does the multiple affiliation of Academic Entrepreneurs influence their behaviours? An empirical study***' in which I apply the developed measurement model to a matched sample of individuals affiliated to a matched-pair sample of Academic Spin-offs and Private Start-ups in order to assess the organizational influences in the enactment of the behaviours. In Chapter 6 I present the conclusions.

In the Appendix A I provide a general description of the support mechanisms put in place by the Universities and by the Public Research Centres. In appendix B I provide a general description of the Academic Spin-offs sample and of the matched sample reporting some firm level statistics. In appendix C I exhibit the list of the 133 firms included in this Doctoral Thesis, while in Appendix D I include the two questionnaires which have been used for the data collection. Appendix E reports the detailed program of the seminar organized as the result of this Doctoral Thesis.

REFERENCES
(CHAPTER 1)

Ajzen, I. 1991. The theory of planned behavior. ***Organizational Behavior and Human Decision Processes***, 50: 179-211.

Ashforth, B., & Mael, F. 1989. Social Identity theory and the organization. ***The Academy of Management Review,*** 14, 1: 20-39.

Baldini, N., Grimaldi R., & Sobrero M., 2004, '***La diffusione di pratiche organizzative tra pressioni ambientali e processi di legittimazione***', In Zollo G. (a cura di), Valori, risorse e competenze nelle organizzazioni, Edizioni Scientifiche Italiane, Napoli. *XV conference AIIG*, 14-15 ottobre.

Baron, R. A. 2004. The cognitive perspective: A valuable tool for answering entrepreneurship's basic "why" questions. ***Journal of Business Venturing***, 19, 2: 221-239.

Baum, R.J., Locke, E., & Smith, K.G. 2001. A multidimensional model of venture growth. ***Academy of Management Journal***, 44, 2: 292-303.

Covin, J. G., & Slevin, D. P. 1989. Strategic management of small firms in hostile and benign environments. ***Strategic Management Journal***, 10: 75-87.

Covin, J. G., Green, K. M., & Slevin, D. P. 2006. Strategic process effects on the entrepreneurial orientation - sales growth rate relationships. ***Entrepreneurship Theory and Practice***, 30, 1: 57-81.

Eisenhardt KM., & Schoonhoven CB., 1990, Organizational Growth: Linking Founding Team, Strategy, Environment, and Growth among U.S. Semiconductor Ventures, 1978-1998, ***Administrative Science Quarterly,*** vol. 35.

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

Eurostat, 2005 http://epp.eurostat.ec.europa.eu/

Fini, R., & Grimaldi, R. 2007. Academic Founders and Business Opportunity Generation: an Empirical Analysis based on Italian Academic Spin-offs'. In: M. Dowling, Schmude J., (Eds.) ***Empirical Entrepreneurship in Europe: New Perspectives***: 177-197, Edward Elgar UK.

Gartner, W. B., Gatewood, E., & Shaver, K. G., 1991, Reasons for starting a business: Not-so-simple answers to simple questions. In G. E. Hills & R. W. LaForge (Eds.), ***Research at the marketing/entrepreneurship interface:*** 90–101. Chicago: University of Illinois at Chicago.

Gomez-Mejia L.R., & Balkin, D. 1989. Effectiveness of Individual and aggregate compensation strategies. ***Industrial relations***, 28, 3: 431-445.

Gupta, A.K., & Govindarajan, V. 2000. Knowledge flows within multinational corporations. ***Strategic management journal***, 21, 4: 473-496.

Isaksen, E. 2006. ***Initial growth intentions and subsequent early business performance***. Working paper.

ISTAT. 2003. http://www.istat.it/ambiente/contesto/infoterr/azioneB.html

Joreskog, K., & Sorbom, D. 2006. ***Lisrel 8.80***, software.

Kolvereid, L., & Bullvåg, E. 1996. Growth intentions and actual growth: the impact of entrepreneurial choice. ***Journal of Enterprising Culture***, 4, 1: 1–17.

Lacetera, N. 2008. ***Academic Entrepreneurship.*** Working Paper, Available at SSRN: http://ssrn.com/abstract=1090714.

Locke, E. A. 1991. Introduction to special issue. O***rganizational Behaviour and Human Decision Making***, 50, 2: 151–3.

Lockett, A., & Wright, M. 2005. Resources, capabilities, risk capital and the creation of universities spin-out companies. ***Research Policy***, 34: 1043-1057.

Louis K., Bluemental D., 1989, Entrepreneurs in Academe: an exploration of behaviours among life scientists, ***Administrative science quarterly***, 34,1, pp.110-131.

Lumpkin, G. T., & Dess, G. G. 1996. Clarifying the entrepreneurial orientation construct and linking it to performance. ***The academy of management review***, 21(1): 135-172.

MacMillan, I.C., Katz, J.A. 1992, Idiosyncratic milieus of entrepreneurial research: The need for comprehensive theories, ***Journal of Business Venturing***, 7:1-8.

March, J. & Olsen, J. P. 1989. ***Rediscovering Institutions: the organizational basis of Politics***. New York: free press.

Miller D., 1987, The structural and environmental correlates of business strategy. ***Strategic management journal***, 8(1): 55-76.

Miller, D. 1983. The correlates of entrepreneurship in three types of firms. ***Management science,*** 29: 770-791.

Miller, S. & Friesen, P. 1982, Innovation in conservative and entrepreneurial firms: Two models of strategic momentum. ***Strategic Management Journal,*** 3: 1-25.

Mustar P., Renault M., Colombo M.G., Piva E., Fontes M., Lockett A., Wright M., Clarysse B., Moray N., 2006, Conceptualising the heterogeneity of research-based spin-offs: A multi-dimensional taxonomy, ***Research Policy,*** 35, pp. 289–308.

Perry, J. 1996. Bringing Society in: Toward a theory of public service motivation. ***Journal of Public Administration Research and Theory***, 10, 2: 471-488.

Radosevich, R. 1995. A model for entrepreneurial spin-offs from public technology sources. ***International Journal of Technology Management***, 10, 7/8: 879-93.

Rauch, A., Wiklund, J., Lumpkin, G.T., & Frese, M. 2004. ***Entrepreneurial orientation and business performance: a meta-analysis***. Paper presented at the 2004 Babson-Kauffman Entrepreneurship Research Conference in Glasgow, Scotland.

Roberts, E. B., & Fusfeld, A. R. 1981. Staffing the Innovative Technology-Based Organization. ***Sloan Management Review,*** 22, 3: 19.

Saegert, S. & Winkel, G. H. 1990. Environmental Psychology. ***Annual Reviews Psychology***, 41: 441-477.

Shane, S. 2004. ***Academic Entrepreneurship: University Spin-offs and Wealth Creation.*** UK: Edward Elgar Publishing.

Wiklund, J., & Shepherd, D. 2003. Knowledge-Based Resources, Entrepreneurial Orientation, and the Performance of Small and Medium-Sized Businesses. ***Strategic Management Journal,*** 24: 1307–1314.

CHAPTER 2

THE ENTREPRENEURS

The following chapter is organized into three Sections. Section 2.1 provides a characterization of the 614 shareholders affiliated to the 133 interviewed firms. The 407 shareholders, affiliated to the 72 'Academic Spin-offs', are compared, along some dimensions such as: gender, etc., to the control group of 207 shareholders affiliated to 61 'Private Start-ups'. Section 2.2 reports some detailed information, both at 2006 and at the establishment, for the 132 interviewed *Public Entrepreneurs (*from now on: *Public)* and for the control sample of 68 *Private Entrepreneurs (*from now on: *Private).* In Section 2.3 the Sample (observed) and the Population (observable) are compared.

With Public Research Institutions (PRI) I refer to both the Public Universities (UNI) and the Public Research Centers (PRC). With *Public (or Private) shareholder* I refer either to an individual, an Institution, a firm which shares some equity in an 'Academic Spin-off' (or 'Private Start-up'). With *Public (or Private) Entrepreneur* I refer to an individual who is a founder and shares some equity in an 'Academic Spin-off' (or 'Private Start-up'). With *Public (or Private) 'Academic-affiliated' Entrepreneur*[10] I refer to an individual who is a founder and shares some equity in an 'Academic Spin-off' (or 'Private Start-up') and is employed (either Fully or Pro-Tempore) in a Public Research Institution.

2.1 The Population: a characterization of the Public and the Private shareholders

In this section I provide a general characterization of the 614 shareholders who are currently (at 2006) sharing some equity in the 133 firms included in the analysis. The information I have been able to retrieve for the Population are: (a) the shareholders team composition at 2006, (b) the shareholders' gender, and (c) the shareholders participation at the

[10] For the sake of simplicity these individuals are going to be labelled Academic (and Private) Entrepreneurs

Spinner program[11] (a public program aimed at supporting regional entrepreneurship and at developing entrepreneurial skills). In Table 2.1 I report the shareholders team composition for both the 72 'Academic Spin-offs' and the 61 matched 'Private Start-ups'. The shareholders types have been divided into seven categories, namely: (1) 'Institution', (2) 'Private Firm', (3) 'Financial Institution', (4) 'Public Fully-Employed', (5) 'Public Pro-Tempore Employed', (6) 'Former Public Employed' and (7) 'Non-Public Affiliated'. In the 'Institution' category I include: the five regional Universities (UNI) (Bologna, Ferrara, Modena-Reggio Emilia, Parma and Cattolica Piacenza), the Public Foundations and Associations (Fondazione Alma Mater and Confindustria) the regional Public Research Centers (PRC) (Cnr, Infm, Infn, Enea) and the Scientific Parks (Parma TecnInnova and Parco del Delta del Po). In the 'Private Firm' domain I include the Private Companies which share equity in the firm, while in the third domain, 'Financial Institution', are included the Banks and the Venture Capital Firms. Within the 'Public Fully Employed' category I consider: the Full Academic (UNI) (full, associate and assistant professors, technical personnel and administrative staff who are fully employed at the University) and the Full Researcher (PRC) (head researchers, researchers and technicians who are fully employed at the Public Research Centers). In the fifth category, 'Public Pro-Tempore Employed', I include: the Pro-Tempore Academic (UNI) (research fellows, PhD students, lecturer and university collaborators affiliated to University) and the Pro-Tempore Researchers (PRC) (research fellows and research collaborators affiliated to Public Research Centers). In the six domain, 'Former Public employed', I consider both: the Former Public Fully Employed (such as: professors, technicians, etc.) and the Former Pro-Tempore Employed (such as: PhD student, lecturers, etc.). In the 'Non Public Affiliated' category I include: the Business Angels and the individuals with No current or former Affiliations with the PRI.

[11] www.spinner.it Spinner is an initiative of the Regione Emilia-Romagna, financed by the European Social Found, aimed at supporting entrepreneurship and technology transfer from the regional public research institutions to the firms.

Table 2.1: Shareholders team composition (at 2006)

		Academic Spin-offs (N=72)			Private Start-ups (N=61)			Total firms (N=133)		
Domain	**Specific definition**	**Freq.**	**Mean**	**Std. Dev.**	**Freq.**	**Mean**	**Std. Dev.**	**Freq.**	**Mean**	**Std. Dev.**
Institution	University (UNI)	29	0.40	0.52	0	0.00	0.00	29	0.22	0.43
	Public Foundation/ Association	3	0.04	0.20	0	0.00	0.00	3	0.02	0.15
	Public Research Centre (PRC)/ Scientific Park	4	0.06	0.23	0	0.00	0.00	4	0.03	0.17
Private Firm	Firm	31	0.43	1.09	19	0.31	0.76	50	0.38	0.95
Financial Institution	Bank	3	0.04	0.26	2	0.03	0.18	5	0.04	0.23
	Venture capitalist	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00
Public Fully Employed[12]	Full Academic (UNI)	123	1.90	1.81	0	0.00	0.00	123	0.92	1.50
	Full Researcher (PRC)	19	0.26	0.71	0	0.00	0.00	19	0.14	0.54
Public Pro-Tempore Employed[13]	Pro Tempore Academic (UNI)	79	1.09	1.50	5	0.08	0.92	84	0.63	1.20
	Pro Tempore Researcher (PRC)	5	0.07	0.26	0	0.00	0.00	5	0.04	0.19
Former Public Employed	Former Public Fully/Pro-Tempore Employed	32	0.44	0.80	16	0.26	0.68	48	0.36	0.75
Non public affiliated	Business Angels	2	0.03	0.17	0	0.00	0.00	2	0.02	0.12
	Private Individuals	77	1.07	1.25	165	2.70	1.81	242	1.82	1.73
	Total Shareholders	**407**	**5.65**	**3.35**	**207**	**3.39**	**1.73**	**614**	**4.62**	**2.95**

In Table 2.2 I report Entrepreneurs' gender. The 81% of *Public* are males and in a similar fashion the 83% of the *Private* are.

Table 2.2: Entrepreneurs' gender

	Public Entrepreneurs (N=337)			Private Entrepreneurs (N=186)			Total Entrepreneurs (N=523)		
	n	**Freq.**	**Perc.**	**n**	**Freq.**	**Perc.**	**N**	**Freq.**	**Perc.**
Males	309	251	81.0	184	153	83.0	493	404	82.0

In Table 2.3 I provide some information related to the entrepreneurs' participation to the Spinner program. Spinner is a public financed program aimed at supporting and fostering

[12] In the 'Public Fully Employed' domain I include: Full academic (UNI) (professore emerito, professore fuori ruolo, professore ordinario, professore associato e ricercatore universitario, dipendente universitario area tecnica, dipendente universitario area amministrativa), Full researcher (PRC) (dirigente di ricerca, ricercatore, tecnologo, tecnico – afferenti ad un centro di ricerca pubblico).

[13] In the 'Public Pro-Tempore Employed' domain I include: Pro-tempore academic (UNI) (assegnista di ricerca universitario, studente di dottorato, professore a contratto, borsista di ricerca universitario –afferenti ad una università), Pro-tempore researcher (PRC) (assegnista di ricerca, borsista di ricerca – afferenti ad un centro di ricerca pubblico).

entrepreneurial activities. The 41% of *Public* participated at the program, on the contrary only the 5% of the *Private* did.

Table 2.3: Entrepreneurs' Spinner program participation

	Public Entrepreneurs (N=337)		Private Entrepreneurs (N=186)		Total Entrepreneurs (N=523)	
	Frequency	**Percent**	**Frequency**	**Percent**	**Frequency**	**Percent**
Spinner participation	139	41.0	9	5.0	148	28.0

2.1.1 The Population of the Public and Private 'Academic-affiliated' Entrepreneurs

The following section is aimed at characterizing the *Public* and *Private* Entrepreneurs with a formal on-going relationship (employment or collaboration) with a Public Research Institution. The descriptive statistics are referred to the individuals included in the 'Public Fully Employed' and 'Public Pro-Tempore Employed' domains presented in Table 2.1. The first set of Tables (from 2.4 to 2.6) refer to the 226 *Public Entrepreneurs* who have a formal relationship with a Public Research Institution, while the latter set of Exhibits (from Table 2.7 to 2.9) are referred to the 5 *Private Entrepreneurs* who are currently affiliated to either UNI or PRC. The 226 *Public* include 142 'Public Fully Employed' and 84 'Public Pro-Tempore Employed'. The 5 *Private* include 5 'Public Pro-Tempore Employed'.

In Table 2.4 I include some information about the public employment status, both at the establishment and at 2006, of the 226 *Public Entrepreneurs*. At 2006, the 'Public Fully Employed' Entrepreneurs are: 1 Emeritus professor (UNI), 42 Full professors (UNI), 36 Associate professors (UNI), 26 Assistant professors (UNI), 13 Technical personnel (UNI), 1 Administrative staff (UNI), 1 Head Researcher (PRC), 15 Researchers (PRC) and 3 Technicians (PRC). The 'Public Pro-Tempore Employed' category encompasses: 33 Research fellows (UNI), 23 PhD students (UNI), 23 Lecturers/Collaborators (UNI), 1 Research fellow (PRC) and 4 Research collaborators (PRC).

Table 2.4: *Public 'Academic-affiliated' Entrepreneurs*: Status

		Establishment		2006	
		Frequency	**Percent**	**Frequency**	**Percent**
	Non public affiliation	7	3.1	0	0.0
	Missing values	11	4.9	4	1.8
Public Fully Employed[14]	Emeritus professor (UNI)	0	0.0	1	0.4
	Full professor (UNI)	32	14.2	42	18.6
	Associate professor (UNI)	38	16.8	36	15.9
	Assistant professor (UNI)	28	12.4	26	11.5
	Technical personnel (UNI)	12	5.3	13	5.8
	Administrative staff (UNI)	1	0.4	1	0.4
	Head Researcher (PRC)	1	0.4	1	0.4
	Researcher (PRC)	14	6.2	15	6.6
	Technician (PRC)	3	1.3	3	1.3
Public Pro-Tempore Employed[15]	Research fellow (UNI)	29	12.8	33	14.6
	PhD student (UNI)	15	6.6	23	10.2
	Lecturer/Collaborator (UNI)	30	13.3	23	10.2
	Research fellow (PRC)	1	0.4	1	0.4
	Research collaborator (PRC)	4	1.8	4	1.8
	Total	**226**	**100.0**	**226**	**100.0**

The table also reports the public employment status at the establishment. At the establishment, 7 Public Entrepreneurs, who currently have an on-going relationship with Public Research Institutions, were non affiliated to both UNI or PRC. The increases are registered in terms of Emeritus professors (from 0 to 1), Full professors (from 32 to 42), Technical personnel (from 12 to 13), Research fellows (from 29 to 33) and PhD students (form 15 to 23). The decreases are registered in terms of: Associate professors (from 38 to

[14] In the 'Public Fully Employed' domain I include: Emeritus professor (UNI) (professore emerito, professore fuori ruolo), Full professor (UNI) (professore ordinario), Associate professor (UNI) (professore associato), Assistant professor (UNI) (ricercatore universitario), Technical personnel (UNI) (dipendente universitario area tecnica), Administrative staff (UNI) (dipendente universitario area amministrativa), Head Researcher (PRC) (dirigente di ricerca), Researcher (PRC) (ricercatore), Technician (PRC) (tecnico).

[15] In the 'Public Pro-Tempore Employed' domain I include: Research fellow (UNI) (assegnista di ricerca universitario), PhD student (UNI) (studente di dottorato), Lecturer/Collaborator (UNI) (professore a contratto, borsista di ricerca universitario), Pro tempore researcher (PRC) (assegnista di ricerca), Research collaborator (PRC) (borsista di ricerca).

36), Assistant professors (from 28 to 26) and Lecturers/Collaborators (from 30 to 23). All other categories result to be stationery.

In the following table (Table 2.5) I report the Entrepreneurs' affiliation (both at the establishment and at 2006). In 2006, the 226 Entrepreneurs are mainly affiliated to the regional Public Research Institutions; only 8 are affiliated to extra regional UNI and only 1 is affiliated to a PRC located outside Emilia Romagna. There are very few differences between the affiliation at the establishment and at 2006, showing fairly low mobility rates among the different Institutions. University of Bologna, with more than 50% of affiliations (both at the establishment and at 2006), is the leading PRI. In the table I've also included the Emilia Romagna Government Offices because of the current pro-tempore affiliation of 2 *Public Entrepreneurs*.

Table 2.5: *Public 'Academic-affiliated' Entrepreneurs*: Affiliation

	Establishment		2006	
	Frequency	**Percent**	**Frequency**	**Percent**
Non public affiliation	7	3.1	0	0.0
Missing values	11	4.9	12	5.3
Cnr Bologna	8	3.5	8	3.5
Cnr Faenza	4	1.8	4	1.8
Cnr Modena	3	1.3	3	1.3
Enea Bologna	6	2.7	6	2.7
Infm Padova	1	0.4	1	0.4
Regione Emilia Romagna	1	0.4	2	0.9
University of Bologna	115	50.9	116	51.3
University of Ferrara	27	11.9	29	12.8
University of Firenze	1	0.4	1	0.4
University of Foggia	1	0.4	1	0.4
University of Lecce	1	0.4	1	0.4
University of Milano (San Raffaele)	1	0.4	1	0.4
University of Modena-Reggio Emilia	15	6.6	16	7.1
University of Padova	2	0.9	2	0.9
University of Parma	19	8.4	20	8.8
University of Piacenza (Cattolica)	1	0.4	1	0.4
University of Urbino	1	0.4	1	0.4
University of Verona	1	0.4	1	0.4
Total	**226**	**100.0**	**226**	**100.0**

In Table 2.6 I report the nine selected research domains in which the *Public* are currently focusing on: Agrvet (encompassing agro, food and veterinary), Bio (encompassing

biology and biotechnology), Chim (encompassing chemistry and pharmacology), Ecosta (encompassing statistics, management, political science, economics and law), Fismat (encompassing physics, geometry and math), Geo (encompassing geology, archeology, architecture), Ingind (encompassing aerospace eng., electrical eng., materials eng., mechanical eng., nuclear eng.) Inginf (encompassing automation, electronics, ICT, telecommunication) and Med (encompassing biomedical, genetics, medicine).

Table 2.6: *Public 'Academic-affiliated' Entrepreneurs*: Research domain[16]

	Frequency	Percent
Missing values	12	5.3
Agrvet	21	9.3
Bio	14	6.2
Chim	21	9.3
Ecosta	22	9.7
Fismat	12	5.3
Geo	19	8.4
Ingind	43	19.0
Inginf	50	22.1
Med	11	4.9
Not Applicable	1	0.4
Total	**226**	**100.0**

The evidence provided shows that more than 40% of the *Public* are researching in engineering related fields while they're putting a limited effort in the other fields; all the other domains, in fact, account for less than 10% each. The 'Not applicable' domain refers to an Entrepreneur who has an affiliation with a Public Research Institution but without being involved in any research activities.

In the following three Tables (Table 2.7, 2.8, 2.9) I access the Status, the Affiliation and the Research domain of 5 *Private Entrepreneurs* with an on going relationship with

[16] Between parenthesis I report the research areas which have included in each macro-domain: Agrvet (agro-alimentare, veterinaria), Bio (bio-informatica, bio-ingegneria, biotecnologie, biologia ambientale e biologia marina), Chim (chimica, biochimica, fotochimica, farmacologia), Ecosta (contabilità, diritto, economia agraria, estimo rurale, management, politica economica e statistica), Fismat (fisica, geometria e matematica), Geo (geologia, idrologia, archeologia, architettura, beni culturali), Ingind (ing. acustica, ing. aero-spaziale, domotica, ing. elettrica, ing. gestionale, fisica tecnica, ing. materiali, ing. meccanica ing. nucleare), Inginf (ing. automazione, ing. elettronica, ICT, ing. informatica, intelligenza artificiale, misure elettroniche, ricerca operativa, robotica, ing. telecomunicazioni, visione artificiale), Med (biomedicale, genetica, medicina, oncologia).

Public Research Institutions. All individuals started their commitments after the establishment of their firms, therefore no employment status at the establishment is reported.

Table 2.7: *Private 'Academic-affiliated' Entrepreneurs*: Status

		2006	
		Frequency	**Percent**
Public Pro-Tempore Employed	Research fellow (UNI)	2	40.0
	Lecturer/Collaborator (UNI)	3	60.0
	Total	**5**	**100.0**

As Table 2.8 shows, the 5 Entrepreneurs are affiliated to 5 different Universities, 4 of them settled in the region Emilia Romagna.

Table 2.8: *Private 'Academic-affiliated' Entrepreneurs*: Affiliation

	2006	
	Frequency	**Percent**
University of Bologna	1	20.0
University of Ferrara	1	20.0
University of Modena-Reggio Emilia	1	20.0
University of Parma	1	20.0
University of Venezia	1	20.0
Total	**5**	**100.0**

The 5 *Private Entrepreneurs* are researching in 5 different areas, as it is showed in Table 2.9.

Table 2.9: *Private 'Academic-affiliated' Entrepreneurs*: Research domain

	Frequency	**Percent**
Fismat	1	20.0
Geo	1	20.0
Ingind	1	20.0
Inginf	1	20.0
Med	1	20.0
Total	**5**	**100.0**

2.2. The Sample: a characterization of the interviewed Entrepreneurs

In this section I characterize the 200 Entrepreneurs included in the sample[17]. Table 2.10 presents the Entrepreneurs' gender. As the statistics show, the 80% of *Public Entrepreneurs* are males as well as the 87% of *Private*.

Table 2.10: Gender

	Public Entrepreneurs (N=132)		Private Entrepreneurs (N=68)		Total Entrepreneurs (N=200)	
	Frequency	**Percent**	**Frequency**	**Percent**	**Frequency**	**Percent**
Males	106	80.0	59	87.0	165	83.0

In Table 2.11 I report the decades of birth. The data presented in Table 2.12 shows similar patterns within the two samples. More than a half of the interviewed Entrepreneurs were born in the '60 -'70 decades. The highest frequencies are registered: in the 70s for the *Public* and in the 60s for the *Private*.

Table 2.11: Decade of birth

	Public Entrepreneurs (N=132)		Private Entrepreneurs (N=68)		Total Entrepreneurs (N=200)	
	Frequency	**Percent**	**Frequency**	**Percent**	**Frequency**	**Percent**
1930	4	3.0	1	1.4	5	2.2
1940	9	6.8	7	10.2	16	8.5
1950	19	14.3	18	26.4	37	20.4
1960	35	26.5	22	32.3	57	29.4
1970	64	48.4	19	27.9	83	38.2
1980	1	0.7	1	1.4	2	1.1
Total	**132**	**100.0**	**68**	**100.0**	**200**	**100.0**

In Table 2.12 I report some information in relation to the place of birth (missing values are more than 75%). Based on the partial evidence collected: 36 *Public Entrepreneurs* were born in Emilia Romagna, 2 in foreign countries and the remaining in other Italian regions (2 South, 8 Centre and 12 North). For the *Private* I have been able to retrieve information about 2 of them (both of them were born in Emilia Romagna).

[17] The number of observations which have been included in the analysis always corresponds to the sample size (N); if not, the actual sample size (n), or the missing values, are reported.

Table 2.12: Place of birth

	Public Entrepreneurs (N=132)		Private Entrepreneurs (N=68)		Total Entrepreneurs (N=200)	
	Frequency	**Percent**	**Frequency**	**Percent**	**Frequency**	**Percent**
Missing value	72	54.5	66	97.0	138	75.8
Ascoli Piceno	2	1.5	0	0.0	2	0.8
Bologna	14	10.6	1	1.5	15	6.0
Chieti	1	0.7	0	0.0	1	0.4
Etiopy	1	0.7	0	0.0	1	0.4
Ferrara	4	3.0	0	0.0	4	1.5
Foggia	1	0.7	0	0.0	1	0.4
Forlì-Cesena	3	2.2	0	0.0	3	1.2
Greece	1	0.7	0	0.0	1	0.4
Imperia	1	0.7	0	0.0	1	0,4
Mantova	1	0.7	0	0.0	1	0.4
Modena	5	3.7	0	0.0	5	1.9
Padova	1	0.7	0	0.0	1	0.4
Parma	5	3.7	0	0.0	5	1.9
Pavia	2	1.5	0	0.0	2	0.8
Pesaro Urbino	4	3.0	0	0.0	4	1.5
Piacenza	3	2.2	0	0.0	3	1.2
Pistoia	1	0.7	0	0.0	1	0.4
Pordenone	1	0.7	0	0.0	1	0.4
Ravenna	1	0.7	0	0.0	1	0.4
Reggio Emilia	2	1.5	1	1.5	3	1.2
Rimini	1	0.7	0	0.0	1	0.4
Roma	1	0.7	0	0.0	1	0.4
Siena	1	0.7	0	0.0	1	0.4
Taranto	1	0.7	0	0.0	1	0.4
Venezia	2	1.5	0	0.0	2	0.8
Total	**132**	**100.0**	**68**	**100.0**	**200**	**100.0**

2.2.1 Characterization of the Entrepreneurs Sample (at 2006)

In the following section I present a multidimensional characterization of the 132 *Public Entrepreneurs* and the control sample of 68 *Private*. Table 2.13 shows the average shares at 2006. The interviewed individuals own, on average, about the 45% of the company's total shares. The two samples show similar values.

Table 2.13: Share

	Public Entrepreneurs (N=132)			Private Entrepreneurs (N=68)			Total Entrepreneurs (N=200)		
	n	**Mean**	**Std. Dev.**	**n**	**Mean**	**Std. Dev.**	**n**	**Mean**	**Std. Dev.**
At 2006	11	45.09	30.49	58	44.24	22.56	69	44.38	23.74

In Table 2.14 I report some information about the amount of time each shareholder has been dedicating to corporate work in 2006 (on a weekly basis). The full time job applies to individuals who work in the firm more then 40 hours per week; part time job refers to a commitment of 40 or less hours per week. Among the *Public* more than the 60% are part time workers, while more than the 90% of the *Private* are full time workers.

Table 2.14: Time devoted to corporate work (in 2006)

	Public Entrepreneurs (N=132)		Private Entrepreneurs (N=68)		Total Entrepreneurs (N=200)	
	Frequency	**Percent**	**Frequency**	**Percent**	**Frequency**	**Percent**
Missing value	6	4.5	0	0.0	6	2.2
Full time	45	34.2	62	91.1	107	62.5
Part time	81	61.3	6	8.9	87	35.3
Total	**132**	**100.0**	**68**	**100.0**	**200**	**100.0**

The following table (Table 2.15) refers to the corporate position that each Entrepreneur holds in 2006. I identify 4 possible categorizations: a) 'Presidential level', including President and Vice President, b) 'CEO level' (Chief Executive Officer), c) 'Other C level position', such as: CFO (Chief Financial Officer), COO (Chief Operating Officer) and CTO (Chief Technical Officer) and d) 'Board member'. The frequencies show that almost the 50% of the *Public Entrepreneurs* are board members (46%), while the majority of the *Private* ones are CEOs (38%)[18].

Table 2.15: Corporate occupational level (at 2006)[19]

	Public Entrepreneurs (N=132)		Private Entrepreneurs (N=68)		Total Entrepreneurs (N=200)	
	Frequency	**Percent**	**Frequency**	**Percent**	**Frequency**	**Percent**
Missing value	5	3.8	0	0.0	5	1.9
Presidential level	26	19.7	18	26.5	44	23.1
CEO level	33	25.0	26	38.2	59	31.6
Other C-level	7	5.3	6	8.8	13	7.1
Board member	61	46.2	18	26.5	79	36.3
Total	**132**	**100.0**	**68**	**100.0**	**200**	**100.0**

[18] If more than one position the respondent is included in the highest responsibly category

[19] 'Presidential level' includes: presidente, vice presidente e legale rappresentate; 'CEO level' includes: amministratore delegato, direttore generale, amministratore unico; 'Other C level position' includes: direttore tecnico, direttore commerciale, direttore sanitario; 'Board member' includes: membro consiglio di amministrazione/socio.

In Table 2.16 I assess the relationship each Entrepreneur has with the Public Research Institutions (at 2006). The categorization reflects the one previously used (see Table 2.1). The 79% of the *Public Entrepreneurs* are currently affiliated to a PRI, the 11% of them have been affiliated in the past, while the 10% have never been working or collaborating with UNI or PRC. In the control sample, the 8% of the interviewed Entrepreneurs have an ongoing pro tempore relationship with the Public Research Institutions, the 10% of them had a collaboration in the past, while more then the 80% have never been formally interacting.

Table 2.16: Entrepreneurs' Public Institutions relationship (at 2006)

	Public Entrepreneurs (N=132)		Private Entrepreneurs (N=68)		Total Entrepreneurs (N=200)	
	Frequency	**Percent**	**Frequency**	**Percent**	**Frequency**	**Percent**
Public Fully Employed	62	47.0	0	0.0	62	30.0
Public Pro-Tempore Employed	42	32.0	5	7.8	47	24.0
Former Public Fully/Pro-Tempore Employed	15	11.0	7	10.0	22	11.0
No public affiliation	13	10.0	56	82.2	69	35.0
Total	**132**	**100.0**	**68**	**100.0**	**200**	**100.0**

In the Table 2.17 I provide some information about the number of interviewed Entrepreneurs who have participated to the Spinner program. About the 50% of the *Public* have been involved in the program, on the contrary the 6% of the *Private* have.

Table 2.17: Spinner participation (at 2006)

	Public Entrepreneurs (N=132)		Private Entrepreneurs (N=68)		Total Entrepreneurs (N=200)	
	Frequency	**Percent**	**Frequency**	**Percent**	**Frequency**	**Percent**
Spinner participation	61	46.0	4	6.0	65	33.0

In the following Exhibit (Table 2.18) I report some information about the shareholders' entrepreneurial activities. Among the 200 interviewed Entrepreneurs, 34 *Public* and 30 *Private* have been involved in other firms' creation (other then the one in which they're currently involved).

Table 2.18: Establishment of other firms (at 2006)

	Public Entrepreneurs (N=132)			Private Entrepreneurs (N=68)			Total Entrepreneurs (N=200)		
	Freq.	Mean	Std. Dev.	Freq.	Mean	Std. Dev.	Freq.	Mean	Std. Dev.
Establ. other firms	34	0.26	0.44	30	0.44	0.50	64	0.32	0.47

As reported in Table 2.19 the *Public Entrepreneurs* have founded one firm each, with the exception of 3 of them who have founded 2. Among the *Private*, 30 individuals have been involved in the creation of 57 firms. Specifically, 13 *Private Entrepreneurs* have founded 2 firms, while 5 have established 3 or more (these specific information are not included in the Exhibit). 28 Entrepreneurs (14 for each sample) have settled the new company within the same sector of their previous ventures.

Table 2.19: Serial entrepreneurship (at 2006)

	Public Entrepreneurs (N=34)			Private Entrepreneurs (N=30)			Total Entrepreneurs (N=64)		
	Freq.	Mean	Std. Dev.	Freq.	Mean	Std. Dev.	Freq.	Mean	Std. Dev.
N other firms	37	1.09	0.29	57	1.90	1.67	94	1.47	1.22
Firms same sector	14	0.45	0.51	14	0.47	0.51	28	0.46	0.50

In Table 2.20 I report some information about the individuals who are involved in patent activities: 50 Public Entrepreneurs, as well as 12 Private, have filed at least one patent. I assess: the number of patents filed, the number of patents granted, the number of patents granted at the Italian, European and US Patent Offices (P.O.). The average number of patents filed is higher for the *Public Entrepreneurs* (4.34 vs. 3.17). The same pattern persists for the patents granted which are consistently higher for the *Public Entrepreneurs* (3.47 vs. 1.56).

Table 2.20: Patent activity (at 2006)

	Public Entrepreneurs (N=132)				Private Entrepreneurs (N=68)				Total Entrepreneurs (N=200)			
	n	Freq.	Mean	Std. Dev.	n	Freq.	Mean	Std. Dev.	n	Freq.	Mean	Std. Dev.
Patent filed	50	217	4.34	6.66	12	38	3.17	5.34	62	255	4.11	6.40
Patent granted (P.G.)	36	125	3.47	4.18	9	14	1.56	0.53	45	139	3.09	3.81
P.G. Italian P.O.	33	99	3.00	3.70	7	8	1.14	0.38	40	107	2.68	3.43
P.G. European P.O.	18	73	4.06	4.24	5	5	1.00	0.00	23	78	3.39	3.94
P.G. U.S. P.O.	18	66	3.67	4.24	3	3	1.00	0.00	21	69	3.29	4.03

In Table 2.21 I report the Entrepreneurs' average years of higher education. The average instruction level is higher for the *Public Entrepreneurs* (11.54 vs. 8.59), with a smaller standard deviation (1.61 vs. 3.05).

Table 2.21: Years of higher education (at 2006)

	Public Entrepreneurs (N=132)			Private Entrepreneurs (N=68)			Total Entrepreneurs (N=200)		
	n	Mean	Std. Dev.	n	Mean	Std. Dev.	n	Mean	Std. Dev.
Average Years	132	11.54	1.61	68	8.59	3.05	200	10.54	2.61

The following table (Table 2.22) refers to the completed degrees by the Entrepreneurs at 2006. With the regard to the *Public Entrepreneurs* sample, the 50% hold a PhD degree, the 7,5% have a Master degree, the 99% have a Bachelor and the 100% of them have an High school diploma. In the *Private* sample, the 10% hold a PhD, the 11% have completed a Master, the 64% have a Bachelor degree and the 98% have an High school diploma.

Table 2.22: Completed degrees (at 2006)

	Public Entrepreneurs (N=132)		Private Entrepreneurs (N=68)		Total Entrepreneurs (N=200)	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
PhD degree	66	50.0	7	10.2	73	37.0
Master degree	10	7.5	8	11.7	18	9.0
Bachelor degree	131	99.2	44	64.7	175	87.5
High school diploma	132	100.0	67	98.5	199	99.5

The average year of completion for each degree is reported in the following Table 2.23.

Table 2.23: Year of completion

	Public Entrepreneurs (N=132)			Private Entrepreneurs (N=68)			Total Entrepreneurs (N=200)		
	n	Mean	Std. Dev.	n	Mean	Std. Dev.	n	Mean	Std. Dev.
PhD	65	1997.95	6.91	7	1998.43	5.29	72	1998.00	6.74
Master	10	1993.90	12.51	7	1995.71	7.89	17	1994.65	10.59
Bachelor	117	1991.49	11.63	41	1991.46	9.73	158	1991.48	11.14
High school	36	1989.06	7.71	24	1980.88	9.79	60	1985.78	9.43

In the following Exhibit (Table 2.24) I provide the list of the Institutions who've assigned the PhD degrees. Among the *Public* more than the 80% are regional Universities, the

16% are extra regional Institutions and the 4% are foreign Institutions. In the *Private* sample, more than the 85% of the degrees are assigned by regional Universities and the 15% by extra regional Public Research Institutions.

Table 2.24: PhD degrees: Institutions

	Public Entrepreneurs (N=132)		Private Entrepreneurs (N=68)		Total Entrepreneurs (N=200)	
	Frequency	**Percent**	**Frequency**	**Percent**	**Frequency**	**Percent**
No PhD	66	50.0	61	89.7	127	69.9
New York University (USA)	1	0.8	0	0.0	1	0.4
University La sapienza Roma	1	0.8	0	0.0	1	0.4
University of Bologna	39	29.5	4	5.9	43	17.7
University of Cambridge (UK)	1	0.8	0	0.0	1	0.4
University of Ferrara	4	3.0	0	0.0	4	1.5
University of Firenze	1	0.8	0	0.0	1	0.4
University of Grenoble (France)	1	0.8	0	0.0	1	0.4
University of Modena-Reggio Emi	3	2.3	1	1.5	4	1.9
University of Padova	3	2.3	0	0.0	3	1.1
University of Parma	6	4.5	1	1.5	7	3.0
University of Pavia	1	0.8	0	0.0	1	0.4
University of Piacenza Cattolica	3	2.3	0	0.0	3	1.1
University of Pisa	0	0.0	1	1.5	1	0.7
University of Siena	2	1.5	0	0.0	2	0.8
Total	**132**	**100.0**	**68**	**100.0**	**200**	**100.0**

In Table 2.25 I report the PhD scientific fields. The codification used is the same as above (see Table 2.6) with the addition of the category 'Scieuman' which encompasses 'classical literature' and 'historical studies'.

Table 2.25: PhD degrees: Fields

	Public Entrepreneurs (N=132)		Private Entrepreneurs (N=68)		Total Entrepreneurs (N=200)	
	Frequency	**Percent**	**Frequency**	**Percent**	**Frequency**	**Percent**
No PhD	66	50.0	61	90.0	127	70.0
Missing value	0	0.0	1	1.2	1	0.6
Agrvet	9	6.8	0	0.0	9	3.4
Bio	6	4.5	1	1.5	7	3.0
Chim	7	5.3	1	1.5	8	3.4
Ecosta	3	2.3	0	0.0	3	1.1
Fismat	10	7.6	2	2.9	12	5.3
Geo	3	2.3	1	1.5	4	1.9
Ingind	7	5.3	0	0,0	7	2.7
Inginf	16	12.1	0	0.0	16	6.1
Med	4	3.0	0	0.0	4	1.5
Scieuman	1	0.8	1	1.5	2	1.1
Total	**132**	**100.0**	**68**	**100.0**	**200**	**100.0**

In Table 2.26 I report the list of Institutions where the Entrepreneurs have obtained the Master degrees. The 40% of *Public Entrepreneurs* got their degrees outside Italy, while the 12% of *Private* did. The 30% of the *Public* and the 50% of the *Private* got their degrees attending programs hosted at regional Institutions.

Table 2.26: Master degrees: Institutions

	Public Entrepreneurs (N=132)		Private Entrepreneurs (N=68)		Total Entrepreneurs (N=200)	
	Frequency	**Percent**	**Frequency**	**Percent**	**Frequency**	**Percent**
No Master	122	92.4	60	88.2	182	90.3
Missing value	2	1.5	1	1.5	3	1.5
Ecole des Mines - Paris (France)	1	0.8	0	0.0	1	0.4
Guilford College (UK)	1	0.8	0	0.0	1	0.4
Ohio State University (USA)	0	0.0	1	1.5	1	0.7
Profingest Bologna	0	0.0	2	2.9	2	1.5
University of Bologna	0	0.0	1	1.5	1	0.7
University of Budapest (Unghery)	1	0.8	0	0.0	1	0.4
University of Ferrara	2	1.5	1	1.5	3	1.5
University of Giordany (Giordany)	1	0.8	0	0.0	1	0.4
University of Milano	0	0.0	1	1.5	1	0.7
University of Napoli	1	0.8	0	0.0	1	0.4
University of Parma	1	0.8	0	0.0	1	0.4
University of Verona	0	0.0	1	1.5	1	0.7
Total	**132**	**100.0**	**68**	**100.0**	**200**	**100.0**

In the following Exhibit (Table 2.27) I report Master fields. In the *Public* sample more than 50% got Masters in technological related fields while among the *Private* almost the 50% hold a Master in management or economics.

Table 2.27: Master degrees: Fields

	Public Entrepreneurs (N=132)		Private Entrepreneurs (N=68)		Total Entrepreneurs (N=200)	
	Frequency	**Percent**	**Frequency**	**Percent**	**Frequency**	**Percent**
No Master	122	92.4	60	88.2	182	90.3
Missing value	2	1.5	1	1.5	3	1.5
Agrvet	0	0.0	1	1.5	1	0.7
Bio	1	0.8	0	0.0	1	0.4
Chim	2	1.5	0	0.0	2	0.8
Ecosta	1	0.8	4	5.9	5	3.3
Fismat	1	0.8	1	1.5	2	1.1
Geo	2	1.5	0	0.0	2	0.8
Ingind	1	0.8	0	0.0	1	0.4
Med	0	0.0	1	1.5	1	0.7
Total	**132**	**100.0**	**68**	**100.0**	**200**	**100.0**

Table 2.28 provides the list of Institutions from where the Entrepreneurs got their Bachelor degrees. With the regard to the *Public Entrepreneurs* almost the 60% of them got their Bachelors at the University of Bologna, the 10% of them got their degrees from extra regional Universities, while the remaining hold a degree from the other regional Institutions. Almost the 30% of the *Private Entrepreneurs* hold a Bachelor degree from the University of Bologna, more than the 10% have a degree from extra regional Universities, about the 20% hold a degree from the other regional Universities, while the 35% have no Bachelor.

Table 2.28: Bachelor degrees: Institutions

	Public Entrepreneurs (N=132)		Private Entrepreneurs (N=68)		Total Entrepreneurs (N=200)	
	Frequency	**Percent**	**Frequency**	**Percent**	**Frequency**	**Percent**
No Bachelor	1	0.8	24	35.3	25	18.0
Missing value	14	10.6	2	2.9	16	6.8
Oxford University (UK)	0	0.0	1	1.5	1	0.7
Politecnico of Milano	0	0.0	2	2.9	2	1.5
University La sapienza Roma	2	1.5	0	0.0	2	0.8
University of Ancona	1	0.8	1	1.5	2	1.1
University of Aquila	0	0.0	1	1.5	1	0.7
University of Bari	0	0.0	1	1.5	1	0.7
University of Bologna	78	59.1	20	29.4	98	44.3
University of Castellanza (Cattaneo)	0	0.0	1	1.5	1	0.7
University of Ferrara	4	3.0	5	7.4	9	5.2
University of Firenze	1	0.8	0	0.0	1	0.4
University of Genova	1	0.8	0	0.0	1	0.4
University of Giordany (Giordany)	1	0.8	0	0.0	1	0.4
University of Milano San Raffaele	0	0.0	1	1.5	1	0.7
University of Modena-Reggio Emilia	8	6.1	3	4.4	11	5.2
University of Napoli	1	0.8	0	0.0	1	0.4
University of Padova	4	3.0	0	0.0	4	1.5
University of Parma	9	6.8	5	7.4	14	7.1
University of Pavia	2	1.5	0	0.0	2	0.8
University of Piacenza Cattolica	4	3.0	0	0.0	4	1.5
University of Pisa	1	0.8	1	1.5	2	1.1
Total	**132**	**100.0**	**68**	**100.0**	**200**	**100.0**

In the following Table (Table 2.29) I report the Bachelor related fields. *Public Entrepreneurs*, prevalently hold a degree in engineering (34%) and chemical-pharmaceutical (13%) related fields. The *Private Entrepreneurs* mainly hold their degrees in engineering (23%) and geology (16%) related areas.

Table 2.29: Bachelor degrees: Fields

	Public Entrepreneurs (N=132)		Private Entrepreneurs (N=68)		Total Entrepreneurs (N=200)	
	Frequency	**Percent**	**Frequency**	**Percent**	**Frequency**	**Percent**
No Bachelor	1	1.0	24	35.3	25	18.2
Missing value	13	9.6	2	3.0	15	6.3
Agrvet	16	12.1	0	0.0	16	6.1
Bio	11	8.3	1	1.5	12	4.9
Chim	18	13.6	4	5.9	22	9.8
Ecosta	7	5.3	4	5.9	11	5.6
Fismat	9	6.8	2	2.9	11	4.9
Geo	9	6.8	11	16.2	20	11.5
Ingind	14	10.6	4	5.9	18	8.2
Inginf	30	22.7	12	17.6	42	20.2
Med	2	1.5	0	0.0	2	0.8
Scuman	2	1.5	4	5.9	6	3.7
Total	**132**	**100.0**	**68**	**100.0**	**200**	**100.0**

In the following Table (Table 2.30) I exhibit the localization of the high school Institutions where the interviewed Entrepreneurs obtained their High school diplomas.

Table 2.30: High school diplomas: Localization

	Public Entrepreneurs (N=132)		Private Entrepreneurs (N=68)		Total Entrepreneurs (N=200)	
	Frequency	**Percent**	**Frequency**	**Percent**	**Frequency**	**Percent**
No High School diploma	0	0.0	1	1.5	1	0.7
Missing value	96	72.7	43	63.2	139	68.0
Ascoli Piceno	2	1.5	0	0.0	2	0.8
Bologna	6	4.5	9	13.2	15	8.9
Ferrara	2	1.5	2	2.9	4	2.2
Foggia	1	0.8	0	0.0	1	0.4
Forlì-Cesena	1	0.8	1	1.5	2	1.1
La Spezia	1	0.8	0	0.0	1	0.4
Mantova	1	0.8	0	0.0	1	0.4
Milano	1	0.8	0	0.0	1	0.4
Modena	5	3.8	7	10.3	12	7.0
Padova	1	0.8	0	0.0	1	0.4
Parma	4	3.0	2	2.9	6	3.0
Pavia	2	1.5	0	0.0	2	0.8
Pesaro Urbino	2	1.5	0	0.0	2	0.8
Piacenza	3	2.3	0	0.0	3	1.1
Ravenna	0	0.0	1	1.5	1	0.7
Reggio Emilia	1	0.8	2	2.9	3	1.8
Rimini	1	0.8	0	0.0	1	0.4
Roma	1	0,8	0	0.0	1	0.4
Udine	1	0,8	0	0.0	1	0.4
Total	**132**	**100.0**	**68**	**100.0**	**200**	**100.0**

Within the *Public Entrepreneurs* sample, the 15% of them got their High school diplomas in the Emilia Romagna region and the 13% outside the region. On the contrary, all the *Private* hold a regional High school degree.

In Table 2.31 I report a categorization of the different types of Diplomas. Four are the identified macro areas: 'Classical' (developing: classical, historical and humanistic skills), 'Scientific' (developing: mathematical, physics, science related skills), 'Administrative' (developing: accounting and economic skills) and 'Technical' (developing production and manufacturing skills). *Public Entrepreneurs* mainly hold technical (9%) and scientific (9%) Diplomas, while the *Private* have mainly developed some technical (22%) and administrative (7%) skills.

Table 2.31: High school diplomas: Fields[20]

	Public Entrepreneurs (N=132)		Private Entrepreneurs (N=68)		Total Entrepreneurs (N=200)	
	Frequency	**Percent**	**Frequency**	**Percent**	**Frequency**	**Percent**
Missing value	98	74.2	44	64.7	142	69.5
Classical	8	6.1	2	2.9	10	4.5
Scientific	13	9.8	2	2.9	15	6.4
Administrative	1	0.8	5	7.4	6	4.1
Technical	12	9.1	15	22.1	27	15.6
Total	**132**	**100.0**	**68**	**100.0**	**200**	**100.0**

2.2.2 Characterization of the Entrepreneurs Sample (at the establishment)

In the following section I provide a characterization of the 200 interviewed Entrepreneurs by the time they established their companies. In Table 2.32 I show the average shares at the establishment. The interviewed individuals own, on average, about the 44% of the company's total shares. The two samples show similar values. The patterns are consistent with the ones showed for 2006 in Table 2.13.

[20] Between parenthesis I report the Italian denomination of the Diplomas I included in each category: 'Classical' (liceo classico, liceo linguistico, istituto magistrale, istituto d'arte) 'Scientific' (liceo scientifico) 'Administrative' (ragioneria, segretaria di azienda) 'Technical' (perito, istituto tecnico)

Table 2.32: Share

	Public Entrepreneurs (N=132)			Private Entrepreneurs (N=68)			Total Entrepreneurs (N=200)		
	n	Mean	Std. Dev.	n	Mean	Std. Dev.	n	Mean	Std. Dev.
At Establishment	11	44.09	22.22	57	44.95	22.49	68	44.81	22.28

In Table 2.33 I report the completed degrees by the Entrepreneurs at the establishment of their companies. With the regard to the *Public Entrepreneurs*, 57 held a PhD (compared to the 65 at 2006), 7 a Master (compared to the 10 at 2006), while the number of Bachelor degrees and High school diplomas remained the same. Within the *Private Entrepreneurs* sample the only variation occurred in the number of Master degrees (from 7 at establishment to 8 at 2006).

Table 2.33: Completed degrees (at the establishment)

	Public Entrepreneurs (N=132)		Private Entrepreneurs (N=68)		Total Entrepreneurs (N=200)	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
PhD degree	57	43.0	7	10.0	64	32.0
Master degree	7	5.0	7	10.0	14	7.0
Bachelor degree	131	99.0	44	65.0	175	88.0
High school diploma	132	100.0	67	99.0	199	99.0

In the following table (Table 2.34) I report a set of activities in which the interviewed Entrepreneurs have been involved in their previous careers (before establishing the company). The respondents have been asked, with a yes or no forced answer, their involvement in each of the listed activities (see Table 2.34). The *Public Entrepreneurs* have been mainly involved in research (both at UNI and PRC), in consultancy and in product and process design related activities. They show a low level of expertise in some procedural areas such as: accounting, marketing, sales, finance and logistic. The *Private Entrepreneurs* show a more comprehensive background. With the exception of research, finance and logistic related dimensions, the *Private* possess a more diversified background with high level of expertise in almost all the listed areas.

Table 2.34: Previous experience (at the establishment)

	Public Entrepreneurs (N=132)		Private Entrepreneurs (N=68)		Total Entrepreneurs (N=200)	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Production	8	6.0	15	22.0	23	11.5
Design	21	15.9	30	44.1	51	25.5
Accounting	7	5.3	14	20.5	21	10.5
Marketing	5	3.7	16	23.5	21	10.5
Sales	6	4.5	23	33.8	29	14.5
Finance	0	0.0	1	1.4	1	0.5
Logistic	4	3.0	8	11.7	12	6.0
Managerial	12	9.0	18	26.4	30	15.0
Consultancy	47	35.6	38	55.8	85	42.5
Research at UNI	99	75.0	12	17.6	111	55.5
Research at PRC	25	18.9	4	5.8	29	14.5

In the following Exhibit (Table 2.35) I report some information about the Entrepreneurs' personal income variation one year after the establishment of the company. For both samples the increases are similar and relevant (46% of the shareholders experienced an increase). Among the *Public* only the 8% had a decrease (and the remaining 45% experienced no changes), in the *Private* sample more than the 26% had a decrease (and only 27% experienced no changes).

Table 2.35: Personal income variation after one year of operation (at the establishment)

	Public Entrepreneurs (N=132)		Private Entrepreneurs (N=68)		Total Entrepreneurs (N=200)	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
NO changes	60	45.4	19	27.6	79	39.5
Increase	61	46.0	31	46.0	92	46.0
Decrease	11	8.6	18	26.4	29	14.5

For those Entrepreneurs who declared to have experienced an increase (or decrease) in the yearly personal income I report the corresponding means and standard deviations of the magnitude. The average increase is lower for the *Public* (30.80 vs. 47.42), with a lower standard deviation. The average decrease is bigger for the *Public* (48.64 vs. 30.83) with a bigger standard deviation.

Table 2.36: Variation in the yearly personal income after one year of operation

	Public Entrepreneurs (N=132)			Private Entrepreneurs (N=68)			Total Entrepreneurs (N=200)		
	n	Mean	Std. Dev.	n	Mean	Std. Dev.	n	Mean	Std. Dev.
% increase	61	30.80	27.63	31	47.42	53.99	92	36.40	39.07
% decrease	11	48.64	34.79	18	30.83	18.17	29	37.59	26.65

In the following Exhibit (Table 2.37) I report the affiliation of the 200 interviewed Entrepreneurs at the establishment of their firms. 9 *Public Entrepreneurs* had a multiple affiliation. Among *Public Entrepreneurs* the 15% were involved in other firms, more than the 80% were affiliated to Public Research Institutions, very few were students or unemployed. Among the *Private* more than the 80% were involved in other firms, less than the 5% were students and the 10% were unemployed.

Table 2.37: Affiliation at the establishment

	Public Entrepreneurs (N=132 + 9)		Private Entrepreneurs (N=68)		Total Entrepreneurs (N=200)	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Private firm[21]	20	15.0	57	84.0	77	39.0
University	100	76.0	0	0.0	100	50.0
Public research centre	11	8.0	0	0.0	11	5.0
Student (undergrad)	2	2.0	3	4.5	5	3.0
Unemployed	6	5.0	7	10.0	13	7.0
Other occupation (affiliated to Government Offices)	2	2.0	1	1.5	3	2.0

In Table 2.38 I provide more detailed information about the multiple affiliation of the 9 *Public Entrepreneurs* at the establishment.

Table 2.38: Multiple affiliation (at the establishment)

Affiliation (I)	Affiliation (II)	Frequency
Private firm	Full professor	2
Private firm	Research fellow (UNI)	4
Private firm	Government office (ER) collaborator	2
Student	Research fellow (UNI)	1

[21] In the category Private firm I include individuals who held one of the following positions: Entrepreneur (shareholder), CEO, CFO, COO, CTO, Manager, Employee and Collaborator

Building on the evidence provided in Table 2.37, in the following set of Tables (from 2.39 to 2.41), I report a detailed characterization of the occupational status of the individuals involved in the private firms (77) (Table 2.39) and in the Public Research Institutions (111) (Table 2.40 and 2.41) at the establishment.

Table 2.39 refers to the corporate occupational status of the 77 individuals who were working in a private firm. Among the *Public* the 80% were already Entrepreneurs, the 5% were managers and the 10% were employed. In the *Private* sample, more than the 60% were Entrepreneurs, more than the 10% were C-level employed, the 5% were managers and the 23% were employed or collaborators.

Table 2.39: Corporate occupational status (at the establishment)

	Public Entrepreneurs (N=20)		**Private Entrepreneurs (N=57)**		**Total Entrepreneurs (N=77)**	
	Frequency	**Percent**	**Frequency**	**Percent**	**Frequency**	**Percent**
Missing value	1	5.0	0	0.0	1	1.3
Entrepreneur (shareholder)	16	80.0	35	61.0	51	66.3
CEO, CFO, COO, CTO	0	0.0	6	11.0	6	7.8
Manager	1	5.0	3	5.0	4	5.2
Employee	2	10.0	12	21.0	14	18.1
Collaborator	0	0.0	1	2.0	1	1.3
Total	**20**	**100.0**	**57**	**100.0**	**77**	**100.0**

In the next Table (Table 2.40) I report the occupational status of the 111 Entrepreneurs with a Public Research Institution's affiliation. 100 of them were affiliated to Universities (59 Full Employed and 41 Pro-Tempore Employed) and 11 were affiliated to Public Research Centers (7 Full Employed and 4 Pro-Tempore Employed). These individuals are all P*ublic Entrepreneurs.*

Table 2.40: *Public 'Academic-affiliated' Entrepreneur*: Status (at the establishment)

		Frequency	Percent
Public Fully Employed	Emeritus professor	0	0.0
	Full professor	13	11.7
	Associate professor	15	13.5
	Assistant professor	14	12.6
	Technician	6	5.4
	Administrative	1	0.9
	Head Researcher (PRC)	1	0.9
	Researcher (PRC)	6	5.4
	Technicians (PRC)	0	0.0
Public Pro-Tempore Employed	Research fellow	25	22.5
	PhD students	18	16.2
	Lecturer/Collaborator	8	7.2
	Research fellow (PRC)	1	0.9
	Research collaborator (PRC)	3	2.7
	Total	**111**	**100.0**

In Table 2.41 I report the affiliation of the 111 *Public Entrepreneurs* at the establishment of the firm.

Table 2.41: *Public 'Academic-affiliated' Entrepreneurs*: Affiliation (at the establishment)

	Frequency	Percent
Cnr Bologna	7	6.3
Cnr Faenza	2	1.8
Cnr Modena	1	0.9
Enea Bologna	1	0.9
University of Bologna	65	58.5
University of Ferrara	14	12.6
University of Milano San Raffaele	1	0.9
University of Modena-Reggio Emilia	9	8.1
University of Parma	7	6.3
University of Piacenza Cattolica	4	3.6
Total	**111**	**100.0**

2.2.3 The sample of Public and Private 'Academic-affiliated' Entrepreneurs (at 2006)

Among the 132 interviewed *Public Entrepreneurs* 104 are currently employed or have an ongoing collaboration with 'Public Research Institutions'. Similarly, among the 68 *Private*, 5 have an ongoing formal relationship with both UNI or PRC. The following set of Tables (Table 2.42, 2.43 and 2.44) are referred to these specific individuals who'll be addressed as

Public 'Academic-affiliated' Entrepreneurs and *Private 'Academic-affiliated' Entrepreneurs*[22].

In the following Exhibit (Table 2.42) I report the current status of the 109 'Academic-affiliated' Entrepreneurs. The 60% of the *Public 'Academic-affiliated' Entrepreneurs* are Fully Employed while the remaining 40% are Pro-Tempore Employed. All the *Private 'Academic-affiliated' Entrepreneurs* hold a Pro-tempore Employed position at the University.

Table 2.42: Public-affiliated Entrepreneurs: Status (at 2006)

		Public 'Academic-affiliated' Entrepreneurs (N=104)		Private 'Academic-affiliated' Entrepreneurs (N=5)		Total 'Academic-affiliated' Entrepreneurs (N=109)	
		Frequency	**Percent**	**Frequency**	**Percent**	**Frequency**	**Percent**
Fully Employed	Emeritus professor (UNI)	1	1.0	0	0.0	1	0.5
	Full professor (UNI)	15	14.4	0	0.0	15	7.2
	Associate professor (UNI)	15	14.4	0	0.0	15	7.2
	Assistant professor (UNI)	17	16.3	0	0.0	17	8.2
	Technical personnel (UNI)	6	5.8	0	0.0	6	2.9
	Administrative staff (UNI)	1	1.0	0	0.0	1	0.5
	Head Researcher (PRC)	1	1.0	0	0.0	1	0.5
	Researcher (PRC)	7	6.7	0	0.0	7	3.4
	Technicians (PRC)	0	0.0	0	0.0	0	0.0
Pro-Tempore Employed	Research fellow (UNI)	19	18.0	2	40.0	21	29.0
	PhD students (UNI)	8	7.7	0	0.0	8	3.8
	Lecturer/Collaborator (UNI)	11	10.5	3	60.0	14	35.3
	Research fellow (PRC)	1	1.0	0	0.0	1	0.5
	Research collaborator (PRC)	2	1.9	0	0.0	2	1.0
	Total	**104**	**100.0**	**5**	**100.0**	**109**	**100.0**

In Table 2.43 I report the list of the PRI which are currently employing the 109 'Academic-affiliated' Entrepreneurs. Almost the 60% of the *Public 'Academic-affiliated' Entrepreneurs* are together with the University of Bologna, less then 30% are researching at the other regional Universities, the 10% are linked to Public Research Centers and only the 1% are employed in some extra-regional Universities. The 100% of the *Private 'Academic-*

[22] In Chapters 3, 4 and 5 the *Public 'Academic-affiliated' entrepreneurs* are labeled *Academic Entrepreneurs*

affiliated' Entrepreneurs are collaborating with Universities: the 80% with regional ones and the 20% with Institutions outside the region.

Table 2.43: 'Academic-affiliated' Entrepreneurs: Affiliation (at 2006)

	Public 'Academic-affiliated' Entrepreneurs (N=104)		Private 'Academic-affiliated' Entrepreneurs (N=5)		Total 'Academic-affiliated' Entrepreneurs (N=109)	
	Frequency	**Percent**	**Frequency**	**Percent**	**Frequency**	**Percent**
Cnr Bologna	7	6.7	0	0.0	7	3.4
Cnr Faenza	1	1.0	0	0.0	1	0.5
Cnr Modena	1	1.0	0	0.0	1	0.5
Enea Bologna	1	1.0	0	0.0	1	0.5
Regione Emilia Romagna	1	1.0	0	0.0	1	0.5
University of Bologna	61	58.7	1	20.0	62	39.3
University of Ferrara	14	13.5	1	20.0	15	16.7
University of Milano San Raffaele	1	1.0	0	0.0	1	0.5
University of Modena-Reggio Emilia	11	10.6	1	20.0	12	15.3
University of Parma	6	5.8	1	20.0	7	12.9
University of Venezia	0	0.0	1	20.0	1	10.0
Total	**104**	**100.0**	**5**	**100.0**	**109**	**100.0**

In the following Exhibit (Table 2.44) I list the research areas in which the 'Academic-affiliated' Entrepreneurs are currently researching. The nine domains reflect the same categorization previously used (see Table 2.6).

Table 2.44: 'Academic-affiliated' Entrepreneurs: Research area (at 2006)

	Public 'Academic-affiliated' Entrepreneurs (N=104)		Private 'Academic-affiliated' Entrepreneurs (N=5)		Total 'Academic-affiliated' Entrepreneurs (N=109)	
	Frequency	**Percent**	**Frequency**	**Percent**	**Frequency**	**Percent**
Agrvet	15	14.4	0	0.0	15	7.2
Bio	6	5.8	0	0.0	6	2.9
Chim	13	12.5	0	0.0	13	6.3
Ecosta	9	8.7	0	0.0	9	4.3
Fismat	6	5.8	1	20.0	7	12.9
Geo	10	9.6	1	20.0	11	14.8
Ingind	18	17.3	1	20.0	19	18.7
Inginf	24	23.1	1	20.0	25	21.5
Med	3	2.9	1	20.0	4	11.4
Total	**104**	**100.0**	**5**	**100.0**	**109**	**100.0**

More than the 40% of the *Public 'Academic-affiliated' Entrepreneurs* are researching in engineering related areas, almost the 15% in the agro-food industry, the 13% in chemical and pharmaceutical topics, while all the remaining research domains account for less than the 30%. The *Private 'Academic-affiliated'* are researching in five different fields: engineering (industrial and software), physics, geology and medical related topics.

2.3 Do the observed and the observables differ?

In this section I provide some statistical comparisons between the Sample of 200 Entrepreneurs and the corresponding Population of 523 Individuals. The observed and the observables are compared along three dimensions: Gender, Participation to the Spinner program and Employment affiliation at 2006. As the Table 2.45 shows, there are no differences in terms of Gender between the respondents and the population.

Table 2.45: Chi square test for: Gender

	Entrepreneurs Sample (N=200)	Entrepreneurs Population (N=523)	Residual	Chi-square test
Females	35	89	-4.45	
Males	165	404	4.45	χ^2 (1) = 0.62
Total	**200**	**493˙**		

† = < 0.1; * = < 0.05; ** = <0.01; *** = <0.001 / ˙unknown gender: 30

The following Exhibit (Table 2.46) reports the Chi-square test for the Spinner participation. As it is shown, there are no statistical differences between the two samples.

Table 2.46: Chi square test for: Spinner participation

	Entrepreneurs Sample (N=200)	Entrepreneurs Population (N=523)	Residual	Chi-square test
Spinner participant	65	148	8,40	
No spinner participant	135	375	-8,40	χ^2 (1) = 1,74
Total	**200**	**523**		

† = < 0.1; * = < 0.05; ** = <0.01; *** = <0.001

Statistical differences occur in terms of the employment affiliation at 2006 (See Table 2.47); the individuals with an 'academic-affiliation' are over-represented. This holds for the two samples analyzed together (χ^2 (3) = 13.08**), as for the two samples analyzed separately (χ^2_{Pub} (3) = 14,13**; χ^2_{Priv} (2) = 6,04*; the latter chi-square test has only 2 degrees of freedom because the 'public fully employed' category has no-observables). Both in the *Public* and *Private* samples there is an over-representation of the 'academic-affiliated' Entrepreneurs (either Public Full Employed and Public Pro-Tempore Employed).

Table 2.47: Chi square test for: employment affiliation (at 2006)

	Entrepreneurs Sample (N=200)	Entrepreneurs Population (N=523)	Residual	Chi-square test
Public Full Employed	62	142	7.69	
Public Pro-Tempore Employed.	47	89	12.96	χ^2 (3) = 13.08**
Former Public Full/Pro Temp. Empl	22	48	3.64	
No public affiliation	69	244	-24.30	
Total	**200**	**523**		

† = < 0.1; * = < 0.05; ** = <0.01; *** = <0.001

The three performed tests show that the only differences occur in terms of employment affiliation. The reason for that is related to the selected research design and to the criteria used to identify the interviewed Entrepreneurs. For the 'Academic Spin-offs', in fact, I've identified the leading *Public Entrepreneur* (as advertised by the company's websites, conferences, fairs, etc), in terms of expertise and equity shared. This resulted in an overrepresentation of 'academic-affiliated' Entrepreneurs. The *Private entrepreneurs* have been identified trough the equity criteria; also in this case the Private 'academic-affiliated' Entrepreneurs turn out to be over represented. All the five individuals with an ongoing relationship with the Public Research Institutions are also among the largest shareholders of their firms; therefore they've been selected to be interviewed. In Table 2.48 I report the shares owned (on average) by the interviewed Entrepreneurs and by the whole population. This table

shows that the average share owned by the interviewed Entrepreneurs is significantly higher than the average share owned by the others. This is coherent with the selected research design.

Table 2.48: T-test for: share owned at 2006

	Entrepreneurs Sample (N=200)			Entrepreneurs Population (N=523)			T test
	n	Mean	Std. Dev.	n	Mean	Std. Dev.	
2006	69	44.37	23.73	111	21.11	15.52	-7.9***

† = < 0.1; * = < 0.05; ** = <0.01; *** = <0.001

CHAPTER 3

PAPER I[23]

EXPLORING CHARACTERISTICS AND BEHAVIOURS OF INDIVIDUALS: A COMPARATIVE ANALYSIS OF ACADEMIC AND PRIVATE ENTREPRENEURS

ABSTRACT

This paper presents an empirical investigation of personal characteristics of founders of high-tech start-ups. Among the individual level characteristics that we investigate there are: *Personal Traits*, *Psychological Attributes*, *Skills and Competences*, *Entrepreneurial Orientation Related Dimensions*, *Founders' perception of the Support and Obstacles coming from Environment.* We compare a sample of 104 Academic Entrepreneurs to a control sample of 63 Private Entrepreneurs founders of a matched sample of Academic Spin-offs and Private Start-ups to detect any similarities or differences. The results show that the Academic Entrepreneurs differ in terms of Instruction Level, number of Patens' Application, number of Established Firms, Risk taking, Passion for Corporate Work, Organizational Skills and Perception of the external Support, while they are similar in terms of Entrepreneurial Orientation Related Dimensions, Tenacity, Self Efficacy, Technical Skills and Perception of Market Dynamism and Industry Opportunity. Policy implications are discussed.

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[23] ***Previous versions of this paper have been presented at:*** *(a) Technology Transfer Society T2S Conference, 2007, University of California, Riverside, USA; (b) Riunione annuale FIRB, 2007, 11th-12th November, Politecnico di Torino, Italia; (c) The Dynamics of Science-Based Entrepreneurship, 2008, March 31st – April 2nd, Sestri Levante Seminar, Italia;* ***Paper accepted for*** *possible inclusion in the Journal of Technology Transfer's Special Issue on Academic Spin offs;*

3.1 Introduction

The interest towards the study of entrepreneurship in the theoretical and empirical literature appears to increase over time. Since the early contribution of Schumpeter (1934), different scholars have been dealing with it in different ways (Roberts, 1991; Shane, 2004; Baum & Locke, 2004; Mustar, Renault, Colombo, Piva, Fontes, Lockett, Wright, Clarysse, & Moray, 2006). Most of the contributions have focused on high tech start-ups, which have always been at the centre of attention for the important contribution that they can give to enhance technological development of countries. Many authors, in the attempt to come to a better understanding of high tech entrepreneurship, have looked at growth patterns of Start-ups and their determinants using a firm-level perspective (Colombo & Delmastro, 2002). Some others have focused on institutional characteristics and on factors (environmental, policy, etc.), that may foster the creation of new companies (Degroof & Roberts, 2004). Some others have focused on individual level characteristics of individuals involved in the entrepreneurial process (Baum & Locke, 2004; Shane, 2004).

An important part of the literature on high tech entrepreneurship has focused on Academic Spin-offs, since these are companies supposed to have high contents of technology (Louis & Bluemental, 1989; Shane, 2004; Mustar et al, 2006). In the stream of research on Academic Entrepreneurship different scholars have pointed out that additional research is required at individual level (Lockett & Wright, 2005), in order to investigate the relevance of academic founders' incentives, motivations and capabilities in developing successful academic ventures (Shane, 2004). Exploring individual level characteristics may be important for understanding the Entrepreneurial Orientation of founders and for exploring how it relates to companies' performance.

Moreover, there is scant empirical and theoretical reflection relating to personal level characteristics fostering the creation and the success of new ventures, based on comparative

analyses between different kinds of Entrepreneurs. This suggests one simple question: do Academic Entrepreneurs differ from other Entrepreneurs in their characteristics and behaviors?

The aim of this study is to empirically analyze individual level characteristics of Academic Entrepreneurs, by using a multidimensional perspective, encompassing several dimensions that have been addressed by previous studies. The analysis is based on a sample of 104 Academic Entrepreneurs, founders of 72 Academic Spin-offs, and on a control sample of 63 Private Entrepreneurs founders of 61 Private Start-ups. The sample of Academic Spin-offs is matched with a sample of Private Start-ups in terms of Industry, Year of Establishment and Localization. All companies are located in the region Emilia Romagna, in Italy.

We provide descriptive statistics of the entrepreneurs, of their companies and of the support mechanisms put in place by the Public Research Institutions. Also, we provide empirical evidence of the differences/similarities between Academic Entrepreneurs and Private Entrepreneurs. In order to explore individual level characteristics, we use scales which have been extensively used in sociological and psychological studies on individuals. We run Confirmatory Factor Analysis to validate these scales.

Empirical evidence shows that Academic Entrepreneurs have a higher instruction level and a higher number of patens' application. Very few of them, in relation to their Private counterparts, have created more than one company. Academic Entrepreneurs are less Risk Takers and have less Passion for Corporate Work. They also have less Procedural Skills but higher level of Organizational Skills. Academic founders perceive the external Support (from the Government, from the local Context in which their companies are settled and from Universities) to be higher than Private Entrepreneurs. There are no major differences in terms of Entrepreneurial Orientation Related Dimensions, Tenacity and Self Efficacy, Technical Skills and perception of Market Dynamism and Industry Opportunity.

This study contributes to the extant literature in two ways: it addresses the topic of Academic Entrepreneurship at individual level, using a multidimensional perspectives and an interdisciplinary approach, testing scale that have been previously introduced by other researchers. Second, it is based on a matched sample of firms (in terms of industry, year of establishment and localization) all settled in the same region. The match allows to control for some dimensions, while the regional connotation of the study guarantees that all firms are regulated by the same legislation and set of norms.

The paper is organized as follows: Section 2 reviews the literature which has addressed the study of Entrepreneurs at an individual level; Section 3 addresses the peculiarities of Academic Entrepreneurs in relation to other Entrepreneurs involved in Private Start-ups; Section 4 discusses the research design, while in Section 5 the empirical analysis are presented. A final Section concludes with discussion and implications.

3.2 A Multidimensional Characterization of Entreprenerus

The focus on individuals in studying Academic Entrepreneurship is an exercise which is not only of intellectual interest but is also fundamental for extracting meaningful insights, that might be used to inform policy making with regard to university technology transfer activities (Ensley & Hmieleski, 2005). Studies on Entrepreneurs have been conducted in relation to a variety of factors, which, for the sake of simplicity, we have grouped below in different categories.

Personal/Demographic Characteristics: since the early contribution of Roberts (1991) on personal characteristics of high-tech Entrepreneurs, there have been several papers that have looked at individuals' Education (Storey, 1994; Bates, 1995), Employment Status (Taylor, 2001; Ritsila & Tervo, 2002), Age (Boyd, 1990; Bates, 1995), Marital Status (Butler

& Herring, 1991; Evans & Leighton, 1989), Income (Amit, Muller, & Cockburn, 1995), and their effect on entrepreneurial decisions.

Psychological Traits: a variety of factors have been found to be associated with the tendency of people to engage in entrepreneurial activities. Some of these have to do with traits of personality, like Need for Achievement (McClelland, 1961; Begley & Boyd, 1986), Overconfidence (Busenitz, 1999), Locus of Control (Evans & Leighton, 1989; Cromie & Johns, 983), Optimism (Cooper, Woo, & Dunkelberg, 1988), Risk Taking propensity (Begley & Boyd, 1987; Stewart & Roth, 2001, Weber, Blais, & Betz, 2002), Tenacity (Gartner, Gatewood, & Shaver, 1991), Passion (Locke, 1993). Some others have to do with motivations which are specific to entrepreneurial settings, like Self Efficacy (Baum & Locke, 2004), Goal Setting and Vision (Locke & Latham, 1990). These factors have been proven to be associated to Entrepreneurial Related Behaviours.

Skills and Competences: also Skills and Prior Knowledge influence and shape the entrepreneurial activities. In particular Career Experience (Shane & Khurana, 2003; Evans & Leighton, 1989), Serial Entrepreneurship (Kolvereid, 1996), Patenting (Roberts, 1991) Social Skills (Baron, 2004) Technical and Industry Skills (Baum, Locke, & Smith, 2001), Organizational Skills (Roberts & Fusfeld, 1981) play an important role in affecting Entrepreneurial Behaviours.

Perceptions of External Environment: the external context plays an important role in influencing individual Entrepreneurial decisions and Behaviours. The attention to the external context is coherent with a theoretical debate which emphasizes the importance of exogenous stimuli in affecting Entrepreneurial Behaviours. Several authors have stressed that Market and Industry Characteristics, Government Policies, University Support Mechanisms and, more generally, Characteristics of the Local Context in which companies are settled, may influence the generation and success of newly established companies (Shane, 2004). Perception of the

Market and Industry Dynamics are relevant in characterizing entrepreneurial actions at individual level (Wiklund, 1999; Wiklund & Sheperd, 2003). Specifically the literature has pointed out that the nature of the Industry (and of the technology itself) can influence and foster Entrepreneurial Behaviours (Hsu & Bernstein, 1997). Also governments may intervene with Founding Schemes, Tax Policies and other Support Mechanisms, which are aimed at mitigating market inefficiencies and at promoting start-up creation (Lerner, 1999). As for local context, several studies have stressed the importance for newly established companies to be settled in a fertile environment, offering Resources, both Tangible (physical infrastructure, corporate physical assets, R&D laboratories) and Intangible (human capital, routines) [Niosi & Bas, 2001], Financial Support (such as venture capital availability) [Beck, Demirgüç-Kunt, & Maksimovic, 2005], Entrepreneurial Support Services (training opportunities, small loans, physical infrastructure such as incubators and parks, business plan competition) [Feldman, 2001; Foo, Wong, & Ong, 2005], as well as the Availability of Firms in the same or Related Industries [Deeds, DeCarolis, & Coombs, 1998]. Finally, Specific University Support Mechanisms have been identified as relevant in supporting entrepreneurial actions. The set of Policies and Instruments that have been put in place by Universities for supporting Academic Entrepreneurship (but not only) is quite varied, ranging from Technology Transfer Offices and Faculty Consultants (Mian, 1996), University Incubators and Physical Resources (Mian, 1997), and University Venture Founds (Lerner 2005).

Entrepreneurial Orientation: a dimension which has been significantly studied in relation to the study of entrepreneurial activities is the so-called Entrepreneurial Intention or Orientation. Entrepreneurial Orientation cannot be directly included into the psychological domain, or among the personal traits, because it comes out as a result of an individual perception to be engaged in entrepreneurial activities (Miller, 1983; Brown, 1996; Wiklund, 1999). Entrepreneurial Orientation reflects entrepreneurs' willingness (or intention) to engage

in Entrepreneurial Behaviours. Five dimensions underline Entrepreneurial Orientation: Riskynesss, Proactiveness, Innovativeness, Competitive Aggressiveness and Autonomy (Lumpkin & Dess, 1996). Riskyness includes the uncertainty and riskyness of self-employment, which is the main factor that separates Entrepreneurs from non-Entrepreneurs. Proactivness relates to a forward-looking perspective, which is supposed to be a characteristic of a marketplace leader, who has the foresight to act in anticipation of future demand and shape the environment. Innovativeness reflects a tendency to engage in and support new ideas, novelty, experimentation, and creative processes that may result in new products, services, or technological processes. Competitive aggressiveness: it refers to a firm's propensity to directly and intensely challenge its competitors to achieve entry or improve position, in order to outperform industry rivals in the marketplace. Autonomy: it describes the independent action of an individual or a team in bringing forth an idea or a vision and carrying it through to completion.

3.3 Intrinsic features of Academic Entrepreneurs: do they differ from others?

To our knowledge there are few (if none) contributions that have looked at individual level differences between Academic Entrepreneurs and other founders of Private Start-ups. However, this is an interesting issue to be explored in general, because it may possibly explain the differences in growth patterns that might occur for Academic Spin-offs and Private Start-ups.

Very few research papers have addressed differences, at firm level, between Academic Spin-offs and Private Start-ups. Ensley and Hmieleski (2005) show that the first ones have a more homogeneous, but less dynamic, top management team and experience lower performance in terms of cash flow and revenue growth. In a recent study by Colombo and Delmastro (2002) Academic Spin-offs are not found to be any more innovative or higher

performing. In contrast, a study by George, Zahra, and Wood (2002) finds that Academic Spin-offs tend to be more innovative, but do not necessarily achieve greater financial performance than Private Start-ups. Westhead (1997) shows that there are no differences in innovation between the two groups with regard to the number of new products and services targeted to existing customers and launched in new markets.

A throughout comprehension of the differences and similarities between Academic and Private newly established ventures requires an analysis of the individual characteristics of founders of both types of companies. An interesting question to be empirically addressed to this regard is: Do Academic Entrepreneurs differ from other founders of high tech companies in terms of individual level related characteristics?

The question relating to the differences that might exist between Academic Entrepreneurs and Private Entrepreneurs, in relation to individual level factors, makes us wonder about the existence of any specific features that Academics might have because of their affiliation to a Public Organization. We all know that previous work experiences might influence individuals' decisions to start-up a new venture (Kolvereid, 1996; Taylor, 2001). Yet, being affiliated to Universities might provide Academics with an academic mind set, as they come to share university specific beliefs, values and culture. In other words, they might develop a 'professional' and 'organizational' identity', through which they seek to integrate their various statuses and roles, as well as their diverse experiences, into a coherent image of themselves (Epstein, 1978).

We do not know that much about the relation between Academics' professional identity and their decisions to get engaged in entrepreneurial processes, their Motivations, their Attitudes. This is particularly relevant in a moment in which much effort is being put by Policy Makers and University Managers in promoting Technology Transfer, University Patenting and an outward looking attitude on universities' side (Grimaldi & Sobrero, 2005).

More generally we need a better understanding of the effect that universities' efforts (in creating entrepreneurial culture within academia) have on shaping academics' Entrepreneurial Orientation and their professional identities.

The arguments here briefly outlined support our interest towards understanding whether Academic Entrepreneurs have intrinsic features, deriving from their specific professional identities, which make them differ from other Non Academic Entrepreneurs with regard to their individual characteristics.

Building on this point, it seems that individual related dimensions, studied within a matched sample of Academic Spin-offs and Private Start-ups, could be an interesting domain to be explored in order to look for differences/similarities between the founders of these two types of firms.

3.4 Research Design

3.4.1 The Research Context

Our study is settled in the region Emilia Romagna in Italy. Emilia Romagna has been identified by the European Commission as one of the leading regions in Europe for its increasing number of Academic Spin-offs and, more generally, for its proactive role in supporting research-to-industry technology transfer. Located in the north of Italy, Emilia Romagna has an extension of about 22,100 sq. km and a population of 4.1 million, with an annual pro capita GDP of 28,684 € which is among the highest in Europe (the European average is 22,400 €) (Eurostat, 2005). Emilia Romagna leads Italy in terms of number of Academic Spin-offs (Piccaluga & Balderi 2007) and with 3.7 researchers every 1,000 inhabitants and an R&D expenditure rate (over GDP) of 0.61 is among the top three Italian regions for R&D workforce (the national average is of 2.8 reserachers/1000 inhabitants) and expenses (the average national R&D expenditure is 0.54) (Istat, 2003).

In November 2003 the region Emilia Romagna has adopted its first program for industrial research, innovation and technology transfer (PRRIITT)[24], aimed at fostering applied research through new collaborations between public researchers and industry, the creation of new research labs by industry and the creation of Academic Spin-offs. It is the very first case of an Italian region with its own law concerning innovation. This program, which allocated around 160 million€ of public money to support innovation in different forms between 2003 and 2005, has given emphasis, among other things, to new research-based venture creation. More precisely, the program includes the activation of a regional venture capital fund of about 13 million€ (10 million€ of which directly provided by the Regional Government) and 1 million€ in direct funding assigned to newly established high tech Start-ups. This regional initiative followed legislative changes at national level aimed at creating the conditions necessary for an effective commercialization of research results through Academic Spin-offs. The national Law 297 of 27th August 1999 reformulated rules and practices in support of scientific and technological research, the diffusion of technologies and labor mobility for researchers. This law was meant to provide financial benefits in support of the creation of new Academic Spin-offs. Following this important national law, the majority of Italian universities and Public Research Centers adopted, within their organizations, Spin-off regulations to set rules on duties and rights for the actors involved, to define the practices to be followed and to allocate specific tasks to those Universities administrators, who are supposed to be in charge of technology transfer activities. After an initial period of reluctance, now Italian Universities are increasingly adopting measures to favor the Spin-off creation. Emilia Romagna's Universities have been among the first Italian Public Research Institutions

[24] http://first.aster.it/dossier/dossier.php Misura 2 (Azione A e B) of PRRIITT (Programma regionale per la ricerca industriale, l'innovazione e il trasferimento tecnologico). Misura 2 refers to the infrastructural and organizational support (Azione A) and to the financial support (Azione B) aimed at fostering the creation of new entrepreneurial activities.

in formalizing a Patent (1996) and Spin-off regulation (2002) (Baldini, Grimaldi, & Sobrero, 2004).

In Table 3.1 we show the support mechanisms that the five Universities, namely: the University of Bologna, the University of Ferrara, the University of Modena and Reggio Emilia, the University of Parma and Catholic University of Milan at Piacenza; and the three Public Research Centres: CNR, ENEA and INFM, have put in place.

University of Bologna and University of Ferrara are the two regional leading Institutions in relation to the availability of supportive mechanisms. With the only exception of the Business Plan Competition, which is not available at the University of Ferrara, both Universities have put in place the whole set of supportive mechanisms. CNR leads the Public Research Centres in terms of availability of supportive mechanisms.

Insert Table 3.1 about here

3.4.2 The Questionnaire

Based on the theoretical and empirical research on the foundation of entrepreneurship we constructed a survey to collect data directly from Entrepreneurs. The survey is structured in two main parts (Part 1 and Part 2): the first one is dedicated to gather information at firm level, while the second one is aimed at gathering information at individual level. Part 1 encompasses four sections aimed at collecting: (a) general information relating to the firm, (b) data on companies' financial and innovative performance, (c) the sources and amount of financing and (d) company's existing network and relationships with Institutions.

We structured the individual level survey (Part 2) into six sections: in the first one we gather Demographical Information and Personal Traits (Gender, Education, Employment); in the second we gather information about Psychological Attributes (Passion for Corporate work, Tenacity, Occupational Risk, Financial Risk, Gambling Risk, Self Efficacy); in section three we collect information about the Individual Skills (Technical, Procedural and Organizational Skills, Patenting, Serial Entrepreneurship and Previous Employment); in section four we focus on the Entrepreneurial Orientation and some related dimensions, in the fifth one we address the Perception of the Market Dynamics, the Industry Opportunities and the Perceived Corporate Strategy; finally, the last section is devoted to investigate the perceived Support (and Obstacles) coming from the Government, the Local Context and University. Responses to all questions (except for Self Efficacy, Patenting, Serial Entrepreneurship and Previous Employment), are given on 7-points scales. (in Appendix 3.A we report an English version of the questionnaire).

For all scales related to sections from 2 to 5 we relied on the existing literature and on pre-tested constructs. While the importance and relevance of the topics related to External Support and Obstacles (section 6) emerge clearly from a review of the literature, there are no fully developed and validated scales for measuring the corresponding constructs. For the development and selection of the items included in this final section, we first carefully analyzed studies that followed a similar approach in order to derive a first set of possible items. More specifically Fini, Grimaldi and Sobrero (2006) provide a first assessment of some environmental factors which are perceived as relevant in supporting Entrepreneurial Behaviors (in particular Academic Entrepreneurship). We also relied on Roberts and Malone (1996), who point out some aspects related to the characteristics of the local context in which companies operate, and we drew on Watson, Ponthieu, and Critelli (1995) and Stuart and

Abetti (1987) who made extensive usage, in their studies on new venture creation, of self-reported data to describe characteristics of the institutions and of the external context.

Finally, we used a small-scale field test to gather data on whether questions were phrased in an unambiguous manner or not, and to find out if other relevant aspects could be included in the different parts of the questionnaire. More specifically the questionnaire has been validated by a panel of ten Expertises (professors and managers of incubators and technology transfer offices) and ten Entrepreneurs who provided very helpful insights with regard to the questionnaire's completeness and clarity, as well as an evaluation of the time needed to complete it. No major inconsistencies emerged from this pre-test phase.

3.4.3 The Sample

We include in our analysis all new ventures based on the transfer of knowledge generated within the five Universities settled in Emilia Romagna, namely the University of Bologna, the University of Ferrara, the University of Modena and Reggio Emilia, the University of Parma and Catholic University of Milan at Piacenza and the three Public Research Centres, namely CNR, ENEA and INFM.

Our definition of Academic Spin-off includes companies which have either the University/Research Centre or at least one academic/researcher (full, associate, assistant professor; senior, young researcher; lecturer; research fellow; PhD student; technician) among the founders. Such a definition encompasses situations where: a) there is a formal commitment of the University/Research Centre (the Spin-off has passed through the University/Research Centre Spin-off regulation approval, or University/Research Centre is involved as one of the shareholders); b) there is no formal commitment of the Public Research organization (except for individuals who decide to share equity). We do not include in our definition those firms based on a university technology licensing established by surrogate

Academic Entrepreneurs (Radosevich, 1995). The regional population of Academic Spin-offs counted 89 firms.

With the term 'Academic Entrepreneur' we refer to an individual who, having a working experience within Universities (professors, researchers, technicians, research assistants), decides to found a new venture, based on academic knowledge and on the experience that he/she has gained at Universities. Such definition does not include 'surrogate Academic Entrepreneurs' (Radosevitch, 1995), who are external individuals, establishing a new venture on the basis of University assigned technologies. With 'Private Entrepreneur' I refer to an individual who is a founder and share some equity in a Private Start-up and has no formal affiliation with a Public Research Institution.

Through the five Universities' and the three Research Centers' websites, and their Technology Transfer Offices (where available) we retrieved basic information about each company, like names, telephone and e-mail contacts. We had previous information about 50 Academic Spin-offs which had already been contacted for previous studies (see Fini et al, 2006; Fini & Grimaldi, 2007). Moreover for each company we identified the names and contact information of the leading academic shareholder. After a first round of e-mails at the end of November 2006, a second reminder targeted to non respondents at the beginning of December 2006, and several phone calls, we set up face to face interviews with 134 individuals involved in Academic Spin-offs (132 founders and 2 CEOs) affiliated to 72 firms. All interviews were run on the basis of a structured questionnaire and lasted, on average, one hour and a half. The data collection was closed at the beginning of February 2007 with a total number of 72 Academic Spin-offs visited and 132 Entrepreneurs interviewed (we excluded the CEOs), corresponding to an overall firm level response rate of 81% (=72/89) and an overall individual level response rate of 39% (=132/337). Table 3.2 shows the Affiliation of the 72 Academic Spin-offs.

Insert Table 3.2 about here

We matched the 72 Academic Spin-offs with a sample of Private Start-ups in terms of Industry (ATECO codification), Year of Establishment and Localization. Our definition of Private Start-ups applies to all the private companies without public affiliated individuals or Public Institutions between the founders (slightly modified from Colombo, Grilli, Mariotti, & Piva, 2006).

Through the data bases of the Chamber of Commerce of Bologna we could gather information related to the population of Private Start-ups in the region. Specifically, we retrieved the name of the company, the legal status, the address (in some cases the telephone number), the ATECO codification (industry codification), year of establishment, localization and a general description of the operations. Through Internet we completed the company information, in particular email addresses and some more detailed specifications of the product and services commercialized.

Almost all the high-tech industries were significantly represented in the region except for the Aerospace, Biotechnological and Pharmaceutical ones, which turned out to be under-represented only in the Private Start-up sample. Because of that, it has been impossible to match, with Private counterparts, 8 of the Academic Spin-offs affiliated to that industries. Three Academic Spin-offs remained unmatched because the selected Private Start-ups decided not to participate at the study (and because it was impossible to replace them). The matched procedure ended up with 72 Academic Spin-offs and a corresponding sample of 61 Private Start-ups.

All of the interviews were run on the basis of the same structured questionnaire and lasted, on average, two hours. The data collection started at the beginning of March 2007 and was closed at the beginning of May 2007 with a total number of 61 Private Start-ups visited and 75 individuals interviewed (68 founders and 7 CEOs), corresponding to an overall individual level response rate of 37% (=68/186). In Table 3.3 we report the Industry, Year of Establishment and Localization for the matched sample.

3.4.4 Methods

The empirical analysis follows a three stage process. First descriptive statistics are computed at individual level. The sample of Academic Entrepreneurs is analyzed highlighting some dimensions that we believe to be of interest.

Then we have tested the scales and performed a Confirmatory Factor Analysis (CFA), relying on the 200 interviewed entrepreneurs. CFA is used to test for Convergent and Discriminant Validity as well as for the generalizability of the measures. In doing so, we return Composite Reliability indexes for all the scales. The Lisrel 8.80 has been employed in the analysis (Joreskog & Sorbom, 2006). All tests have been made on covariance matrices (please refer to Appendix 3.A for the factor loadings).

In the third step we explore the sources of inter individual differences within the two samples of Entrepreneurs based on the factors that we've extracted in phase two. More specifically, drawing on the results of the CFA, we've computed a set of macro-indicators, as a result of the average of items loading on each specific variable. We've included in our analysis only those 104 Academic Entrepreneurs who have (at the time of the data gathering) a formal on-going relationship with Universities or Public Research Centers (e.g. individuals working as professors, researchers, technicians, research assistants, PhD students, research fellow). In a similar way, we have dropped from our analysis the 5 Private Entrepreneurs

formally linked to PRIs, ending up with two samples of 104 Academic Entrepreneurs and 63 Private Entrepreneurs.

Within the two categories of Entrepreneurs (Academic and Private) we also have tested for differences in relation to the Serial Entrepreneurship of each individual ("Serial" vs. "Non Serial"). We've included in the category of Serial Entrepreneurs all the individuals who founded, at least, another firm, (other than the one in which they're already involved). For the two categories (Academic and Private) we've also built two new categorical variables, for which we control; "Fully Enrolled" and "Pro Tempore" (for Academic Entrepreneurs) and "White Collar" and "Blue Collar" (for Private Entrepreneurs). We include in the "Fully Enrolled" category all the Academics that, in 2006, are: full, associate or assistant professors, researchers or technicians, while we label "Pro Tempore" all founders such as: research fellows, PhD students, research collaborators or pro tempore professors. Finally, for Private Entrepreneurs, we include in the "White Collar" category all the individuals that, at the time they've founded the new venture were entrepreneurs or executives (C-level). We label "Blue Collar" all the remaining ones.

3.4.5 Measures

In this section we provide a more detailed specification of the items and scales which have been used in the survey. Data have been collected for the 22 theory-based scales from the 200 Entrepreneurs. Table 3.3 summarizes the macro domain, the latent variables, the number of items used, the Composite Reliability index (CR) and the research references. CR is a Structural Equation Model statistic which gives an indication of internal consistency. It is calculated as the sum of the square roots of the item-squared multiple correlations squared and divided by the same quantity plus the sum of the error variance (Werts, Linn, & Joreskog, 1974) (See Appendix 3.A for the scales and items).

Insert Table 3.3 about here

3.5 Empirical Analysis

3.5.1 Descriptive statistics

Table 3.4 shows the Industry, the Year of Establishment and the Localization for both the Academic Spin-offs and the control group of Private Start-ups. As for Academic Spin-offs, almost 50% of them are affiliated to the University of Bologna and more then 85% of the population are spun off from the five regional Universities. Following the OECD industry classification, 13 Sectors have been identified: Advances Services[25], Aerospace, Biomedical, Biotechnology, Chemical, Electronics, Environment and Energy, Food, ICT, Materials and Acoustic, Mechanics and Automations, Pharmaceutical, Sensors and Diagnostics. Among them the ICT and Environment/Energy industries (counting respectively 13 and 12 firms) are the most representative of the population. In terms of Year of Establishment and Localization, as Table 3.4 shows, more than 70% of Academic Spin-offs have been founded after 2003 and more than 50% are localized in the Bologna area.

Insert Table 3.4 about here

In the following Exhibit (Table 3.5) we report the current status of the 104 Academic Entrepreneurs. The 60% of them are Fully Employed, almost the 60% of the Academic

[25] Advanced Statistical Services and Architectural Services

Entrepreneurs are together with the University of Bologna, less then 30% are researching at the other regional Universities, the 10% are linked to Public Research Centers and only the 1% are employed in some extra-regional Universities. In the Exhibit we also list the Research Areas in which there are currently researching. More than the 40% of the Academic Entrepreneurs are researching in Engineering related areas, almost the 15% in the Agro-Food industry, the 13% in Chemical and Pharmaceutical topics, while all the remaining research domains account for less than the 30%.

Insert Table 3.5 about here

3.5.2 Confirmatory Factor Analysis and T-Test

As Table 3.3 shows, eleven out of twenty-two of the performed scales have a Composite Reliability Index greater than .80, eight have a CR between .70 and .79 and only three have a CR between .60 and .69. All the concept to domain coefficients turned out to be statistically significant ($t>2.0$, $p<.05$). We checked for Discriminant Validity by determining that the Average Variance Extracted by each latent variable's measures was larger than its shared variance with any other latent variable. In order to look for some differences or similarities between Academic and Private Entrepreneurs, we constructed one macro indicator per latent factors, as the average of the items loading on that factor. Then we compared along the above mentioned dimensions the 104 Academic Entrepreneurs and the 63 Private counterparts.

As it is showed in Table 3.6, the Psychological Traits partially differ between the two, in particular 'Passion for Corporate Work' and 'Occupational Risk' are lower for Academic Entrepreneurs than for the Private Ones (3.76 vs. 4.85; $p<.001$; 5.28 vs. 5.90; $p<.001$), while

'Investment Risk' is higher (3.65 vs. 3.05; p<.01). The two set of Entrepreneurs do not to differ in terms of Technical Skills, while they differ in terms of Procedural Skills, which are lower for the Academics (3.11 vs. 3.75; p<.001), and Organizational Skills, which are higher for the Academic Ones (5.63 vs. 5.15; p<.001). The Academics have a higher Number of Patent Applications (1.35 vs. .59; p<.1), while they have founded a lower Number of Firms (.27 vs. .87; p<.001). Other statistical differences are recorded in terms of the perception of received support. Academic Entrepreneurs perceive Governmental (3.36 vs. 2.01; p<.001), Context (3.61 vs.1.73 p<.001) as well as University (4.64 vs. 1.85; p<.001) Support to be higher than the Private ones. No statistical differences are registered in terms of the obstacles coming from the Market. Coming to the Entrepreneurial Orientation Related Dimension no major differences have been assessed. Also in the Market and Industry domains the Entrepreneurs' perceptions result to be similar; the only difference is assessed in the Strategy domain with the regard to the Academic Entrepreneurs declare to run firms less oriented to a Cost Reduction Strategy (4.55 vs. 5.14; p<.05).

Insert Table 3.6 about here

In Table 3.7 we look for statistical differences within the group of Academic Entrepreneurs in terms of Serial Entrepreneurship ('Non Serial' (78) vs. 'Serial' (26)) and employment status ('Fully enrolled' (62) vs. 'Pro tempore' (42)). In relation to the first categorization the only statistical differences that we've found are in terms of Occupational Risk (5.15 vs. 5.67; p<.1), Procedural Skills (5.52 vs. 5.95; p<.05) and Organizational Skills (5.52 vs. 5.95; p<.001) which are all lower for Non Serial Entrepreneurs. No differences have

been assessed in terms of perceived Support and Obstacles as well as in the Entrepreneurial Orientation related Dimensions.

Within the same group of Academic Entrepreneurs we also test for differences in terms of employment Status. 'Fully Enrolled' Academic Entrepreneurs are characterized (as compared to 'Pro Tempore' Academics) by lower levels of Passion for Corporate Work, (3.43 vs. 4.27; p<.001) Occupational Risk Propensity (5.03 vs. 5.65; p<.01) and Self Efficacy (44.43 vs. 48.31; p<.1). On the contrary, they have a higher Number of Patents Filed (2.03 vs. .33; p<.01). The perception of the support and obstacles are similar, with the only exception for the Context Support which is perceived to be lower for the Fully Enrolled (3.38 vs. 3.96; p<.05). Almost all the dimensions related to the Entrepreneurial Orientation domain differ significantly between the 'Fully Enrolled' Academics and the 'Pro-Tempore' enrolled; Entrepreneurial Orientation (5.16 vs. 5.42; p<.1), Attitude toward Entrepreneurship (6.25 vs. 6.57; p<.01) and Interest about the External approval of the behavior (4.01 vs. 4.68; p<.05) are statistically lower. Differences are also recorded in terms of Differentiation Strategy (4.43 vs. 5.23; p.<001), which is lower for the 'Fully Enrolled' Entrepreneurs.

Insert Table 3.7 about here

Finally, we test for differences within the group of 63 Private Entrepreneurs (Table 3.8). The 34 'Non Serial' Private Entrepreneurs have a lower Tenacity (5.32 vs. 5.75; p<.1), as well as a lower Entrepreneurial Orientation (5.22 vs. 5,59; p<0,1), than the Serial ones. We record no other differences. Then, we've compared the 22 Entrepreneurs that, before founding the new venture, were occupied as 'Blue Collars' with the 41 Entrepreneurs, who, before

founding the new venture, were occupied as 'White Collar'. We register differences under several dimensions. The 'Blue Collar' Entrepreneurs show a lower level of Tenacity (5.12 vs. 5.73; p<.01), and a higher Attitude toward Gambling (1.74 vs. 1.15; p<.05). They have also founded a lower Number of Firms (.36 vs. 1.15; p<.05). All the support and obstacle dimensions are statistically different within the two categories, with an exception for the Market Obstacles. The Governmental Support (2.64 vs. 1.67; p<.001), the Context Support (2.32 vs. 1.41; p<.001) and the University Support (2.33 vs. 1.59; p<.001) are all perceived to be higher for the 'Blue Collar' rather then for their counterparts. 'Blue Collars' perceive their firms to be less quality oriented then the 'White Collar' ones (6.18 vs. 6.56; p<.1) No statistical differences are recorded in terms of Entrepreneurial Orientation Related Dimensions.

Insert Table 3.8 about here

3.6 Discussion and Conclusions

This paper presents the results of an empirical multi dimensional analysis that explores individual level characteristics of Academic Entrepreneurs.

We provide empirical evidence of the differences and similarities in individual level characteristics between founders of Academic Spin-offs and founders of Private Start-ups. We examines founders' Personal Traits, Psychological Attributes, Skills and Competences, their Perception of the Support/Obstacles coming from the external context together with their Entrepreneurial Orientation Related Dimensions. The analysis of Academic vs. Private Entrepreneurs are based on a matched sample of firms (in terms of industry, year of establishment and localization) all settled in the Emilia Romagna region. The matched

procedure allows control for some dimensions while the regional connotation of the study guarantees that all firms are regulated by the same legislation and set of norms.

Our results show that Academic Entrepreneurs, if compared to Private counterparts, have similar Entrepreneurial Orientation Related Dimensions. They partially differ in terms of Psychological Traits (Passion for corporate work; Occupational Risk and Investment Risk), while they strongly differ in terms of Skills and developed Competences (Procedural Skills, Organizational Skills, Number of Patents Filed and Number of Firms Founded). They also have a more positive and supportive perception of the Government, Context and University Support.

Within the Academic sample we've also assessed some differences in terms of Entrepreneurial Orientation Related Dimension in comparing the 'Fully Enrolled' and the 'Pro-Tempore Enrolled' Academic Entrepreneurs. In other words, according to what the Fully Enrolled declared, their Orientation towards Corporate Innovation, Risk and Proactiveness is lower than what was declared by 'Pro-tempore Enrolled' Academic Entrepreneurs. Because we still cannot say anything about why that happens, we believe that future research should be devoted to shed some light on the existence of a causal path between the examined dimensions. Why is it that they show different Entrepreneurial Orientation? What are the determinants of these differences? And what are the implications of differences in Entrepreneurial Orientation in terms of venture growth?

We also suspect that the professional identities of Academics might interfere with their Entrepreneurial Orientation. The investments that many Universities have been doing to foster entrepreneurial culture within their settings are supposed to ultimately affect the way Academics perceive themselves as part of the Academia. In other words, in the policy makers intention, it would be desirable that at some point the new mission, beliefs and values of entrepreneurial Universities were reflected in the(multiple) professional identities of

academics, so to make them feel 'potential Entrepreneurs'. To this regard there is an interesting study by Henkel (2005) that looks at the impact of policy changes for Academic Identity. It shows that, while there was some evidence that attitudes to industry-based research and opportunities for commercial exploitation were changing, it was also evident that, for many of academic seniors, the normative significance of the boundary between the firm and the University, as contexts of research, remained quite clear and a source of identity reinforcement. Researches in different types of organizations show a positive relationship between tenure and the development of positive Attitudes toward the 'organizational behaviours' (in this specific case the Academia). In other words, notwithstanding the investments made by Universities to invest in technology transfer and to gain a more outward looking attitude, it may be that the new values, beliefs and mission of 'entrepreneurial' universities take time to be transferred and (eventually) to shape academics' professional identities. March and Olsen (1989) and Perry (2000), referring to public organizations, reinforce this position arguing that Institutions might foster a logic of appropriateness in the minds of individual which causes them to develop a Public service oriented motivation. Moynihan and Pandey (2007) argue that work-related rules and norms are organizational institutions that shape not only the administrative behaviour of public servants but also the basic attitude that the actors hold about the value of public service. Further efforts should be devoted to analysing the professional identities of academic.

A second relevant evidence emerging from our study is related to the different perceptions of external support the Entrepreneurs can count on. All three types of support which have been tested, statistically differ between the two samples of Academic and Private Entrepreneurs. The Academic perceive the Government, the Context and the University to be more supportive than the private ones. The higher perception of Governmental, Local Context and University Support by Academic Entrepreneurs might signal that these individual are

more confident in the role of Institutions, or that they do receive additional institutional support. This seems to be controversial, if we think about the similar Entrepreneurial Orientation and Capacity to implement Entrepreneurial Behaviour showed by the Academics. Therefore, it is reasonable to wonder, at least for the Italian context, about the effectiveness and the necessity of tailored policies aimed at fostering the creation and support of Academic Spin-offs. In order to shed some light on this important policy and managerial issue, future research should be developed.

EXHIBITS
(CHAPTER 3)

Table 3.1: Universities and Public Research Centres' Support Mechanisms

	Uni. Bo	Uni. Pc	Uni. Fe	Uni. Mo-Re	Uni. Pr	CNR	ENEA	INFM
Business plan competition (year of first edition)	2000	NA	NA	2001	NA	NA	NA	NA
University incubator (year of establishment)	2001	NA	2005	NA	NA	NA	NA	NA
Formal Technology Transfer Office (TTO) (year of establishment)	2001	NA	2004	NA	NA	NA	NA	NA
Office dealing with TT issues (year of establishment)	1989	2001	2001	2001	2001	A	A	A
Patent regulation (year of first release)	1996	2004	1997	2001	2001	2001	NA	2005
Spin-off regulation (year of first release)	2002	2004	2002	2002	2003	2001	NA	NA
Personnel in charge of TTO activity (at 2005)	3	0	4	½	1	NA	NA	NA

Note: A=available (but no information about the year); NA = non available; ½ represents part time personal

Table 3.2: Academic Spin-offs Affiliation

	Academic Spin-offs N=72
University of Bologna	33
University Cattolica (Piacenza)	1
University of Ferrara	12
University of Modena/Reggio Emilia	7
University of Parma	8
CNR	5
ENEA	4
INFM	2

Table 3.3: Domains Specification

Domain	Latent variable	Number of items	Composite Reliability	Research Reference
Psychological Traits	Passion for work	5	.81	Locke, 1993
	Tenacity	5	.80	Gartner et al., 1991
	Investment Risk	4	.74	Weber, 2002
	Gambling Risk	4	.85	Weber, 2002
	Occupational Risk	4	.75	Gomez and Meija, 1989
	Self Efficacy	4	.82	Baum and Locke, 2004
Individual Skills	Technical Skills	3	.71	Gupta and Govindarajan, 2000
	Procedural Skills	5	.82	Gupta and Govindarajan, 2000
	Organizational Skills	5	.84	Roberts and Fusfeld, 1981
Support and Obstacles	Governmental Support	2	.69	Fine and Grimaldi, 2007
	Context Support	4	.78	Fine and Grimaldi, 2007
	University Support	4	.75	Fine and Grimaldi, 2007
	Market Obstacles	4	.69	Niosi and Bas, 2001
Entrepreneurial Orientation Related Dimensions	Entrepreneurial Orientation	9	.77	Covin and Slevin, 1989
	Attitudes toward Entrepreneurship	9	.88	Ajzen, 1991
	External approval of her/his own Entrepreneurial Behaviour (Subjective Norms)	1	1.00	Ajzen, 1991
	Capacity to implement an Entrepreneurial Behaviour (Perceived Entrepreneurial Control)	2	.67	Ajzen, 1991
Market and Industry	Market Dynamism	3	.87	Miller and Frisien, 1982
	Industry Opportunities	4	.77	Miller, 1987
Strategy	Quality	1	1.00	Iakovleva, 2004
	Breadth	4	.73	Iakovleva, 2004
	Cost Reduction	1	1.00	Iakovleva, 2004

Table 3.4: Matched sample: Academic Spin-offs vs. Private Start-ups

	Academic Spin-offs N=72	Private Start-ups N=61
Industry		
Advanced Services	3	2
Aerospace	2	0
Biomedical	1	3
Biotechnology	7	3
Chemistry	4	3
Electronics	4	5
Environment and Energy	12	9
Food	4	3
ICT	13	16
Material and Acoustics	9	6
Mechanics and Automations	2	8
Pharmaceutical	4	0
Sensors and Diagnostics	7	3
Year of Establishment		
1997	1	0
1998	0	2
1999	6	3
2000	4	5
2001	5	3
2002	3	5
2003	15	10
2004	12	10
2005	20	19
2006	6	4
Localization		
Bologna	36	26
Ferrara	12	7
Forlì	2	1
Modena	7	13
Parma	8	4
Piacenza	1	2
Ravenna	3	2
Reggio Emilia	3	6
Rimini	0	0

Note: Advanced Services (encompassing: Advanced Statistical Services and Architectural Services)

Table 3.5: Academic Entrepreneurs (at 2006)

	Frequency (N=104)	Percent (%)
Status		
Fully Employed		
Emeritus professor (UNI)	1	1.0
Full professor (UNI)	15	14.4
Associate professor (UNI)	15	14.4
Assistant professor (UNI)	17	16.3
Technical personnel (UNI)	6	5.8
Administrative staff (UNI)	1	1.0
Head Researcher (PRC)	1	1.0
Researcher (PRC)	7	6.7
Technicians (PRC)	0	0.0
Pro- Tempore Employed		
Research fellow (UNI)	19	18.0
PhD students (UNI)	8	7.7
Lecturer/Collaborator (UNI)	11	10.5
Research fellow (PRC)	1	1.0
Research collaborator (PRC)	2	1.9
Affiliation		
CNR Bologna	7	6.7
CNR Faenza	1	1.0
CNR Modena	1	1.0
ENEA Bologna	1	1.0
Regione Emilia Romagna	1	1.0
University of Bologna	61	58.7
University of Ferrara	14	13.5
University of Milano San Raffaele	1	1.0
University of Modena-Reggio Emilia	11	10.6
University of Parma	6	5.8
University of Venezia	0	0.0
Research Area		
Agrvet	15	14.4
Bio	6	5.8
Chim	13	12.5
Ecosta	9	8.7
Fismat	6	5.8
Geo	10	9.6
Ingind	18	17.3
Inginf	24	23.1
Med	3	2.9

Note: UNI=University; PRC=Public Research Centre;
Agrvet (encompassing agro, food and veterinary), Bio (encompassing biology and biotechnology), Chim (encompassing chemistry and pharmacology), Ecosta (encompassing statistics, management, political science, economics and law), Fismat (encompassing physics, geometry and math), Geo (encompassing geology, archeology, architecture), Ingind (encompassing aerospace eng., electrical eng., materials eng., mechanical eng., nuclear eng.) Inginf (encompassing automation, electronics, ICT, telecommunication) and Med (encompassing biomedical, genetics, medicine).

Table 3.6: Academic Entrepreneurs vs. Private Entrepreneurs

Domain	Latent variable	Mean		T	Sig.
		Academic (104)	Private (63)		
Demographic Characteristics	Years of higher education	11.74	8.35	9.69	<.001
Psychological Traits	Passion for work	3.76	4.85	-5.30	<.001
	Tenacity	5.47	5.52	-0.33	
	Occupational risk	5.28	5.90	-3.54	<.001
	Investment risk	3.65	3.05	2.80	<.01
	Gambling risk	1.59	1.36	1.36	
	Self efficacy	46.11	44.41	1.10	
Individual Skills	Product skills	4.17	4.25	-.31	
	Procedural skills	3.11	3.73	-3.10	<.001
	Organizational skills	5.63	5.15	3.18	<.001
	Number of patent filed	1.35	.59	1.64	<.1
	Number of firms founded	.27	.87	-3.82	<.001
Support and Obstacles	Governmental support	3.36	2.01	6.03	<.001
	Context support	3.61	1.73	8.88	<.001
	University support	4.64	1.85	13.77	<.001
	Market obstacles	3.46	3.42	.22	
Entrepreneurial Orientation Related Dimensions	Entrepreneurial Orientation	5.27	5.39	-1.00	
	Attitudes toward Entrepreneurship	6.38	6.45	-.74	
	External approval of her/his own entrepreneurial behaviour	4.29	4.02	1.02	
	Capacity to implement an entrepreneurial behaviour	3.73	3.67	.27	
Market and Industry	Market Dynamism	5.33	4.87	1.61	
	Industry Opportunities	5.03	4.87	.92	
Strategy	Quality	6.35	6.43	-.53	
	Breadth	4.75	4.83	-.37	
	Cost reduction	4.55	5.14	-2.08	<.05

Table 3.7: Inter group differences for Academic Entrepreneurs (N=104)

Domain	Latent variable	Mean		T-test	Mean		T-test
		Non Serial (78)	Serial (26)		Fully enrolled (62)	Pro tempore (42)	
Demographic Characteristics	Years of higher education	11.76	11.69	.19	11.90	11.50	1.35
Psychological Traits	Passion for work	3.84	3.52	1.01	3.43	4.27	-3.1***
	Tenacity	5.47	5.45	.10	5.51	5.40	.62
	Occupational risk	5.15	5.67	-2.02*	5.03	5.65	-2.80**
	Investment risk	3.57	3.88	-1.07	3.71	3.55	.63
	Gambling risk	1.53	1.77	-.94	1.63	1.52	.48
	Self efficacy	45.72	47.40	-.72	44.43	48.31	-1.99*
Individual Skills	Product skills	4.29	3.83	1.28	4.22	4.11	.33
	Procedural skills	2.99	3.46	-1.72†	2.96	3.33	-1.55
	Organizational skills	5.52	5.95	-2.11*	5.74	5.45	1.60
	Number of patent filed	1.32	1.42	-.15	2.03	.33	2.86**
	Number of firms founded	.00	1.08	-35.3***	.32	.19	1.36
Support and Obstacles	Governmental support	3.30	3.53	-.64	3.47	3.19	.93
	Context support	3.56	3.77	-.60	3.38	3.96	-1.96*
	University support	4.62	4.70	-.24	4.52	4.80	-.99
	Market obstacles	3.40	3.68	-1.03	3.59	3.28	1.31
Entrepreneurial Orientation Related Dimensions	Entrepreneurial Orientation	5.29	5.20	.53	5.16	5.42	-1.85†
	Attitudes toward Entrepreneurship	6.39	6.36	.20	6.25	6.57	-2.70**
	External approval of her/his own entrepreneurial behaviour	4.30	4.26	.11	4.01	4.68	-2.15*
	Capacity to implement an entrepreneurial behaviour	3.65	4.00	-1.17	3.60	3.93	-1.27
Market and Industry	Market Dynamism	5.32	5.35	-.06	5.19	5.54	-1.11
	Industry Opportunities	4.95	5.29	-1.58	5.07	4.96	.56
Strategy	Quality	6.33	6.42	-.39	6.25	6.51	-1.44
	Breadth	4.85	4.42	1.36	4.43	5.23	-3.0***
	Cost reduction	4.46	4.83	-.86	4.52	4.59	-.16

† = < .1; * = < .05; ** = <.01; *** = <.001

Table 3.8: Inter group differences for Private Entrepreneurs (N=63)

Domain	Latent variable	Mean		T-test	Mean		T-test
		Non Serial (34)	Serial (29)		Blue Collar (22)	White Collar (41)	
Personal Characteristics	Years of higher education	8.50	8.17	.43	9.00	8.00	1.26
Psychological Traits	Passion for work	4.79	4.92	-.47	4.77	4.89	-.40
	Tenacity	5.32	5.75	-1.85†	5.12	5.73	-2.56**
	Occupational risk	5.73	6.11	-1.52	5.82	5.95	-.50
	Investment risk	3.24	2.82	1.22	2.93	3.11	-.48
	Gambling risk	1.46	1.23	.94	1.74	1.15	2.37*
	Self efficacy	43.27	45.76	-1.07	43.90	44.68	-.32
Individual Skills	Product skills	4.40	4.07	.91	4.20	4.28	-.21
	Procedural skills	3.75	3.70	.13	3.65	3.77	-.32
	Organizational skills	5.18	5.12	.21	4.89	5.29	-1.59
	Number of patent filed	.24	1.00	-1.18	.91	.41	.72
	Number of firms founded	.00	1.90	-6.5***	.36	1.15	-2.04*
Support and Obstacles	Governmental support	2.20	1.79	1.38	2.64	1.67	3.37***
	Context support	1.90	1.54	1.48	2.32	1.41	3.96***
	University support	2.14	1.52	2.64	2.33	1.59	3.04***
	Market obstacles	3.58	3.23	1.07	3.41	3.43	-.02
Entrepreneurial Orientation Related Dimensions	Entrepreneurial Orientation	5.22	5.59	-1.65†	5.21	5.49	-1.21
	Attitudes toward Entrepreneurship	6.41	6.50	-.62	6.52	6.41	.66
	External approval of her/his own entrepreneurial behaviour	4.26	3.74	1.21	4.03	4.01	.04
	Capacity to implement an entrepreneurial behaviour	3.65	3.71	-.18	3.82	3.60	.63
Market and Industry	Market Dynamism	4.97	4.76	.41	4.52	5.07	-1.04
	Industry Opportunities	4.85	4.89	-.11	4.74	4.94	-.61
Strategy	Quality	6.41	6.45	-.17	6.18	6.56	-1.74†
	Breadth	5.00	4.64	.93	4.74	4.88	-.36
	Cost reduction	5.15	5.14	.02	5.50	4.95	1.25

† = < .1; * = < .05; ** = <.01; *** = <.001

APPENDIX
(CHAPTER 3)

Table 3.A.1 Details of Measures

Latent variable	Items description	Item [a] loading
Passion for corporate work	Please indicate how strongly you agree or disagree with each statement by circling the appropriate number (1=strongly disagree; 7=strongly agree):	
	1. I derive most of my life satisfaction from my work	.64
	2. I think about my work when I'm showering, driving or when others are talking about things have nothing to do with work	.61
	3. I frequently have to tear myself away form my work to satisfy other obligations	.51
	4. I accomplish a lot of work because I love my job	.83
	5. Other would say that I'm intensely focused on my occupation	.75
Tenacity	Please indicate how strongly you agree or disagree with each statement by circling the appropriate number (1=strongly disagree; 7=strongly agree):	
	1. I can think of many times that I persisted with tasks when other wanted to quit	.70
	2. I work harder than most people I know	.63
	3. I'm able to perform challenging work for long periods	.74
	4. When something goes wrong I immediately analyze the cause of the problem and take action	.54
	5. I continue to work hard on projects, even when other oppose me	.73
Occupational Risk	Please indicate how strongly you agree or disagree with each statement by circling the appropriate number (1=strongly disagree; 7=strongly agree):	
	1. I'm not willing to take risks when choosing a job or a company to work for	.63
	2. I prefer a low risk/high security job with a steady salary over a job that offers high risks and high rewards"	.79
	3. I prefer to remain on a job that has problems that I know about rather than take the risks or working at a new job that has unknown problems even if the new job offers greater rewards	.64
	4. I view risk on a job as a situation to be avoided at all costs	.56
Investment Risk	Please indicate how strongly you agree or disagree with each statement by circling the appropriate number (1=strongly disagree; 7=strongly agree):	
	1. Investing 10% of your annual income in a moderate growth mutual fund	.54
	2. Investing 5% of your annual income in a conservative stock	.72
	3. Investing 5% of your annual income in a very speculative stock	.85
	4. Investing 10% of your annual income in government bonds (treasury bills)	.42
Gambling Risk	Please indicate how strongly you agree or disagree with each statement by circling the appropriate number (1=strongly disagree; 7=strongly agree):	
	1. Betting a day's income at the horse races	.73
	2. Betting a day's income at a high stake poker game	.83
	3. Betting a day's income on the outcome of a sporting event (e.g. soccer, etc.)	.66
	4. Gambling a week's income at a casino	.85
Self Efficacy	1. Thinking about your skills write a number from the confidence scale below (1 to 7) to show how sure you are that you can beat the % change in 2007 (compared to 2006) [the same for 2008 compared to 2007]:	.87 (2007) .83 (2008)
	Up 100% or better	
	Up 50% or better	
	Up 20% or better	
	Up 5% or better	
	No change or better	
	Down 5% or better	
	Down 10% or better	

	Down 25% or better	
Technical Skills	Please assess the skills level you have now (1=no skills at all; 7=very skilled):	
	1. Product designs	.69
	2. Process designs	.69
	3. Production systems	.66
Procedural Skills	Please assess the skills level you have now (1=no skills at all; 7=very skilled):	
	1. Accounting	.58
	2. Marketing	.78
	3. Purchasing and sales	.80
	4. distribution	.63
	5. Logistic	.64
Organizational Skills	Please indicate how strongly you agree or disagree with each statement by circling the appropriate number (1=strongly disagree; 7=strongly agree):	
	1. I'm good in problem solving and in the generation of new idea	.64
	2. I'm good in communicating my point of view and supporting my ideas	.71
	3. I'm good in motivating people and leading teams	.84
	4. I'm good in the maintaining interpersonal relationships and coordinating people	.73
	5. I'm good in developing resources and creating new competences within the organizations	.65
Governmental Support	To what extend do you think the following factors are supporting your innovation activities and helping you at pursuing a significant venture growth (1=no support; 7=high support):	
	1. National public founding	.80
	2. International (EU) public founding	.65
Context Support	To what extend do you think the following factors are supporting your innovation activities and helping you at pursuing a significant venture growth (1=no support; 7=high support):	
	1. Regional founding (ex. PRIITT, Spinner)	.66
	2. Existence of a business plan competition	.57
	3. Existence in the region of technology transfer offices	.86
	4. Existence in the region of patent support offices	.64
University Support	To what extend do you think the following factors are supporting your innovation activities and helping you at pursuing a significant venture growth (1=no support; 7=high support):	
	1. Interest of public research institutions in investing in firms' equity	.58
	2. Possibility to access academic laboratories and equipments	.72
	3. Possibility to be hosted in a university incubator	.64
	4. Synergies between public research institutions and private firms	.68
Governmental Obstacles	To what extend do you think the following factors are impeding your innovation activities and preventing you at pursuing a significant venture growth (1=no obstacle; 7=high obstacle):	
	1. Difficulty in accessing National public founding	.51
	2. Lack of a set of norms and policies in supporting entrepreneurship	.63
Market Obstacles	To what extend do you think the following factors are impeding your innovation activities and preventing you at pursuing a significant venture growth (1=no obstacle; 7=high obstacle):	
	1. Difficulty in accessing distribution channels	.44
	2. Difficulty in accessing technical qualified personnel	.34
	3. Difficulty in recruiting managerial and C-level executives	.82
	4. Difficult in accessing sales personnel	.75

Entrepreneurial orientation	In the next year I want my firm:	
	1. (1) favours a strong emphasis on the marketing of tried and true products or services or (7) favours a strong emphasis on R&D, technological leadership and innovation	.38
	2. (1) favours the introduction of no new lines of products or services or (7) favours the introduction of very many new lines of products or services	.50
	3. (1) favours changes in product or services lines mostly of a minor nature or (7) favours changes in product or services line quite dramatic	.52
	4. (1) responds to action which competitors initiate or (7) initiates actions which competitors then respond to	.36
	5. (1) would be very seldom the first businesses to introduce new products/services or (7) would be the first business to introduce new product/services	.58
	6. (1) seeks to avoid competitive clashes, preferring a "live and let live" posture or (7) adopts a very competitive, "undo the competitors" posture	.59
	7. (1) has a strong proclivity for low risk projects (with normal and certain rates of return) or (7) has a strong proclivity for high risk projects (with chances of very high returns)	.53
	8. (1) explores the environment gradually, via timid, incremental behaviour or (7) acts bold, wide-ranging in order to achieve the firm's objectives.	.63
	9. (1) adopts a cautious, "wait and see" posture in order to minimize the probability of making costly decisions or (7) adopts a bold, aggressive posture in order to maximize the probability of exploiting potential opportunities.	.57
Attitude toward Entrepreneurship	During the next year, emphasising an entrepreneurial behaviour would be:	
	1. (1) Unpleasant or (7) Pleasant	.53
	2. (1) Useless or (7) Useful [b]	.71
	3. (1) Unsuitable or (7) Suitable	.75
	4. (1) Negative or (7) Positive [b]	.78
	5. (1) Regrettable or (7) Laudable [b]	.68
	6. (1) Unpleasant or (7) Pleasant	.70
	7. (1) Harmful or (7) Beneficial	.64
	8. (1) Bad or (7) Good [b]	.74
	9. (1) Foolish or (7) Wise	.49
Subjective Norms	Please assess your preference in the following single item scale:	
	1. During the next year do you think your relevant others would appreciate your entrepreneurial behaviour: (1) not at all or (7) significantly	1.00
Perceived Entrepreneurial Control	Please assess your preference in the following two items scale:	
	1. During the next year, emphasising an entrepreneurial behaviour do you think is going to be: (1) not easy at all or (7) really easy	.60
	2. To what extend do you think the following statement is true or false: "during the next year, if I would, I could act in an entrepreneurial way" (1) false or (7) true	.83
Market Dynamism	In the market your firm operates, are there great differences among the product services with regard to (1=about the same for all product; 7=varies a great deal from one line to another):	
	1. Costumers' buying habits	.76
	2. The nature of the competition	.86
	3. Market dynamism and uncertainty	.88
Industry	In the industry your company operates, in the last year:	

Opportunities		
	1. Growth opportunities in the environment: (1) have decreased dramatically or (7) have increased dramatically	.50
	2. Production/service technology in your principal industry: (1) has remained the same or (7) has changed very much	.75
	3. Rate of innovation of new operating processes and new products or services in your principal industry (1) rate has fallen dramatically or (7) rate has dramatically increased	.79
	4. Research and development (R&D) activity in your principal industry (1) has fallen off greatly or (7) has substantially increased [b]	.63
Strategy: Quality	With regard to your firms' strategy: Please assess your preference on the following forced items scale:	
	1. (1) We do not emphasize on superior product quality or (7) We emphasize on superior product quality	1.00
Strategy: Breath	With regard to your firms' strategy: Please assess your preference on the following forced items scale:	
	1. (1) We are a lowly diversified conglomerate and operate in related industries or (7) We are a highly diversified conglomerate and operate in unrelated industries	.84
	2. (1) We have plenty of similar and related product/service lines or (7) We have plenty of distinctly different (unrelated) product/service lines	.69
	3. (1) Our product/service lines are similar different in terms of technologies or (7) Our product/service lines are very different in terms of technologies	.53
	4. (1) Our product/service lines are similar in terms of the required market strategy or (7) Our product/service lines are very different in terms of the required market strategy	.47
Strategy: Cost Reduction	With regard to your firms' strategy: Please assess your preference on the following forced items scale:	
	1. (1) The cost reduction in product making or service providing is not a priority or (7) The cost reduction in product making or service providing is a priority	1.00

[a] Standardized item loadings are reported; [b] These items were reverse coded; All items have $p<.01$; N=200

REFERENCES
(CHAPTER 3)

Ajzen, I. 1991. The theory of planned behavior. ***Organizational Behavior and Human Decision Processes***, 50: 179-211.

Amit, R., Muller, E. & Cockburn, I. 1995. Opportunity costs and entrepreneurial activity. ***Journal of Business Venturing***, 10, 2: 95-106.

Baldini, N., Grimaldi R., & Sobrero M., 2004, '***La diffusione di pratiche organizzative tra pressioni ambientali e processi di legittimazione***', In Zollo G. (a cura di), Valori, risorse e competenze nelle organizzazioni, Edizioni Scientifiche Italiane, Napoli. *XV conference AIIG*, 14-15 ottobre.

Baron, R. A. 2004. The cognitive perspective: A valuable tool for answering entrepreneurship's basic "why" questions. ***Journal of Business Venturing***, 19, 2: 221-239.

Bates, T. 1995. Self employment entry across industry groups. ***Journal of Business Venturing***, 12, 2: 109-124.

Baum, R.J., & Locke, E. 2004. The relationship of entrepreneurial traits, skill and motivation to subsequent venture growth. ***Journal of applied psychology***, 89, 4: 587-598.

Baum, R.J., Locke, E., & Smith, K.G. 2001. A multidimensional model of venture growth. ***Academy of Management Journal***, 44, 2: 292-303.

Beck, T., Demirgüç-Kunt, A. & Maksimovic, V. 2005. Financial and legal constraints to firm growth: does size matter?. ***Journal of Finance***, 60, 1:, 137-151.

Begley, T., & Boyd, D. 1987. A comparison of entrepreneurs and managers of small business firms. ***Journal of Management***, 13: 99-108.

Boyd, R. 1990. Black and Asian self-employment in large metropolitan areas: A comparative analysis. ***Social Problems,*** 37, 2: 258-274.

Brown, T. 1996. ***Resource orientation, entrepreneurial orientation and growth: How the perception of resource availability affects small firm growth***. Rutgers University, Newark, NJ.

Busenitz, L. 1999. Entrepreneurial risk and strategic decision making. ***Journal of Applied Behavioural Science***, 35, 3: 325-340.

Butler, J. S., & Herring, C. 1991. Ethnicity and Entrepreneurship in America: Toward an Explanation of Racial and Ethnic Group Variations in Self-Employment. ***Sociological Perspectives***, 34: 79-94.

Colombo, M., Grilli, L., Mariotti, S., & Piva, E. 2006. Le giovani imprese italiane ad alta tecnologia: fatti stilizzati e implicazioni di politica tecnologica. forthcoming in ***Economia e politica industriale***.

Colombo, M. G., & Delmastro, M. 2002. How effective are technology incubators? Evidence from Italy. ***Research Policy***, 31: 1103 – 1122.

Cooper, A., Woo, C., & Dunkelberg, W. 1988. Entrepreneurs' perceived chances for success, ***Journal of Business Venturing***, 3, 2: 97-108.

Covin, J. G., & Slevin, D. P. 1989. Strategic management of small firms in hostile and benign environments. ***Strategic Management Journal***, 10: 75-87.

Covin, J. G.. & Slevin, D. P. 1997. High growth transitions: Theoretical perspectives and suggested directions. In D. L. Sexton & R. W. Smilor (Eds.), ***Entrepreneurship2000***: 99-126. Chicago: Upstart Publishing.

Cromie, S., & Johns, S. 1983. Irish entrepreneurs: Some personal characteristics. ***Journal of Organizational Behaviour***, 4: 317-324.

Deeds, D. L., DeCarolis, D., & J. E. Coombs, 1998. Firm-specific resources and wealth creation in high-technology ventures: evidence from newly public biotechnology firms. ***Entrepreneurship Theory and Practice***, 22, 3: 55-73.

Degroof, J., Roberts, E., 2004. Overcoming weak entrepreneurial infrastructures for academic spin off ventures. ***Journal of Technology Transfer***, 29: 327-352.

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

Epstein, A. 1978. ***Ethos and Identity***, Tavistock, London.

Eurostat, 2005 http://epp.eurostat.ec.europa.eu/

Evans, D., & Leighton, L. 1989. Some empirical aspects of entrepreneurship. ***American Economic Review***, 79: 519-535.

Feldman, M. P. 2001. The entrepreneurial event revisited: firm formation in a regional context. ***Industrial and Corporate Change***, 10, 4: 861-875.

Fini, R., & Grimaldi, R. 2007. Academic Founders and Business Opportunity Generation: an Empirical Analysis based on Italian Academic Spin-offs'. In: M. Dowling, Schmude J., (Eds.) ***Empirical Entrepreneurship in Europe: New Perspectives***: 177-197, Edward Elgar UK.

Fini, R., Grimaldi, R., & Sobrero, M. 2006. ***Factors Fostering Academics to Start up New Ventures: an Assessment of Italian Founders' Incentives***. Paper presented at the 2006 Academy of Management Meeting, August 11-16, in Atlanta, Georgia, USA.

Foo, M. D., Wong, P. K. & Ong, A. 2005. Do others think you have a viable business idea? Team diversity and judges' evaluation of ideas in a business plan competition'. ***Journal of Business Venturing***. 20, 3: 385-402.

Gartner, W. B., Gatewood, E., & Shaver, K. G. 1991. Reasons for starting a business: Not-so-simple answers to simple questions. In G. E. Hills & R. W. LaForge (Eds.), ***Research at the marketing/entrepreneurship interface***: 90–101. Chicago: University of Illinois at Chicago.

George, G., Zahra, S.A., & Wood, 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.

Gomez-Mejia L.R., & Balkin, D. 1989. Effectiveness of Individual and aggregate compensation strategies. ***Industrial relations***, 28, 3: 431-445.

Grimaldi R., & Sobrero M. 2005. ***Complements or substitutes? An empirical analysis of the role of Universities and local context in supporting the creation and growth of academic start-ups***, Working Paper.

Gupta, A.K., & Govindarajan, V. 2000. Knowledge flows within multinational corporations. ***Strategic management journal***, 21, 4: 473-496.

Henkel, M. 2005, Academic identity and autonomy in a changing policy environment. ***Higher Education***, 49: 155-176.

Hsu, D., & Bernstein, T. 1997. Managing the university technology licensing process: Findings from case Studies. ***Journal of the Association of University Technology Managers***, 9: 1-33.

Iakovleva, T. 2004. ***Entrepreneurial performance in Russia***. Paper presented at European Summer University Conference in Twentee, Nederland, 19-21 September.

ISTAT. 2003. http://www.istat.it/ambiente/contesto/infoterr/azioneB.html

Joreskog, K., & Sorbom, D. 2006. ***Lisrel 8.80***, software.

Kogan, M, Bauer, M., Bleiklie, I., & Henkel, M. 2000. ***Transforming higher education: a comparative study: a comparative study***. London: Jessica Kingsley.

Kolvereid L., 1996, Prediction of employment status choice intentions. ***Entrepreneurship theory and practice***, 21: 47-57.

Lerner, J. 2005. The university and the start-up: lessons from the past two decades. ***Journal of Technology Transfer***, 30, 1-2: 49-58.

Lerner, J. 1999. The Government as Venture Capitalist: The Long-Run Impact of the SBIR Program. ***Journal of Business,*** 72, 3: 285-318.

Locke, E. A. 1993. ***The traits of American business heroes***. Manuscript in preparation, University of Maryland.

Locke, E. A., & Latham, G. P. 1990. ***A theory of goal setting and performance***. Englewood Cliffs, NJ: Prentice-Hall.

Lockett, A., & Wright, M. 2005. Resources, capabilities, risk capital and the creation of universities spin-out companies. ***Research Policy***, 34: 1043-1057.

Louis, K., & Bluemental D. 1989. Entrepreneurs in Academe: an exploration of behaviours among life scientists. ***Administrative science quarterly***, 34,1: 110-131.

Lumpkin, G. T., & Dess, G. G. 1996. Clarifying the entrepreneurial orientation construct and linking it to performance. ***The academy of management review***, 21, 1: 135-172.

March, J. & Olsen, J. P. 1989. ***Rediscovering Institutions: the organizational basis of Politics***. New York: free press.

McClelland, D. C. 1961. ***The achieving society***. Princeton, NJ: Van Nostrand.

Mian, S.A. 1996. Assessing value-added contributions of university technology business incubators to tenant firms. ***Research Policy***, 25, 3: 325-335.

Mian, S.A., 1997. Assessing and managing the university technology business incubator: an integrative framework. ***Journal of Business Venturing,*** 12: 251–285.

Miller, S. & Friesen, P. 1982. Innovation in conservative and entrepreneurial firms: Two models of strategic momentum. ***Strategic Management Journal***, 3: 1-25.

Miller D. 1987. The structural and environmental correlates of business strategy. ***Strategic management journal***, 8, 1: 55-76.

Miller, D. 1983. The correlates of entrepreneurship in three types of firms. ***Management science,*** 29: 770-791.

Moynihan, D., & Pandey, S. K. 2007. The role of organizations in fostering public service motivation. ***Public Administration Review***, 67, 1: 40-53.

Mustar P., Renault M., Colombo M.G., Piva E., Fontes M., Lockett A., Wright M., Clarysse B., & Moray N. 2006. Conceptualising the heterogeneity of research-based spin-offs: A multi-dimensional taxonomy. ***Research Policy***, 35: 289–308.

Niosi, J. & Bas, T.G. 2001. The competencies of regions: Canada's clusters in Biotechnology. ***Small Business Economics***, 17, 1-2: 31-42.

Perry, J. 1996. Bringing Society in: Toward a theory of public service motivation. ***Journal of Public Administration Research and Theory***, 10, 2: 471-488.

Piccaluga, A., & Balderi, C. 2007. ***Consistenza ed evoluzione delle imprese spin off della ricerca pubblica in Italia***. Report Finlombarda.

Radosevich, R. 1995. A model for entrepreneurial spin-offs from public technology sources. ***International Journal of Technology Management***, 10, 7/8: 879-93.

Ritsila, J., & Tervo, H. 2002. Effects of unemployment on new firm formation: Micro-level panel data evidence from Finland. ***Small Business Economics***, 19: 31-40.

Roberts, E. B. 1991. ***Entrepreneurs in high technology: lesson from Mit and beyond***. New York, Oxford University Press.

Roberts, E. B., & Fusfeld, A. R. 1981. Staffing the Innovative Technology-Based Organization. ***Sloan Management Review,*** 22, 3: 19.

Roberts, E.B. & D. E. Malone. 1996. Policies and structures for spinning off new companies from research and development organizations. ***R & D Management***, 26, 1: 17-46.

Schumpeter, J., 1934, ***Capitalism, socialism, and democracy***. New York: Harper and Row.

Shane, S. 2004. ***Academic Entrepreneurship: University Spin-offs and Wealth Creation.*** UK: Edward Elgar Publishing.

Shane, S., & Khurana, R. 2003. Bringing individuals back in: the effects of career experience on new firm founding. ***Industrial and Corporate Change***, 12, 3: 519-543.

Stewart, W., & Roth, P. 2001. Risk propensity differences between entrepreneurs and managers: A meta-analytic review. ***Journal of Applied Psychology***, 86, 1:145-153.

Storey, D. 1994. ***Understanding the Small Business Sector***, London: Routledge.

Stuart, R. & P. A. Abetti, 1987. Start-up ventures: towards the prediction of initial success. ***Journal of Business Venturing***, 2, 3: 215-230.

Taylor, N. 2001. Self-employment and windfall gains in Britain: Evidence from panel data. ***Economica***, 68: 539-605.

Watson, W.E., Ponthieu, L.D. & J.W. Critelli. 1995. Team interpersonal process effectiveness in venture partnerships and its connections to perceived success. ***Journal of Business Venturing***, 10, 5: 393-412.

Weber, E., Blais, A. & Betz, N. 2002. A Domain-specific Risk-attitude Scale: Measuring Risk Perceptions and Risk Behaviors. ***Journal of Behavioral Decision Making***, 15: 263–290.

Werts, C. E., Linn, R. L., & Joreskog, K. 1974. Interclass reliability estimates: Testing structural assumptions. ***Educational and Psychological Measurement***, 34: 25–33.

Westhead, P., 1997. R&D 'inputs' and 'outputs' of technology-based firms located on and off science parks. ***R&D Management***, 27, 1: 45–62.

Wiklund, J. 1999. ***Entrepreneurial orientations as predictor of performance and entrepreneurial behaviour in small firms—longitudinal evidence.*** Paper presented at the 18th annual Entrepreneurship Research Conference, Gent. Belgium.

Wiklund, J., & Shepherd, D. 2003. Knowledge-Based Resources, Entrepreneurial Orientation, and the Performance of Small and Medium-Sized Businesses. ***Strategic Management Journal,*** 24: 1307–1314.

CHAPTER 4

PAPER II[26]

A MULTIDIMENSIONAL MODEL OF ENTREPRENEURIAL ORIENTATION

ABSTRACT

Entrepreneurial Orientation (EO) concept has become a central issue in the domain of entrepreneurship. Based on our knowledge, no previous attempts have been made to simultaneously provide a multidimensional characterization of EO and propose a set of antecedents for that measure. The purpose of this paper is to test the validity and robustness of EO construct and to assess the nomological validity of its antecedents. Our analysis are based on a sample of 200 entrepreneurs. The measurement models show that EO is a multi-dimensional micro-founded construct which is influenced by S*ituationally specific motivation, Individual skills and competences, Personal traits and Perception of the business environment.*

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4.1 Introduction

Since the early contribution of Miller (1983), the Entrepreneurial orientation (EO) concept has become a central issue in the domain of entrepreneurship, receiving a substantial amount of theoretical and empirical attention (Lumpkin & Dess, 1996; Wiklund & Shepherd 2003; Covin, Green, & Slevin, 2006). Consensus about what EO represents, both empirically and theoretically, is increasing. In their work Covin and Slevin (1989) propose a widely used nine items scale, encompassing three underlying dimensions (innovativeness, proactiveness and riskiness), for the empirical assessment of EO; while Lumpkin and Dess (1996) provide a detailed theory-based conceptualization of the EO construct. Despite the role played by EO as one of the few areas of entrepreneurship research where a cumulative body of knowledge is developing (Rauch, Wiklund, Lumpkin, & Frese, 2004), very few contributions tackle a broader perespective of the methodological issues related to EO, rather then limiting their scope to the examination of the internal consistency of the scale.

One recent debate is focused on the dimensionality of the EO construct and the interdependence among the three sub-dimensions of EO (Innovativeness, Proactiveness and Riskiness), and specifically on the issue whether the dimensions should co-vary or should vary independently. This is reflected in the different measurement models being used in the relevant literature to test hypotheses involving EO (George, 2006). Moreover, there is still no strong empirical evidence supporting either the first or the latter position and we are still lacking a methodological contribution to assess the validity of the scale and test for a second-order factorial structure.

Another open debate is related to the identification of the dimensions which foster and enact EO. Based on our knowledge no previous attempts have been simultaneously made to provide a multidimensional characterization of EO and propose a set of antecedents for the construct. In an attempt to fill part of this void, we build our model of causal antecedents of

EO on constructs extensively used and validated, both from a theoretical and empirical perspective, in sociological and psychological studies. We focus our investigation on five major domains: *(a) Situationally Specific Motivation, (b) Personal Traits and Characteristics, (c) Individual Skills, (d) Perception of the Business Environment and (e) Entrepreneurial Orientation-Related Dimensions.*

Hence, the purpose of this paper is threefold:

1) to test the EO construct (Strategic Posture Scale) proposed by Covin and Slevin (1989), assessing the overall validity and the robustness of the scale;

2) to check if our data support the notion of EO as a three-component latent structure (Innovativeness, Proactiveness and Riskiness) latent structure that may be represented by means of a second-order factor;

3) to assess the nomological validity of the EO construct through the analysis of the causal relationships between EO and a set of its antecedents.

We rely on a sample of 200 entrepreneurs, affiliated to a matched sample of 72 Academic Spin-offs and Private Start-ups. Firms were matched by industry, year of establishment and localization and they are all localized in the Emilia Romagna region, in northern Italy. We gathered data by face-to-face interviews and used a Structural Equation Modelling technique (Lisrel 8.80) to perform the empirical analysis. The results show that EO is a multi-dimensional micro-founded construct which can be better represented by a second-order model. The rest of the paper is structured as follows: in Section 2 we provide a characterization of the Entrepreneurial Orientation construct, Section 3 is devoted to assess the micro foundation of EO, while in Section 4 we present the conceptual model. Section 5

describes the research design and in Section 6 we discuss our results. A final section concludes.

4.2 The Entrepreneurial Orientation construct

Entreprenerurial Orientation describes a set of strategic activities (Wiklund & Shepherd, 2003) and may be viewed as a firm-level strategy-making process that firms use to enact their organizational purpose, sustain their vision, and create competitive advantage. The salient dimensions of EO can be derived from the strategic management and entrepreneurship literatures. Starting from the inspiring contribution of Miller (1983: 771), firms with an Entrepreneurial Orientation have been defined as "those that engage in product market innovation, undertake somewhat risky ventures, and are first to come up with proactive innovations, beating competitors to the punch". Hence, EO can be seen as a firm-level orientation which is influenced by individual actions, decisions and attitudes. Different theories model organization behaviour as the result of individual behaviour emerging through social and political processes that are themselves determined by individuals (Baum & Wally, 2002). Especially in small firms the strategic orientation of the CEO/entrepreneur is likely to be tantamount to the strategic orientation of firm; therefore EO has been defined as the CEO/entrepreneur's strategic orientation, reflecting a willingness (or intention) of a firm to engage in entrepreneurial behaviours (Brown, 1996; Wiklund, 1999).

Three dimensions of EO have been identified and used consistently in the literature: Innovativeness, Proactiveness and Rriskiness (Covin & Slevin, 1989; Wiklund, 1999; Lumpkin & Dess, 2001; Wiklund & Sheperd, 2003; Sciascia, Naldi & Hunter, 2006). The three dimensions together represent the Strategic Posture Scale (Covin & Slevin, 1989) and can be defined as (Lumpkin & Dess, 1996):

- Innovativeness: it reflects a tendency to engage in and support new ideas, novelty, experimentation, and creative processes that may result in new products, services, or technological processes;

- Proactiveness: it suggests a forward-looking perspective, which is supposed to be a characteristic of a marketplace leader, who has the foresight to act in anticipation of future demand and shape the environment;

- Riskiness: it measures the firm's willingness to engage in risky projects and managers' preferences for bold versus cautions acts to achieve firm objectives;

Other scholars, in order to explore different level of EO, come up with a definition which takes into account two extra dimensions: competitive aggressiveness and autonomy (Lumpkin & Dess, 1996). The two dimensions can be described as:

- Competitive aggressiveness: it refers to a firm's propensity to directly and intensely challenge its competitors to achieve entry or improve position, in order to outperform industry rivals in the marketplace;

- Autonomy: it describes the independent action of an individual or a team in bringing forth an idea or a vision and carrying it through to completion.

Together, these five dimensions capture a wide range of behaviours commonly held to be entrepreneurial. However, the Strategic Posture Scale, encompassing the three dimensions of innovativeness, proactiveness and riskiness, remains the most commonly used (Wiklund & Sheperd 2003, Sciascia et al., 2006) .

In the literature there is currently a debate whether the dimensions of EO should simultaneously co-vary or whether the dimension should vary independently (Covin et al., 2006). In his original work, Miller (1983) considers a firm being entrepreneurial if it is high on three dimensions of EO: Innovativenss, Proactiveness and Riskiness. Miller (1983) does not claim that the dimensions must co-vary but rather proposes that EO is a formative construct. Lumpkin and Dess (1996) proposed an alternative position about EO arguing that the underlying dimension of EO may vary independently. Both positions conceptualize the three dimensions as distinct without co-variation. In contrast, other researchers conceptualized EO as a reflective construct implying that the dimensions of EO must covary and that a change in EO results in a change of innovativeness, proactiveness and riskiness concurrently (Kreiser, Marino, & Weaver, 2002). Only two studies explicitly addressed this debate by analyzing the relationships between the dimensions of EO (Stetz, Howell, Stewart, Blair, & Fottler, 2000; George, 2006) tentatively concluding that EO should be considered as a formative construct. Thus, more empirical and methodological evidence has to be provided in order to assess if the underlying dimensions of EO represent different aspects of the multidimensional concept and clarifying if the correlations with antecedences (or consequences) of EO should be studied at the level of the underlying dimensions or at an aggregate level. In the following section we tackle this issue, providing a literature review of some dimensions which have been demonstrated to be relevant in predicting entrepreneurial related behaviours.

4.3 The Micro-foundation of Entrepreneurial Orientation

4.3.1 Theory of the Planned Behaviour

The scientific literature points out that EO is a behaviour which can not be considered under a complete volitional control. In studying behaviours the role of intentions has been

showed to be predominant. Therefore, intention models offer us a significant opportunity to increase our ability to understand and predict EO. The versatility and robustness of intention models support the broader use of comprehensive, theory-driven, testable, process models in entrepreneurship research (MacMillan & Katz, 1992). A widely accepted theoretical approach, which strongly emphasises these behavioural dimensions, is the Theory of the Planned Behaviour proposed by Ajzen (1991). This theory is a well-established and validated psychological theory (Locke, 1991) which represent one of the most influential attitude theory in the entrepreneurship literature (Kolvereid & Bullvåg, 1996; Wiklund & Sheperd, 2003; Isaksen, 2006). The theory encompasses five specific domains: Attitude towards the behaviour, Subjective norms, Perceived behavioural control, Intention to behave and Behaviour. Attitude towards the behaviour refers to attitudes developed from the beliefs people hold about the object of the attitude. Subjective norms, instead, are related to the approval or disapproval that important referent individuals (or groups) have in relation to the enactment of a given behaviour. Perceived behavioural control can be seen as the person's belief related to how easy (or difficult) the enactment of the behaviour is likely to be. Central to this theory is the role of intentions and their power in predicting the focal behaviour (Ajzen, 1991).

Insert Figure 4.1 about here

The present contribution is primarily focused on EO and on its antecedents. Hence, we consider four of the listed domains: the three exogenous variables (Attitude towards Entrepreneurship, Subjective Norms and Perceived Entrepreneurial Control) and the first level endogenous variable (Entrepreneurial Orientation or intention to behave in an

entrepreneurial way). The study of the fifth dimension (the Entrepreneurial Behaviour), is not undertaken in the present contribution since is not included among the purposes of our study. As already mentioned before, we rephrase the four dimensions applying the Theory of the Planned Behaviour to the entrepreneurship domain and providing a set of theoretically based antecedents to the three exogenous variables.

4.3.2 Antecedents of the Theory of the Planned Behaviour

Many scholars affiliated to the entrepreneurship research domain put great emphasis in defining attributes, characteristics and perceptions of people and in showing their direct or indirect association with entrepreneurial behaviours. Davidsson (1995), as well as Wiklund and Sheperd (2003), find out that personality traits, competences and environmental dynamism are significant in predicting entrepreneurial behaviours. Iakovleva (2004) identifies individual competences, personality traits, as well as competitive strategies and business environment, as predictor of entrepreneurial behaviours.

The purpose of this section is to provide a detailed review of the dimensions which have been demonstrated to empirically predict the behaviours commonly held to be entrepreneurial. The scientific literature normally addresses the Entrepreneurial Behaviour as a firm level related dimension. As stated before the focus of this contribution is related to EO (and on its micro-foundation), which can be considered as an antecedent of EB. Because of the very low number of scientific contributions related to the impact of individual related dimension on EO, and because of the close link between EO and EB, in reviewing the literature we looked at both EO and EB as dependent variables. Other then the already characterized *Entrepreneurial Orientation-Related Dimensions, w*e identified four major domains: *Situationally Specific Motivation, Personal Traits and Characteristics, Individual*

Skills and Perception of the Business Environment. In the following section we provide a detailed review of the previous mentioned dimensions.

Situationally Specific Motivation

The first attempt to study the willingness and drive of individuals in undertaking entrepreneurial activities can be traced back to the psychological studies of Atkinsons and McClelland in the late 50'. Atikinsons (1957) postulated entrepreneurial motivation as a result of motive, expectancy and incentive stimuli. McClelland found an incentive and provided some early characterizations of entrepreneurial individuals introducing the need-for-achievement concept. He argued that individuals with high Need-for-Achievement are more likely to engage in activities that have a high degree of individual responsibility for outcomes, require individual skill and effort, have a moderate degree of risk, and include clear feedbacks on performance (McClelland, 1961). During decades, the concept of need-for-achievement has received much attention from scholars, who showed how it is not the only dimension characterizing the motivation domain. Motivation has in fact to be considered a multidimensional entity encompassing also Risk Taking (Gomez-Meija & Balkin, 1989; McGrath, MacMillan, & Scheinberg, 1992; Weber, 2002). In addition to Need-for-Achievement and Risk Taking, in the past fifty years, researchers introduced new dimensions to characterize motivation, such as Tolerance for Ambiguity [defined by Budner (1982) as the propensity to view situations without clear outcomes as attractive rather than threatening], Locus of Control [defined by Rotter (1966) as the belief in the extent to which individual believe that their actions or personal characteristics affect outcomes], Self Efficacy [defined by Bandura (1997) as the belief in one's ability to muster and implement the necessary personal resources, skills, and competencies to attain a certain level of achievement on a given task] and Goal Setting [defined by Locke & Latham (1990) as the ability of individuals

in setting objectives and goals]. Finally, some qualitative researches show that independence, Drive and Egoistic Passion (or a passionate, selfish love of the work) can play a role in motivating individuals (Shane, Locke, & Collins, 2003). All of these motivational concepts have been extensively reviewed and included in Entrepreneurial Behaviour studies. Yet, very few of them proved to strongly empirically predict Entrepreneurial Behaviours with the exceptions of **Self Efficacy** (Davidsson, 1995, Baum, Locke, & Smith, 2001) and **Risk Taking** (Gomez-Meija & Balkin, 1989; McGrath et al., 1992; Weber, 2002).

Personal Traits and Characteristics

Scholars focus also on Personal Traits and on their capability to predict entrepreneurial behaviours. Empirical evidence shows that personal traits have an indirect influence on behaviours, while they easily influence key attitudes such as situationally specific motivation, etc. (Krueger, Reilly, & Carsrud, 2000). Herron and Robinson (1990) state that personality traits might predict the state of entrepreneurship (e.g. Situationally Specific Motivation), while failing to predict any level of performance of entrepreneurship. Baum and Locke (2004) show how the personal traits (Tenacity and Passion) have statistical relevance in predicting Entrepreneurial Behaviour only if mediated by other domains such as: competences, situationally specific motivations, perceptions, etc. Smilor (1997) emphasizes the importance of passion in influencing EB as well as Krauss et al. (2005) who found an impact of tenacity on EB.

Personal characteristics might also play a role in determining entrepreneurial behaviours. Hisrich and Peter (1989) refer to family environment dimensions, in particular to birth order and parent's occupation, and show how they predict EB. Based on the empirical review we state that **Passion and Tenacity** seem to be the most reliable indicators in predicting EB.

Individual Skills

Despite this broad characterization of the personal dimensions some scholars believe that a mono-dimensional study, only dealing with motivational dimensions and personality traits, would not be satisfying in the characterization of the Entrepreneurial Behaviours (Sexton & Smilor, 1986; Roberts, 1991). Wiklund and Sheperd (2003) argue that there are reasons to conceptualize Entrepreneurial Behaviours as a function of the entrepreneurs' personal abilities. Also Hisrich and Peter (1989) state that "we agree that entrepreneurs are not born but rather they develop, we need to investigate how such traits emerge and what are the conditions facilitating their presence and what are those inhibiting".

On top of motivational aspects and personal traits, the scientific debate has been also focusing on competences and skills. Background and skills accumulated by each individual entrepreneur, because of education and aging characteristics, have been extensively analyzed by some scholars as a predictor of entrepreneurial activities. Gupta and Govindarajan (2000) state that technical and procedural skills are fundamental in knowledge intensive environment, while Roberts and Fusfeld (1981) show how individuals involved in high-technology based organizations should possess organizational skills. Baum et al. (2001) show that a specific set of Skills (Technical, Procedural and Managerial) have an impact on Entrepreneurial Behaviour.

Based on the foregoing review, the most robust indicators in predicting entrepreneurial related activities are **Technical, Procedural and Organizational Skills** (Baum et al. 2001).

Perception of the Business Environment

Entrepreneurial activities may also be shaped by the perceptions that entrepreneurs have of the surrounding business environment. The attention to the external context is coherent with a theoretical debate which is related to the importance of exogenous stimuli in

affecting Entrepreneurial Behaviours. Some scholars point out that the availability of support mechanisms and environmental infrastructure, such as: logistic, financial, economic, political and legal support, can play a role in fostering EB (Morris & Lewis, 1995). Therefore the absence of support mechanisms can be perceived as an obstacle that slows down the entrepreneurial dynamics. Iakovleva (2004) shows how financial capital, as well as the heterogeneity of the environment (market and industry) can foster EB. Wiklund (1999) and Wiklund and Sheperd (2003) find that environmental dynamics (market and industry), can strongly predict Entrepreneurial Behaviours. More specifically Fini and Grimaldi (2007) provide an assessment of some environmental factors (government, context and university support) which are perceived as relevant in supporting Entrepreneurial Behaviours. Other scholars also argue that organizational and strategic decisions can predict EB within new ventures. In particular Baum et al. (2001) and Iakovleva (2004) show high correlation between competitive strategies (such as focus, low cost and differentiation) and EB. In sum, two of the environmental related dimensions with the highest explanatory power in predicting EB are the **Support Mechanisms** (Government, Context and University Support) and the **Heterogeneity of the Environment** (Market Dynamism and Industry Opportunity).

4.4 The Conceptual Model

Drawing on the evidence provided in the previous two sections we propose a modelization of the EO and of its antecedents. We identify a set of antecedents for the three input dimensions of the Theory of the Planned Behaviour: Attitude toward Entrepreneurship, Subjective Norms and Perceived Entrepreneurial Control. In the following section we'll provide a theoretical motivation for the set of antecedents with the only exception of the Subjective Norms. Several contributions show that this domain is the Theory component

which often fails to predict intentions (Armitage & Conner, 2001), therefore we decide to include Subjective Norms in our model without investigating a set of antecedents.

4.4.1 Antecedents of Attitude toward Entrepreneurship

In reviewing the literature review, we identified three dimensions which can directly or indirectly influence the Attitude toward Entrepreneurship: Situationally Specific Motivation, Personal Traits and Characteristics and Individual Skills. In order to provide a theoretical justification for considering the Situationally Specific Motivation as an antecedent of Attitude, we refer to a contribution of Eagly and Chaiken (1993) where the authors argue that motivation is an important determinant in the attitudes formation process. Within the literature concerning the psychology of attitudes, the idea that emotional and motivational forces impinge upon the cognitive system has been central to three broad theoretical traditions: the reinforcement perspective (Hovland, Janis, & Kelley, 1953), the cognitive consistency perspective (Heider, 1946) and the functional perspective (Katz, 1960). All of these theories emphasize that Situational Specific Motivation can contribute to attitude formation.

On another end, some scholars believe that social and cultural dimensions, as well as race and skills, can determine attitudes (Wang & Buffalo, 2004). These findings are coherent with the assumption of Ajzen and Fishbein (1980), who argue that personality traits and developed competences have an impact on specific behaviours only indirectly by influencing some of the factors that are more closely linked to the behaviour in question (e.g. attitudes). As a result, we assume that **Personal Traits**, as well as **Individual Skills**, may determine the attitude (Kolvereid, 1996; Linan & Chen, 2006).

4.4.2 Antecedents of Perceived Entrepreneurial Behaviour control

As it has been already pointed out, the perceived entrepreneurial control represents the perceived control that each individual thinks to have on the enactment of entrepreneurial behaviour. Based on the evidence provided, two dimensions may directly influence the control: Environmental dynamism, such as: **Market Heterogeneity and Industry Opportunity,** as well as Environmental support such as: the **Support** (or obstacles) coming from the business environment (Morris & Lewis, 1995; Wiklund, 1999; Iakovleva, 2004; Kolveried, 2006). As previously, we assume that personality traits have an indirect impact on the Entrepreneurial Behaviours, while they influence some of the factors (attitudes and perceived control) that are more closely linked to the behaviour in question (Ajzen & Fishbein, 1980).

Drawing on the reviewed contributions, we integrate the different perspectives in a single comprehensive testable model (Figure 4.2), which attempt to provide a multidimensional representation of EO distinguishing between five major domains. The five selected domains are: (a) Situationally Specific Motivation (encompassing Self Efficacy and Risk-Taking), (b) Personal Traits and Characteristics (encompassing Passion and Tenacity), (c) Individual Skills (encompassing Technical, Procedural and Organizational Skills), (d) Perception of the Business Environment (encompassing Government, Context and University Support, Market Dynamism and Industry Opportunity) and (e) Entrepreneurial Orientation-Related Dimensions (EO, Attitude towards Entrepreneurship, Subjective Norms and Perceived Entrepreneurial Control).

Insert Figure 4.2 about here

4.5 Research Design

4.5.1 The questionnaire

Based on the theoretical and empirical research about the foundation of entrepreneurship we developed a survey instrument in order to collect primary data directly from entrepreneurs. The questionnaire is structured in two main parts (Part 1 and Part 2): the first one is dedicated to gather information at firm level, while in the second one we gather information at individual level. Part 1 encompasses four sections, which are respectively aimed at collecting: 1) firm's general information, 2) data on companies' financial and innovative performance, 3) data on the sources and amount of financing, 4) information on company's existing network and relationships with institutions.

We structured the individual level survey (Part 2) into six sections: in the first one we gather demographical information (gender, education, employment); in the second we gather information about Personal Traits and Situationally Specific Motivation (Passion for corporate work, Tenacity, Occupational risk, Financial risk, Gambling risk, Self Efficacy and Goal Setting); in section three we collect information about Skills and Competences (Technical, Procedural and Organizational skills, Patenting, Serial entrepreneurship, Previous employment); in section four we focus on the Entrepreneurial Orientation Related Dimensions (Entrepreneurial Orientation, Attitude toward Entrepreneurship, Subjective Norms, Perceived Entrepreneurial Control), in the fifth one we address the Perception of the Market Dynamics, the Industry Opportunities and the Perceived Corporate Strategy; finally, the last section is devoted to investigate the Perceived Support (and Obstacles) coming from the Government, the Local Context and University (see Appendix 4.A for the details of the measures).

We used a small-scale field pre-test to gather feedback on questions phrasing and to find out if other relevant facets of the domains under study remained untapped.

Subsequentially, the questionnaire has been validated by a panel of ten experts and ten entrepreneurs who provided very helpful insights with regard to the questionnaire's completeness and clarity, as well as an evaluation of the time needed to complete it. No major inconsistencies emerged from this pre-test phase.

4.5.2 The sample

Our study is located in the Emilia Romagna region, in Italy's northeast. Emilia Romagna has been identified by the European Commission as one of the leading regions in Europe for its increasing number of research start-ups and, more generally, for its proactive role in supporting research-to-industry technology transfer. Located in the north of Italy, Emilia Romagna has an extension of about 22,100 sq. km and a population of 4.1 million, with an annual pro capita GDP of 29,059 €, among the highest in Europe (European average is 23,545 €) (Eurostat, 2003). One of the peculiar characteristics of Emilia Romagna production system is represented by the presence of clusters of small-medium enterprises operating in specific sectors and concentrated in specific geographical areas: industrial machinery, the agricultural and food sector, the advanced mechanics, the ceramic industry and the bio-medical sector. Emilia Romagna leads Italy in terms of number of Academic Spin-offs (Piccaluga & Balderi, 2007) and with 3.7 researchers every 1,000 inhabitants and an R&D expenditure rate (over GDP) of 0.61 is among the top three Italian regions for R&D workforce (the national average is of 2.8 reserachers/1000 inhabitants) and expenses (the average national R&D expenditure is 0.54; Istat, 2003). In November 2003 the region adopted its first program for industrial research, innovation and technology transfer (PRRIITT). It is the very first case of an Italian region with its own law concerning innovation.

We built our sample matching the regional population of Academic Spin-offs with a sample of Private Start-ups in terms of: industry (ATECO codification), year of establishment

and localization. We define Academic Spin-offs, all companies generated within the five regional Universities, namely the University of Bologna, the University of Ferrara, the University of Modena and Reggio Emilia, the University of Parma and Catholic University of Milan at Piacenza and the three Public Research Centres, CNR, ENEA and INFM. Our definition of private start-ups applies to all the private companies without public affiliated individuals or public Institutions between the founders (slightly modified from Colombo, Grilli, Mariotti, & Piva, 2006).

Through the five Universities' and the three Research Centers' websites, and their technology transfer offices (where available) we retrieved basic information about each company, like names, telephone and e-mail contacts. We had previous information about 50 academic firms which have already been contacted for previous studies (see Fini et al, 2006; Fini & Grimaldi, 2007). Moreover for each company we identified the names and contact information of the leading academic shareholder. After a first round of e-mails at the end of November 2006, a second reminder targeted to non respondents at the beginning of December 2006, and several phone calls, we set up face to face interviews with 134 individuals involved in Academic Spin-offs (132 founders and 2 CEOs) affiliated to 72 firms. All interviews were conducted on the basis of the aforementioned structured questionnaire and lasted, on average, one hour and a half. The data collection was closed at the beginning of February 2007 with a total number of 72 Academic Spin-offs visited and 132 entrepreneurs interviewed (we excluded the CEOs), corresponding to an overall firm level response rate of 81% and an overall individual level response rate of 39%.

Through the data bases of the Chamber of Commerce of Bologna we were able to gather information related to the population of Private Start-ups in the region. Specifically we retrieved the name of the company, the legal status, the address (in some cases the telephone number), the ATECO codification (industry codification), year of establishment, location and

a general description of the operations. All of the interviews were conducted on the basis of the same structured questionnaire and lasted, on average, two hours. The data collection started at the beginning of March 2007 and was closed at the beginning of May 2007 with a total number of 61 Private Start-ups visited and 75 individuals interviewed (68 founders and 7 CEOs), corresponding to an overall individual level response rate of 37%.

4.5.3 Measures and preliminary analysis

In this section we provide a more detailed specification of the scales which have been tested in the model. Data were collected for the 15 theory-based scales from the 200 entrepreneurs. Table 4.1 shows the 5 macro domains, the 15 scales, the number of items for each scale, the scales format, the research references and the composite reliability indexes (CR).

Insert Table 4.1 about here

All of the measurement and structural models described in the next section were tested using the LISREL 8.80 program (Jöreskog & Sörböm 2006). The goodness-of-fit of the models was assessed based on a common set of measures: chi-square tests, Root Mean Square Error of Approximation (RMSEA), Standardized Root Mean Square Residual (SRMR), Non-Normed Fit Index (NNFI) and the Comparative Fit Index (CFI). Discussions of these indices can be found in Bentler (1990), Browne and Cudeck (1993), Marsh and Hovecar (1985) and Marsh, Balla, and Hau (1996). Satisfactory model fits are indicated by non-significant chi-square tests, RMSEA values less than .09, SRMR values less than .10, and NNFI and CFI values greater than or equal to .90. All analyses were performed on covariance matrices.

4.6 Results

4.6.1 Independence and validity

We assess the micro-foundation of EO through a three stages sequential model. The first one (Model A) is the empirical test of the Theory of the Planned Behaviour and it represents EO measurement model. The second one (Model B) refers to the antecedents of the Theory; specifically it relates Situationally Specific Motivation, Individual Skills, Environment Support and Environment Heterogeneity to Entrepreneurial Orientation-Related Dimensions (specifically to Attitude toward Entrepreneurship and Perceived Entrepreneurial Control). The third one (Model C) focus on the paths departing from Personal Traits to Situationally Specific Motivation, Individual Skills, Environment Support and Environment Heterogeneity.

Because of the selected research design we had to deal with the multiple-affiliation of the 200 individuals to the 133 firms. In order to check for the independence of the observations within the same firm, in those firms with more than one respondents, we selected the "leading shareholder" (in terms of: % of equity owned, responsibility level and amount of hours devoted to corporate work). Then we computed, for each scale, an Euclidean distance of the answers given by the leading shareholder with the average values of the other respondents (a) affiliated to the same firm and (b) affiliated to the other 132 firms. We performed the analysis for both personal traits measures (Tenacity and Passion) and in both cases the results showed no statistical differences among the value means **within** the same firm and **between** the firms under scrutiny (tenacity within – tenacity between: t = -1.29, sig. .20, passion within – passion between: t = -1.25, sig. .21). We choose to check for independence in the Tenacity and Passion constructs because they represented the first level exogenous dimensions of the tested model.

We then proceeded to evaluate the internal consistency of the 15 constructs, checking for convergent validity, through the assessment of the Composite Reliability (CR). CR is calculated as the sum of the square roots of the item-squared multiple correlations squared and divided by the same quantity plus the sum of the error variance (Werts, Linn, & Joreskog, 1974), Estimates of CR above .60 and concept-to-domain coefficients statistically significant ($t > 2.0$, $p < .05$) are usually considered as supportive of convergent validity (Bagozzi & Yi 1988). All values had CR significantly higher than the stipulated criteria, and all items were statistically significant. Table 2 reports the Composite Reliability index.

We also verified the discriminant validity of the constructs by determining that the average variance extracted by each latent variable's measure was larger than its shared variance with any other latent variable. This measure estimates the amount of variance captured by a construct's measure relative to random measurement error (Fornell & Larcker, 1981).

In sum, the results of the independence test, and the assessment of the convergent and discriminant validities enabled us to proceed to the estimation of the structural models.

4.6.2 Models

Model A (Figure 4.3) exhibits satisfactory measures of goodness-of-fit: $\chi^2(181) = 293$, $p \approx .00$, RMSEA = .058, SRMR = .064, NNFI = .94, CFI = .95. The empirical evidence partially support the effectiveness of the Theory of Planned Behaviour in predicting intentions. Attitudes ($\gamma = .48$, s.e. = .10) and Perceived Entrepreneurial Control ($\gamma = .24$, s.e. = .11) predict EO, while the Subjective norms path fails to reach statistical significance ($\gamma = -.05$, s.e. = .11, n.s.). As stated before, EO has been modelled as a second-order factor; all three underlying domains Innovativeness ($\beta = .86$, s.e. = .16), Proactiveness ($\beta = .79$, s.e. = .23) and

Riskiness (β = .54, s.e. = .11) load on the factor. Squared multiple correlation for structural equations having EO as a dependent variable is .31.

The appropriateness of using the second-order construct as a theoretical representations of the EO construct has also been explored. We exploit a two pronged testing strategy. On one side we perform an inspection of the modification indexes of our second-order model: the values suggest that no significant improvement in the model's chi-squared could be obtained adding any direct path linking the three dimensions of the Theory of the Planned Behaviour to any sub dimension of EO. A more formal test of appropriateness has been conducted assessing an alternative model including all the nine direct effects of the three components of the Theory (Attitude, Subjective norms and Perceived Entrepreneurial Control) on the three underlying sub-dimensions of EO. This fully disintermediated model has been estimated and compared with our original one. Technically speaking the two models are not nested[27], thus the well known generalized likelihood ratio test may not be used. Rust, Chol, and Valente (1995), in a methodological contribution on the issue of comparison between covariance structure models, suggest many alternative approaches for comparing non nested models having all observed variables in common. We specifically used a variant of the Akaike's criterion originally derived by Cudeck and Browne (1983): the test is a function of the chi-squared goodness of fit statistic and the number of parameters of the models. The test results confirm that the model that uses a representation of EO as second-order has a better fit than the fully disintermediated one ($A''_{2nd} = -97$; $A''_{dis} = -108$).

Insert Figure 4.3 about here

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[27] Both models use the same set of observed variables but the two functional forms are different.

Model B (Figure 4.4) is built with 47 indicators, 12 latent constructs and 4 second-order factors. It appears to be quite satisfactory: the goodness-of-fit statistics for the model are $\chi^2(1015) = 1398$, $p \approx .00$, RMSEA = .045, SRMR = .076, NNFI = .92, CFI = .92. All the first order factors load heavily on the second-order ones (see Figure 4.4 for the coefficients). The tested model partially support the hypothesized paths: Individual Skills predict Attitudes (γ = .27, s.e. = .12), as well as Situationally Specific Motivation (γ = .19, s.e. = .09). Similarly, the path going from Environmental Heterogeneity to Perceived Entrepreneurial Control is positive and significant (γ = .44, s.e. = .13), while Environmental Support shows no impact (γ = .03, s.e. = .11, n.s.).

Insert Figure 4.4 about here

Model C (Figure 4.5) shows an acceptable fit of the data: $\chi^2(953) = 1390.09$, $p \approx .00$, RMSEA = .050, SRMR = .081, NNFI =.91, CFI = .92. Traits, as Figure 4.5 shows, can be considered a second-order factor of Passion and Tenacity. Traits influence the Individual Skills (γ = .93, s.e. = .54) and predict the Situationally Specific Motivation (γ = .62, s.e. = .24). Traits have an impact on the Environmental Heterogeneity (Market Dynamism and Industry Opportunities) (γ = .60, s.e. = .22) while fail to reach statistical significance in predicting the Environmental Support (γ = .10, s.e. = .09, n.s.). Figure 4.5 summarizes the model.

Insert Figure 4.5 about here

4.7 Conclusions

In the current study, drawing on managerial, sociological and psychological literature, we test a multidimensional model of the nomological network of the Entrepreneurial Orientation and its antecedents.

First, we assess that the EO construct, tested with the Strategic Posture Scale (Covin & Slevin, 1989), is robust and has a strong internal and discriminant validity.

Second, we do not disconfirm the hypothesis that EO exhibits a three-component second-order factor structure (Innovativeness, Proactiveness and Riskiness). Innovativeness results to be the most related dimensions to the second-order factor EO, followed by Proactiveness and Riskiness. In order to explore the appropriateness of using the second-order construct of EO we compare our original model to a fully disintermediate one (a model where the three underlying dimensions of EO are regressed on the Theory Planned Behaviour component). Empirical evidence (goodness of fit indexes) shows that both models hold. The Akaike criterion for non nested models (with the same number of observed variables) also demonstrates that the second-order model provides a better fit to the data.

Third, we test the effectiveness of a well established psychosocial theory (Theory of the Planned Behaviour) in explaining the EO behavioural intentions. Two of the predictors of EO behavioural intentions, namely Attitude toward Entrepreneurship and Perceived Entrepreneurial Control, do effectively explain the variance of the dependent construct (R^2=.31); the only exception is the Subjective Norms path which fails to reach a statistical significance. This is not a surprising finding, as we stressed before, the literature consistently shows that Subjective Norm is the component which more often fails to predict behavioural intentions (Armitage & Conner, 2001). Next, we assess the nomological validity of the causal path between EO and its set of antecedents. In doing so we show that EO is a microfounded behaviour primarily explained by Situationally Specific Motivation, Individual Skills and by

Perceptions of Business Environment. Perceived Support fail to predict the EO-Related Dimensions. One potential explanation for this pattern may be that perceived entrepreneurial control is not mediated by government policies, infrastructures availabilities and financial aids, but rests mainly on the perception of the environmental condition role, suggesting the necessity of a fine tuning of existing supportive mechanisms.

The nature of this cross-sectional study is exploratory: the specific sampling strategy this research rests upon is robust enough to grant the internal consistency of the obtained results, while greater care (and more research) is needed in order to generalize the results to a broader entrepreneurial population. Despite of that, the proposed modelization might be of interest in the assessment of differences/similarities between different types of entrepreneurs (e.g. Academic vs. Private entrepreneurs). In summary, the theoretical grounding and the satisfactory measures of goodness-of-fits of the hierarchically ordered models offer a strong support for the conceptualization of EO as a multi-dimensional micro-founded construct.

EXHIBITS
(CHAPTER 4)

Table 4.1: Predictor Measures

Domain and Predictor	Item	Scale format	Research reference	CR
Situationally specific motivation				
Occupational risk	4	1 to 7 likert like	Gomez and Meija, 1989	.75
Self efficacy	2	0 to 7 scale	Baum et al., 2001	.82
Personal Traits and characteristics				
Passion for corporate work	5	1 to 7 likert like	Locke, 1991	.81
Tenacity	5	1 to 7 likert like	Gartner et al., 1991	.80
Individual skills and competences				
Technical skills	3	1 to 7 scale	Gupta and Govindarajan, 2000	.71
Procedural skills	5	1 to 7 scale	Gupta and Govindarajan, 2000	.82
Organizational skills	5	1 to 7 likert like	Roberts and Fusfeld, 1981	.84
Perception of the Business environment				
Governmental support	2	1 to 7 likert like	Fini and Grimaldi, 2007	.69
Context support	4	1 to 7 likert like	Fini and Grimaldi, 2007	.78
University support	4	1 to 7 likert like	Fini and Grimaldi, 2007	.75
Market dynamism	3	1 to 7 forced choice	Miller and Friesen, 1982	.88
Industry opportunities	4	1 to 7 forced choice	Miller, 1987	.77
Entrepreneurial orientation related dimensions (TPB)				
Entrepreneurial orientation (EO)	9	1 to 7 forced choice	Covin and Slevin, 1989	.77
Attitude toward entrepreneurship	9	1 to 7 forced choice	Ajzen, 1991	.88
Perceived entrepreneurial control	2	1 to 7 forced choice	Ajzen, 1991	.67
Subjective norms	1	1 to 7 forced choice	Ajzen, 1991	-

Figure 4.1: Theory of the planned behaviour (Ajzen, 1991)

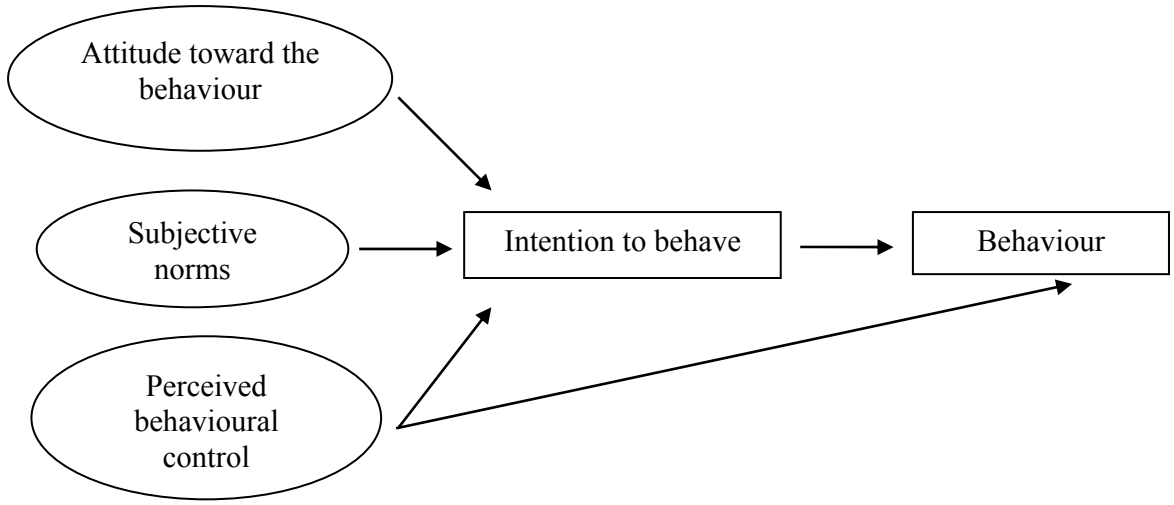


Figure 4.2: Conceptual model of the micro foundation of Entrepreneurial Orientation

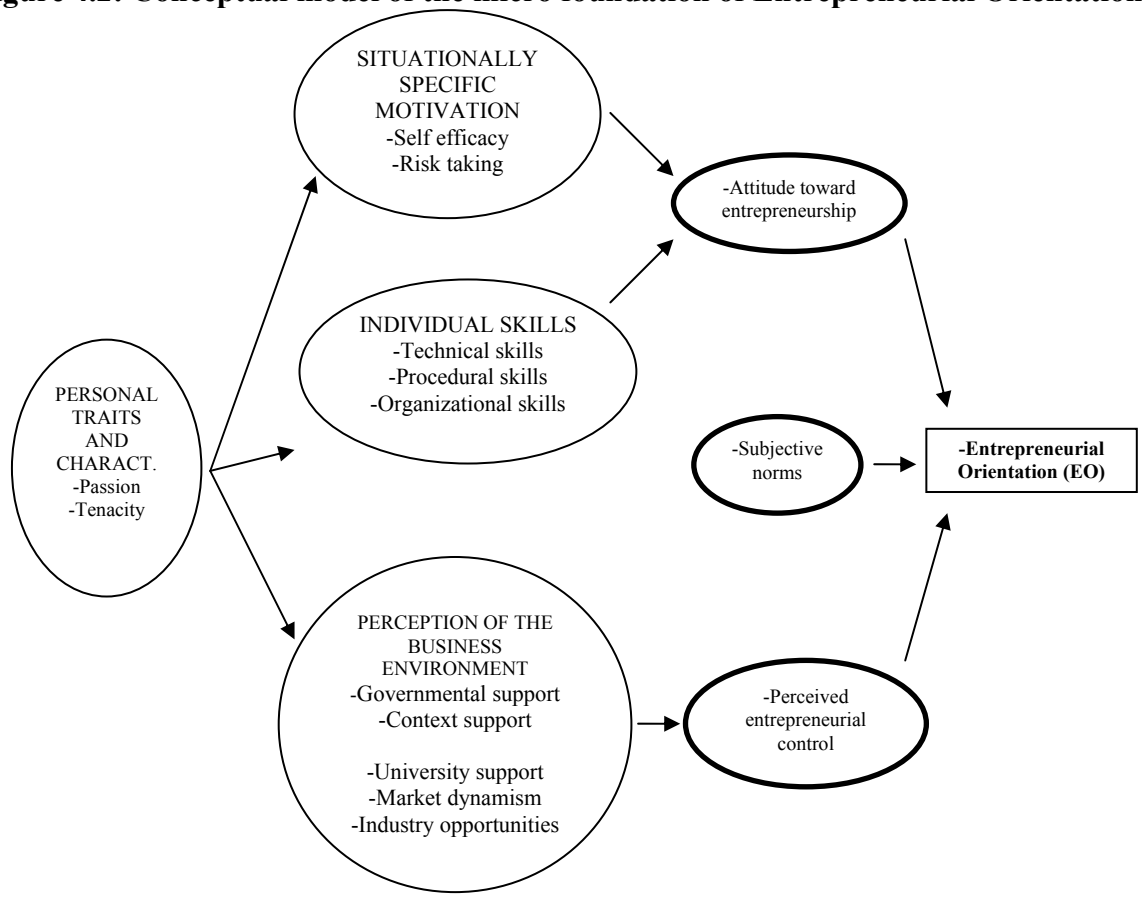
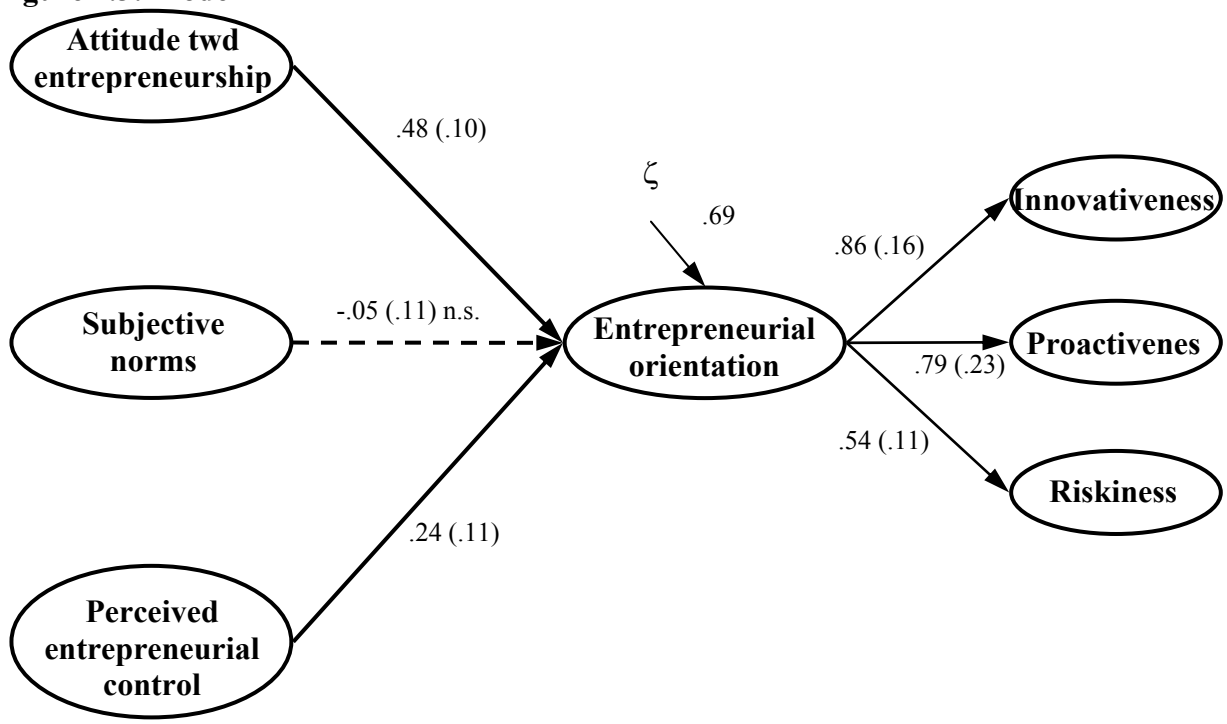


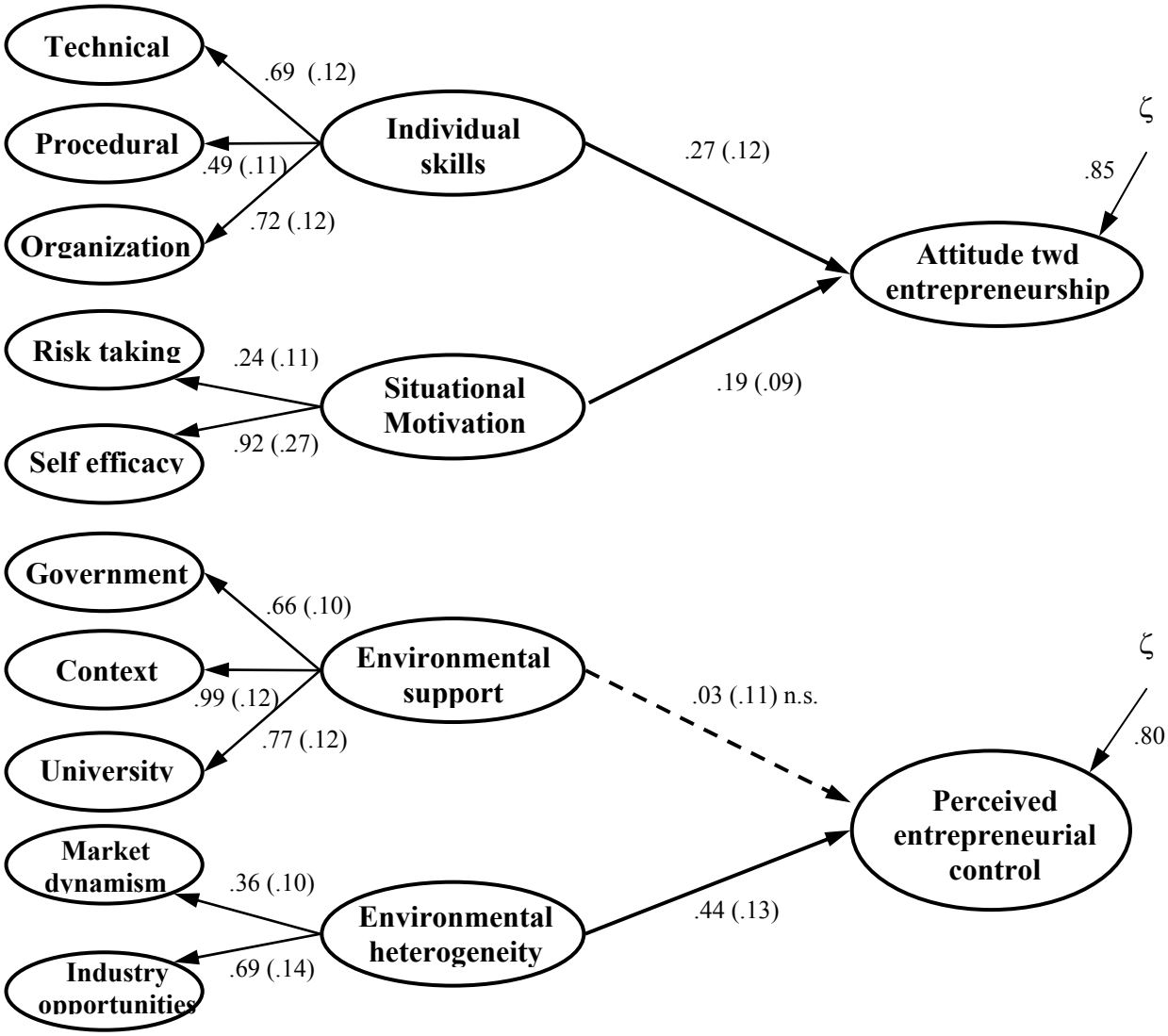
Figure 4.3: Model A



$\chi^2(181) = 293$, $p \approx .00$, RMSEA = .058, SRMR = .064, NNFI = .94, CFI = .95

Standardized Coefficients, Standard errors in parentheses, Two-sided significance tests.

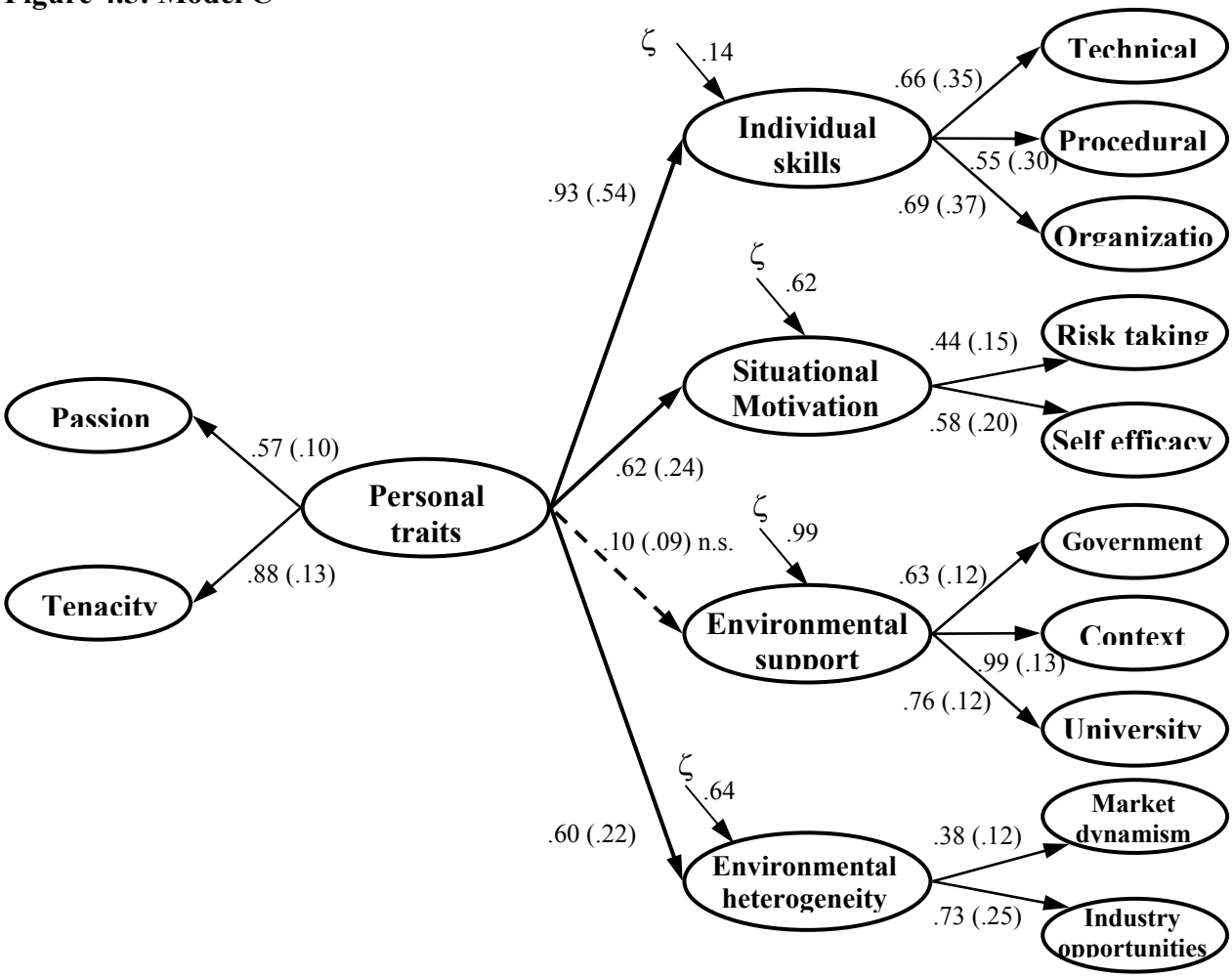
Figure 4.4: Model B



$\chi^2(1015) = 1398$, $p \approx .00$, RMSEA = .045, SRMR = .076, NNFI = .92, CFI = .92.

Standardized Coefficients, Standard errors in parentheses, Two-sided significance tests.

Figure 4.5: Model C



$\chi^2(953) = 1390.09$, $p \approx .00$, RMSEA = .050, SRMR = .081, NNFI =.91, CFI = .92.

Standardized Coefficients, Standard errors in parentheses, Two-sided significance tests.

APPENDIX
(CHAPTER 4)

Table 4.A.1: Details of Measures

Latent variable	Items description	Item [a] loading
Occupational risk	Please indicate how strongly you agree or disagree with each statement by circling the appropriate number (1=strongly disagree; 7=strongly agree):	
	1. I'm not willing to take risks when choosing a job or a company to work for	.63
	2. I prefer a low risk/high security job with a steady salary over a job that offers high risks and high rewards"	.79
	3. I prefer to remain on a job that has problems that I know about rather than take the risks ogf working at a new job that has unknown problems even if the new job offers greater rewards	.64
	4. I view risk on a job as a situation to be avoided at all costs	.56
Self efficacy	1. Thinking about your skills write a number from the confidence scale below (1 to 7) to show how sure you are that you can beat the % change in 2007 (compared to 2006) [the same for 2008 compared to 2007]:	.87 (2007) .83 (2008)
	Up 100% or better Up 50% or better Up 20% or better Up 5% or better No change or better Down 5% or better Down 10% or better Down 25% or better	
Tenacity	Please indicate how strongly you agree or disagree with each statement by circling the appropriate number (1=strongly disagree; 7=strongly agree):	
	1. I can think of many times that I persisted with tasks when other wanted to quit	.70
	2. I work harder than most people I know	.63
	3. I'm able to perform challenging work for long periods	.74
	4. When something goes wrong I immediately analyze the cause of the problem and take action	.54
	5. I continue to work hard on projects, even when other oppose me	.73
Passion for corporate work	Please indicate how strongly you agree or disagree with each statement by circling the appropriate number (1=strongly disagree; 7=strongly agree):	
	1. I derive most of my life satisfaction from my work	.64
	2. I think about my work when I'm showering, driving or when others are talking about things have nothing to do with work	.61
	3. I frequently have to tear myself away form my work to satisfy other obligations	.51
	4. I accomplish a lot of work because I love my job	.83
	5. Other would say that I'm intensely focused on my occupation	.75
Technical skills	Please assess the skills level you have now (1=no skills at all; 7=very skilled):	
	1. Product designs	.69
	2. Process designs	.69
	3. Production systems	.66
Procedural skills	Please assess the skills level you have now (1=no skills at all; 7=very skilled):	
	1. Accounting	.58
	2. Marketing	.78
	3. Purchasing and sales	.80
	4. distribution	.63

	5. Logistic	.64
Organizational skills	Please indicate how strongly you agree or disagree with each statement by circling the appropriate number (1=strongly disagree; 7=strongly agree):	
	1. I'm good in problem solving and in the generation of new idea	.64
	2. I'm good in communicating my point of view and supporting my ideas	.71
	3. I'm good in motivating people and leading teams	.84
	4. I'm good in the maintaining interpersonal relationships and coordinating people	.73
	5. I'm good in developing resources and creating new competences within the organizations	.65
Governmental support	To what extend do you think the following factors are supporting your innovation activities and helping you at pursuing a significant venture growth (1=no support; 7=high support):	
	1. National public founding	.80
	2. International (EU) public founding	.65
Context support	To what extend do you think the following factors are supporting your innovation activities and helping you at pursuing a significant venture growth (1=no support; 7=high support):	
	1. Regional founding (ex. PRIITT, Spinner)	.66
	2. Existence of a business plan competition	.57
	3. Existence in the region of technology transfer offices	.86
	4. Existence in the region of patent support offices	.64
University support	To what extend do you think the following factors are supporting your innovation activities and helping you at pursuing a significant venture growth (1=no support; 7=high support):	
	1. Interest of public research institutions in investing in firms' equity	.58
	2. Possibility to access academic laboratories and equipments	.72
	3. Possibility to be hosted in a university incubator	.64
	4. Synergies between public research institutions and private firms	.68
Market dynamism	In the market your firm operates, are there great differences among the product services with regard to (1=about the same for all product; 7=varies a great deal from one line to another):	
	1. Costumers' buying habits	.76
	2. The nature of the competition	.86
	3. Market dynamism and uncertainty	.88
Industry opportunities	In the industry your company operates, in the last year:	
	1. Growth opportunities in the environment: (1) have decreased dramatically or (7) have increased dramatically	.50
	2. Production/service technology in your principal industry: (1) has remained the same or (7) has changed very much	.75
	3. Rate of innovation of new operating processes and new products or services in your principal industry (1) rate has fallen dramatically or (7) rate has dramatically increased	.79
	4. Research and development (R&D) activity in your principal industry (1) has fallen off greatly or (7) has substantially increased [b]	.63
Entrepreneurial orientation	In the next year I want my firm:	
	1. (1) favours a strong emphasis on the marketing of tried and true products or services or (7) favours a strong emphasis on R&D, technological leadership and innovation	.38
	2. (1) favours the introduction of no new lines of products or services or (7) favours the introduction of very many new lines of products or services	.50
	3. (1) favours changes in product or services lines mostly of a minor nature or (7) favours changes in product or services line quite dramatic	.52
	4. (1) responds to action which competitors initiate or (7) initiates actions which	.36

	competitors then respond to	
	5. (1) would be very seldom the first businesses to introduce new products/services or (7) would be the first business to introduce new product/services	.58
	6. (1) seeks to avoid competitive clashes, preferring a "live and let live" posture or (7) adopts a very competitive, "undo the competitors" posture	.59
	7. (1) has a strong proclivity for low risk projects (with normal and certain rates of return) or (7) has a strong proclivity for high risk projects (with chances of very high returns)	.53
	8. (1) explores the environment gradually, via timid, incremental behaviour or (7) acts bold, wide-ranging in order to achieve the firm's objectives.	.63
	9. (1) adopts a cautious, "wait and see" posture in order to minimize the probability of making costly decisions or (7) adopts a bold, aggressive posture in order to maximize the probability of exploiting potential opportunities.	.57
Attitude toward entrepreneurship	During the next year, emphasising an entrepreneurial behaviour would be:	
	1. (1) Unpleasant or (7) Pleasant	.53
	2. (1) Useless or (7) Useful [b]	.71
	3. (1) Unsuitable or (7) Suitable	.75
	4. (1) Negative or (7) Positive [b]	.78
	5. (1) Regrettable or (7) Laudable [b]	.68
	6. (1) Unpleasant or (7) Pleasant	.70
	7. (1) Harmful or (7) Beneficial	.64
	8. (1) Bad or (7) Good [b]	.74
	9. (1) Foolish or (7) Wise	.49
Perceived entrepreneurial control	Please assess your preference in the following two items scale:	
	1. During the next year, emphasising an entrepreneurial behaviour do you think is going to be: (1) not easy at all or (7) really easy	.60
	2. To what extend do you think the following statement is true or false: "during the next year, if I would, I could act in an entrepreneurial way" (1) false or (7) true	.83
Subjective norms	Please assess your preference in the following single item scale:	
	1. During the next year do you think your relevant others would appreciate your entrepreneurial behaviour: (1) not at all or (7) significantly	1.00

[a] Standardized item loadings are reported; [b] These items were reverse coded; All items have $p<.01$

REFERENCES
(CHAPTER 4)

Ajzen I., 1991. The theory of planned behavior. ***Organizational Behavior and Human Decision Processes***, 50: 179-211.

Ajzen I., & Fishbein M., 1980. ***Understanding attitudes and predicting social behaviour***. Englewood Cliffs, NJ: Prentice Hall.

Armitage C., & Conner M., 2001. Efficacy of the theory of planned behaviour: a meta analytic review. ***British Journal of Social Psychology,*** 40: 471-499.

Atkinson, J. W., 1957. ***Motives in fantasy, action, and society***. Princeton, NJ: Van Nostrand.

Bagozzi, R. P., & Yi Y., 1988. On the Evaluation of Structural Equation Models. ***Academy of Marketing Science Journal***. 16, 1: 74-95.

Bandura, A., 1997. ***Self-efficacy: the exercise of self control***. New York: Freeman.

Baum R.J., & Locke E., 2004. The relationship of entrepreneurial traits, skill and motivation to subsequent venture growth. ***Journal of applied psychology***, 89(4): 587-598.

Baum R.J., Locke E., & Smith K.G., 2001. A multidimensional model of venture growth. ***Academy of Management Journal***, 44(2): 292-303.

Baum R.J., & Wally S., 2002. ***Entrepreneurial orientation, and strategic decision speed: the role of compressed experience and experimentation***. Working paper.

Bentler, P. M., 1990. Comparative Fit Indexes in Structural Models. ***Psychological Bulletin***, 107(2): 238-246.

Brown, T., 1996. ***Resource orientation, entrepreneurial orientation and growth: How the perception of resource availability affects small firm growth***. Rutgers University, Newark, NJ.

Browne, Michael W. & Cudeck R., 1989. Single Sample Cross-Validation Indices for Covariance Structures. ***Journal of Multivariate Behavioral Research***, 24: 445-455.

Budner, S., 1982. Intolerance of ambiguity as a personality variable. ***Journal of Personality***, 30: 29–50.

Colombo M., Grilli L., Mariotti S., & Piva E., 2006. Le giovani imprese italiane ad alta tecnologia: fatti stilizzati e implicazioni di politica tecnologica. forthcoming in ***Economia e politica industriale***.

Covin, J. G., Green, K. M., & Slevin, D. P., 2006. Strategic process effects on the entrepreneurial orientation - sales growth rate relationships. ***Entrepreneurship Theory and Practice***, 30(1): 57-81.

Covin, J. G.. & Slevin, D. P., 1997. High growth transitions: Theoretical perspectives and suggested directions. In D. L. Sexton & R. W. Smilor (Eds.), ***Entrepreneurship 2000***: 99-126. Chicago: Upstart Publishing.

Covin, J. G., & Slevin, D. P., 1989. Strategic management of small firms in hostile and benign environments. ***Strategic Management Journal***, 10: 75-87.

Cudeck, R., & Brownez, M. W. 1983. Cross Validation of Covariance Structures. ***Multivariate Behavioral Research,*** 18: 147-167.

Davidsson P., 1995. ***Determinants of entrepreneurial intentions***. Paper presented at the RENT IX conference, Piacenza, Italy, Nov. 23-24.

Eagly A. H., & Chaiken S., 1993. ***The psychology of attitudes***. San Diego: Harcourt Brace Janovich.

Eurostat, 2003 http://epp.eurostat.ec.europa.eu

Fini R, Grimaldi R., & Sobrero M, 2006. ***Factors Fostering Academics to Start up New Ventures: an Assessment of Italian Founders' Incentives***. Paper presented at the 2006 Academy of Management Meeting, August 11-16, in Atlanta, Georgia, USA.

Fini R., Grimaldi R., 2007. Academic Founders and Business Opportunity Generation: an Empirical Analysis based on Italian Academic Spin-offs'. In: M. Dowling, Schmude J., ***Empirical Entrepreneurship in Europe: New Perspectives***: 177-197, Edward Elgar UK.

Fini R., Grimaldi R., & Sobrero M., 2007. ***Exploring new venture founders' entrepreneurial orientation and its determinants: an Empirical Analysis based on Italian research-based Spin-offs***. Paper presented at 2007 T2S Conference, University of California, Riverside, USA.

Fornell C. & Larcker D. F., 1981. Structural equation models with unobservable variables and measurement error: Algebra and statistics, ***Journal of Marketing Research*** 18, 3: 382-389.

Gartner, W. B., Gatewood, E., & Shaver, K. G., 1991. Reasons for starting a business: Not-so-simple answers to simple questions. In G. E. Hills & R. W. LaForge (Eds.), ***Research at the marketing/entrepreneurship interface:*** 90–101. Chicago: University of Illinois at Chicago.

George, 2006, B. A., 2006. ***Entrepreneurial orientation: A theoretical and empirical examination of the consequences of differing construct representations.*** Paper presented at the 2006 Babson College Entrepreneurship Research Conference. Bloomington, Indiana, June 8-10.

Gomez-Mejia, Balkin D., 1989. Effectiveness of Individual and aggregate compensation strategies. ***Industrial relations***, 28(3): 431-445.

Gupta A.K., & Govindarajan V., 2000. Knowledge flows within multinational corporations. ***Strategic management journal***, 21(4): 473-496.

Heider, F., 1946. Attitudes and cognitive organization. ***Journal of Psychology***, 21: 107–112.

Herron, L. A., & Robinson, R. B., Jr. 1990. ***Entrepreneurial skills: An empirical study of the missing link connecting the entrepreneur with venture performance***. Paper presented at the annual meeting of the Academy of Management, San Francisco.

Hisrich, R.D., & Peters M.P., 1989. ***Entrepreneurship: Starting, developing and managing a new enterprise***. Homewood, IL, BPI/Irwin.

Hovland CL, Janis Il., & Kelley HH., 1953. ***Communication and persuasion***. Yale University Press New Haven.

Iakovleva T., 2004. ***Entrepreneurial performance in Russia***. Working paper.

Isaksen E., 2006. ***Initial growth intentions and subsequent early business performance***. Working paper.

ISTAT, 2003. http://www.istat.it/ambiente/contesto/infoterr/azioneB.html

Joreskog K., & Sorbom D., 2006. ***Lisrel 8.80***, software.

Katz, D., 1960. The functional approach to the study of attitudes. ***Public Opinion Quarterly***, 24: 163-204.

Kolvereid L., 1996. Prediction of employment status choice intentions. ***Entrepreneurship theory and practice***, 21: 47-57.

Kolvereid, L., & Bullvåg, E., 1996. Growth intentions and actual growth: the impact of entrepreneurial choice. ***Journal of Enterprising Culture***, 4(1): 1–17.

Krauss S., Frese M., Friedrich C., & Unger J., 2005. Entrepreneurial orientation: a psychological model of success among southern African small business owners. ***European Journal of work and organization psychology***, 14(3): 315-344.

Kreiser, P.M., Marino, L. D., & Weaver, K. M., 2002. Assessing the relationship between entrepreneurial orientation, the external environment, and firm performance scale: A multi- country analysis. ***Entrepreneurship: Theory and Practice***, 26(4): 71-95.

Krueger N. F., Reilly M. & Carsrud A., 2000. Competing models of entrepreneurial intentions. ***Journal of business venturing,*** 15: 411-432.

Linan F., & Chen T., 2006. ***Testing the entrepreneurial intention model on a two-country sample***. Working paper.

Locke, E. A., 1991. Introduction to special issue. O***rganizational Behaviour and Human Decision Making***, 50(2): 151–3.

Locke, E. A., & Latham, G. P., 1990. ***A theory of goal setting and performance***. Englewood Cliffs, NJ: Prentice-Hall.

Lumpkin G. T., & Dess G. G., 1996. Clarifying the entrepreneurial orientation construct and linking it to performance. ***The academy of management review***, 21(1): 135-172.

Lumpkin, G. T., & Dess, G. G., 2001. Linking two dimensions of entrepreneurial orientation to firm performance: The moderating role of environment and industry life cycle. ***Journal of Business Venturing***, 16: 429-451.

MacMillan, I.C., Katz, J.A. 1992. Idiosyncratic milieus of entrepreneurial research: The need for comprehensive theories. ***Journal of Business Venturing,*** 7:1-8.

Marsh, Herbert W. & D. Hovecar, 1985. Application of Confirmatory Factor Analysis to the Study of Self-Concept: First and Higher Order Factor Models and Their Invariance Across Groups. ***Psychological Bulletin***, 97 (3): 562-582.

Marsh, H. W., Balla, J. R., & Hau, K.-T., 1996. An evaluation of incremental fit indices: A clarification of mathematical and empirical properties. In G. A. Marcoulides & R. E. Schumacker (Eds.), ***Advanced structural equation modeling: Issues and techniques:*** 315–353. Mahwah, NJ: Erlbaum.

McClelland, D. C., 1961. ***The achieving society***. Princeton, NJ: Van Nostrand.

McGrath R.G., MacMillan I., & Scheinberg S., 1992. Elitists, risk-takers and rugged individualists? An exploratory analysis of cultural differences between entrepreneurs and non entrepreneurs. ***Journal of Business Venturing,*** 7: 115-135.

Miller, S. & Friesen, P. 1982. Innovation in conservative and entrepreneurial firms: Two models of strategic momentum. ***Strategic Management Journal,*** 3: 1-25.

Miller D., 1983. The correlates of entrepreneurship in three types of firms. ***Management science,*** 29: 770-791.

Miller D., 1987. The structural and environmental correlates of business strategy. ***Strategic management journal***, 8(1): 55-76.

Morris M., & Lewis P., 1995. The determinants of entrepreneurial activity. ***European journal of marketing***, 29(7): 31-48.

Piccaluga A., & Balderi C., 2007. ***Consistenza ed evoluzione delle imprese spin off della ricerca pubblica in Italia***. Report Finlombarda.

Rauch A., Wiklund J., Lumpkin G.T., & Frese M., 2004. ***Entrepreneurial orientation and business performance: a meta-analysis***. Paper presented at the 2004 Babson-Kauffman Entrepreneurship Research Conference in Glasgow, Scotland.

Roberts E.B., & Fusfeld A.R., 1981. Staffing the Innovative Technology-Based Organization. ***Sloan Management Review,*** (pre-1986); Spring 1981; 22(3): 19.

Roberts E.B., 1991. ***Entrepreneurs in high technology: lesson from Mit and beyond***. New York, oxford university press.

Rotter, J. B., 1966. Generalized expectancies for internal versus external control of reinforcement. ***Psychological Monographs: General and Applied,*** 80: 609.

Rust, R., Chol L., & Valente E. Jr., 1995. Comparing Covariance Structure Models: A General Methodology. ***International Journal of Research in Marketing***, 12: 279–91.

Sciascia S., Naldi L., & Hunter E., 2006. Market orientation of entrepreneurship: an empirical investigation on SMEs. ***Entrepreneurship Management***, 2: 21-38.

Sexton, D. L., & Smilor R.W., 1986. ***The art and science of entrepreneurship***. Cambridge, MA, Ballinger Publishing.

Shane S., 2000. Prior knowledge and the discovery of entrepreneurial opportunities. ***Organization science***, 11(4): 448-469.

Shane, S., Locke, E. A., & Collins, C. J., 2003. Entrepreneurial motivation. ***Human resource management review***, 13(2): 257–279.

Smilor. R. W., 1997. Entrepreneurship: Reflections on a subversive activity. ***Journal of Business Venturing***, 12: 341-346.

Stetz, P. E., Howell, R., Stewart, A., Blair, J. D. & Fottler, M. D., 2000. Multidimensionality of entrepreneurial firm-level processes: Do the dimensions covary? In ***Frontiers of Entrepreneurship Research***: Wellesley, MA: Babson College.

Wang G., & Buffalo, M.D., 2004. Social and cultural determinants of attitudes toward abortion: a test of Reiss' hypotheses. ***Social science journal***, 41(1): 93-106.

Weber E., Blais A. & Betz N., 2002. A Domain-specific Risk-attitude Scale: Measuring Risk Perceptions and Risk Behaviors. ***Journal of Behavioral Decision Making***, 15: 263–290.

Werts, C. E., Linn, R. L., & Joreskog, K., 1974. Interclass reliability estimates: Testing structural assumptions. ***Educational and Psychological Measurement***, 34: 25–33.

Wiklund, J., 1999. ***Entrepreneurial orientations as predictor of performance and entrepreneurial behaviour in small firms—longitudinal evidence. P***aper presented at the 18th annual Entrepreneurship Research Conference, Gent. Belgium.

Wiklund, J., & Shepherd D., 2003. Knowledge-Based Resources, Entrepreneurial Orientation, and the Performance of Small and Medium-Sized Businesses. ***Strategic Management Journal,*** 24: 1307–1314.

CHAPTER 5

PAPER III[28]

DOES THE MULTIPLE AFFILIATION OF ACADEMIC ENTREPRENEURS INFLUENCE THEIR BEHAVIOURS?

AN EMPIRICAL STUDY

ABSTRACT

The study of the individual behaviours as a result of organizational membership represents a central issue in the management literature. The purpose of this paper is to test the differences in individual behaviours between a sample of 92 Academic Entrepreneurs and 63 Private Entrepreneurs, affiliated to a matched-pair sample of 52 Academic Spin-offs and Private Start-ups. We develop a two-stages measurement model of Entrepreneurial Orientation and its antecedents. Our results show that Entrepreneurial Orientation is a multi-dimensional micro-founded construct which is influenced by individual behaviours related to three macro domains: Situationally Specific Motivation, Individual Skills, and Perception of the Business Environment. Our results show that the differences in the behaviours lay in Self Efficacy, Risk Taking, Procedural Skills, and in the Support coming from the Context and University. The proposed modelization assesses that Academics' Entrepreneurial Behaviours are mainly influenced by the availability of Technical Skills and by the Perception of a Supportive Environment. On the contrary, Private Entrepreneurs are mostly driven by Self Efficacy while their perception of the External Support negatively impacts the Entrepreneurial Behaviours. Managerial implications are discussed.

[28] ***This paper has been submitted*** *to the 2008 DRUID Conference, Copenhagen, June 17-20, 2008.*

5.1 Introduction

The study of individual behaviours as a result of organizational affiliation has been emphasized in different research domains. Sociologists, psychologists, anthropologists and economists have been framing this issue in many different ways. Despite the different approaches, all of them agree in viewing the person as a social agent, rather than an autonomous individual, whom behaviours and perceptions are influenced by organizational affiliation (Lewin 1936; Giddens 1984; Saegert & Winkel, 1990; Charness, Rigotti & Rustichini, 2007). Despite the great attention devoted to the behavioural dimensions in the social sciences, very few contributions have been focusing on the study of individuals in the entrepreneurship domain (Baum, Locke & Smith, 2001; Shane, 2004). The Entrepreneurial Orientation concept (Miller, 1983) represents one of the few behavioural dimensions which has received a substantial amount of theoretical and empirical attention by scholars in the entrepreneurship literature (Covin & Slevin, 1989; Lumpkin & Dess, 1996; Wiklund & Shepherd 2003; Covin, Green, & Slevin, 2006).

Aim of this contribution is to simultaneously provide a multidimensional characterization of Entrepreneurial Orientation, proposing a set of antecedents for the construct, and assess the influence of multiple organizational affiliation on the individual behaviours. Building on the Theory of the Planned Behaviour, proposed by Ajzen (1991), we build our two-stages model of causal antecedents of Entrepreneurial Orientation focusing on four major domains: (a) Entrepreneurial Orientation Related Dimensions, (b) Situationally Specific Motivation, (c) Individual Skills, and (d) Perception of the Business Environment.

The analysis is based on a sample of 92 Academic Entrepreneurs[29] compared to a control sample of 63 Private Entrepreneurs[30], affiliated to a matched-pair sample of 52

[29] We define 'Academic Entrepreneur' an individual who is a founder and shares some equity in an 'Academic Spin-off' and is employed (either Fully or Pro-tempore) in a University or in a Public Research Centre.

Academic Spin-offs and Private Start-ups. Firms are matched by industry, year of establishment and localization and they are all located in the Emilia Romagna region, in northern Italy. We gathered data by face to face interviews and we used a Structural Equation Modelling technique (Lisrel 8.80) to perform the empirical analysis. We test two sets of models: a "general" one, including the 155 Entrepreneurs, aimed at assessing the causal path of the antecedents of the Entrepreneurial Orientation, and a "group specific" one, distinguishing between the 92 Academic Entrepreneurs and 63 Private Entrepreneurs, aimed at assessing whether the academic affiliation influences the Entrepreneurial Behaviours.

The results show that Entrepreneurial Orientation is a multi-dimensional micro-founded construct which can be directly predicted by Attitudes toward Entrepreneurship and Perceived Entrepreneurial Control (related to the Entrepreneurial Orientation Related Dimensions domain) and indirectly by: Self Efficacy and Risk Taking (related to the Situationally Specific Motivation domain), Technical and Procedural Skills (related to Individual Skills domain), and Perception of Context Support, University Support and Market Dynamism (related to the Perception of the Business Environment domain). The analysis also reveal that the main differences between the two groups lay in the predicting power of Technical Skills, Perceived Context Support and Perceived University Support in explaining some of the Entrepreneurial Orientation Related Dimensions.

This study contributes to the extant literature in three different ways: First, it addresses the topic of Academic Entrepreneurship at individual level providing a robust modelization of the antecedents of Entrepreneurial Orientation. Second, through a sequence of multi-group nested models it empirically shows that some Academics' Entrepreneurial related Behaviours are influenced by their affiliation to Academia. Third, it relies on a sample of Entrepreneurs

[30] We define 'Private Entrepreneur' an individual who is a founder and shares some equity in a 'Private Start-up' and has no ongoing formal relationship with Universities or Public Research Centers. (see Methodology Section for a more detailed characterization)

affiliated to a matched-pair sample of firms all settled in the same region. The matched pair allows to control for some dimensions, and the regional connotation of the study guarantees that all firms are regulated by the same legislation and all the individuals are exposed to similar environmental influences.

The reminder of this paper is organized as follows: in Section 2 we provide the theoretical framework, in Section 3 we put forward a set of hypotheses, in Section 4 we present the methodology and the research design, while in Section 5 we report the empirical results. A final Section concludes with discussion and implications.

5.2 Theory

5.2.1 Individual Behaviour and Organizational Membership

The interest toward the study of situational effects in influencing individual behaviours, as well as the psychological mechanisms that underline those effects, has been central to the scientific debate (Lewin, 1936). Individuals both define and are defined by the social groups and organizations in which they participate (Saegert & Winkel, 1990). Researchers have shown that individual participation to a specific organization has an influence on behaviours and perceptions. Also people's perception of the environment are influenced by participation to groups, organizations and institutions. Duncan (1985) shows how individuals gain status from membership, as well as Charness et al. (2007) who argue that outcomes that follow from individual actions are going to be biased by the affiliations of individuals.

Individuals can also have multiple affiliations. The behaviours and perceptions of individual are differently influenced by the membership in different work organizations. (Ashforth & Mael, 1989). Rainey (1982), for example, finds that managers who are employed in Public Institutions, if compared to managers who work for private companies, show

significant differences in their perceptions of the importance of different types of rewards. March and Olsen (1989) and Perry (2000), referring to Public Organizations, reinforce this position arguing that Institutions foster a logic of appropriateness in the minds of individual which causes them to develop a Public service oriented motivation. Moynihan & Pandey (2007) argue that work-related rules and norms are organizational institutions that shape not only the administrative behaviour of Public servants but also the basic attitude that the actors hold about the value of Public service. Actors construct beliefs and behaviours based on what is appropriate in light of their environment and the norms of behaviour of those around them. Therefore, we expect that the Attitudes, the Perceptions and the Behaviours of Academic Entrepreneurs might be influenced by their University affiliation. As Charness et al. (2007) suggest, other researchers should investigate how membership affects the behaviour of individuals in strategic environment and economic institutions.

In the following sections we provide a theoretical characterization of the Entrepreneurial Orientation concept (Miller, 1983) which represents one of behavioural dimensions in the entrepreneurship research where a cumulative body of knowledge is developing (Rauch, Wiklund, Lumpkin & Freese, 2004) and an overview of the Theory of the Planned Behaviour (Ajzen, 1991) which has been identified as one of the most influential attitude theory in the entrepreneurship literature (Kolvereid & Bullvåg, 1996; Wiklund & Sheperd, 2003; Isaksen, 2006).

5.2.2 Entrepreneurial Orientation defined

The Entrepreneurial Orientation concept describes a set of strategic activities (Wiklund & Shepherd, 2003) and may be viewed as a firm-level strategy-making process that firms use to enact their organizational purposes, sustain their visions, and create competitive advantages (Miller 1983). Entrepreneurial Orientation can be seen as a firm-level orientation

which is influenced by individual actions, decisions and attitudes. Especially in small firms the strategic orientation of the CEO/entrepreneur is likely to be tantamount to the strategic orientation of firm; therefore Entrepreneurial Orientation has been defined as the CEO/entrepreneur's strategic orientation, reflecting a willingness (or intention) of a firm to engage in Entrepreneurial Behaviours (Brown, 1996; Wiklund, 1999). Entrepreneurial Orientation encompasses five underlying dimensions: Innovativeness, Proactiveness, Riskiness, Competitive aggressiveness and Autonomy. Together, these five dimensions capture a wide range of behaviours commonly held to be entrepreneurial (Lumpkin & Dess, 1996):

- Innovativeness: it reflects a tendency to engage in and support new ideas, novelty, experimentation, and creative processes that may result in new products, services, or technological processes;

- Proactiveness: it suggests a forward-looking perspective, which is supposed to be a characteristic of a marketplace leader, who has the foresight to act in anticipation of future demand and shape the environment;

- Riskiness: it measures the firm's willingness to engage in risky projects and managers' preferences for bold versus cautions acts to achieve firm objectives;

- Competitive aggressiveness: it refers to a firm's propensity to directly and intensely challenge its competitors to achieve entry or improve position, in order to outperform industry rivals in the marketplace;

- Autonomy: it describes the independent action of an individual or a team in bringing forth an idea or a vision and carrying it through to completion.

Entrepreneurial Orientation has been conceptualized as having anywhere from three to five dimensions which may vary independently (Lumpkin & Dess, 1996). However, the Strategic Posture Scale, encompassing the three dimensions of Innovativeness, Proactiveness and Riskiness remains the most consistently used in the literature (Covin & Slevin, 1989; Wiklund, 1999; Lumpkin & Dess, 2001; Wiklund & Sheperd, 2003; Richard, Barnett, Dwyer & Chadwick, 2004; Sciascia, Naldi & Hunter, 2006). In our contribution we rely on the Strategic Posture Scale and on its three underling dimensions.

5.2.3 The Theory of the Planned Behaviour

In order to better understand the Entrepreneurial Orientation construct and its antecedents we've selected Ajzen's Theory of the Planned Behaviour (Ajzen, 1991). The scientific literature points out that Entrepreneurial Orientation is a behaviour which can not be considered under a complete volitional control. In studying behaviours the role of intentions has been showed to be predominant. Therefore, intention models offer us a significant opportunity to increase our ability to understand and predict Entrepreneurial Orientation. The Theory of the Planned Behaviour proposed by Ajzen (1991) is a well-established and validated psychological theory (Locke, 1991) which represent one of the most influential attitude theory in the entrepreneurship literature (Kolvereid & Bullvåg, 1996; Wiklund & Sheperd, 2003; Isaksen, 2006). The theory encompasses five specific domains: Attitude towards the Behaviour, Subjective Norms, Perceived Behavioural Control, Intention to Behave and Behaviour. 'Attitude Towards the Behaviour' refers to attitudes developed from the beliefs people hold about the object of the attitude. 'Subjective Norms', instead, are

related to the approval or disapproval that important referent individuals (or groups) have in relation to the enactment of a given behaviour. 'Perceived Behavioural Control' can be seen as the person's belief related to how easy (or difficult) the enactment of the behaviour is likely to be. Central to this Theory is the role of Intentions and their power in predicting the focal Behaviour (Ajzen, 1991).

Insert Figure 5.1 about here

In the following section we'll assess the micro-foundation of the Entrepreneurial Orientation identifying some direct antecedents to the Theory of the Planned Behaviour. We'll also compare the individual behaviours putting forward a set of hypotheses both related to the Theory of the Planned Behaviour and to its direct antecedents.

5.3 Hypotheses

5.3.1 Entrepreneurial Orientation and its Direct Antecedents

In order to understand the consequences of Intentions on Behaviours it is necessary to understand the antecedents of Intentions (Krueger, Reilly & Carsrud, 2000). As already mentioned, this contribution is primarily focused on the Entrepreneurial Orientation and on its antecedents. Hence, we consider Attitude towards Entrepreneurship, Subjective Norms and Perceived Entrepreneurial Control as the direct antecedents of Entrepreneurial Orientation.

Individuals hold different Attitudes toward different Intentions and Behaviours. It has been argued that Attitudes are influenced by organizational participations. Many scholars have recognized changes in Attitude occur form social processes such as informal discussion and feedback from social interactions (Brown & Duguid, 1991). Researches in different types

of organizations show a positive relationship between tenure and the development of positive Attitudes toward the 'organizational behaviours'. Glaser (1964) argues that as scientists advanced into supervisory positions they became more committed to the laboratory as a career setting. Several scholars have found that actual experience with a behaviour increases Attitude-Behaviour consistency (Doll & Ajzen, 1992; Regan & Fazio, 1977). When people have performed a behaviour, the predictive powers of the attitude measure for that behaviour are increased. Doll and Ajzen (1992) suggest that this is a consequence of greater attitude stability over time, resulting from direct behavioural experience (Hill, Mann & Wearing, 1996). In sum, because of the developed mindset and the organizational stimulus as a result of the past (and current) academic exposure, we expect that the Academic Entrepreneurs' Attitude toward Entrepreneurship would result in a lower positive impact on Entrepreneurial Orientation rather than for the Private Entrepreneurs. We argue that because as time passes by, the Academics become more focused on the University as a career setting incorporating and sharing Institutions' values and mission. Based on these arguments we hypothesize the following:

H1: The effect of Attitude Toward Entrepreneurship on Entrepreneurial Orientation will be lower for Academic Entrepreneurs than for Private Entrepreneurs.

Academic and Private Entrepreneurs have different incentives in bringing projects to the market (Lacetera, 2008). There is a set of commercial projects with profitability that the Private Entrepreneurs would undertake and the Academic Entrepreneurs would not. The Academic Entrepreneurs are more selective in starting entrepreneurial related activities and they can also rely on a set of support mechanisms which have been put in place in order to foster and support University technology commercialization (Siegel, Waldman, Atwater, &

Link, 2003; Shane, 2004). The set of policies and instruments is quite varied, ranging from: technology transfer offices and faculty consultants (Mian, 1996), university incubators (Grandi & Grimaldi, 2005), and university venture founds (Lerner, 2005). Because the Academic Entrepreneurs are more selective in undertaking Entrepreneurial Opportunities and because of the institutional, infrastructural and financial supports given to Academic Entrepreneurship, we hypothesize the following:

H2: The effect of Perceived Entrepreneurial Control on Entrepreneurial Orientation will be stronger for Academic Entrepreneurs than for Private Entrepreneurs

5.3.2 The Micro-Foundation of the Entrepreneurial Orientation: Antecedents of the Theory of the Planned Behaviour

Many scholars affiliated to the entrepreneurship research domain have put great emphasis in defining attributes, characteristics and perceptions of people and in showing their direct or indirect association with Entrepreneurial Behaviours. Davidsson (1995), as well as Wiklund and Sheperd (2003), have found out that personality traits, competences and environmental dynamism might influence Entrepreneurial Behaviours. Iakovleva (2004) identifies individual competences, personality traits, as well as competitive strategies and business environment, as predictor of Entrepreneurial Behaviours. Other then the already characterized Entrepreneurial Orientation Related Dimensions, we have identified three major domains: Situationally Specific Motivation, Individual Skills and Perception of the Business Environment which have been demonstrated to be relevant in determining Entrepreneurial Behaviours (Fini & Marzocchi, 2008). In the next three paragraphs we review the literature related to the three selected macro domains and we'll put forward a set of related hypotheses.

The relationship of Situationally Specific Motivation to Attitudes toward Entrepreneurship.

The first attempt to study the willingness and drive of individuals in undertaking entrepreneurial activities can be traced back to the psychological studies of Atkinsons (1957) and McClelland (1961). During decades scholars have showed that entrepreneurial motivation has to be considered a multidimensional entity, encompassing: Need-for-Achievement [defined by McClelland (1961) as an individual's desire for significant accomplishment, mastering of skills, control, or high standards], Risk Taking propensity [defined by Weber, Blais & Betz (2002) as the willingness to bear risk], Tolerance for Ambiguity [defined by Budner (1982) as the propensity to view situations without clear outcomes as attractive rather than threatening], Locus of Control [defined by Rotter (1966) as the belief in the extent to which individual believe that their actions or personal characteristics affect outcomes], Self Efficacy [defined by Bandura (1997) as the belief in one's ability to muster and implement the necessary personal resources, skills, and competencies to attain a certain level of achievement on a given task] and Goal Setting [defined by Locke & Latham (1990) as the ability of individuals in setting objectives and goals]. All of these motivational concepts have been extensively reviewed and included in the Entrepreneurial Behaviour studies. Yet, very few of them have proved to be robust predictors of Entrepreneurial related Behaviours with the exceptions of **Self Efficacy** (Davidsson, 1995, Baum, Locke & Smith, 2001) and **Risk Taking** (Gomez-Meija & Balkin, 1989; McGrath, MacMillan & Scheinberg, 1992; Weber, Blais & Betz, 2002).

In their contribution Choi, Prince and Vinokur (2003) show how group and organizational membership might play a role in influencing Self Efficacy. Individuals develop and strengthen beliefs about their efficacy in four ways; (1) mastery experiences (or enactive mastery); (2) modeling (observational learning); (3) social persuasion; and (4) judgments of their own physiological states (Bandura, 1982; Wood & Bandura, 1989). Entrepreneurial Self

Efficacy can be defined as entrepreneurs' beliefs and confidence in their capabilities to affect their environment and become successful by their behaviours (Luthans & Ibrayeva, 2006). Academic Entrepreneurs, as a result of their multiple affiliations, will accomplish their Self Efficacy in two different ways: their academic legitimization and their entrepreneurial performance. Academic Entrepreneurs therefore have two areas of focus as opposed to one for Private Entrepreneurs. As a result, we argue that Attitude toward the Entrepreneurship will show a lower effect for Academic Entrepreneurs than for Private Entrepreneurs.

H3: The effect of Self Efficacy on Attitude Toward Entrepreneurship will be lower for Academic Entrepreneurs than for Private Entrepreneurs

Scholars have demonstrated that an individual will tend to select an organizational career congruent with some important facet of his identity (Vroom, 1966; Hall, Schneider, & Nygren, 1970). A meta-analytic review proposed by Stewart and Roth (2001) confirm the common belief that entrepreneurs have higher risk propensity than managers. Furthermore, it has been also argued that once the person joins an organization, that career relevant facet of his identity may develop further and become increasingly invested in his organizational career (Becker & Strauss, 1956) sharing, for example, the values at the organizational level, such as: propensity toward risks, etc. Because of that we can argue that Academic Entrepreneurs might develop a lower level of risk propensity and, because of the developed mindset and environmental exposure, their behaviours could be possibly triggered not by a strong willingness in bearing risks but by other dimensions more coherent with the Academia, such as: availability of superior technological knowledge, etc. As for the Self-Efficacy, we put forward the following hypothesis:

H4: The effect of Risk Taking on Attitude Toward Entrepreneurship will be lower for Academic Entrepreneurs than for Private Entrepreneurs.

The relationship of Individual Skills to Attitudes toward Entrepreneurship.

Despite this broad characterization of the personal dimensions some scholars believe that a mono-dimensional study, only including motivational dimensions and personality traits, would not be satisfying in the characterization of the Entrepreneurial Behaviours (Sexton & Smilor, 1986; Roberts, 1991; Wiklund & Sheperd, 2003). On top of motivational aspects and personal traits, the scientific debate has been also focusing on Skills. Background and Skills accumulated by each individual entrepreneur, because of education and aging characteristics, have been extensively analyzed by some scholars as a predictor of entrepreneurial activities. Gupta and Govindarajan (2000) state that Technical and Procedural Skills are fundamental in knowledge intensive environment, while Roberts and Fusfeld (1981) show how individuals involved in high-technology based organizations should possess Organizational Skills. Baum et al. (2001) show that a specific set of Skills (Technical, Procedural and Managerial) have an impact on Entrepreneurial Behaviours. Based on the foregoing review, we rely on **Technical Skills** and **Procedural Skills** (Baum et al. 2001) as the most robust indicators in predicting Entrepreneurial Behaviours.

We all know that the paces of Academics careers are set on the research outcomes. Most of the them, especially the ones who research in high-technology fields, might see a commercialization potential of their knowledge (Shane, 2004). Greater knowledge will directly provides greater awareness about the existence of career options based on that knowledge (Ronstald, 1990), which may trigger Entrepreneurial Behaviours. Because of that we argue that:

H5: The effect of Technical Skills on Attitude Toward Entrepreneurship will be stronger for Academic Entrepreneurs than for Private Entrepreneurs

In addition to Technical Skills, other skills, such as: Marketing skills, Financial Skills, etc, are necessary for successful entrepreneurship. Not just specific Technical Skills, but generic competences are increasing required, because of the technological development and changes in the business environment (Roodt, 2005). In other words, not only field specific Skills are required, but also new Skills and procedural techniques to cope with changes in customers' needs. Following Gupta and Govindarajan (2000) and Wiklund and Shepherd (2003), we focus on Procedural Knowledge as a set of Skills which can influence Entrepreneurial Behaviours. Procedural knowledge refers to knowing the procedures for how to do things and arises from experience with similar situations (Lesgold, 1988). Therefore, we argue that Procedural Skills will have a positive impact on Attitude toward Entrepreneurship. In reviewing the literature we found no theoretical or empirical reasons for hypothesizing that this relationship should have different impacts in the two samples. Because of that we put forward the following hypothesis of equality between the two samples:

H6: The effect of Procedural Skills on Attitude Toward Entrepreneurship will be similar for both Academic Entrepreneurs and Private Entrepreneurs

The relationship of Perception of the Business Environment to Perceived Entrepreneurial Control.

Entrepreneurial activities may also be shaped by the perceptions that entrepreneurs have of the surrounding business environment. Some scholars point out that the availability of

support mechanisms and environmental infrastructure, such as: logistic, financial, economic, political and legal support, can play a role in fostering Entrepreneurial Behaviours (Morris & Lewis, 1995). Iakovleva (2004) shows how financial capital, as well as the heterogeneity of the environment (market and industry), can foster Entrepreneurial Behaviours. Wiklund (1999) and Wiklund and Sheperd (2003) find that environmental dynamics (market and industry), can strongly predict Entrepreneurial Behaviours. More specifically Fini and Grimaldi (2007) provide an assessment of some environmental factors (government, context and university support) which are perceived as relevant in supporting Entrepreneurial Behaviours. In sum, three of the environmental related dimensions with the highest explanatory power in predicting Entrepreneurial Behaviours are: the **Context Support Mechanisms, University Support Mechanisms and Market Dynamism** (Fini & Marzocchi, 2008).

As mentioned before, policy makers have put a lot of emphasis in creating the favourable infrastructures and set of norms in order to foster entrepreneurial activities. Several mechanisms, such as: Business Incubators (Mian, 1996) Science Parks (Feldman, 2001), Business Plan Competitions (Foo, Wong & Ong, 2005) and Financial Incentives (Beck, Demirgüç-Kunt & Maksimovic, 2005) have been put in place by local government for supporting entrepreneurship. Moreover some scholars have shown that a lot of effort has been specifically devoted to facilitate the creation and growth of Academic Spin-offs (Mustar, 1997; Lockett, Siegel, Wright & Ensley, 2005). Because of this idiosyncratic attention and support to the Academic Entrepreneurship we suggest the following hypothesis.

H7: The effect of Perceived Context Support on Perceived Entrepreneurial Control will be stronger for Academic Entrepreneurs than for Private Entrepreneurs

Some of the support mechanisms which have been put in place by Public Research Institutions are not solely targeted to Academic Spin-offs. The possibility to access public laboratories or the possibility to be hosted in university incubators are available to all types of firms (Mian 1996, Feldman, 2001). Despite of that, we argue that Academic Entrepreneurs are the ones who are better enjoying these support mechanisms, we put forward the following hypothesis.

H8: The effect of Perceived University Support on Perceived Entrepreneurial Control will be stronger for Academic Entrepreneurs than for Private Entrepreneurs

Market Dynamisms can be seen both as an opportunity or a threat (Tyzoon, Bruno, & McIntyre, 1983; Rajdeep & Tansuhaj, 2001). Despite of that, in the entrepreneurship related literature it has been argued that dynamism and turbulence in the market may be seen as a source of opportunities by entrepreneurs (Sakarya, Eckman & Hyllegard, 2007). In reviewing the literature we found no theoretical or empirical reasons for hypothesizing that the perception of the Market Dynamism should differently impact the Perceived Entrepreneurial Control in the two samples. Then, we state the following:

H9: The effect of Perceived Market Dynamism on Perceived Entrepreneurial Control will be similar for both Academic Entrepreneurs and Private Entrepreneurs

5.4 Methodology

5.4.1 Sample

Our study is located in the Emilia Romagna region, in Italy's northeast. Emilia Romagna has been identified by the EU Commission as one of the leading regions in Europe

for its increasing number of Academic Spin-offs and, more generally, for its proactive role in supporting research-to-industry technology transfer. Located in the north of Italy, Emilia Romagna leads Italy in terms of number of Academic Spin-offs (Piccaluga & Balderi, 2007) and with 3.7 researchers every 1,000 inhabitants and an R&D expenditure rate (over GDP) of 0.61 is among the top three Italian regions for R&D workforce (the national average is of 2.8 reserachers/1000 inhabitants) and expenses (the average national R&D expenditure is 0.54; Istat, 2003). In November 2003 the region has adopted its first program for industrial research, innovation and technology transfer (PRIITT). It is the very first case of an Italian region with its own law concerning innovation. Emilia Romagna has five Universities, namely: the University of Bologna, the University of Ferrara, the University of Modena and Reggio Emilia, the University of Parma and Catholic University of Milan at Piacenza and the three Public Research Centres, namely: CNR, ENEA and INFM.

We've built our sample matching the regional population of Academic Spin-offs with a sample of Private Start-ups in terms of: Industry (ATECO codification), Year of establishment and Localization. Our definition of Academic Spin-off includes companies which have either the University/Public Research Centre or at least one academic (full, associate, assistant professor, PhD student, research fellow or technician) among the founders. Such a definition encompasses situations where: a) there is a formal commitment of the University/Public Research Centre (the Spin-off has passed through the Spin-off regulation approval, and/or the Institution is involved as one of the founders); b) there is no formal commitment of the Institution (except for individuals who decide to share equity) (Fini, Grimaldi & Sobrero, 2006). We do not include in our definition those firms based on a University technology licensing established by surrogate Academic Entrepreneurs (Radosevich, 1995). Our definition of Private Start-ups applies to all the private companies

without either public Institutions or public affiliated individuals between the founders (slightly modified from Colombo, Grilli, Mariotti, & Piva, 2006).

With Public (or Private) Entrepreneur we refer to an individual who is a founder and shares some equity in an 'Academic Spin-off' (or 'Private Start-up'). With Public (or Private) 'Academic-affiliated' Entrepreneur we refer to an individual who is a founder and shares some equity in an 'Academic Spin-off' (or 'Private Start-up') and is employed (either fully or pro-tempore) in a University or in a Public Research Centre[31].

Through the five Universities' and the three Research Centers' websites, and their technology transfer offices (where available), we retrieved basic information about each company, like names, telephone and e-mail contacts. We had previous information about 50 Academic Spin-offs which have already been contacted for previous studies (see Fini et al, 2006; Fini & Grimaldi, 2007). Moreover for each company we identified the names and contact information of the leading academic shareholder. After a first round of e-mails at the end of November 2006, a second reminder targeted to non respondents at the beginning of December 2006, and several phone calls, we set up face to face interviews with 134 individuals (132 Founders and 2 CEOs) involved in 72 Academic Spin-Offs. In order to avoid biases all interviews were conducted by the same interviewer on the basis of a structured questionnaire (see Appendix 5.A for the details) and lasted, on average, one hour and a half. The data collection was closed at the beginning of February 2007 with a total number of 72 Academic Spin-offs visited and 132 Entrepreneurs interviewed (we excluded the CEOs), corresponding to an overall firm level response rate of 81% (= 72/89) and an overall individual level response rate of 39% (= 132/337).

Through the data bases of the Chamber of Commerce of Bologna we were able to gather information related to the regional population of Private Start-ups. Specifically we

[31] For the sake of simplicity Public 'academic-affiliated' Entrepreneurs are going to be labelled 'Academic Entrepreneurs', while Private 'non academic-affiliated' Entrepreneurs are going to be labelled Private Entrepreneurs.

retrieved the name of the company, the legal status, the address (in some cases the telephone number), the ATECO codification (industry codification), year of establishment, location and a general description of the operations. All of the interviews were conducted by the same interviewer on the basis of the same structured questionnaire and lasted, on average, two hours. The data collection started at the beginning of March 2007 and was closed at the beginning of May 2007 with a total number of 61 Private Start-ups visited and 75 individuals interviewed (68 Founders and 7 CEOs); corresponding to an overall individual level response rate of about 37% (= 68/186).

Eleven Academic Spin-offs remained unmatched because of an under representation of the aerospace, biotechnology and pharmaceutical industries within the regional population of Private Start-ups. We had also to drop 9 pairs because for 9 Private Start-ups we had information only about CEOs and/or Private 'academic-affiliated' entrepreneurs. So far, we included in our analysis 92 Academic Entrepreneurs and 63 Private entrepreneurs who are among the founders of a matched-pair sample of 52 Academic Spin-offs and Private Start-ups.

5.4.2 Measures and Statistical analysis

For the 155 Entrepreneurs included in the study we collected data with the 11 theory-based scales. Scales were tested within the whole sample, while group comparison analysis were performed on the Academic and Private Entrepreneurs sub-samples. Table 1 summarizes the measurement model latent variables, the number of measurement items, the measurement description and format, and the composite reliability (CR). CR is a structural equation model reliability statistic (Lisrel 8.80 and Prelis 2) that is conceptually similar to alpha. In Appendix 5.A we report the items and the details of the measures.

Insert Table 5.1 about here

All of the measurement and structural models described in the next section were tested using the LISREL 8.80 program (Jöreskog & Sörböm 2006). The goodness-of-fit of the models was assessed based on a common set of measures: Chi-square tests, Root Mean Square Error of Approximation (RMSEA), Standardized Root Mean Square Residual (SRMR), Non-Normed Fit Index (NNFI) and the Comparative Fit Index (CFI). Discussions of these indices can be found in Bentler (1990), Browne and Cudeck (1993), Marsh and Hovecar (1985) and Marsh, Balla, and Hau (1996). Satisfactory model fits are indicated by non-significant Chi-Square tests, RMSEA values less than .09, SRMR values less than .10, and NNFI and CFI values greater than or equal to .90. All analyses were performed on covariance matrices.

5.5 Results

We assess the Entrepreneurial Orientation and its predictors through a two stages sequential model. In the first one (Model A) we empirically test the Theory of the Planned Behaviour through a measurement model of Entrepreneurial Orientation. The second one (Model B) refers to the antecedents of the Theory of the Planned Behaviour, specifically it relates Self Efficacy and Risk Taking as well as Technical Skills and Procedural Skills to the Attitudes toward Entrepreneurship. It also assesses the relationship from Context Support, University Support and Market Dynamics to the Perceived Entrepreneurial Control. The proposed modelization is based on a previous study from Fini & Marzocchi (2008) in which the authors assessed a three-stages second-order model of the micro-foundation of Entrepreneurial

Orientation. In order to test for the proposed set of hypotheses we draw on that previous contribution testing their model of the Theory of the Planned Behaviour (Model A) and a more robust and simplified version of the model encompassing its direct antecedents (Model B).

We then evaluated the internal consistency of the 11 constructs, checking for convergent validity, through the assessment of the Composite Reliability. The index is calculated as the sum of the square roots of the item-squared multiple correlations squared and divided by the same quantity plus the sum of the error variance (Werts, Linn, & Joreskog, 1974). Estimates of Composite Reliability above .60 and concept-to-domain coefficients statistically significant ($t > 2.0$; $p < .05$) are usually considered as supportive of convergent validity (Bagozzi & Yi 1988). All values had Composite Reliability significantly higher than the stipulated criteria, and all items were statistically significant. Table 5.1 reports the indexes.

We also verified the discriminant validity of the constructs by determining that the average variance extracted by each latent variable's measure was larger than its shared variance with any other latent variable. This index estimates the amount of variance captured by a construct's measure relative to the random measurement error (Fornell & Larker, 1981).

5.5.1 Measurement models

The overall fit for model A (Figure 5.2) is acceptable ($\chi^2(111) = 149.05$; $p = 0.0093$; RMSEA = .049; SRMR = .063; NNFI = .95; CFI = .96). Our results partially support the effectiveness of the Theory of the Planned Behaviour in predicting Intentions. Attitudes toward the Behaviour ($\gamma = .49$; $p<.05$) and Perceived Behavioural Control ($\gamma = .25$; $p<.05$) predict the Intention (namely Entrepreneurial Orientation), while the Subjective Norms path fails to reach statistical significance ($\gamma = -.03$; n.s.). As in the contribution from Fini and

Marzocchi (2008), Entrepreneurial Orientation has been modelled as a second-order factor; all three underlying domains Innovativeness ($\beta = .90$; $p<.05$), Proactiveness ($\beta = .85$; $p<.05$) and Riskiness ($\beta = .60$; $p<.05$) load on Entrepreneurial Orientation.

Insert Figure 5.2 about here

Model B (Figure 5.3) relies on 32 indicators and 9 latent constructs. It exhibits satisfactory measures of goodness-of-fit ($\chi^2(460) = 606.24$; $p \approx .00$; RMSEA = .047; SRMR = .090; NNFI = .90; CFI = .91). The tested model fully support the hypothesized paths: Self Efficacy ($\gamma = .33$; $p<.05$), Risk Taking ($\gamma = .29$; $p<.05$), Technical Skills ($\gamma = .25$; $p<.05$) and Procedural Skills ($\gamma = .25$; $p<.05$) predict Attitudes toward Entrepreneurship. Similarly, the paths going from Context Support ($\gamma = .90$; $p<.05$), University Support ($\gamma = .97$; $p<.05$) and Market Dynamism ($\gamma = .23$; $p<.05$) are positive and have a significant impact on the Perceived Entrepreneurial Control.

Insert Figure 5.3 about here

5.5.2 Hypotheses testing

Before testing for any differences in strengths of paths and latent means, both the invariance of form and factor loadings have to be sequentially assessed (Bollen, 1989). For each of the two models, as shown in Table 5.2, we first tested the equality of factor patterns

assessing the corresponding baseline models. This procedure allowed us to test whether the same factors underline the measures across groups. A failure to reject this hypothesis allowed us to perform the following test of equality of factor loadings. Equal factor loadings imply that the correspondence between indicators and underling factors is the same for both Academic and Private Entrepreneurs. The results support this assumption both for Model A ($\Delta\chi^2$=8.49; Δdf=13; p>.1) and Model B ($\Delta\chi^2$=37.93; Δdf=23; p>.1).

Insert Table 5.2 about here

These structural results allowed us to test for the set of hypotheses we put forward. Table 5.3 summarizes the result for the test of invariance of the regression paths between the two groups, while in Table 5.4 we provide a summary of the test of hypotheses assessing the regression coefficients and the corresponding statistical significances.

In Model A the two paths from Attitude toward Entrepreneurship ($\Delta\chi^2$=.37; Δdf=1; p>.1) and Perceived Entrepreneurial Control ($\Delta\chi^2$=.00; Δdf=1; p>.1) to Entrepreneurial Orientation did not differ between the samples. *This implies that neither Hypothesis 1 and 2 are supported*. Despite the invariance of the two paths, in Table 4 we show that in both groups the coefficients are significant and have different magnitudes. For Academic Entrepreneurs the effect of Attitudes on Entrepreneurial Orientation is higher (β_{acad} = .60; p<.05) that for Private Entrepreneurs (β_{priv} = .32; p<.1) as well as the effect of Perceived Entrepreneurial Control (β_{acad} = .42; p<.1 vs. β_{priv} = .33; p<.05).

Similarly, in Model B, the path linking Self Efficacy ($\Delta\chi^2$=1.6; Δdf=1; p>.1) to Attitude toward Entrepreneurship and the one ranging from Risk Taking ($\Delta\chi^2$=.02; Δdf=1;

p>.1) to Attitude toward Entrepreneurship showed no statistical differences between Academic and Private Entrepreneurs. Despite of that, the influence of Self Efficacy was significantly higher in the Private group (β_{acad} = .22; p>.1 vs. β_{priv} = .53; p<.1); this resulted in a *partial support to Hypothesis 3*. In both sample, Risk Taking has a positive and significant impact on Attitude (β_{acad} = .29; p<.1 vs. β_{priv} = .29; p<.1), resulting in the *rejection of Hypothesis 4*.

On the contrary, we found some differences in terms of the effect of Technical Skills on Attitude. Specifically, when the path from Technical Skills to Attitude toward Entrepreneurship was set to be equal, the change in the chi-square was significant ($\Delta\chi^2$=3.02; Δdf=1; p=.07). The magnitude of the effect was positive and significant for Academic Entrepreneurs (β_{acad} = .43; p<.01) while failed to reach statistical significance for the Private ones (β_{priv} = -.10; p>.1). *Hypothesis 5 turned out to be partially supported*. No inequality were registered in terms of the impact of Procedural Skills on Attitude toward Entrepreneurship ($\Delta\chi^2$=1.0; Δdf=1; p>.1). *Thus, Hypothesis 6 was verified*.

Finally we tested the set of three Hypotheses related to the antecedents of the Perceived Entrepreneurial Control. As it is shown by the significant increase in the delta chi-squares, relevant differences were registered in terms of Context Support ($\Delta\chi^2$=10.7; Δdf=1; p=.001) and University Support ($\Delta\chi^2$=6.27; Δdf=1; p=.01). The regression paths for the Context Support showed a strong positive and significant effect for the Academic Entrepreneurs (β_{acad} = 1.00; p<.001) and a negative effect (β_{priv} = -.56; p<.001) for the Private ones. The same pattern occurred for the University Support with positive and significant coefficients for the Academic entrepreneurs (β_{acad} = .99; p<.05) and negative and significant values for the others (β_{priv} = -.72; p<.001). This suggests that *both Hypotheses 7 and 8 were supported by the data*. Finally *Hypothesis 9 turned out to be partially supported* because of

the similarity of Market Dynamics paths between the two groups ($\Delta\chi^2$=1.15; Δdf=1; p>.1) but the failure in reaching significance in the two paths (β_{acad} = .15; p>.1) and (β_{priv} = .01; p>.1).

Insert Tables 5.3 and 5.4 about here

5.5.3 Latent means

With the finding that factor loadings appeared reasonably invariant between the two groups, the assumption for the latent mean analysis was met (Bollen, 1989). Table 5.5 summarizes the results for the mean differences between the Academic and Private Entrepreneurs. We fixed the means of Private Entrepreneurs to zero. In Model A no significant differences in factor means were registered. In model B Academic Entrepreneurs showed stronger Self Efficacy (.47; p<.1) and a lower level of Risk Taking (-.76; p<.001). No differences in Technical Skill were assessed, while we were able to estimate a lower level of Procedural Skills (-47; p<.01) in the Academic Entrepreneurs sample. Finally Academic Entrepreneurs showed stronger levels of Perception of the Context Support (1.53; p<.001) and University Support (1.49; p<.001) as well as of the Market Dynamism (.54; p<.1). The results are coherent with the ones provided by Fini et al. (2007) in a previous contribution.

Insert Table 5.5 about here

5.6 Discussion

In the current study, drawing on managerial, sociological and psychological literature, we assess a two stages model of the Entrepreneurial Orientation and its antecedents and we test a set of nine theoretically based hypotheses exploring inter-group differences between a sample of Academic Entrepreneurs and Private Entrepreneurs.

We assess the Entrepreneurial Orientation construct with the Strategic Posture Scale (Covin & Slevin, 1989), and we test the effectiveness of a well established psychosocial theory (Theory of the Planned Behaviour; Ajzen, 1991) in explaining that measure an its set of direct antecedents, namely Attitude toward Entrepreneurship, Subjective Norms and Perceived Entrepreneurial Control. We also confirm the result from a previous study from some of the authors (Fini & Marzocchi, 2008), in which they have assessed the nomological validity of the causal path from some micro-foundated dimensions to the Entrepreneurial Orientation. We show that Attitude toward Entrepreneurship is explained by Self Efficacy, Risk Taking, Technical Skills and Procedural Skills, while Perceived Entrepreneurial Control is influenced by the Perceptions of the Context Support, University Support and Market Dynamism.

We also provide an empirical test of a set of nine hypotheses based on the assumption that individual behaviors should be considered as a result of some inner psychological characteristics as well as influenced by affiliation and membership of the individuals. In comparing two samples of Academic and Private Entrepreneurs our result show that there are no differences in the influence of the behaviors (Regression Paths) and in the behaviors themselves (Latent Means) in the Entrepreneurial Orientation domain and its direct antecedents (Model A). Both the hypotheses of diversity (H1 and H2) have been rejected and no differences have been assessed in the structured latent means for Entrepreneurial

Orientation, Attitude toward Entrepreneurship, Subjective Norms, Perceived Entrepreneurial Control.

On the contrary, the differences are strongly recorded in the modelization of the micro-foundation of the Entrepreneurial related Behaviours (Model B). For Academic Entrepreneurs, Attitude toward Entrepreneurship is mainly explained by the availability of Technical Skills (rather by an entrepreneurial motivation), while for Private Entrepreneurs is strongly influenced by Self Efficacy (rather by the availably of Skills and Competences). In both groups Context Support and University Support have a significant impact on the Entrepreneurial Control; for Academic Entrepreneurs is strongly positive while for Private Entrepreneurs is strongly negative.

Based on our empirical modelization we can argue that Academic Entrepreneurs' Entrepreneurial Orientation is triggered by (a) a developed set of Technical Skills and (b) by the perception of a supportive environment, while for Private Entrepreneurs is (a) enacted by Self Efficacy and (b) negatively influenced by the infrastructural and normative context.

Rephrasing the results, we can state that Academic Entrepreneurs act because *they know how to do it*, while Private Entrepreneurs act because *they know they can do it*.

The nature of this cross-sectional study is exploratory: the specific sampling strategy this research rests upon is robust enough to grant the internal consistency of the obtained results, while greater care (and more research) is needed in order to generalize the results to a broader entrepreneurial population. Despite of that, the proposed modelization is of interest in the assessment of differences or similarities between the two types of Entrepreneurs (Academic and Private) and is relevant in shading some lights on the debate whether (or not) the organizational affiliation has an influence on individual behaviours.

EXHIBITS
(CHAPTER 5)

Table 5.1: Predictor Measures

Domain and Predictor	Item	Scale format	Research reference	CR
Entrepreneurial Orientation related dimensions (Theory of the Planned Behaviour)				
Entrepreneurial Orientation	9	1 to 7 forced choice	Covin and Slevin, 1989	.87
Attitude toward Entrepreneurship	5	1 to 7 forced choice	Ajzen, 1991	.76
Perceived Entrepreneurial Control	2	1 to 7 forced choice	Ajzen, 1991	.73
Subjective Norms	1	1 to 7 forced choice	Ajzen, 1991	
Situationally Specific Motivation				
Self Efficacy	2	0 to 7 scale	Baum et al., 2001	.85
Risk Taking	4	1 to 7 likert like	Gomez and Meija, 1989	.75
Individual Skills				
Technical Skills	3	1 to 7 scale	Gupta and Govindarajan, 2000	.72
Procedural Skills	5	1 to 7 scale	Gupta and Govindarajan, 2000	.81
Perception of the Business Environment				
Context Support	4	1 to 7 likert like	Fini and Grimaldi, 2007	.80
University Support	4	1 to 7 likert like	Fini and Grimaldi, 2007	.76
Market Dynamism	3	1 to 7 forced choice	Miller and Friesen, 1982	.90

Note: Composite Reliability (CR) is calculated as the sum of the square roots of the item-squared multiple correlations squared and divided by the same quantity plus the sum of the error variance (Werts et al., 1974)

* The Attitude toward Entrepreneurship scale is a simplified version of the original one which encompasses 9 items (Fini & Marzocchi, 2008); in dropping 4 items we applied the procedure suggested by Bagozzi & Heatherton (1994)

Table 5.2: Multisample nested models and χ^2 differences with increased equality constraints

Model	χ^2	df	RMSEA	CFI	Δ Model	$\Delta\chi^2$	Δdf	p-value
Model A								
1. Baseline	267.65	222	.053	.92	-	-	-	-
2. Invariance of factor loadings	276.14	235	.049	.92	2-1	8.49	13	>.1
Model B								
1. Baseline	1116.97	920	.055	.74	-	-	-	-
2. Invariance of factor loadings	1154.90	943	.056	.73	2-1	37.93	23	>.1

Note: Root Mean Square Error of Approximation (RMSEA); Comparative Fit Index (CFI)

Table 5.3: Test of Invariance of the Regression Paths

Path Specification	χ^2	df	Δ Model	$\Delta\chi^2$	p-value	Path Diff.
Model A						
1. Baseline	267.65	222	-	-	-	-
2. Attitude toward Entrepreneurship → Entrepreneurial Orientation	268.02	223	2-1	0.37	>.1	**No**
3. Perceived Entrepreneurial Control → Entrepreneurial Orientation	267.65	223	3-1	0.00	>.1	**No**
Model B						
1. Baseline	1116.97	920	-	-	-	-
2. Self Efficacy → Attitude toward Entrepreneurship	1118.57	921	2-1	1.6	>.1	**No**
3. Risk Taking → Attitude toward Entrepreneurship	1116.99	921	3-1	0.02	>.1	**No**
4. Technical Skills → Attitude toward Entrepreneurship	1119.99	921	4-1	3.02	.07	**Yes**
5. Procedural Skills → Attitude toward Entrepreneurship	1117.97	921	5-1	1	>.1	**No**
6. Context Support → Perceived Entrepreneurial Control	1127.73	921	6-1	10.7	.001	**Yes**
7. University Support → Perceived Entrepreneurial Control	1123.24	921	7-1	6.27	.01	**Yes**
8. Market Dynamism → Perceived Entrepreneurial Control	1118.12	921	8-1	1.15	>.1	**No**

Table 5.4: Summary of the Test of Hypotheses

Hp	Path Specification	Coefficient Academic	Coefficient Private	Path Diff.	Hp Support
H1	Attitude toward Entrepreneurship → Entrepreneurial Orientation	.60*	.32†	**No**	**No**
H2	Perceived Entrepreneurial Control → Entrepreneurial Orientation	.42†	.33*	**No**	**No**
H3	Self Efficacy → Attitude toward Entrepreneurship	.22	.53**	**No**	**Part.**
H4	Risk Taking → Attitude toward Entrepreneurship	.29†	.29†	**No**	**No**
H5	Technical Skills → Attitude toward Entrepreneurship	.43**	-.10	**Yes**	**Part.**
H6	Procedural Skills → Attitude toward Entrepreneurship	.30†	.13	**No**	**Part.**
H7	Context Support →Perceived Entrepreneurial Control	1.00***	-.56***	**Yes**	**Yes**
H8	University Support →Perceived Entrepreneurial Control	.99*	-.72***	**Yes**	**Yes**
H9	Market Dynamism →Perceived Entrepreneurial Control	.15	.01	**No**	**Part.**

† = p<.1; * = p<.05; ** = p<.01; *** = p<.001; In Hp Support: Part. = Partially

Table 5.5: Multiple sample analysis: Structured Means

Variable	Estimates of Differences on Factor Means	T-test
Model A		
Entrepreneurial Orientation	-.13	-1.00
Attitude toward Entrepreneurship	-.08	-.47
Subjective Norms	.15	.76
Perceived Entrepreneurial Control	.04	.24
Model B		
Self Efficacy	.47	1.79†
Risk Taking	-.76	-3.71***
Technical Skills	-.09	-.41
Procedural Skills	-.47	-2.67**
Context Support	1.53	7.49***
University Support	1.49	6.66***
Market Dynamism	.54	1.80†

Note: Means of Private Entrepreneurs fixed to zero; † = p<.1; * = p<.05; ** = p<.01; *** = p<.001

Figure 5.1: Theory of the Planned Behaviour (Ajzen, 1991)

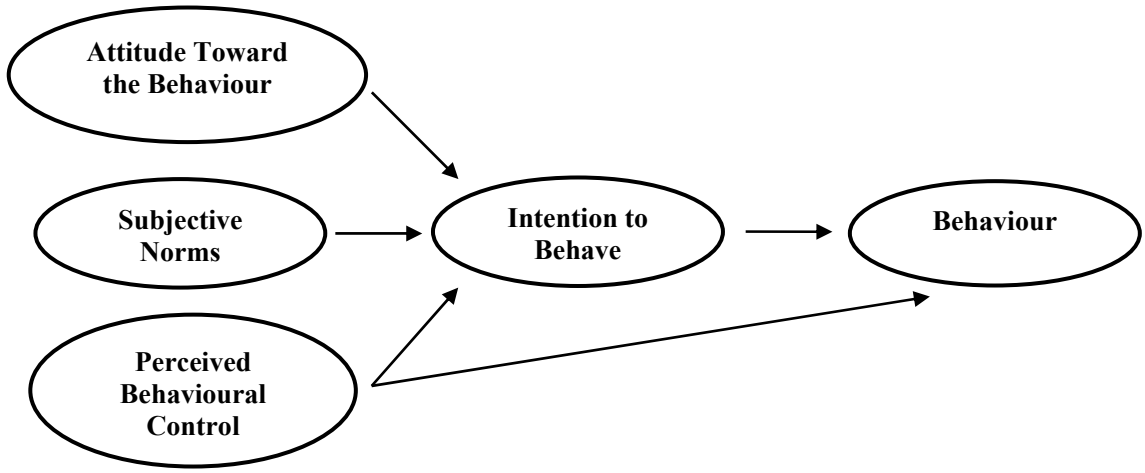
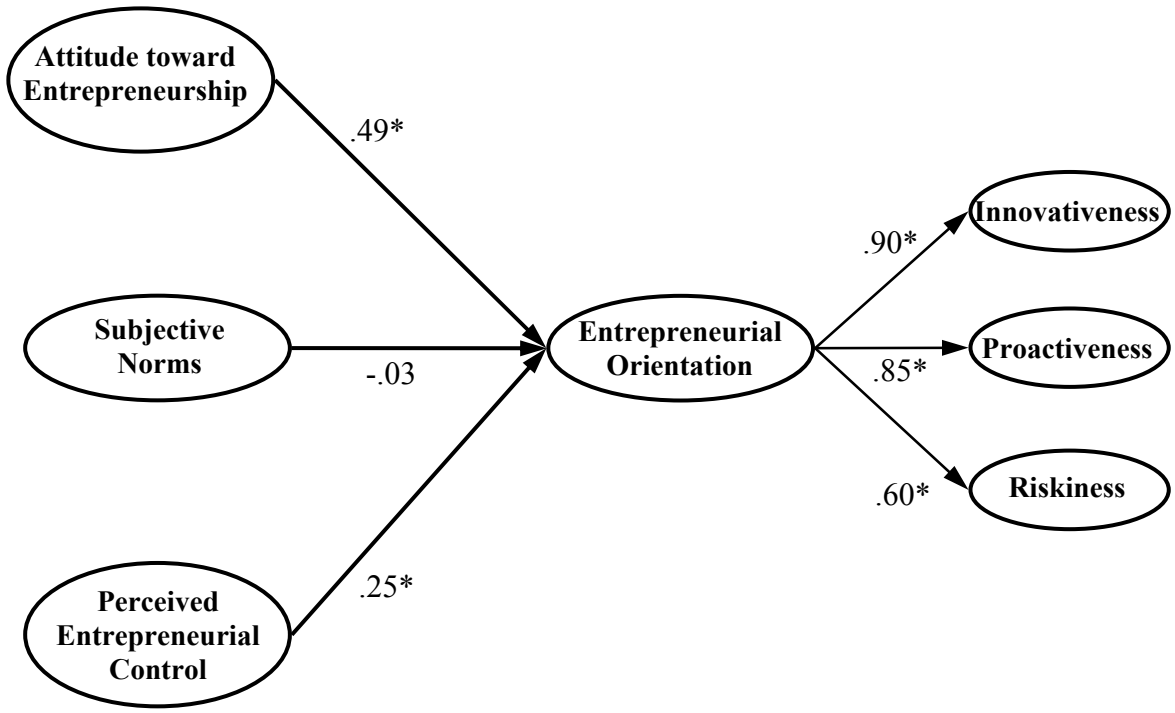


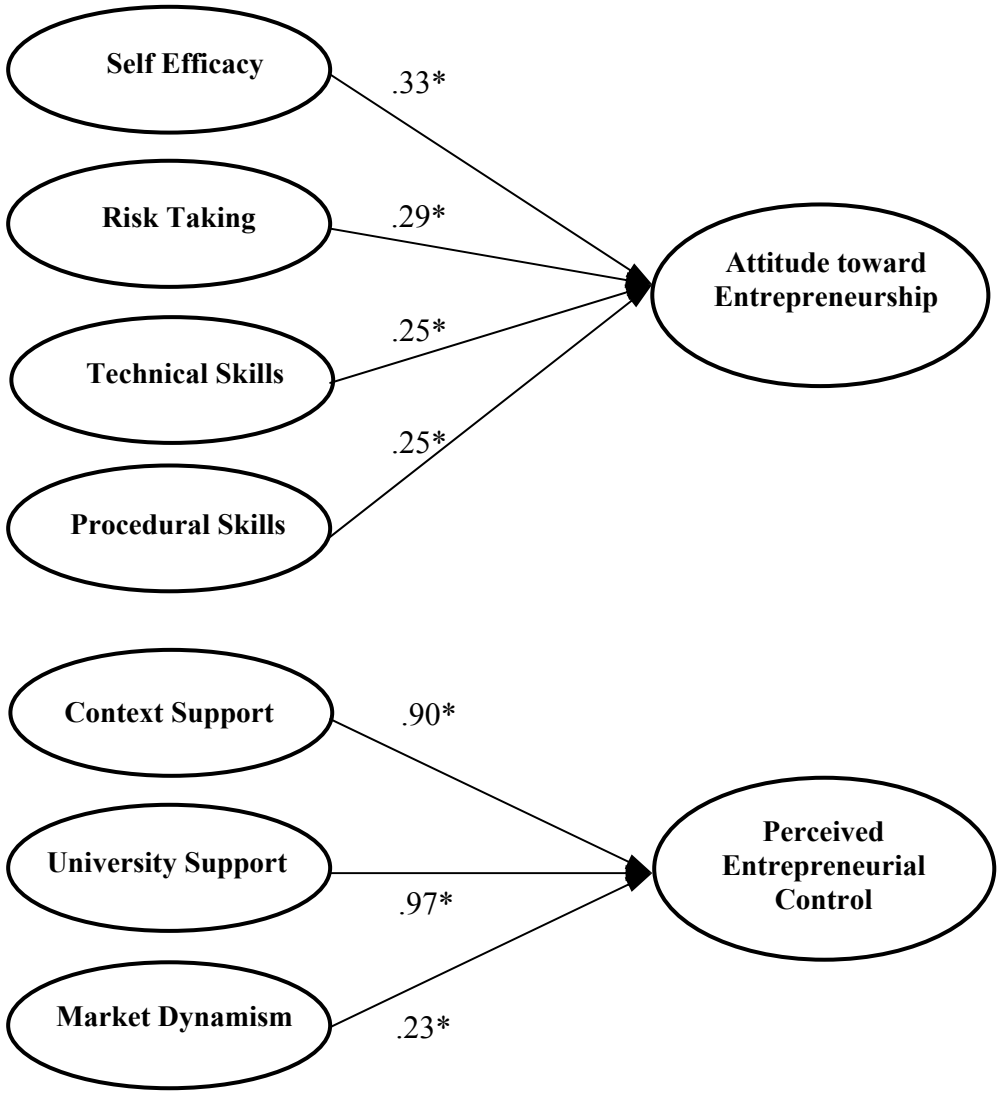
Figure 5.2: Model A



$\chi^2(111) = 149.05$; p = 0.0093; RMSEA = .049; SRMR = .063; NNFI = .95; CFI = .96

Note: Standardized Coefficients, Two-sided significance tests, * = p<.05; N=155

Figure 5.3: Model B



$\chi^2(460) = 606.24$; $p \approx .00$; RMSEA = .047; SRMR = .090; NNFI = .90; CFI = .91.

Note: Standardized Coefficients, Two-sided significance tests, * = p<.05; N=155

REFERENCES
(CHAPTER 5)

Ajzen, I. 1991. The theory of planned behavior. ***Organizational Behavior and Human Decision Processes***, 50: 179-211.

Ashforth, B., & Mael, F. 1989. Social Identity theory and the organization. ***The Academy of Management Review,*** 14, 1: 20-39.

Atkinson, J. W. 1957. ***Motives in fantasy, action, and society***. Princeton, NJ: Van Nostrand.

Bagozzi, R.P., & Heatherton, T.F. 1994. A general approach to representing multifaceted personality constructs: application to state self-esteem. ***Structural Equation Modeling***, 1, 1: 35-67.

Bagozzi, R. P., & Yi, Y. 1988. On the Evaluation of Structural Equation Models. ***Academy of Marketing Science Journal***, 16, 1: 74-95.

Bandura, A. 1997. ***Self-efficacy: the exercise of self control***. New York: Freeman.

Bandura, A. 1982. Self-efficacy mechanism in human agency. ***American Psychologist***, 37, 2: 122-146.

Baum, R.J., & Locke, E. 2004. The relationship of entrepreneurial traits, skill and motivation to subsequent venture growth. ***Journal of applied psychology***, 89(4): 587-598.

Baum, R.J., Locke, E., & Smith, K.G. 2001. A multidimensional model of venture growth. ***Academy of Management Journal***, 44, 2: 292-303.

Beck, T., Demirgüç-Kunt, A. & Maksimovic, V. 2005. Financial and legal constraints to firm growth: does size matter?. ***Journal of Finance***, 60, 1:, 137-151;

Becker, H. S., & Strauss, A. L. 1956. Careers, personality, and adult socialization. ***American Journal of Sociology***, 62: 253-263.

Bentler, P. M. 1990. Comparative Fit Indexes in Structural Models. ***Psychological Bulletin***, 107, 2: 238-246.

Bollen, K. 1989. ***Structural Equations with Latent Variables***. New York: John Wiley & Sons, Inc.

Brown, T. 1996. ***Resource orientation, entrepreneurial orientation and growth: How the perception of resource availability affects small firm growth***. Rutgers University, Newark, NJ.

Brown, J. & Duguid, P. 1991. Organizational learning and communities of practice: toward a unified view of working, learning and innovation. ***Organization Science***, 2: 40-57.

Browne, M.W., & Cudeck, R. 1993. Alternative ways of assessing model fit; in: K.A. Bollen & J.S. Long (Eds.), ***Testing structural equation models***: 136-162. Newbury Park, Ca: sage.

Budner, S. 1982. Intolerance of ambiguity as a personality variable. ***Journal of Personality***, 30: 29–50.

Charness G., Rigotti L., & Rustichini, A. 2007. Individual behavior and group membership. ***The American Economic Review***, September: 1340-1352.

Choi J. N., Price R. H., & Vinokur A. D. 2003. Self-efficacy changes in groups: effects of diversity, leadership and group climate. ***Journal of Organizational Behavior,*** 24, 4: 357-372.

Colombo, M., Grilli, L., Mariotti, S., & Piva, E. 2006. Le giovani imprese italiane ad alta tecnologia: fatti stilizzati e implicazioni di politica tecnologica. forthcoming in ***Economia e politica industriale***.

Covin, J. G., & Slevin, D. P. 1989. Strategic management of small firms in hostile and benign environments. ***Strategic Management Journal***, 10: 75-87.

Covin, J. G., Green, K. M., & Slevin, D. P. 2006. Strategic process effects on the entrepreneurial orientation - sales growth rate relationships. ***Entrepreneurship Theory and Practice***, 30, 1: 57-81.

Davidsson, P., 1995. ***Determinants of entrepreneurial intentions***. Paper presented at the RENT IX conference, Piacenza, Italy, Nov. 23-24.

Doll, J., & Ajzen, I. 1992. Accessibility and stability of predictors in the theory of planned behaviour. ***Journal of personality and social psychology***, 63: 754-765.

Duncan, J. 1985. The House as Symbol of Social Structure: Notes on the Language of Objects Among Collectivistic Groups. In I. Altman & M. Carol M. (Eds.) ***Home Environments***: 133-151. Werner, New York: Plenum.

Feldman, M. P. 2001. The entrepreneurial event revisited: firm formation in a regional context. ***Industrial and Corporate Change***, 10, 4: 861-875.

Fini, R., Grimaldi, R., & Sobrero, M. 2006. ***Factors Fostering Academics to Start up New Ventures: an Assessment of Italian Founders' Incentives***. Paper presented at the 2006 Academy of Management Meeting, August 11-16, in Atlanta, Georgia, USA.

Fini, R., Grimaldi, R., & Sobrero, M. 2007. ***Exploring new venture founders' entrepreneurial orientation and its determinants: an Empirical Analysis based on Italian research-based Spin-offs***. Paper presented at 2007 T2S Conference, University of California, Riverside, USA.

Fini, R., & Grimaldi, R. 2007. Academic Founders and Business Opportunity Generation: an Empirical Analysis based on Italian Academic Spin-offs'. In: M. Dowling, Schmude J.,

(Eds.) ***Empirical Entrepreneurship in Europe: New Perspectives***: 177-197, Edward Elgar UK.

Fini, R., & Marzocchi, G.L. 2008. ***The measurement of Entrepreneurial Orientation: internal consistency, antecedents and nomological validity***. Paper submitted at the 2008 Academy of Management Meeting, August 8-13, in Anaheim, California, USA.

Foo, M. D., Wong, P. K. & Ong, A. 2005. Do others think you have a viable business idea? Team diversity and judges' evaluation of ideas in a business plan competition'. ***Journal of Business Venturing***. 20, 3: 385-402.

Fornell, *C*., & Larcker, D. F. 1981. Structural equation models with unobservable variables and measurement error: Algebra and statistics. ***Journal of Marketing Research,*** 18, 3: 382-389.

Giddens, A. 1984. ***The Constitution of Society***. Berkeley, CA: Univ. Calif. Press.

Glaser, B. 1964. ***Organizational Scientists***. New York: Bobbs-Merrill.

Gomez-Mejia L.R., & Balkin, D. 1989. Effectiveness of Individual and aggregate compensation strategies. ***Industrial relations***, 28, 3: 431-445.

Grandi, A. & Grimaldi, R. 2005. Academic organizational characteristics and the generation of successful business ideas. ***Journal of Business Venturing***, 20, 6: 821-845.

Gupta, A.K., & Govindarajan, V. 2000. Knowledge flows within multinational corporations. ***Strategic management journal***, 21, 4: 473-496.

Hall, D.T., Schneider, B., & Nygren, H. T. 1970. Personal factors in organizational identification. ***Administrative Science Quarterly***, 15: 176-190.

Hill, M., Mann, L., & Wearing, A. J. 1996. The effects of attitude, subjective norm and self-efficacy on intention to benchmark: a comparison between managers with experience and no experience in benchmarking. ***Journal of organizational behaviour***, 17, 4: 313-327.

Iakovleva, T. 2004. ***Entrepreneurial performance in Russia***. Paper presented at European Summer University Conference in Twentee, Nederland, 19-21 September.

Isaksen, E. 2006. ***Initial growth intentions and subsequent early business performance***. Working paper.

ISTAT. 2003. http://www.istat.it/ambiente/contesto/infoterr/azioneB.html

Joreskog, K., & Sorbom, D. 2006. ***Lisrel 8.80***, software.

Kolvereid, L., & Bullvåg, E. 1996. Growth intentions and actual growth: the impact of entrepreneurial choice. ***Journal of Enterprising Culture***, 4, 1: 1–17.

Krueger, N. F., Reilly, M., & Carsrud, A. 2000. Competing models of entrepreneurial intentions. ***Journal of business venturing,*** 15, 5/6: 411-432.

Lacetera, N. 2008. ***Academic Entrepreneurship.*** Working Paper, Available at SSRN: http://ssrn.com/abstract=1090714.

Lesgold, A. 1988. Problem solving. In Sternberg, R. J., & E. E. Smith (Eds.) ***The Psychology of Human Thought***: 188–213. Cambridge University Press: Cambridge, U.K.

Lent, R. W., Brown, S. D., & Hackett, G. 1994. Toward a unifying social cognitive theory of career and academic interest, choice, and performance. ***Journal of Vocational Behavior***, 45, 1: 79–122.

Lerner, J. 2005. The university and the start-up: lessons from the past two decades. ***Journal of Technology Transfer***, 30, 1-2: 49-58.

Lewin, K. 1936. ***Principles of Topological Psychology***. New York: McGraw-Hill.

Locke, E. A. 1991. Introduction to special issue. O***rganizational Behaviour and Human Decision Making***, 50, 2: 151–3.

Locke, E. A., & Latham, G. P. 1990. ***A theory of goal setting and performance***. Englewood Cliffs, NJ: Prentice-Hall.

Lockett, A., Siegel, D., Wright, M. & Ensley, D. 2005. The Creation of Spin-off firms at Public Research Institutions: Managerial and Policy Implications. ***Research Policy***, 34, 7: 981-993.

Lumpkin, G. T., & Dess, G. G. 1996. Clarifying the entrepreneurial orientation construct and linking it to performance. ***The academy of management review***, 21(1): 135-172.

Lumpkin, G. T., & Dess, G. G. 2001. Linking two dimensions of entrepreneurial orientation to firm performance: The moderating role of environment and industry life cycle. ***Journal of Business Venturing***, 16: 429-451.

Luthans, F., & Ibrayeva, E. S. 2006. Entrepreneurial self-efficacy in central Asian transition economies quantitative and qualitative analyses. ***Journal of International Business Studies***, 37:92-110.

March, J. & Olsen, J. P. 1989. ***Rediscovering Institutions: the organizational basis of Politics***. New York: free press.

Marsh, H. W., Balla, J. R., & Hau, K.-T. 1996. An evaluation of incremental fit indices: A clarification of mathematical and empirical properties. In G. A. Marcoulides & R. E. Schumacker (Eds.), ***Advanced structural equation modeling: Issues and techniques:*** 315–353. Mahwah, NJ: Erlbaum.

Marsh, H. W., & Hovecar, D. 1985. Application of Confirmatory Factor Analysis to the Study of Self-Concept: First and Higher Order Factor Models and Their Invariance Across Groups. ***Psychological Bulletin***, 97, 3: 562-582.

McClelland, D. C. 1961. ***The achieving society***. Princeton, NJ: Van Nostrand.

McGrath, R.G., MacMillan, I., & Scheinberg S. 1992. Elitists, risk-takers and rugged individualists? An exploratory analysis of cultural differences between entrepreneurs and non entrepreneurs. ***Journal of Business Venturing,*** 7: 115-135.

Mian, S.A. 1996. Assessing value-added contributions of university technology business incubators to tenant firms. ***Research Policy***, 25, 3: 325-335.

Miller, D. 1983. The correlates of entrepreneurship in three types of firms. ***Management science,*** 29: 770-791.

Moynihan, D., & Pandey, S. K. 2007. The role of organizations in fostering public service motivation. ***Public Administration Review***, 67, 1: 40-53.

Morris, M., & Lewis, P. 1995. The determinants of entrepreneurial activity. ***European journal of marketing***, 29, 7: 31-48.

Mustar, P. 1997. Spin off enterprises. How French academics create high-tech companies: conditions for success or failure. ***Science and Public Policy***, 24, 1: 37-43.

Perry, J. 1996. Bringing Society in: Toward a theory of public service motivation. ***Journal of Public Administration Research and Theory***, 10, 2: 471-488.

Piccaluga, A., & Balderi, C. 2007. ***Consistenza ed evoluzione delle imprese spin off della ricerca pubblica in Italia***. Report Finlombarda.

Radosevich, R. 1995. A model for entrepreneurial spin-offs from public technology sources. ***International Journal of Technology Management***, 10, 7/8: 879-93.

Rajdeep, G., & Tansuhaj P. 2001. Building organizational capabilities for managing economic crisis: the role of market orientation and strategic flexibility. ***Journal of marketing***, april: 67-80.

Rauch, A., Wiklund, J., Lumpkin, G.T., & Frese, M. 2004. ***Entrepreneurial orientation and business performance: a meta-analysis***. Paper presented at the 2004 Babson-Kauffman Entrepreneurship Research Conference in Glasgow, Scotland.

Regan D.T. Fazio R.H., 1977. On the consistency between attitude and behaviour: look to the method of attitude formation. ***Journal of experimental social psychology***, 13: 38-45.

Richard, C. O., Barnett, T., Dwyer, S., & Chadwick, K. 2004. Cultural diversity in management, firm performance, and the moderating role of entrepreneurial dimensions. ***Academy of Management Journal***, 47, 2: 255–266.

Roberts, E. B., & Fusfeld, A. R. 1981. Staffing the Innovative Technology-Based Organization. ***Sloan Management Review,*** 22, 3: 19.

Roberts, E. B. 1991. ***Entrepreneurs in high technology: lesson from Mit and beyond***. New York, Oxford University Press.

Ronstadt, R. 1990. The educated entrepreneurs: a new era of entrepreneurial education is beginning. In C.A. Kent (Eds.), ***Entrepreneurship education: current developments, future directions***, Quorum Books, Westport.

Roodt, J. 2005. Self-employment and the required skills. ***Management Dynamics***, 14, 4: 18-30.

Rotter, J. B., 1966. Generalized expectancies for internal versus external control of reinforcement. ***Psychological Monographs: General and Applied,*** 80: 609.

Saegert, S. & Winkel, G. H. 1990. Environmental Psychology. ***Annual Reviews Psychology***, 41: 441-477.

Sakarya, S., Eckman, M., & Hyllegard, K. H. 2007. Market selection for international expansion, assessing opportunities in emerging markets. ***International Marketing Review***, 24, 2: 208-238.

Sciascia, S., Naldi, L., & Hunter E. 2006. Market orientation of entrepreneurship: an empirical investigation on SMEs. ***Entrepreneurship Management***, 2: 21-38.

Sexton, D. L., & Smilor, R. W. 1986. ***The art and science of entrepreneurship***. Cambridge, MA, Ballinger Publishing.

Shane, S. 2000. Prior knowledge and the discovery of entrepreneurial opportunities. ***Organization science***, 11, 4: 448-469.

Shane, S. 2004. ***Academic Entrepreneurship: University Spin-offs and Wealth Creation.*** UK: Edward Elgar Publishing.

Siegel, D. S., Waldman, D., Atwater, L. & Link, A. N. 2003. Commercial knowledge transfers from universities to firms: improving the effectiveness of university–industry collaboration. ***Journal of High Technology Management Research***, 14: 111–133.

Stewart, W., and Roth, P. 2001. Risk propensity differences between entrepreneurs and managers: A meta-analytic review. Journal of Applied Psychology, 86:145-153.

Super, D., Starishevesk, R., Matlin, N., & Jordan, J. 1963. ***Career Development: Self-concept Theory***. New York: College Entrance Examination Board.

Tyzoon, T. T., Bruno, A. V., & McIntyre, S. 1983. Growing Ventures can anticipate marketing Stages. ***Harward Business Review***, 61, 1: 62-66.

Vroom, V. 1966. Organizational choice: a study of pre- and post-decision processes. ***Organizational Behavior and Human Performance***, 1: 212-225.

Weber, E., Blais, A. & Betz, N. 2002. A Domain-specific Risk-attitude Scale: Measuring Risk Perceptions and Risk Behaviors. ***Journal of Behavioral Decision Making***, 15: 263–290.

Werts, C. E., Linn, R. L., & Joreskog, K. 1974. Interclass reliability estimates: Testing structural assumptions. ***Educational and Psychological Measurement***, 34: 25–33.

Wiklund, J., & Shepherd, D. 2003. Knowledge-Based Resources, Entrepreneurial Orientation, and the Performance of Small and Medium-Sized Businesses. ***Strategic Management Journal,*** 24: 1307–1314.

Wiklund, J. 1999. ***Entrepreneurial orientations as predictor of performance and entrepreneurial behaviour in small firms—longitudinal evidence.*** Paper presented at the 18th annual Entrepreneurship Research Conference, Gent. Belgium.

Wood, R., & Bandura, A. 1989. Social cognitive theory of organizational management. ***Academy of Management Review***, 14, 3: 361-384.

CHAPTER 6

CONCLUSIONS

This Doctoral Thesis presents an empirical study of the differences and similarities in Entrepreneurial Related Behaviours of individuals as a result of their organizational affiliation. Drawing on managerial, sociological, and psychological literature, I've developed and tested a multidimensional model of the nomological network of Entrepreneurial Orientation and its antecedents. Building on a well established psychological theory, the Theory of the Planned Behaviour (Ajzen, 1991[32]), I assess that Entrepreneurial Orientation is directly predicted by Attitude toward Entrepreneurship and Perceived Entrepreneurial Control, while four Macro Domains have an indirect effect on that behaviour. These domains are: Situationally Specific Motivation (encompassing Risk Taking and Self Efficacy), Personal Traits and Characteristics (encompassing Passion and Tenacity), Individual Skills (encompassing Technical, Procedural and Organizational Skills), and Perception of the Environmental Heterogeneity (encompassing Market Dynamism and Industry Opportunities). Perception of Environmental Support (encompassing Government, Context and University Support) fails to reach statistical significance in predicting the behaviour. Relying on the developed structural model, I test a set of nine theoretically based hypotheses exploring inter-group differences between a sample of Academic Entrepreneurs and Private Entrepreneurs.

I find the following results:

1. Confirmatory Factor Analysis shows that the following selected scales result in satisfactory Composite Reliability Indexes: Risk Taking, Self Efficacy, Passion, Tenacity, Technical Skills, Procedural Skills, Organizational Skills, Government Support, Context Support, University Support, Market Dynamism, Industry Opportunities, Entrepreneurial

[32] Ajzen, I. 1991. The theory of planned behavior. ***Organizational Behavior and Human Decision Processes***, 50: 179-211.

Orientation, Attitude toward Entrepreneurship, Subjective Norms and Perceived Entrepreneurial Control (As assessed in Paper I in Chapter 3);

2. The specific tests performed on Entrepreneurial Orientation construct, assessed through the Strategic Posture Scale (Covin & Slevin, 1989[33]), show that it is robust and has strong Internal and Discriminant Validity (As assessed in Paper II in Chapter 4);
3. I do not disconfirm the hypothesis that Entrepreneurial Orientation exhibits a three-component second-order factor structure (Innovativeness, Proactiveness and Riskiness). Innovativeness is the most related dimension to the second-order factor, followed by Proactiveness and Riskiness. Empirical evidence (goodness of fit indexes) shows that both models hold. The Akaike Criterion for non-nested models[34] demonstrates that the second-order model provides a better fit to the data (As assessed in Paper II in Chapter 4);
4. In testing the effectiveness of the Theory of the Planned Behaviour, two of the direct predictors of Entrepreneurial Orientation, namely Attitude toward Entrepreneurship and Perceived Entrepreneurial Control, effectively explain its variance. The only exception is the Subjective Norms path which fails to reach a statistical significance (As assessed in Paper II in Chapter 4);
5. The assessment of the causal path between Entrepreneurial Orientation and its set of indirect antecedents show that it is a micro-founded behaviour indirectly explained by Situationally Specific Motivation, Individual Skills, and the Environmental Heterogeneity. Perceived Environmental Support fails to predict the Entrepreneurial Orientation Related Dimensions (As assessed in Paper II in Chapter 4);
6. I assess the Nomological Validity of the two structural models for Academic and Private Entrepreneurs. For each of the two models, I assess the equality of factor patterns and the

[33] Covin, J. G., & Slevin, D. P. 1989. Strategic management of small firms in hostile and benign environments. ***Strategic Management Journal***, 10: 75-87.

[34] Cudeck, R., & Brownez, M. W. 1983. Cross Validation of Covariance Structures. ***Multivariate Behavioral Research,*** 18: 147-167.

equality of factor loadings, showing that the correspondence between indicators and underling factors holds for both Academic and Private Entrepreneurs (As assessed in Paper III in Chapter 5);

7. Through a T-Test on Latent Means, I show that Academic Entrepreneurs and Private Entrepreneurs differ in some of their characteristics and behaviours. The Academic Entrepreneurs have an higher instruction level, a higher number of patents' applications, but have created a smaller number of firms. Academic Entrepreneurs are less Risk Takers and have less Passion for Corporate Work. They also have less Procedural Skills but higher level of Organizational Skills. Academic founders perceive External Support (from the Government, from the local Context in which their companies are settled and from Universities) to be higher than Private Entrepreneurs. There are no major differences in terms of Entrepreneurial Orientation Related Dimensions: Tenacity, Self Efficacy, Technical Skills and Perception of Market Dynamism and Industry Opportunity (As assessed in Paper I in Chapter 3 and in Paper III in Chapter 5);
8. I empirically test a set of nine Hypotheses based on the theoretical assumption that individual behaviors are influenced by the affiliation of individuals. In comparing samples of Academic and Private Entrepreneurs, I find that there are no differences in the influence of the behaviors (Regression Paths) related to the Entrepreneurial Orientation domain and its direct antecedents (Attitude toward Entrepreneurship, Subjective Norms, and Perceived Entrepreneurial Control). On the contrary, the differences are strongly recorded in the modelization of the micro-foundation of Entrepreneurial Related Behaviours. For Academic Entrepreneurs, Attitude toward Entrepreneurship is mainly explained by the availability of Technical Skills (rather by an entrepreneurial motivation), while for Private Entrepreneurs is strongly influenced by Self Efficacy (rather by the availably of Skills and Competences). In both groups Context Support and University

Support have a significant impact on the Entrepreneurial Control; for Academic Entrepreneurs is strongly positive while for Private Entrepreneurs is strongly negative (As assessed in Paper III in Chapter 5);

9. Finally, the model shows that Academic Entrepreneurs' Entrepreneurial Orientation is triggered by (a) a developed set of Technical Skills and (b) by the Perception of a Supportive Environment, while for Private Entrepreneurs it is (a) triggered by Self Efficacy and (b) negatively influenced by the Infrastructural and Normative context (As assessed in Paper III in Chapter 5).

APPENDIX A

University Support Mechanisms

Table A1 shows the support mechanisms put in place by the five Universities. University of Bologna and University of Ferrara are the two leading regional institutions. With the only exception of the Business Plan Competition, which is not available at the University of Ferrara, both Universities have put in place the whole set of supportive mechanisms.

Table A1: Universities' Characteristics

	Uni. Bo	**Uni. Pc**	**Uni. Fe**	**Uni. Mo-Re**	**Uni. Pr**
Business plan competition (year of first edition)	2000	NA	NA	2001	NA
University incubator (year of establishment)	2001	NA	2005	NA	NA
Formal Technology Transfer Office (TTO) (year of establishment)	2001	NA	2004	NA	NA
Office dealing with TT issues (year of establishment)	1989	2001	2001	2001	2001
Patent regulation (year of first release)	1996	2004	1997	2001	2001
Spin-off regulation (year of first release)	2002	2004	2002	2002	2003

Note: NA= Not Available

In Table A2 we present a synoptic table of the characteristics of both the Spin-offs and Patent regulations. As it is shown, there are no differences in the Spin-offs regulation while the royalties allocation for university patented technology slightly differs.

Table A2: Spin-offs and Patent regulations' characteristics

	Spin off regulation (university share and incubation)		Patent regulation (% of royalties allocation)		
	Equity shared by University (maximum, in %)	Years of incubation (maximum)	Inventor	University	Department
Uni. Bo	10	3	50	45	5
Uni. Pc	10	3	50	45	5
Uni. Fe	10	3	50	40	10
Uni. Mo-Re	10	3	50	35	15
Uni. Pr	10	3	60	28	12

Table A3 shows the support mechanisms that the three Public Research Centres have put in place. CNR is the leading one in terms of availability of supportive mechanisms.

Table A3: Public Research Centres' Characteristics

	CNR	ENEA	INFM
Formal Technology Transfer Office (TTO) (year of establishment)	NA	NA	NA
Office dealing with TT issues (availability)	A	A	A
Patent regulation (year of first release)	2001	NA	2005
Spin-off regulation (year of first release)	2001	NA	NA

Note: NA= Not Available; A= Available

APPENDIX B

The Firms

In Appendix B I provide some descriptive statistics for the 133 firms included in the study. The original research design was meant to rely on a perfectly balanced matched-pair sample of firms (72 vs. 72). On the contrary, 11 Academic Spin-offs remained unmatched because of an under representation of the Aerospace, Biotechnology and Pharmaceutical Industries within the regional population of Private Start-ups. Hence, the current study is based on 72 Academic Spin-offs and a control group of 61 Private Start-ups.

In Table B1 I report the Affiliation of the 72 Academic Spin-offs. As for Academic Spin-offs, 46% of them are affiliated to the University of Bologna and 85% are spun off from the five regional Universities. About 15% are affiliated to the Public Research Centers.

Table B1: Affiliation

	Academic Spin-offs N=72
CNR	5
ENEA	4
INFM	2
University of Bologna	33
University Cattolica (Piacenza)	1
University of Ferrara	12
University of Modena/Reggio Emilia	7
University of Parma	8

In Table B2 I exhibit the firms' Industries. Following the OECD industry classification, 13 sectors have been identified: 'Advances Services' (including 'Advanced Statistical Services' and 'Architectural Services'), 'Aerospace', 'Biomedical', 'Biotechnology', 'Chemical', 'Electronics', 'Environment and Energy', 'Food', 'ICT', 'Materials and Acoustic', 'Mechanics and Automation', 'Pharmaceutical', 'Sensors and Diagnostics'. Among them the 'ICT' and 'Environment and Energy' (counting respectively 29 and 21

firms) are the most representative of the sample. As already mentioned, Aerospace, Biotechnology and Pharmaceutical Industries are under represented in the Private Start-ups sample.

Table B2: Industry

	Academic Spin-offs N=72	**Private Start-ups N=61**
Advanced Services[35]	3	2
Aerospace	2	0
Biomedical	1	3
Biotechnology	7	3
Chemistry	4	3
Electronics	4	5
Environment and Energy	12	9
Food	4	3
ICT	13	16
Material and Acoustics	9	6
Mechanics and Automations	2	8
Pharmaceutical	4	0
Sensors and Diagnostics	7	3

In Table B3 I report the Year of establishment. As reported, more than 65% of Academic Spin-offs have been founded after 2003, and similarly about 70% of the Private Start-ups.

Table B3: Year of Establishment

	Academic Spin-offs N=72	**Private Start-ups N=61**
1997	1	0
1998	0	2
1999	6	3
2000	4	5
2001	5	3
2002	3	5
2003	15	10
2004	12	10
2005	20	19
2006	6	4

[35] In the advanced services domain I've included: 'Advanced Statistical Services' and 'Architectural Services'

In Table B4 I assess the localization of the firms. For both samples about the 50% of firms are located in the Bologna area.

Table B4: Localization

	Academic Spin-offs N=72	Private Start-ups N=61
Bologna	36	26
Ferrara	12	7
Forlì	2	1
Modena	7	13
Parma	8	4
Piacenza	1	2
Ravenna	3	2
Reggio Emilia	3	6
Rimini	0	0

In Table B5 I report the average and total capitalization for both samples. At the establishment, the average capitalization of Academic Spin-offs is about 16,000€, while for private Start Ups is about 45,000€. Individuals are sharing the majority of equity, in fact they own almost the 75% of the Academic Spin-offs and almost the 95% of the Private Start-ups. At the establishment, Public Institutions own about 15% of the Academic Spin-offs.

Table B5: Equity (at the establishment)

	Academic Spin-offs N=72				Private Start-ups N=61			
	n	Mean	Std Dev	Total	n	Mean	Std Dev	Total
University	26	3,198	6,554	83,140	0	-	-	0
Public foundation	6	1,267	1,125	7,600	0	-	-	0
Research centre	6	10,565	17,325	63,390	0	-	-	0
Firm	13	11,079	21,357	144,030	7	18,414	11,815	128,900
Bank	0	-	-	0	2	13,300	10,889	26,600
Venture capitalist	0	-	-	0	0	-	-	0
Business angel	1	7,500	-	7,500	0	-	-	0
Individual	70	12,480	9,706	873,610	60	43,513	186,209	2,610,800
Total Equity		16,609	18,558	1,179,270		45,349	184,555	2,766,300

As reported in Table B6, in 2006 the Academic Spin-offs have experienced (on average) an increase of 60% in the total equity (from 16,609€ to 26,481€). As for their counterparts, the assessed increase has been of more than 400% (from 45,349€ to 206,048€).

Bank and Firms have been substantially investing in equity, especially in the Private Start-ups sample. In the Academic Spin-offs sample, Public Institutions' shares decreased of 7%.

Table B6: Equity (2006)

	Academic Spin-offs N=72				Private Start-ups N=61			
	n	**Mean**	**Std Dev**	**Total**	**n**	**Mean**	**Std Dev**	**Total**
University	28	2,999	5,288	83,970	0	-	-	0
Public foundation	3	1,333	1,443	4,000	0	-	-	0
Research centre	4	12,068	22,082	48,270	0	-	-	0
Firm	20	24,111	55,128	482,210	14	32,100	63,998	449,400
Bank	2	28,150	16,758	56,300	2	640,500	876,105	1,281,000
Venture capitalist	0	-	-	0	0	-	-	0
Business angel	2	7,250	354	14,500	0	-	-	0
Individual	70	17,013	19,032	1,190,876	60	180,642	751,085	10,838,500
Total Equity		26,481	41,317	1,880,126		206,048	864,674	12,568,900

In Table B7 information about the Debt Financing are reported. Since the establishment, 57 Academic Spin-offs have been financed through public founds (average financing: 187,475€), on the contrary only 24 Private Start-ups have (average financing: 448,188€). Banks have been more proactive in landing money to 33 Private Start-Ups (average loan: 953,182€) rather then to 17 Academic Spin-offs (average loan: 101,765€).

Table B7: Debt Financing

	Academic Spin-offs N=72				Private Start-ups N=61			
	n	**Mean**	**Std Dev**	**Total**	**n**	**Mean**	**Std Dev**	**Total**
Public	57	187,475	504,251	10,686,100	24	448,188	1,322,037	10,756,500
Firm	4	394,000	263,105	1,576,000	5	784,000	984,520	3,920,000
Bank	17	101,765	97,979	1,730,000	33	953,182	2,741,222	31,455,000
Friend/Relative	2	13,500	2,121	27,000	1	20,000	.	20,000
Personal	0	0	0	0	0	0	0	0

The following Table B8 reports the Equity Financing. Both samples have been financed in equity by firms: 4 Academic Spin-offs (average finance: 200,375€) and 4 Private Start-ups (average finance: 425,000€). One business angel has been heavily investing in an Academic Spin-off (1,500,000€) while all the remaining sources of financing come from

personal investing. Five Academic Spin-offs are financed by individuals (average: 56,000€) as well as 30 Private Start-ups (average: 707,933€).

Table B8: Equity financing

	Academic Spin-offs N=72				Private Start-ups N=61			
	n	**Mean**	**Std Dev**	**Total**	**n**	**Mean**	**Std Dev**	**Total**
Public	0	0	0	0	0	0	0	0
Firm	4	200,375	215,563	801,500	4	425,000	717,240	1,700,000
Bank	0	0	0	0	0	0	0	0
Business Angel	1	1,500,000	.	1,500,000	0	0	0	0
Venture Capital	0	0	0	0	0	0	0	0
Friend/Relative	0	0	0	0	0	0	0	0
Personal	5	56,000	48,785	280,000	30	707,933	2,722,414	21,238,000

In Tables B9 and B10 I report information about the infrastructural and organizational support given to the firms since their establishment. More than 50% of Academic Spin-offs are incubated within public infrastructures (University department, University incubators[36], Public incubators[37], etc), but less than 10% of the Private Start-ups are. Seven firms (5 Academic and 2 Private) have been previously incubated. About 30% of the Academic Spin-offs have never been incubated as well as the 90% of the Private ones.

Table B9: Incubation

	Academic Spin-offs N=72	**Private Start-ups N=61**
Incubated at 2006	46	4
Dis-Incubated at 2006	5	2
Never Incubated at 2006	21	55

In the following Table B10 I report the number of firms who have participated to the Spinner Program[38]. Spinner is a public founded program aimed at supporting the regional

[36] www.almacube.com AlmaCube is the University of Bologna's Incubator; http://web.unife.it/test/liaison.htm University of Ferrara's Liaison Office and Incubator.
[37] www.itechoff.it I TECH-OFF (Information TECHnology spin-OFF) is an high-tech firms Incubator located in the Bologna area; www.siproferrara.com Sipro is public founded Incubator located in the Ferrara area.
[38] www.spinner.it The Spinner program is a project aimed at supporting the entrepreneurial activities in the Emilia Romagna Region. It's financially supported by the European Community.

high-tech entrepreneurship. More than the 60% of Academic Spin-offs enjoyed the program, while less than 5% of the Private ones did.

Table B10: Spinner Program

	Academic Spin-offs N=72	Private Start-ups N=61
Spinner Participants	45	3

In the following set of three Tables (Table B11, B12, B13) I've included the firms with a positive turnover (at 2006); specifically, 65 Academic Spin-offs and 57 Private Start-ups. Table B11 provides information about the localization of firms' customers, computed as a percentage of the 2006 Turnover. I've identified four categories that I've labeled: Regional, National, European and Global. Based on the results, for both samples the turnover is mainly national (about 85% for the Academic Spin-offs and almost 90% for the Private Start-ups). Academic Spin-offs tend to serve more the international markets, with more than 15% of the 2006 turnover originated outside Italy, if compared to less then the 12% of Private Start-ups. In the Exhibit I also report the corresponding values in Euro.

Table B11: Customers

	Academic Spin-offs N=65		Private Start-ups N=57	
	%	Value (in €)	%	Value (in €)
Regional	44.02	7,332,820	44.63	52,218,947
National	40.22	6,699,752	44.37	51,911,053
European	7.62	1,268,698	6.96	8,148,947
Global	8.15	1,358,404	4.04	4,721,053

Table B12 reports the information about the source of the competition (calculated as a percentage of the 2006 turnover). For the Academic Spin-offs the competition seems to be more global (more than 50% coming from international firms) rather than local (regional competition is less than 20%). On the other end, Private Start-ups seem to compete

prevalently on the regional/national market with more than 70% of the total competition coming from national rivals. The corresponding values are reported.

Table B12: Competitors

	Academic Spin-offs N=65		Private Start-ups N=57	
	%	Value (in €)	%	Value (in €)
Regional	19.17	3,193,532	37.61	44,008,421
National	29.09	4,846,684	35.91	42,017,368
European	23.83	3,970,129	9.53	11,145,789
Global	27.89	4,646,768	16.91	19,787,368

In Table B13 I present the 2006 turnover disaggregated in terms of: Product sales, Consultancy, Technology Commercialization and Royalties generated from Technology Licensing. In 2006, for both groups of firms the main source of revenues is represented by the commercialization of Products (33.28 vs. 31.25) and Consultancy (63.34 vs. 60.93), while Technology Commercialization (.46 vs. 6.40) and Licensing (2.92 vs. 1.40) are not having a significant impact on the turnover. Values are reported.

Table B13: Turnover

	Academic Spin-offs N=65		Private Start-ups N=57	
	%	Value (in €)	%	Value (in €)
Product Sales	33.28	5,543,827	31.25	36,557,368
Services/Consultancy	63.34	10,551,982	60.93	71,287,895
Technology Commercializat.	0.46	76,891	6.40	7,492,105
Royalties from Licensing	2.92	486,975	1.40	1,642,105

Table B14 provides information about firms' market performance. The trend shows that Academic Spin-offs are experiencing slower growth rates if compared to their private counterparts.

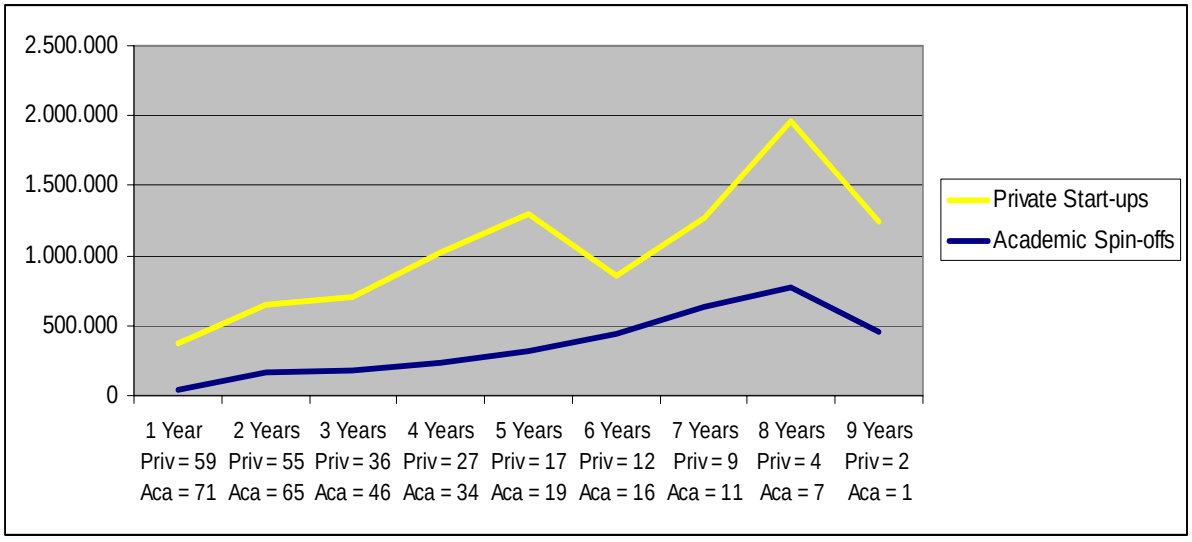
Table B14: Turnover Trend

	N	Mean	Std Dev	Cumulated Value	N	Mean	Std Dev	Cumulated Value
1998	1	25,000		25,000	2	35,000	49,497	70,000
1999	7	27,857	55,064	195,000	4	87,500	118,145	350,000
2000	11	71,818	100,580	790,000	9	134,000	119,348	1,206,000
2001	16	116,687	168,181	1,867,000	12	140,833	134,532	1,690,000
2002	19	211,684	394,094	4,022,000	17	629,255	1,653,436	10,697,350
2003	34	173,411	389,031	5,896,000	27	648,000	1,487,662	17,496,000
2004	46	197,184	369,658	9,070,500	36	586,527	1,281,131	21,115,000
2005	65	192,840	393,450	12,534,630	55	513,327	1,273,608	28,233,000
2006	71	234,643	464,083	16,659,675	59	593,220	696,481	44,000,000

Note: One private Start-up has been excluded from the analysis because of incomparable growth trends; 2 missing values.

In Figure B1 I report the turnover Growth. Both trends have a positive slope. Academic Spin-offs are growing less and slower if compared to the control sample.

Figure B1: Turnover Growth



Note: One private Start-up has been excluded from the analysis because of incomparable growth trends; 2 missing values.

Table B15 provides information about the number of employees. The analysis show that Academic Spin-offs are less likely to employee personnel than the Private Start-ups. In 2006, Academic Spin-offs employees almost 2 individuals while the Private Start-ups almost 5.

Table B15: Employees Trend

	N	Mean	Std Dev	Cumulated Value	N	Mean	Std Dev	Cumulated Value
1998	1	3.00		3	2	1.00	1.41	2
1999	7	1.43	1.81	10	4	2.00	2.83	8
2000	11	1.36	2.62	15	9	1.78	2.33	16
2001	16	1.94	2.77	31	12	1.75	2.60	21
2002	19	2.11	3.60	40	17	3.94	9.18	67
2003	34	1.53	3.01	52	27	3.74	8.00	101
2004	46	1.67	3.11	77	36	3.64	7.47	131
2005	66	1.59	3.21	105	55	3.67	6.94	202
2006	72	1.97	3.62	142	59	4.83	7.94	285

Note: One private Start-ups has been excluded from the analysis because of incomparable growth trends; 1 missing value

As Table B16 shows the Academic Spin-offs are more relying on temporary workers. The number of collaborators through the years is higher for the Academic Spin-offs. In 2006 , on average, both types of firms involve more than 3 collaborators.

Table B16: Collaborators Trend

	N	Mean	Std Dev	Cumulated Value	N	Mean	Std Dev	Cumulated Value
1998	1	4.00	-	4	2	0.00	0.00	0
1999	7	1.29	1.70	9	4	0.00	0.00	0
2000	11	1.00	1.95	11	9	0.33	0.71	3
2001	16	1.31	2.18	21	12	0.50	0.90	6
2002	19	1.84	2.22	35	17	0.82	1.42	14
2003	34	2.09	2.93	71	27	1.30	1.92	35
2004	46	3.20	3.30	147	36	2.00	3.21	72
2005	66	2.94	3.15	194	55	2.07	3.33	112
2006	72	3.63	3.88	260	59	3.39	4.91	200

Note: One private Start-ups has been excluded from the analysis because of incomparable growth trends; 1 missing value

APPENDIX C

List of Academic Spin-offs and Private Start-Ups

Table C1: Academic Spin-offs

	Name	Type	Web Site	Year of establish.	Industry	City	Affiliation	Match
1	A.i.d.a.	S.r.l.	www.aidalabs.com	2005	ICT	Mo	Univ. Modena - Reggio	
2	AAT-TAA (Advanced Analitical Technology)	S.r.l.	www.aat-taa.eu	2005	Food	Pc	Univ. Cattolica Pc	
3	Active Technologies	S.r.l.	www.activetechnologies.it	2003	Sensors and Diagnostics	Fe	Univ. Ferrara	X
4	Advanced Industrial Design in Acoustic	S.r.l.	www.aidasrl.it	2003	Material and Acoustics	Pr	Univ. Parma	X
5	Aequotech	S.r.l.	www.aequotech.com	2005	Biotechnology	Fe	Univ. Ferrara	
6	Almaspace	S.r.l.	www.almasat.org	2006	Aerospace	Fo-Ce	Univ. Bologna	X
7	Almavision	S.r.l.	www.almavision.it	2005	ICT	Bo	Univ. Bologna	X
8	Ambrosialab	S.r.l.	www.ambrosialab.com	2003	Pharmaceutical	Fe	Univ. Ferrara	X
9	Arcadia Lab	S.r.l.	www.arcadialab.com	2005	ICT	Bo	Univ. Bologna	X
10	Arcatecnologie	S.r.l.	www.arcatecnologie.it	2004	Mechanics and Automations	Bo	Univ. Bologna	X
11	Ares	S.c.a.r.l.	www.aresarcheologia.it	1999	Advanced Services	Ra	Univ. Bologna	
12	Biodec	S.r.l.	www.biodec.com	2003	ICT	Bo	Univ. Bologna	X
13	Biogenera	S.n.c No Profit	www.biogenera.org	2005	Pharmaceutical	Bo	Univ. Bologna	
14	Bio-tech (Biotechnology Laboratories)	S.r.l.	www.bio-technology.it	1997	Biotechnology	Pr	Univ. Parma	X
15	Cantil	S.r.l.	www.cantil.it	2003	Material and Acoustics	Bo	Infm	
16	Carpe Cibum (Last Minute Market)	S.c.a.r.l.	www.lastminutemarket.org	2003	Food	Bo	Univ. Bologna	X
17	Clirest	S.r.l.	http://web.unife.it/progetti/clirest	2003	Pharmaceutical	Fe	Univ. Ferrara	
18	Cynagen	S.r.l.	www.cyanagen.it	2003	Biotechnology	Bo	Univ. Bologna	X
19	Econag	S.r.l.	www.econag.it	2005	Advanced Services	Bo	Univ. Bologna	X
20	E-heart	S.r.l.	www.e-heart.it	2004	Sensors and Diagnostics	Fe	Univ. Ferrara	X
21	Elcos (European Laboratory for Characterisation of Ornamental Stones)	S.r.l.		1999	Sensors and Diagnostics	Bo	Univ. Bologna	X

22	Embit	S.r.l.	www.embit.it	2004	Electronics	Mo	Univ. Modena - Reggio	
23	Envis	S.r.l.	www.envis.it	2003	Environment and Energy	Bo	Enea	X
24	Ergo Consulting	S.r.l.	www.ergoconsulting.it	2001	Environment and Energy	Bo	Univ. Bologna	X
25	Et-Ecoinnovative technologies	S.r.l.		2005	Environment and Energy	Bo	Enea	X
26	Etheria (medi@base)	S.r.l.	www.mediabase.it	2005	ICT	Pr	Univ. Parma	
27	Eugea (Ecologia Urbana Giardini E Ambiente)	S.c.a.r.l.	www.eugea.it	2006	Environment and Energy	Bo	Univ. Bologna	X
28	Febe ecologic	S.n.c.	www.febe-ecologic.it	2000	Environment and Energy	Ra	Enea	X
29	Gecosistema	S.r.l.	www.gecosistema.eu	2001	ICT	Fo-Ce	Univ. Bologna	X
30	Genefast	S.r.l.	www.genefast.com	2003	Biotechnology	Mo	Univ. Bologna	
31	Genemore	S.r.l.	www.genemore.com	2005	Biotechnology	Mo	Univ. Modena - Reggio	X
32	Geotema	S.r.l.	www.geotema.it	2004	Environment and Energy	Fe	Univ. Ferrara	X
33	Health Ricerca e Sviluppo (HRS)	S.r.l.	www.hrs.unibo.it	2001	Biomedical	Bo	Univ. Bologna	X
34	Id-solutions	S.r.l.	www.id-solutions.it	2004	ICT	Pr	Univ. Parma	
35	Imavis	S.r.l.	www.imavis.com	2000	ICT	Bo	Univ. Bologna	
36	Ipecc	S.r.l.	www.ipecc.it	2005	Material and Acoustics	Ra	Cnr	
37	Istituto Delta Ecologia Applicata	S.r.l.	www.istitutodelta.it	2001	Environment and Energy	Fe	Univ. Ferrara	X
38	Labtrek	S.r.l.	www.labtrek.net	2004	Sensors and Diagnostics	Bo	Univ. Bologna	X
39	Lesepidado	S.r.l.	www.lesepidado.it	1999	Food	Bo	Univ. Bologna	X
40	Lipinutragen	S.r.l.	www.lipinutragen.it	2005	Chemistry	Bo	Cnr	X
41	Materiacustica	S.r.l.		2004	Material and Acoustics	Fe	Univ. Ferrara	X
42	Mavigex	S.r.l.	www.mavigex.com	2005	ICT	Bo	Univ. Bologna	X
43	Mec (Microwave Electronics for Communications)	S.r.l.	www.mec-mmic.com	2004	Aerospace	Bo	Univ. Bologna	X
44	Mediteknology	S.r.l.		2004	Biotechnology	Bo	Cnr	
45	Meduproject	S.r.l.	www.meduproject.com	2002	Advanced Services	Bo	Univ. Bologna	X
46	Musei e ambiente	S.r.l.	www.museieambiente.com	2005	ICT	Bo	Cnr	X
47	Naturmedia	S.r.l.	www.naturmedia.it	2003	Environment and Energy	Pr	Univ. Parma	X
48	Nectar Imaging	S.r.l.	www.nectarimaging.com	2005	Electronics	Bo	Univ. Bologna	X
49	Nem	S.r.l.	www.nemnuclear.com	2005	Environment and Energy	Fe	Univ. Ferrara	X
50	Nirox	S.r.l.	www.nirox.it	2005	Sensors and Diagnostics	Mo	Univ. Modena - Reggio	X
51	Organic Spintronics	S.r.l.	www.organic-spintronics.com	2003	Material and Acoustics	Bo	Cnr	X
52	Phenbiox	S.r.l.	www.phenbiox.it	2006	Chemistry	Bo	Univ. Bologna	X

53	PolycristalLine	S.r.l.	www.polycrystalline.it	2005	Chemistry	Bo	Univ. Bologna	X
54	Protezione e Gestione Ambientale (PROGEA)	S.r.l.	www.progea.net	2000	Environment and Energy	Bo	Univ. Bologna	X
55	Re:lab	S.r.l.	www.re-lab.it	2004	ICT	Re	Univ. Modena - Reggio	X
56	Scriba Nanotecnologie	S.r.l.	www.scriba-nanotec.com	2005	Material and Acoustics	Bo	Cnr	X
57	Silicon Biosystem	S.p.a.	www.siliconbiosystems.com	1999	Biotechnology	Bo	Univ. Bologna	
58	Silis	S.r.l.	www.silis.it	2002	Electronics	Pr	Univ. Parma	X
59	Sires (Sistemi Integrati di Recupero Ecosostenibile)	S.r.l.		2001	Material and Acoustics	Bo	Univ. Bologna	X
60	Soatec	S.r.l.	www.soatec.unipr.it	2003	Sensors and Diagnostics	Pr	Univ. Parma	X
61	Spin off Idea (Informazione Dati Elettronica Automazione)	S.r.l.		1999	Electronics	Bo	Univ. Bologna	X
62	Star	S.r.l.	www.labstar.it	2005	Material and Acoustics	Mo	Infm	X
63	Te.Am. Geofisica	S.r.l.	www.teamgeofisica.com	2002	Environment and Energy	Fe	Univ. Ferrara	X
64	Techimp	S.p.a.	www.techimp.com	1999	Sensors and Diagnostics	Bo	Univ. Bologna	X
65	Tinval (Tecnologia Innovazione e Valorizzazione Alimenti)	S.r.l.	www.tinval.it	2004	Food	Re	Univ. Bologna	
66	Tp Engineering	S.r.l.		2006	Material and Acoustics	Pr	Univ. Parma	
67	Ufpeptides	S.r.l.	www.ufpeptides.com	2003	Chemistry	Fe	Univ. Ferrara	
68	Unitec	S.r.l.	www.unitec-srl.com	2000	Environment and Energy	Fe	Univ. Ferrara	
69	Vetspin	S.r.l.	www.vetspin.com	2004	Pharmaceutical	Bo	Univ. Bologna	X
70	Vision-E	S.r.l.	www.vision-e.it	2006	ICT	Mo	Univ. Modena - Reggio	X
71	Xanthus	S.r.l.		2003	ICT	Bo	Enea	
72	XBW	S.r.l.	www.xbw.it	2006	Mechanics and Automations	Re	Univ. Modena - Reggio	X

Note: Bo=Bologna; Fe=Ferrara; Fo-Ce= Forlì-Cesena; Mo=Modena; Pr=Parma; Pc=Piacenza; Ra=Ravenna; Re= Reggio Emilia; Rm=Rimini.

The Statistical analysis of Paper I and Paper II include all the 133 firms.

The Statistical analysis of Paper III have been performed including only those firms with an X in the 'Match' domain.

Table C2: Private Start-ups

	Name	Type	Web Site	Year of establish.	Industry	City	Match
73	3000	srl	www.ecosurvey.it	2003	Environment and Energy	Bo	X
74	2md Sistemi	snc	www.2mdsistemi.com	2001	Mechanics and Automations	Fe	X
75	A.Service 2000	srl		1999	Mechanics and Automations	Bo	X
76	AcsonMarine	srl	www.acsonmarine.com	2006	Sensors and Diagnostics	Fo-Ce	X
77	Alchimie Digitali	srl	www.adigitali.it	2005	ICT	Mo	X
78	Almateq	srl	www.almateq.com	2006	ICT	Mo	X
79	Biocosmetici	srl	www.biocosmetici.it	2005	Chemistry	Bo	X
80	Breast life	srl		2004	ICT	Bo	
81	Centrogeo survey	snc	www.centrogeo.it	2003	Environment and Energy	Re	X
82	CPI Centro Polimeri Italia	srl	www.centropolimeri.it	2005	Material and Acoustics	Re	X
83	Cz	srl	www.logossrl.com	2003	Mechanics and Automations	Pr	
84	Data	srl	www.datacarpi.it	2005	ICT	Mo	X
85	Destura	srl	www.destura.it	2005	Sensors and Diagnostics	Mo	X
86	Dexplo	srl	www.dexplo.net	2004	Environment and Energy	Pr	X
87	Domedica	srl	www.domedica.it	2005	ICT	Bo	X
88	Dudat	srl	www.dudat.it	2003	ICT	Bo	X
89	E.L.F. Elettronica	srl	www.elfelettronica.it	2003	Electronics	Fe	X
90	E.qu.a	srl	www.equasrlra.it	1998	Food	Ra	X
91	En.E.Cor (Environmental Engineering Coordination)	srl	www.enecor.it	2004	Environment and Energy	Fe	X
92	Engineering Piacenza (En.Pi.)	srl		2005	Mechanics and Automations	Pc	X
93	F.S.A. Ferrara Service Analyzers	snc	www.fsa-analyzers.com	2000	Chemistry	Fe	X
94	Feon	srl	www.feon.it	2004	Mechanics and Automations	Pr	X
95	Garwer	srl	www.borsarifiuti.com	2000	ICT	Bo	X
96	Generon	srl	www.generon.it	2005	Biotechnology	Mo	X
97	Genesis	srl	www.genesis-aw.com	2005	Material and Acoustics	Pr	
98	Globalproget Elettronica	srl	www.globalproget.it	2004	Electronics	Bo	X
99	Hot Water research & development	srl		2001	Food	Bo	
100	Iaselab	srl	www.iaselab.com	2004	Sensors and Diagnostics	Fe	X
101	Infomap	srl	www.infomap-ambiente.it	2002	Environment and Energy	Fe	X
102	Laboratorio Mendel Genetica Medica	srl		1998	Biotechnology	Mo	

103	Leonardo	srl	www.studioleonardo.it	2000	Advanced Services	Bo	
104	Logica SMC	srl	www.logicasmc.it	2004	ICT	Mo	
105	Look Line	srl	www.lookline.com	2005	Material and Acoustics	Mo	X
106	Luce Medical	srl	www.lucemedical.com	2005	Biomedical	Bo	X
107	Lucedentro	srl	www.lucedentro.com	2006	Material and Acoustics	Mo	X
108	Lvm Technologies	srl		2004	Biomedical	Bo	X
109	Make It	srl	www.make-it.it	2005	ICT	Bo	X
110	Medidata	srl	www.medidata.it	2003	Advanced Services	Re	X
111	Metco	srl	www.metco.it	2002	Chemistry	Bo	X
112	Nethical	srl	www.nethical.net	2005	ICT	Bo	X
113	Novanet	srl	www.novanetsrl.com	2000	Mechanics and Automations	Bo	X
114	O.S.B.	srl	www.osbitalia.it	1999	ICT	Bo	X
115	Picotronik	srl	www.picotronik.it	2003	Electronics	Mo	X
116	Pizzoli R&S	srl	www.pizzoli.it	2005	Food	Bo	
117	Rand	srl	www.rand-biotech.com	1999	Biomedical	Mo	X
118	S.G.Biotech	snc	www.sgbiotech.com	2003	Biotechnology	Pc	
119	Sigma Studio	srl	www.sigmastudiosrl.191.it	2005	Material and Acoustics	Mo	X
120	Sime Automation	srl	www.simeautomation.com	2006	Mechanics and Automations	Bo	X
121	Sinteleia	srl	www.sinteleia.it	2001	Electronics	Bo	X
122	Smart Res	srl	www.smartres.eu	2005	Electronics	Mo	X
123	Softec technology and research	srl	www.softecsas.com	2002	Environment and Energy	Bo	X
124	Soilexpert	srl	www.soilexpert.it	2005	Environment and Energy	Re	X
125	Special Video	srl	www.specialvideo.it	2004	ICT	Bo	X
126	SpinLab	srl	www.spin-lab.it	2003	ICT	Re	X
127	Studio Seta	srl	www.studioseta.it	2004	Environment and Energy	Ra	X
128	Technofluids	srl	www.technofluids.com	2005	Mechanics and Automations	Re	X
129	Tecnocassa	srl	www.tecnocassa.com	2002	ICT	Fe	X
130	Tecnocontrolli	srl	www.tecnocontrolli-lab.it	2002	Material and Acoustics	Bo	X
131	U-series	srl	www.u-series.com	2003	Environment and Energy	Bo	X
132	Waymedia	srl	www.waymedia.it	2005	ICT	Bo	X
133	Yacme	srl	www.yacme.com	2000	ICT	Bo	X

Note: Bo=Bologna; Fe=Ferrara; Fo-Ce= Forlì-Cesena; Mo=Modena; Pr=Parma; Pc=Piacenza; Ra=Ravenna; Re= Reggio Emilia; Rm=Rimini.

All firms have been included in the analysis of Paper I and Paper II. Statistical analysis of paper III are limited to those firms with an 'X' in the Match domain

APPENDIX D

The Questionnaires[39]

	OSSERVATORIO REGIONALE SULLE START UP AD ELEVATO CONTENTUO TECNOLOGICO
	Progetto di ricerca a cura del dipartimento di Scienze Aziendali – Alma Mater Studiorum - Università di Bologna

QUESTIONARIO IMPRESA

Nome e cognome persona intervistata:……...

Ruolo aziendale:…….

E-mail:……..……

Telefono:…….……...

Soci di capitale	
Nome e cognome …….	Nome e cognome …….
E-mail…….	E-mail…….
Telefono……..	Telefono……..
Nome e cognome …….	Nome e cognome …….
E-mail…….	E-mail…….
Telefono……..	Telefono……..

[39] An English version of both questionnaires is available form the author. Please also refer to the appendix of the three papers (Chapter 3, 4 and 5)

A.1) Anagrafica, Nome impresa: ……..…ragione sociale……se S.p.a., dal……...

Indirizzo……..…….Sito web……Osservatorio…….

Data costituzione dell'impresa:……Settore di attività dell'impresa:……..……Codice Ateco.....

L'impresa è partecipata da un gruppo industriale? ……..se si, specificare nome e nazionalità del gruppo…….

L'azienda nasce dallo scorporo di attività da parte di una impresa "madre"?.....se si, indicare il nome ……....

Numero di **soci**:		Alla costituzione	Oggi
	Numero di soci (persone) appartenenti ad un centro di ricerca pubblico		
	Numero di soci (persone) accademici		
	Numero di soci (persone) ex-dipendenti di centri di ricerca o università		
	Numero di soci (persone) con nessun legame con centri di ricerca o università		
	Numero di istituzioni pubbliche		
	Numero di imprese private		
	Totale:		

	Alla costituzione	Oggi
Capitale sociale (in euro)		
Percentuale di partecipazione centro di ricerca nel capitale sociale (in %)		
Percentuale di partecipazione università nel capitale sociale (in %)		

Siete incubati?.....se si, dove? ……a che costi?.....……..…..……...

Eravate precedentemente incubati e vi siete dis-incubati?.....se si, quando?.....

L'azienda attualmente ha più di una sede/stabilimento/ufficio?…….se si, in Italia o all'estero?.....……

Indichi in che percentuale i ricavi dell'impresa derivano dalle seguenti attività:
- Prodotti ……% - Vendita di tecnologie brevettate e non . …..%
- Servizi/ Consulenza ……% - Royalties dalla cessione del diritto d'uso della propria tecnologia ……%

Indicare il livello di **sviluppo della tecnologia** alla base del nuovo prodotto/processo:
- Ancora in fase di sviluppo □ - Prototipo □
- Prodotto/servizio pronto per la commercializzazione □ - Prodotto/servizio commercializzato □

Numero (e breve descrizione) dei nuovi **prodotti** realizzati dalla costituzione dell'impresa :
Numero (e breve descrizione) dei **prodotti** con migliorie **incrementali** disponibili nell'arco dei prossimi 12 mesi:
Numero (e breve descrizione) dei **nuovi prodotti** disponibili nell'arco dei prossimi 12 mesi:
Numero (e breve descrizione) dei nuovi **servizi** realizzati dalla costituzione dell'impresa :
Numero (e breve descrizione) dei **nuovi servizi** che saranno introdotti nell'arco dei prossimi 12 mesi:
Numero (e breve descrizione) dei nuovi **processi** introdotti dalla costituzione dell'impresa:
Numero (e breve descrizione) dei **nuovi processi** che saranno introdotti nell'arco dei prossimi 12 mesi:

Numero di **domande di brevetto** (nazionali, europei, statunitensi) dalla costituzione:
Numero di **brevetti assegnati** (nazionali, europei, statunitensi) dalla costituzione:
Numero di **marchi/copyright** posseduti dalla costituzione:
Numero (e breve descrizione) delle **collaborazioni commerciali** attivate dalla costituzione:
Numero (e breve descrizione) delle **collaborazioni tecnologiche** attivate dalla costituzione:
Numero di **contratti di vendita** (attivati dalla costituzione), valore medio ed ente:
Principali **risultati** raggiunti dalla costituzione (si prega di specificare):

B.1) Performance e finanziamento (Impresa Spinner:……)

	Primo anno	Secondo anno	Terzo anno
Fatturato			
Numero di soci			
Numero di dipendenti (tempo determ. e indet.)			
Numero di collaboratori			

Fatto 100 il totale delle fonti di finanziamento esterno, indicare il contributo in percentuale (o l'entità) delle seguenti fonti di finanziamento (ante e post creazione impresa):							
Business Angel	Venture Capitalist	Finanziamenti pubblici	Finanziamenti da imprese private	Banche	Amici, parenti	Finanziamenti personali	**Totale**
							100

Dalla fondazione l'impresa ha avuto bisogno di maggiori risorse finanziarie?	**No**	□	**Vai alla sezione C.1**
	Si	□	

Se si, dalla fondazione l'impresa ha cercato di ottenere credito presso le banche?	□	**Si**	Se si, l'impresa è riuscita nel suo intento?	□	**Si**	Se si, sarebbe stato disposto a pagare tassi di interesse leggermente maggiori pur di ottenere le maggiori risorse finanziarie?	□	**Si**	
							□	**No**	Perché?. ..... …… …… …… …… ……
				□	**No**	Perché? …….			
	□	**No**	Perché?.....						

Dalla fondazione l'impresa ha cercato di aumentare le proprie dotazioni di capitale con operazioni di private equity (seed e venture capital)?					
□	**Si**	Se si l'impresa è riuscita nel suo intento?	□	**Si**	
			□	**No**	Perché? …….
□	**No**	Perché?.....			

C.1) Clienti, concorrenza e network

Indichi in che percentuale i vostri **clienti** sono localizzati:

nella stessa regione ….%
in altre regioni italiane ….%
in Europa ….%
nel resto del mondo ….%

Indichi in che percentuale i vostri **concorrenti** sono localizzati:

nella stessa regione ….%
in altre regioni italiane ….%
in Europa ….%
nel resto del mondo ….%

Specificare su una scala da 1 a 7 la frequenza di interazioni della Sua impresa con le seguenti istituzioni nell'ultimo anno:

				Nulla						Molto elevata
	Si	No	Se si	1	2	3	4	5	6	7
Parchi scientifici	□	□	Se si	□	□	□	□	□	□	□
Incubatori	□	□	Se si	□	□	□	□	□	□	□
Centri per il Trasferimento tecnologico	□	□	Se si	□	□	□	□	□	□	□
Business Angels	□	□	Se si	□	□	□	□	□	□	□
Società di Venture Capital	□	□	Se si	□	□	□	□	□	□	□
Banche	□	□	Se si	□	□	□	□	□	□	□
Altre agenzie di supporto alle nuove imprese	□	□	Se si	□	□	□	□	□	□	□
Università di provenienza (o della provincia)	□	□	Se si	□	□	□	□	□	□	□
Università diverse da quella di provenienza (o della provincia)	□	□	Se si	□	□	□	□	□	□	□
Altri enti pubblici di ricerca (es. CNR, Enea..)	□	□	Se si	□	□	□	□	□	□	□
Imprese nello stesso settore	□	□	Se si	□	□	□	□	□	□	□
Imprese in settori collegati	□	□	Se si	□	□	□	□	□	□	□
Altro (si prega di specificare) ……	□	□	Se si	□	□	□	□	□	□	□

OSSERVATORIO REGIONALE SULLE START UP AD ELEVATO CONTENUTO TECNOLOGICO

Progetto di ricerca a cura del dipartimento di Scienze Aziendali
Alma Mater Studiorum - Università di Bologna

QUESTIONARIO SOCIO

A.1) Nome e cognome della persona intervistata:…….....
Qualifica all'interno dell'impresa……...…….
Indirizzo e-mail……..Numero di telefono:……..…

- Lei lavora in impresa:
  - □ Part time
  - □ Full time

- Di quanti brevetti risulta inventore? ……

- Ha fondato altre imprese?
  - □ Si, (indicare la denominazione e anno di fondazione):…….…
  - □ No

- Specificare se lei è:
  - □ Dipendente/collaboratore dell'università (se si specificare quale:……..)
  - □ Dipendente/collaboratore di un centro di ricerca pubblico (se si, specificare quale:……..)
  - □ Non ha nessun legame con enti di ricerca pubblici
  - □ Altro (si prega di specificare…….……...)

  Nel caso fosse dipendente/collaboratore di enti di ricerca pubblici (università o centro di ricerca):
  - Specificare la sua qualifica all'interno dell'ente di ricerca di appartenenza:…….…….
  - Specificare l'ambito di ricerca: …….
  - Settore scientifico disciplinare:……..……..

- Indichi il titolo di studio più elevato da lei conseguito:
  - □ Dottorato
  - □ Master
  - □ Laurea
  - □ Diploma di scuola superiore

A.2) Indichi, ad oggi, il suo livello di competenza nelle aree indicate:

	Per nulla competente			Abbastanza competente			Estremamente competente
	1	2	3	4	5	6	7
Progettazione di prodotto	□	□	□	□	□	□	□
Progettazione di processo	□	□	□	□	□	□	□
Produzione	□	□	□	□	□	□	□
Contabilità, bilancio e amministrazione	□	□	□	□	□	□	□
Marketing	□	□	□	□	□	□	□
Commercializzazione e vendite	□	□	□	□	□	□	□
Distribuzione e logistica	□	□	□	□	□	□	□
Finanza	□	□	□	□	□	□	□

A.3) In relazione alle seguenti affermazioni, esprima la sua opinione su di una scala da 1 a 7:

	Per nulla d'accordo						Estremamente d'accordo
	1	2	3	4	5	6	7
Sono bravo a risolvere problemi e a generare nuove idee	□	□	□	□	□	□	□
Mi riesce facile comunicare il mio punto di vista e supportare le mie idee	□	□	□	□	□	□	□
Sono portato nel motivare le persone e nel dirigere team di progetto	□	□	□	□	□	□	□
Sono bravo a mantenere i rapporti interpersonali e ho doti di coordinamento	□	□	□	□	□	□	□
Mi riesce facile contribuire allo sviluppo delle persone e fungere da referente per la creazione di nuove competenze	□	□	□	□	□	□	□
Molte volte porto a termine incarichi che altri abbandonerebbero	□	□	□	□	□	□	□
Lavoro più duro della maggior parte delle persone che conosco	□	□	□	□	□	□	□
Sono in grado di portare avanti lavori impegnativi per lungo tempo	□	□	□	□	□	□	□
Quando qualcosa non va come dovrebbe, analizzo immediatamente la causa del problema e cerco prontamente un rimedio	□	□	□	□	□	□	□
Continuo a lavorare duramente su progetti anche quando altri mi ostacolano	□	□	□	□	□	□	□
Le più grandi soddisfazioni derivano dalla mia impresa	□	□	□	□	□	□	□
Penso alla mia impresa quando mi faccio la doccia, sto guidando o quando altre persone parlano di cose che non hanno niente a che vedere con la stessa	□	□	□	□	□	□	□
Frequentemente mi devo fare forza per dedicarmi ad attività che non siano inerenti alla mia impresa	□	□	□	□	□	□	□
Produco molto perché amo il lavoro in impresa	□	□	□	□	□	□	□
Le altre persone di solito affermano che sono fortemente concentrato su attività inerenti la mia impresa	□	□	□	□	□	□	□
Sono disposto a correre pochi rischi quando scelgo un lavoro o una organizzazione per la quale lavorare	□	□	□	□	□	□	□
Preferisco un lavoro che mi dia elevate sicurezze ed un salario stabile, rispetto ad un lavoro che mi possa offrire ritorni elevati ma rischiosi	□	□	□	□	□	□	□
Preferisco continuare a lavorare in un contesto lavorativo non soddisfacente, piuttosto che intraprendere una nuova carriera imprevedibile ma dai possibili ritorni elevati	□	□	□	□	□	□	□
Penso che i rischi, in un conteso lavorativo, debbano essere evitati a tutti i costi.	□	□	□	□	□	□	□
Investirei il 10% dei miei guadagni annuali in buoni del tesoro	□	□	□	□	□	□	□
Scommetterei il guadagno di una settimana di lavoro ad una corsa di cavalli	□	□	□	□	□	□	□
Investirei il 10% dei miei guadagni annuali in un fondo di investimento a crescita moderata	□	□	□	□	□	□	□
Scommetterei il guadagno di una giornata di lavoro sul risultato di un evento sportivo (partita di calcio, basket, ecc)	□	□	□	□	□	□	□
Investirei il 5% dei miei guadagni annuali in azioni non rischiose	□	□	□	□	□	□	□
Giocherei al casinò il guadagno di una settimana di lavoro	□	□	□	□	□	□	□
Investirei il 5% dei miei guadagni annuali in azioni altamente rischiose	□	□	□	□	□	□	□
Giocherei a poker il guadagno di una giornata di lavoro	□	□	□	□	□	□	□

B.1) Nel prossimo anno, vuole che la sua impresa:

	1	2	3	4	5	6	7	
Non investa in R&S e non ricerchi una posizione di leadership innovativa e tecnologica	□	□	□	□	□	□	□	Enfatizzi l'attività di R&S, ricercando una posizione di leadership innovativa e tecnologica
Non lanci nessun nuovo prodotto/servizio e non introduca nessun nuovo processo	□	□	□	□	□	□	□	Lanci molti nuovi prodotti/servizi e introduca molti nuovi processi
Cambi poco o nulla i prodotti/servizi esistenti	□	□	□	□	□	□	□	Introduca innovazioni radicali nei prodotti/servizi esistenti
Segua prontamente le mosse dei concorrenti	□	□	□	□	□	□	□	Inizi azioni che i concorrenti dovranno seguire
Sia poco aggressiva nel lanciare nuovi prodotti/processi/servizi sul suo mercato di riferimento	□	□	□	□	□	□	□	Sia molto aggressiva nel lanciare nuovi prodotti/processi/servizi sul suo mercato di riferimento
Adotti una strategia poco competitiva	□	□	□	□	□	□	□	Adotti una strategia molto competitiva
Intraprenda progetti dai ritorni non elevati ma certi	□	□	□	□	□	□	□	Intraprenda progetti dal rischio elevato ma potenzialmente molto remunerativi
Esplori nuove possibilità in modo graduale e prudente	□	□	□	□	□	□	□	Esplori nuove possibilità con approcci impulsivi
Gestisca l'incertezza prendendo decisioni in modo conservativo	□	□	□	□	□	□	□	Gestisca l'incertezza prendendo decisioni rischiose non lasciando nulla di intentato

B.2) Nel prossimo anno, mettere in atto un comportamento orientato all'innovazione e alla crescita di impresa sarebbe per lei:

	1	2	3	4	5	6	7	
Spiacevole	□	□	□	□	□	□	□	Piacevole
Utile	□	□	□	□	□	□	□	Inutile
Indesiderabile	□	□	□	□	□	□	□	Desiderabile
Positivo	□	□	□	□	□	□	□	Negativo
Lodevole	□	□	□	□	□	□	□	Deplorevole
Sgradevole	□	□	□	□	□	□	□	Gradevole
Nocivo	□	□	□	□	□	□	□	Benefico
Buono	□	□	□	□	□	□	□	Cattivo
Folle	□	□	□	□	□	□	□	Saggio
Stimolante	□	□	□	□	□	□	□	Noioso
Sicuro	□	□	□	□	□	□	□	Rischioso

- Nel prossimo anno, quanto pensa che le persone la cui opinione è per lei importante approverebbero il suo comportamento orientato all'innovazione e alla crescita di impresa:

	1	2	3	4	5	6	7	
Per nulla	□	□	□	□	□	□	□	Estremamente

- Con riferimento al prossimo anno, quanto le interessa il giudizio delle persone la cui opinione è per lei importante in relazione ad un comportamento orientato all'innovazione e alla crescita di impresa:

	1	2	3	4	5	6	7	
Per nulla	□	□	□	□	□	□	□	Estremamente

- Nel prossimo anno, quanto ritiene che dipenda da lei, e non da altre persone o circostanze, perseguire un comportamento orientato all'innovazione e alla crescita di impresa:

	1	2	3	4	5	6	7	
Da lei	□	□	□	□	□	□	□	Da altre persone o circostanze

- Nel prossimo anno, quanto ritiene che sia facile mettere in atto un comportamento orientato all'innovazione e alla crescita di impresa:

	1	2	3	4	5	6	7	
Per nulla facile	□	□	□	□	□	□	□	Molto facile

- In quale misura la seguente affermazione risulta per lei vera o falsa:
"Nel prossimo anno, se lo volessi potrei, senza alcuna difficoltà, mettere in atto un comportamento orientato all'innovazione e alla crescita di impresa":

	1	2	3	4	5	6	7	
Completamente falsa	□	□	□	□	□	□	□	Completamente vera

C.1) Si chiede di fornire alcune previsioni sul trend del fatturato e del numero di addetti della sua impresa:

	2006	2007	2008
Fatturato			
Numero di addetti (dipendenti a tempo determinato e indeterminato)			

C.2) Sulla base delle sue competenze indichi quali miglioramenti/peggioramenti di performance aziendale pensa di poter raggiungere nei prossimi due anni:

- Cambiamento percentuale nelle vendite del 2007 (rispetto al 2006):

				Per nulla certo			Abbastanza certo			Estremamente certo
	Si	No		1	2	3	4	5	6	7
Superiore al 100% o meglio	□	□	Se si	□	□	□	□	□	□	□
Superiore al 50% o meglio	□	□	Se si	□	□	□	□	□	□	□
Superiore al 20% o meglio	□	□	Se si	□	□	□	□	□	□	□
Superiore al 10% o meglio	□	□	Se si	□	□	□	□	□	□	□
Superiore al 5% o meglio	□	□	Se si	□	□	□	□	□	□	□
Nessun cambiamento o meglio	□	□	Se si	□	□	□	□	□	□	□
Peggioramento del 5% o meglio	□	□	Se si	□	□	□	□	□	□	□
Peggioramento del 10% o meglio	□	□	Se si	□	□	□	□	□	□	□
Peggioramento del 25% o meglio	□	□	Se si	□	□	□	□	□	□	□

- Cambiamento percentuale nelle vendite del 2008 (rispetto al 2007):

				Per nulla certo			Abbastanza certo			Estremamente certo
	Si	No		1	2	3	4	5	6	7
Superiore al 100% o meglio	□	□	Se si	□	□	□	□	□	□	□
Superiore al 50% o meglio	□	□	Se si	□	□	□	□	□	□	□
Superiore al 20% o meglio	□	□	Se si	□	□	□	□	□	□	□
Superiore al 10% o meglio	□	□	Se si	□	□	□	□	□	□	□
Superiore al 5% o meglio	□	□	Se si	□	□	□	□	□	□	□
Nessun cambiamento o meglio	□	□	Se si	□	□	□	□	□	□	□
Peggioramento del 5% o meglio	□	□	Se si	□	□	□	□	□	□	□
Peggioramento del 10% o meglio	□	□	Se si	□	□	□	□	□	□	□
Peggioramento del 25% o meglio	□	□	Se si	□	□	□	□	□	□	□

- Cambiamento percentuale nel numero di addetti del 2007 (rispetto al 2006):

				Per nulla certo				Abbastanza certo		Estremamente certo
	Si	No		1	2	3	4	5	6	7
Superiore al 100% o meglio	□	□	Se si	□	□	□	□	□	□	□
Superiore al 50% o meglio	□	□	Se si	□	□	□	□	□	□	□
Superiore al 20% o meglio	□	□	Se si	□	□	□	□	□	□	□
Superiore al 10% o meglio	□	□	Se si	□	□	□	□	□	□	□
Superiore al 5% o meglio	□	□	Se si	□	□	□	□	□	□	□
Nessun cambiamento o meglio	□	□	Se si	□	□	□	□	□	□	□
Peggioramento del 5% o meglio	□	□	Se si	□	□	□	□	□	□	□
Peggioramento del 10% o meglio	□	□	Se si	□	□	□	□	□	□	□
Peggioramento del 25% o meglio	□	□	Se si	□	□	□	□	□	□	□

- Cambiamento percentuale nel numero di addetti del 2008 (rispetto al 2007):

				Per nulla certo				Abbastanza certo		Estremamente certo
	Si	No		1	2	3	4	5	6	7
Superiore al 100% o meglio	□	□	Se si	□	□	□	□	□	□	□
Superiore al 50% o meglio	□	□	Se si	□	□	□	□	□	□	□
Superiore al 20% o meglio	□	□	Se si	□	□	□	□	□	□	□
Superiore al 10% o meglio	□	□	Se si	□	□	□	□	□	□	□
Superiore al 5% o meglio	□	□	Se si	□	□	□	□	□	□	□
Nessun cambiamento o meglio	□	□	Se si	□	□	□	□	□	□	□
Peggioramento del 5% o meglio	□	□	Se si	□	□	□	□	□	□	□
Peggioramento del 10% o meglio	□	□	Se si	□	□	□	□	□	□	□
Peggioramento del 25% o meglio	□	□	Se si	□	□	□	□	□	□	□

D.1) All'interno della sua impresa esiste un management team diverso dai soci di capitale?

□ No (vai a **D.2**)

□ Si, se si indichi quanto è in accordo con le seguenti affermazioni:

	Per nulla d'accordo						Estremamente d'accordo
	1	2	3	4	5	6	7
Il management incoraggia comportamenti imprenditoriali e volti all'innovazione	□	□	□	□	□	□	□
Il potere decisionale è decentrato	□	□	□	□	□	□	□
I senior manager incoraggiano variazioni rispetto a regole e procedure standard	□	□	□	□	□	□	□
Il top management ha esperienza e si è occupato in maniera estensiva di attività e progetti innovativi	□	□	□	□	□	□	□
Coloro che intraprendono progetti rischiosi vengono gratificati sia nel caso di successo che di insuccesso	□	□	□	□	□	□	□
Il rischio calcolato viene incoraggiato	□	□	□	□	□	□	□
L'attitudine al rischio è considerata una caratteristica positiva	□	□	□	□	□	□	□
I progetti sperimentali vengono incoraggiati	□	□	□	□	□	□	□

D.2) Quanto ritiene che ciascuno dei fattori elencati stia ostacolando il suo comportamento volto all'innovazione e alla crescita di impresa?

	Per nulla d'accordo						Estremamente d'accordo
	1	2	3	4	5	6	7
Difficoltà di accesso a finanziamenti	□	□	□	□	□	□	□
Difficoltà di accesso a canali distributivi	□	□	□	□	□	□	□
Difficoltà di accesso a fornitori e imprese di produzione	□	□	□	□	□	□	□
Difficoltà di accesso a personale qualificato tecnico	□	□	□	□	□	□	□
Difficoltà di accesso a personale qualificato con competenze manageriali	□	□	□	□	□	□	□
Difficoltà di accesso a personale qualificato con competenze commerciali	□	□	□	□	□	□	□
Mancanza di sistemi di protezione della proprietà intellettuale	□	□	□	□	□	□	□
Mancanza di leggi e politiche a supporto dell'imprenditoria	□	□	□	□	□	□	□

D.3) Quanto ritiene che ciascuno dei fattori elencati stia agevolando il suo comportamento volto all'innovazione e alla crescita di impresa?

	Per nulla d'accordo						Estremamente d'accordo
	1	2	3	4	5	6	7
Misure di finanziamento pubbliche regionali (es. Prriitt, Spinner)	□	□	□	□	□	□	□
Misure di finanziamento pubblico nazionale (es. 297)	□	□	□	□	□	□	□
Misure di finanziamento pubblico internazionale (es. finanziamenti comunità europea)	□	□	□	□	□	□	□
Disponibilità delle istituzioni pubbliche (università e/o centri di ricerca) a partecipare come soci all'impresa	□	□	□	□	□	□	□
Esistenza, nel territorio, di una business plan competition	□	□	□	□	□	□	□
Esistenza, nel territorio, di uffici per il trasferimento tecnologico e centri di supporto all'innovazione	□	□	□	□	□	□	□
Esistenza di meccanismi di supporto alla attività di brevettazione	□	□	□	□	□	□	□
Possibilità di utilizzare l'attrezzatura delle istituzioni pubbliche (laboratori, strumentazione e strutture)	□	□	□	□	□	□	□
Possibilità di essere ospitati all'interno di un incubatore	□	□	□	□	□	□	□
Opportunità di sfruttamento commerciale offerte dal settore	□	□	□	□	□	□	□
Ambiente legislativo favorevole	□	□	□	□	□	□	□
Sinergie fra istituzioni pubbliche di ricerca e imprese	□	□	□	□	□	□	□

D.4) Nei mercati di riferimento dell'impresa:

- I comportamenti di acquisto sono:

	1	2	3	4	5	6	7	
Gli stessi per tutti i prodotti	□	□	□	□	□	□	□	Variano da prodotto a prodotto

- La natura della concorrenza è:

	1	2	3	4	5	6	7	
La stessa per tutti i prodotti	□	□	□	□	□	□	□	Varia da prodotto a prodotto

- L'incertezza e le dinamiche di mercato sono:

	1	2	3	4	5	6	7	
Le stesse per tutti i prodotti	□	□	□	□	□	□	□	Variano da prodotto a prodotto

D.5) Con riferimento al settore in cui la sua impresa opera, nell'ultimo anno:

- Le opportunità di crescita:

	1	2	3	4	5	6	7	
Sono diminuite	□	□	□	□	□	□	□	Sono aumentate

- La tecnologia:

	1	2	3	4	5	6	7	
E' rimasta la stessa	□	□	□	□	□	□	□	E' cambiata molto

- Il tasso di innovatività dei nuovi prodotti e processi:

	1	2	3	4	5	6	7	
E' diminuito sostanzialmente	□	□	□	□	□	□	□	E' cresciuto significativamente

- Le attività di R&S sono:

	1	2	3	4	5	6	7	
Sostanzialmente cresciute	□	□	□	□	□	□	□	Diminuite significativamente

E.1) Esprima una sua opinione in riferimento alla strategia messa in atto dalla sua impresa:

	1	2	3	4	5	6	7	
Non ricerchiamo un'elevata qualità di prodotto	□	□	□	□	□	□	□	Ricerchiamo un'eccellente qualità di prodotto
Non utilizziamo tecniche di gestione della qualità totale (TQM)	□	□	□	□	□	□	□	Utilizziamo tecniche di gestione della qualità totale (TQM)
Proponiamo al cliente prodotti con specifiche standard	□	□	□	□	□	□	□	Proponiamo al cliente prodotti dalla customizzazione molto spinta
Siamo un'impresa che opera esclusivamente in un solo settore	□	□	□	□	□	□	□	Siamo un'impresa che opera in diversi settori
Siamo un'impresa mono prodotto e/o servizio	□	□	□	□	□	□	□	Siamo un'impresa con un elevato numero di linee di prodotto e/o servizi
I prodotti/servizi della nostra impresa sono caratterizzati dalla stessa tecnologia	□	□	□	□	□	□	□	I prodotti/servizi della nostra impresa sono caratterizzati da tecnologie diverse
I prodotti/servizi della nostra impresa utilizzano la stessa strategia di mercato	□	□	□	□	□	□	□	I prodotti/servizi della nostra impresa utilizzano diverse strategie di mercato
Il contenimento dei costi relativi alla realizzazione (o erogazione) del prodotto (o servizio) non è una priorità	□	□	□	□	□	□	□	Il contenimento dei costi relativi alla realizzazione (o erogazione) del prodotto (o servizio) è una priorità

F.1) Indichi il titolo di studio più elevato conseguito al momento della presentazione di ammissione al progetto SPINNER (o al momento della costituzione dell'impresa):

- □ Dottorato Anno di conseguimento ……..Nome (e localizzazione) istituzione conferente……
- □ Master Anno di conseguimento ……..Nome (e localizzazione) istituzione conferente……
- □ Laurea Anno di conseguimento ……..Nome (e localizzazione) istituzione conferente……
- □ Diploma Anno di conseguimento ……..Nome (e localizzazione) istituzione conferente……

-Al momento dell'ammissione al progetto SPINNER (o alla costituzione dell'impresa) era:

	Si	**No**				
Occupato presso un'impresa	□	□	Se si, indichi	Nome impresa	……	
				Numero addetti impresa	……..…….....	
				Localizzazione impresa	……..	
				Anno fondazione impresa	……..	
				Settore attività impresa	……..	
				Posizione ricoperta:	Imprenditore	□
					Dirigente	□
					Quadro	□
					Impiegato	□
					Altro (…….....)	□
Occupato presso l'università	□	□	Se si, indichi	Posizione ricoperta:	Professore ordinario	□
					Professore associato	□
					Ricercatore	□
					Borsista	□
					Tecnico/amministrativo	□
Occupato presso un centro di ricerca pubblico	□	□	Se si, indichi	Posizione ricoperta:	Ricercatore	□
					Tecnologo	□
					Tecnico	□
					Amministrativo	□
					Borsista	□
Studente	□	□				
Disoccupato	□	□				
Altro (indicare…….)	□	□				

- Indicare quale tra i seguenti ruoli ha ricoperto durante tutta la sua esperienza lavorativa prima della domanda di partecipazione al progetto SPINNER (o prima della costituzione dell'impresa) (sono possibili più risposte):

- □ Ingegnere o tecnico di produzione
- □ Ingegnere o tecnico di progettazione
- □ Addetto a funzioni amministrative (contabilità, amministrazione e bilancio)
- □ Addetto al marketing
- □ Addetto alle vendite e commerciale
- □ Analista finanziario
- □ Addetto alla distribuzione e logistica
- □ Responsabile della direzione generale di impresa
- □ Consulente/libero professionista
- □ Ricercatore universitario
- □ Ricercatore in centri di ricerca pubblici non universitari

- Indichi come è cambiato il suo reddito annuo, dopo un anno dalla fine del progetto SPINNER (o dall'avvenuta creazione):

□ Non è cambiato □ È aumentato, di quanto (in percentuale)… □ È diminuito, di quanto (in percentuale)..

- Quali sono le motivazioni che l'hanno spinta a creare una nuova impresa?

	Si	No
Opportunità di reddito più elevato	☐	☐
Voglia di indipendenza ed insofferenza verso le strutture gerarchiche	☐	☐
Scarsa valutazione delle sue idee e iniziative da parte del datore di lavoro precedente	☐	☐
Possibilità di perseguire idee di business al di fuori del mercato principale del datore di lavoro precedente	☐	☐
Difficoltà di avanzamento professionale nell'occupazione precedente	☐	☐
Precarietà dell'occupazione precedente	☐	☐
Incertezza circa il futuro del datore di lavoro precedente (es. ristrutturazioni in vista o rischio di fallimento)	☐	☐
Mancanza di alternative occupazionali	☐	☐
Possibilità di commercializzare i risultati della ricerca	☐	☐
Creazione di opportunità occupazionali	☐	☐

APPENDIX E

The Event: OSiRIdE

The following event has been organized relying on the result presented in this Doctoral Thesis. The seminar is focused on the Academic Spin-offs and their growth trends. The event is hosted at the Alma Graduate School (University of Bologna), and is scheduled for March 13th, 2008.

La creazione di opportunità per lo sfruttamento commerciale dei risultati delle ricerche pubbliche rappresenta un'importante occasione per Università ed Enti di Ricerca Pubblici (ERP) per contribuire allo sviluppo tecnologico ed economico dei contesti nei quali essi sono insediati.
Per investire in questa direzione, Università ed ERP hanno implementato alcuni cambiamenti organizzativi, creando le condizioni ed i meccanismi di supporto per incentivare un efficace trasferimento tecnologico. Una parte significativa di questi meccanismi ha a che fare con il supporto alla creazione di nuove imprese dalla ricerca pubblica.

Il tema della creazione di imprese dalla ricerca pubblica ha molti portatori di interesse (ad esempio Imprese, Associazioni di categoria, imprenditori, Enti locali, Università, ERP) e l'Emilia-Romagna è una delle regioni più attive in Italia e in Europa sul fronte della commercializzazione dei risultati della ricerca pubblica e della creazione di spin-off della ricerca.

Quali sono queste imprese? In che settori operano? Che rapporti hanno con le Università e gli EPR della regione? Come si finanziano? Che attività svolgono? Come crescono? Quali opportunità di impiego offrono?

Il convegno sarà un'occasione per dare alcune prime risposte a queste domande attraverso i dati raccolti dall'Osservatorio degli Spin-off della Ricerca Pubblica della regione Emilia-Romagna che ad oggi ha censito le imprese nate da Università ed Enti Pubblici di Ricerca.
(rapporto completo scaricabile da http://www.iris.unibo.it/data_sets.html).

COMITATO SCIENTIFICO
Maurizio Sobrero, Rosa Grimaldi, Riccardo Fini,
Università di Bologna, Dipartimento di Scienze Aziendali

ORGANIZZATORI
ASTER
Dipartimento di Scienze Aziendali - Università di Bologna

SEGRETERIA ORGANIZZATIVA
ASTER | Damiana Badiali | e-mail: info@aster.it | telefono: 051 639 8099
La partecipazione è gratuita.
È necessaria l'iscrizione on-line: http://www.aster.it/eventi/osservatorio_130308.php

PROGRAMMA

13.45 - 14.15

REGISTRAZIONE

14.15 - 16.00

GLI SPIN OFF DELLA RICERCA PUBBLICA:
ESPERIENZE REGIONALI, NAZIONALI
ED INTERNAZIONALI

MAURIZIO SOBRERO
Dipartimento di Scienze Aziendali - Università di Bologna
BENVENUTO

ROSA GRIMALDI E RICCARDO FINI
Dipartimento di Scienze Aziendali - Università di Bologna
PRESENTAZIONE DI OSIRIDE,
L'OSSERVATORIO DEGLI SPIN-OFF DELLA RICERCA
DELLA REGIONE EMILIA-ROMAGNA

MASSIMO COLOMBO
Dipartimento di Ingegneria Gestionale
Politecnico di Milano
LE START-UP ACCADEMICHE ITALIANE:
COMPETENZE, FINANZIAMENTO E PERFORMANCE

MATS MAGNUSSON
Dipartimento di Innovation, Engineering and
Management, Università di Chalmers, Svezia
L'INDIVIDUO DIMENTICATO:
ATTITUDINI, COMPETENZE E PRATICHE NELLA
COMMERCIALIZZAZIONE DI RICERCA ACCADEMICA

16.00 - 16.15

COFFEE BREAK

16.15 - 18.00

TAVOLA ROTONDA
I MECCANISMI ORGANIZZATIVI A SUPPORTO DELLA
CREAZIONE DI SPIN-OFF DELLA RICERCA PUBBLICA

COORDINA:
ALESSANDRO GRANDI
Dipartimento di Scienze Aziendali - Università di Bologna

INTERVENGONO:
MARCO BACCANTI
Science Park Raf SpA
San Raffaele Biomedical Science Park

ANDREA DI ANSELMO
META Group

DONATA FOLESANI
ASTER Scienza Tecnologia Impresa e Consorzio Spinner

GIANNI LORENZONI
PniCube, Associazione degli incubatori universitari

LUCA ROSSI
Confindustria Emilia-Romagna

18.00

APERITIVO