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Essays on Entrepreneurship and Firms Performances

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Chapter 1

Introduction

1.1 What is an entrepreneurial activity?

Although a broad range of literature has proved the important economic value of entrepreneurship, there is still the existence of many competitive theories and schools of thought and a lack of common definitions. Herbert and Link (1989), in their study of the history of economic thought about entrepreneurship, identify and classify three different traditions, each tracing its origin to Richard Cantillon and starting different lines of research. Firstly, the *German tradition*, based on the work of Thünen, Schumpeter and Baumol, emphasizes the role of the entrepreneur in the process of economic growth and relates economic development to dynamic and innovative entrepreneurs. Secondly, the *(neo-)classical tradition*, whose main authors are Marshall, Knight and Schultz, stresses the role of the entrepreneur in leading markets to equilibrium through their entrepreneurial activities. Finally, the *Austrian tradition*, based on the contributions of Menger, von Mises and Kirzner, in opposition to the formal neoclassical theories based on well-defined actors and processes, underlines the spontaneous order emerging in economic systems and the role of uncertainty and tacit knowledge that prompt evolutionary processes.

The lack of a common definition reveals the multidimensional and multilevel nature of entrepreneurship. Different approaches, from economics to management, emphasize different aspects and, moreover, adopt different level of analysis, from the regional to the individual focus. However, it is possible to find some recurring concepts and prevalent views in the literature. In particular, the literature focuses on two main aspects of entrepreneurship: the intuition of new business opportunities and the introduction of new ideas in the market. This idea is consistent with the definition of entrepreneurship proposed in OECD (1998), which defines entrepreneurs "as agents of change and growth in a market economy, able to accelerate the generation, dissemination and application of innovative ideas, willing to take risks to check whether their intuitions are successful or not". Similarly, the widely cited definition by Wennekers and Thurik (1999, p. 46–48) associates the entrepreneurial activity with "the manifest ability and willingness of individuals, on their own, in teams, within and outside existing organisations, to perceive and create new economic opportunities and to introduce their ideas in the market, in the face of uncertainty and other obstacles, by making decisions on location, form and the use of resources and institutions".

Thus, entrepreneurship has to do with novelty and change and involves a variety of entities both at micro and macro-level (Wennekers and Thurik 1999, Davidsson and Wiklund 2001). This opens another complex issue for the research activity, specifically for empirical works. Indeed, to the purpose of operationalizing entrepreneurship, empirical researches have adopted a wide array of measures. At individual level, entrepreneurs are regarded as self-employed, founders or owner-managers of a business. Similarly, an entrepreneurial team is often characterized as two or more individuals with equity interest jointly launching and actively participating in a business, or having a key role in the strategic decision making of the venture at the time of founding.

Following this definitions, empirical works analyse individual characteristics of entrepreneurs and entrepreneurial teams in order to put in evidence common traits and peculiarities (Ensley et al. 1999, Birley and Stockley 2000, McGrath and MacMillan 2000, Lechler 2001, Baron and Markman 2003, Gupta et al. 2004, Minniti et al. 2005). The concept of Entrepreneurial Orientation (EO) defines entrepreneurship at the level of organizations. Entrepreneurial orientation refers to the processes as methods, practices, behaviours and strategies managers adopt to act entrepreneurially. Three main dimensions have been used for characterising and describing companies' entrepreneurial orientation, i.e. risk taking, innovation and proactivity (Miller 1983, Covin and Slevin 1991, Lumpkin and Dess 1996). Empirical researches have adopted various approaches, such as managerial perceptions, firm behaviours and resource allocations (Lyon et al. 2000) with the purpose of revealing entrepreneurial activities in terms management perceptions, firm behaviours and strategic decision making. At the firm level of analysis, entrepreneurial measures are often associate with small firms, young firms or nascent firms. In dynamic terms, entrepreneurial activities are measured as firms' rate of growth in accordance with the idea that the entrepreneurial activity is mainly a growth-oriented phenomenon which stimulates economic performance of individual firms (Covin and Covin, 1990; Covin and Slevin, 1991; Lumpkin and Dess, 1996; Sadler-Smith et al., 2003; Swierczek and Ha, 2003; Wolff and Pett, 2006). Actually, different variables have been used as proxies of firm growth, e.g. sales or market share growth, number of employees. Finally, moving the attention to the aggregate level of analysis, studies focusing on geographical areas, such as clusters, regions or whole countries, refer to self-employment rates, business ownership rates, firms' entry and exit (Fritsch 1997, Fölster 2000, Wennekers et al. 2005, Mueller et al. 2008, Acs and Mueller 2008, Baptista et al. 2008, Carree and Thurik 2008, Fritsch and Mueller 2008, Van Stel and

Suddl 2008). Although such measures have some limitations – in particular they do not distinguish between high-tech and low-tech activities – all of them are easy to collect and can be compared across countries and over time.

1.2 Linking entrepreneurship and economic performances

The relationship between entrepreneurial activities and economic performances is not obvious. The role of entrepreneurship has changed rapidly during the second half of last century. After the World War II, traditional theories highlighted a decreasing function of entrepreneurial activities in the leading economies. Entrepreneurial companies, meaning small and young companies, were found to be less efficient than their counterparts and only marginally involved in innovation activities. This caused a negative impact of entrepreneurship on economic performances. As a consequence, traditional theories assert that entrepreneurial activities retard economic growth. By contrast, more recently, literature has revealed changing dynamics and has suggested that, in the new economic framework, entrepreneurship generates growth. Empirical evidence has shown a revitalization of entrepreneurial activities since the Seventies. In order to give an explanation to these phenomena, researchers have developed a set of hypothesis. Firstly, the rapid technical progress, the growing importance of niche markets and innovation in high income countries have fostered the creation of new firms and businesses, in particular, of small and medium-sized enterprises (SMEs). Secondly, the competition from low-wage countries has changed the nature of workplaces towards high-skilled work and knowledge-intensive activities. Moreover, globalization has increased market volatility because of higher

competition from foreign companies, and this has caused the exit of many firms. By contrast, deregulation and privatization policies have boosted the entry of new firms in formerly-regulated industries.

The phenomena described have influenced the entrepreneurial dynamism and also carry relevant implications for the entire Economy. In particular, it is widely accepted that a fundamental step for the reconsideration of entrepreneurship has been the transition from the traditional to the knowledge economy. The most competitive modern economies are often referred to as knowledge economies meaning economies which are directly based on production, distribution and use of knowledge and information (OECD 1996). The basic thesis behind the emergence of the knowledge economy concept is that firms' competitive advantage and economic growth in general, both at national and local level, are more and more determined by knowledge creation and technical progress. This thesis brings some implications for entrepreneurial dynamics. As Audretsch (2002) points out "The new theories are dynamic in nature and emphasize the role that knowledge plays. Because knowledge is inherently uncertain, asymmetric and associated with high costs of transactions, divergences emerge concerning the expected value of new ideas. Economic agents therefore have an incentive to leave an incumbent firm and start a new firm in an attempt to commercialize the perceived value of their knowledge. Entrepreneurship is the vehicle by which (the most radical) ideas are sometimes implemented". These evolutionary theories focus on change and innovation, being one of the central manifestations of change. In this line of reasoning, entrepreneurial firms enter the market motivated by the desire to appropriate the expected value of new economic knowledge. However, firm may not be able to remain on the market. As a consequence, markets are in motion, with a lot of new firms entering the industry and a lot of firms exiting out of the industry. This generates high turbulence. Apparently, as highlighted and

demonstrated by empirical evidences, this entrepreneurial process has a positive impact on economic growth. Many studies have shown that entrepreneurship indeed leads to substantial benefits in terms of, for instance, employment generation, innovations, productivity and growth (see van Praag and Versloot 2007 for an extensive review of the literature).

It is now clear that several fields of research have recognised the importance of entrepreneurship for economic growth. Historical views, management literature, growth theory and evolutionary economics, explicitly or implicitly , consider entrepreneurship relevant for explaining economic growth. A crucial point to be presented now is the understanding of the link between entrepreneurship and economic growth. This also means to link the diverse levels of analysis involved. As Wennekers and Thurik (1999) points out "linking entrepreneurship to economic growth also means linking the individual level to the firm and the macro level" (pp. 50). Entrepreneurship is firstly an individual level concept and refers to the behaviours of individuals. Entrepreneurs need a vehicle to act entrepreneurially, firms provide such a vehicle. As a result of individual actions companies show an entrepreneurial posture. At organizational level, entrepreneurial actions take the form of innovation, proactive exploitation of new opportunities and risk taking. At the aggregate level of geographical areas, the variety of new businesses adds to the productive potential of an economy increasing its competitiveness. The final effect of this chain of linked facts is economic growth.

In conclusion, as highlighted by the literature at the end of the last century, entrepreneurship "is more important for economic growth than it has ever been. The reason is that globalization and the ICT-revolution imply a need for structural change, requiring a substantial reallocation of resources" (Wennekers and Thurik 1999). The wide array of works linking entrepreneurial activities to economic growth has been the starting point for a broad agenda of research. Since the beginning of the new century, a

major field of research has been focusing on the determinants of economic performances, both at the level of firm performance and that of the development of regional and national economies. The research questions considered in the thesis are originated in this framework.

1.3 Aims and scope of the dissertation

The present research is rooted in the debate on the entrepreneurial factors affecting economic performances. The main objective of the thesis is addressing the determinants of firm performances with a particular focus on entrepreneurial dimensions at different level of analysis, i.e. individual characteristics, organizational factors and external environment.

The research question is originated by the observation of a high rate of new firm formation in the modern economies and the resulting turbulence due to the fact that many new companies fail while just a smaller fraction succeed. In particular the main idea of this work is to highlight the entrepreneurial dimension behind the fast growth of firms formed around new business ideas in a knowledge-based economy, where value-relevant assets are expected to consist mainly of intangible and non-marketable assets. To this purpose, we centre our attention on public companies, with a particular focus on the Alternative Investment Market (henceforth, AIM) IPOs. A number of different reasons supports our choice. Firstly, an initial public offering is one of the most notable entrepreneurial settings, being characterized by a high degree of uncertainty. A firm undertaking an IPO and entering the arena of public offerings faces new challenges and pressures, such as the acceptance and monitoring activities from a new variety of stakeholders. Moreover, the AIM is recognized as the most successful secondary market in Europe, brought forward as an example by

other stock exchanges in mainland Europe when trying to (re)launch second-tier markets. The AIM is a secondary market dedicated to young and growing companies. These firms are in the entrepreneurial phase, characterized by high innovativeness and entrepreneurial creativity, and are facing uncertainty and risks due, for example, to the lack of operating history and reputation on the market. No specific suitability criteria are requested to qualify for the listing on the AIM. The firms listing on this market are indeed formed around new business ideas, the main factor behind the entrepreneurship capital creation. Furthermore, the AIM is not a market dedicated to high-tech companies. Firms quoted on the AIM operate both in science and non-science based industries. Accordingly, compared to the new stock markets, the AIM allows for a more extensive analysis without industry specificities.

In order to address the above-mentioned objective, the thesis is structured in three individual contributions.

The first paper aims at highlighting whether individual features of founders and top managers play an important role in determining firms' growth. In particular, by focusing on variables relating to both firm and top management history, we firstly try to underline the impact of three dimensions of entrepreneurship, i.e. risk taking, education and learning. The results of our analysis underline how risk taking and CEO educational level seem to matter. At the same time innovativeness and creativity, typical of both young firms and top managers, appear to have positive effects on the rate of growth of firms listed on the AIM.

Since our results show that both firm and individual characteristics positively affect firms' growth, in the second part of the thesis we investigate the relationship between firms' entrepreneurial orientation (EO), with a particular focus on organizational factors, and investors' valuation. Despite the literature on entrepreneurial orientation found support for a positive impact of EO on operating and financial

performances, literature on IPOs still has to consider the effects of EO on investor valuation. For this reason in this work we claim that entrepreneurial orientation should be taken in consideration in the analysis on IPO performances and enter the model on investor valuation. Following the literature, firms' entrepreneurial orientation is measured in terms of risk taking, innovation and proactivity while the percent price premium is used as the proxy for investor valuation. Our results confirm a positive impact of risk-taking and proactivity, two of the main dimensions of entrepreneurial orientation, on investors' valuation.

Besides individual and organizational features, firms' performances are affected by environmental factors. Coupling entrepreneurship and regional science approaches, the third contribution explores the effect of universities, largely considered in the literature as the main source of knowledge spillovers, on firm's growth. By analyzing the role played by external knowledge sources such as universities, the paper contributes to the literature on the determinants of firms' growth. Addressing this issue is a significant contribution in the literature as previous empirical studies have mainly focused on the impact of knowledge spillovers on firm concentration while their effects on firms' growth have not been sufficiently investigated. To our purposes, in the empirical analysis we use the Gibrat's Law of Proportionate Effects model. The results supports the hypothesis that, controlling for firm's idiosyncratic factors and external forces, both universities knowledge input and output are important determinants of the growth of entrepreneurial firms listed on the AIM.

Chapter 2

Entrepreneurial dimensions as determinants of small companies growth

Abstract

Our aim is to highlight the main features of entrepreneurial businesses and to shed light on the determinants of small firms' growth undertaking an IPO. To this purpose, we centre our attention on companies going public on the Alternative Investment Market (AIM), a market dedicated to young and growing companies. In the paper we investigate the post-IPO performance of 665 listed firms, which have gone public during the period going from 1995 to 2006. In the work the factors influencing business performance are inferred from a broad range of variables (e.g., accounting information, CEO and board age, educational background and past experiences). Our findings confirm that small companies listed on the AIM growth at a faster rate after the IPO. It seems that intangible assets are important determinants of their fast growth. The results of this work underline the relevance of secondary markets, such as the AIM, as a valuable alternative to traditional financial institutions in providing capital to small and entrepreneurial companies.

JEL classification : D92, L25, M13

Keywords: Entrepreneurship, Firm Size and Performance, Public Enterprises

2.1 Introduction

The aim of the research is to highlight the entrepreneurial dimension behind the creation of firms formed around new business ideas in a knowledge-based economy, where value-relevant assets are expected to consist mainly of intangible and non-marketable assets. To this purpose, we focus on companies listed on the Alternative Investment Market (henceforth, AIM). In this work we investigate the post Initial Public Offering (IPO) performance on a three period of time of 665 listed firms, which went public during the period going from 1995 to 2006, with the two-fold aim to highlight the determinants shaping that performance and to underline the role of entrepreneurship in fostering firm growth.

The analysis carried out in this paper is relevant for different reasons. Firstly, an Initial Public Offering is one of the most notable entrepreneurial settings, being characterized by a high degree of uncertainty. A firm undertaking an IPO and entering the arena of public offerings faces new challenges and pressures, such as the acceptance and monitoring activities from a new variety of stakeholders. Moreover, AIM is a secondary market dedicated to young and growing companies. This kind of firms at the moment of the IPO are facing uncertainty and risks as a result of the lack of operating history and reputation on the market, among the others. These companies range from young, venture capital-backed start-ups to young international companies looking to use a public market to fund further expansion and raise their global profile. Thirdly, the AIM is the most successful growth market in the world. Since its launch in 1995, over 2,500 companies have joined AIM. Today, more than 1500 companies from any industry sector are quoted on it. Hence, in literature there is a growing interest in this market. For all these reasons we find of some interest shedding light on the features of entrepreneurial companies listed on AIM.

To our purposes, we investigate the post-IPO (Initial Public Offering) performance of the 665 firms in our sample and highlight how the entrepreneurial dimensions play an important role in determining firms' growth. In particular, by focusing on variables relating to both firm and top management history, our results show that both firm and CEO characteristics positively affect firms' growth. In particular, the results of our analysis underline how risk taking and CEO educational level seem to matter. At the same time innovativeness and creativity, typical of both young firms and top managers, appear to have positive effects on the rate of growth of firms listed on the AIM. In the discussion of our results we also try to draw some useful policy indications both at national and regional level. We argue that policy makers could pay attention to the key role of secondary financial market. We also claim that some policy issues may be voted to encouraging the propensity to risk.

The paper is organized as follows. In the first part we outline the theoretical framework underlying the paper and clarify the research background of the study. In this section we illustrate the relationship between entrepreneurial dimensions and firms' performance and describe the theoretical model that guides our study. In the methodological section we describe the dataset, the sample of companies we used in our work and the variables used in our model. Next, we describe the results of our analyses. Finally, we discuss our interpretation regarding our findings and try to carry some policy implications.

2.2 Theoretical framework

Empirical works have concentrated the attention on traditional determinants of firm performance as, for example, age, size, industry, legal form and location (Storey 1994, Audretsch 1995, Sutton 1997, Caves

1998, Almus and Nerlinger 1999, Davidsson et al. 2002) and have demonstrated that small, young and independent businesses grow at fastest rate. However, in a knowledge-based economy, where value-relevant assets are expected to consist mainly of intangible assets, firms' performance may be influenced by factors other than the traditional ones. In particular, a growing interest in the literature has been devoted to human and intellectual capital as critical factors shaping firm performance. Among the determinants of growth, entrepreneurship is assumed to play a relevant role, as this kind of intangible asset promotes the spillover of knowledge, becoming crucial in building both firms' and regions' innovation capability and strengthening learning skills. This is consistent with the critical resources theories (Wernerfelt 1984, Zingales 2000, Rajan and Zingales 2001, Kaplan et al. 2005) that emphasizes the role of critical resources in shaping firms evolution and growth. According to these theories a critical resource can be either a person or a specific asset. In particular, Kaplan et al. (2005) interprets this theory in a dynamic perspective and highlight that while the firm initial critical resource is the founder, along the life cycle path the investments built around the founder become the critical resource.

The role of entrepreneurship on firm performance has been analysed on different levels. On the one hand, the literature on entrepreneurship has paid interest on the role of founders, entrepreneurial as well as management teams showing that their human capital, in terms of knowledge and skills, has a positive impact on firm growth (Eisenhardt and Schoonhoven 1990, Storey 1994, Timmons 1999, Birley and Stockley 2000, Weinzimmer 1997). On the other hand, literature has focused attention on firm entrepreneurial behavior at the organizational level. In this vein, one of the most important features of a firm showing an entrepreneurial orientation is considered its propensity for risk taking, which consists of activities such as borrowing heavily, committing a high

percentage of resources to projects with high risks but high returns and entering in unknown markets (Baird and Thomas 1985).

These concepts are consistent with both the definition of entrepreneurship proposed in OECD (1998), which defines the entrepreneurs "as agents of change and growth in a market economy, able to accelerate the generation, dissemination and application of innovative ideas, willing to take risks to check whether their intuitions are successful or not" and in Wennekers and Thurik (1999, p. 46–48) which defines entrepreneurial "the manifest ability and willingness of individuals, on their own, in teams, within and outside existing organisations, to perceive and create new economic opportunities and to introduce their ideas in the market, in the face of uncertainty and other obstacles, by making decisions on location, form and the use of resources and institutions".

Following these arguments, we argue that young and fast growing companies formed around new business ideas and, furthermore, undertaking an IPO are in an entrepreneurial phase. First, they are introducing new ideas in the market. Second, they are facing uncertainty, as they don't have market history. Third, they are making decision on their form and resources allocation. In accordance with the literature on this topic, we claim that such a firms growth is affected by both entrepreneurial firm behaviour as risk taking and organizational factors as founder and top management team characteristics.

In our work we thus focus on public companies listed on the AIM trying to highlight three dimensions of entrepreneurship: risk taking, education and learning. A brief review of the literature may allow us to identify for each dimension some of the relevant variables influencing firms' performance.

First, empirical evidence shows how younger and smaller firms grow more than the older and larger ones. Consistently with the life cycle model (see Quinn and Cameron 1983, Miller and Friesen 1984), actually, an

enterprise starts as young, small and simple, showing a risk-taking posture and high rate of growth. However, along the path of transformation it becomes older, bigger and in general more complex and it begins to grow at a slow rate and to slow down its propensity towards risk taking. In sum, the life cycle model argue that the firm shows an exponential growth path over time during the first stages – birth and growth; after that, during the maturity and decline phases, the firm starts a new path showing an asymptotic profile, as soon as sales growth slows down. Following these arguments, we expect a negative relationship between age and size and firms growth. Furtermore, concerning the risk level of business, previous researches show how young and small firms are associated with a high risk as they lack of past experience and no complete information on their operational activities and quality are available. For this reason small and young enterprises are often subject to 'credit rationing' (Jaffe and Russel 1976, Stiglitz and Weiss 1981, Fazzari et al. 1988, Winker 1999). This may hamper their prospects of growth. However such a companies have also the opportunity to attract investments from venture capitalists, which provide equity to those firms with a high risk. For this reason, the literature has tried to understand the impact of venture capitalist on firm performances. However, the effect of venture capitalists investments on firm growth seems to be ambigous (Audretsch and Lehman 2004, Cressey 2006). Another dimension of risk taking is related to the borrowing propensity of a company. Entrepreneurial firms are expected to incurr in high debt and, hence, to show high leverage ratios in order to obtain high returns. Several studies have focused on firm's financial risk and found a negative relationship between leverage ratio and firm profitability (Arditti 1967, Gale 1972). Following these arguments we want to verify the impact of risk taking on firms' growth.

Secondly, a large body of empirical research provides support to the existence of a relationships between firms performances and founder or top managers educational background (Bates 1990, Storey 1994, Roper 1998, Carmeli and Tisher 2004, Audretsch and Lehmann 2004, Lester et al. 2006). The board of directors has important roles of governance as, for example, the right to choose and advice the management of the firm. Moreover, directors acquire and evaluate information on firm financial situation in order to define firm strategies. Their education and skills may, thus, be an important asset for the firm. For example, Audretsch and Lehmann (2004), in their study on the determinants of the post-IPO performance on the German Neuer Market, suggest that human capital, measured as the educational background of the owner and the board, is one of the most significant determinants of the market performance of listed firms. Therefore, we aim to analyze the relationship between the presence of highly educated directors and firm growth.

Finally, previous works highlight how firms' performance may depend on executive managers competences and experiences (Lee and Tsang 2001, Carmeli and Tisher 2004). Moreover, some contributions (Rotemberg and Saloner 2000, Schutjens e Wever 2000) argue that the survival of the firm is influenced by the capabilities and experiences of the board. Lester et al. (2006) find that the prestige of top management teams (TMTs), measured on the bases of previous experiences and educational level, at the time of an IPO enhances organizational legitimacy and thereby influences investor valuations. Furthermore, the entrepreneurship literature offers theoretical contributions and give empirical foundation to the relationship between propensity to new firm formation and the individual characteristics of entrepreneurs, such as age, level of education and degree of working experience (Evans and Leighton 1989, Shaver and Scott 1991, Adaman and Devine 2002). Empirical research finds a positive relationships between entrepreneurial attitudes – for example cognitive

ability, creativity, intuition – and both knowledge and expertise. Following these arguments, we finally aim at verify if companies managed by directors with previous experiences and skills will exhibit higher growth rate than those managed by directors without previous experiences and skills.

2.3 Dataset and Methodology

2.3.1 Dataset and sample

In order to investigate the relationship between firms' performance and entrepreneurship, we refer to EurIPO[1] database which collects data on more than 3,000 operating companies that went public on the main European markets (London, Frankfurt, Euronext, and Milan) through IPO during the period 1985-2006. We focus on the subset of companies listed on the AIM from 1995 to 2006. The dataset combines publicly available information (e.g., year of establishment, listing date), accounting data from balance sheets (the main variables of consolidated financial statements in a range of three years before and three years after the listing date of each firm) and data related to both the offer and the ownership structure from IPO prospectuses.

To the purpose of analyzing the influence of intangibles assets (such as human, organizational and entrepreneurship capital) on firm performance, we mainly focus on offer and ownership set of data. The IPO prospectus, accordingly, is the primary source of data for our study. It is an important document, which gives detailed information about the firm

[1] EurIPO is a database containing information on European public companies realized at the University of Bergamo. The dataset is organized in three sections: Accounting, collecting data from the balance sheets, e.g., assets, equity, sales, EBIT and capital expenditure; Offer, which brings together data on the offering, such as pricing methodology, number of share, cost of the IPO and Book Value; Ownership, gathering information on main shareholder, founder, CEO and board of directors. Additional information referring to intellectual property rights are also included.

such as the operating history, firm products and ownership structure. Additionally, it includes biographical information regarding the founder, CEO and the firm executive management.

Our sample consists of 665 companies listed on the AIM. The Alternative Investment Market is regarded as the most successful secondary market in Europe, brought forward as an example by other stock exchanges in mainland Europe when trying to (re) launch second-tier markets. A number of different reasons made this market interesting for our purposes.

Firstly, the AIM is a secondary market dedicated to young and growing companies. In accordance with the corporate life cycle model by Quinn and Cameron (1983), these firms are in the entrepreneurial phase, characterized by high innovativeness and entrepreneurial creativity, and also by a high level of uncertainty.

Furthermore, no specific suitability criteria are requested to qualify for the listing on the AIM. The firms listing on the AIM are indeed formed around new business ideas, the main factor behind the entrepreneurship capital creation. As Audretsch and Keilbach (2004) argue, entrepreneurship capital shows up through the creation of new firms, involving entrepreneurs, who are willing to deal with the risk of creating new firms, and investors, that want to share the risks and benefits involved.

Moreover, firms quoted on the AIM operate both in science and non-science based industries. Accordingly, compared to the new stock markets, the Alternative Investment Market allows for a more extensive analysis without industry specificities. Actually, this is consistent with our aims as entrepreneurship can be considered a firm- or a region-specific factor rather than an industry-specific factor. It is a transversal phenomenon with regard to the industrial sector.

Descriptive statistics for the sample at the IPO year are provided in Table 2.1 and 2.2. Data in panel a) (Age and Size) confirm that on average companies going public on the AIM are quite young and small. Companies are 10 years old in mean, 4 in median. As far as the size is concerned, AIM's firms with 122 employees and 25.1 millions euro on average are included in the SME segment according to the definition of the European Commission[2].

Panel b) (Industry) reports the industry classification referring to the 1-digit SIC Classification. The Services companies (e.g., hotels, business services, health, legal and social services) are highly represented in our sample (42.46%). Manufacturing cover more than 20% of the sample while each of the other economic groups gathers about 10% or less of the IPOs.

Panel c) (Ownership) describes the sample in terms of top management related variables as CEO biographical information, board educational level and number of venture capitalists. The CEO is also the founder of the company for the 48% of the sample. On average the CEO has past experiences in other companies' board of directors. Most of the CEO are in their 40s and don not hold a post-graduate title. Most of the companies have in their board at least one director with an academic degree while almost a half of firms are financed with venture capital funds.

[2] Commission Recommendation 2003/361/EC of 6 May 2003 regarding the SME definition, which replaced Recommendation 96/280/EC as from 1 January 2005.

Table 2.1 – Panel a) and b) - Descriptive statistics at IPO

Panel A: Descriptive statistics in terms of AGE and Size at the IPO of companies listed on the Alternative Investment Market (AIM) during the period 1995–2005. Panel B: Frequency distribution by industrial sector according to the SIC Classification. The table reports the number of companies belonging to each industrial sector; the percentage is relative to the total sample. Panel C: Sample distribution in terms of ownership relate variables. Frequency reports the number of companies; the percentage is relative to the total sample.
The number of observations varies across different indexes as the panel is unbalanced. Observations out of the 1 and 99 percentile are excluded.

a) Age and Size

Variable Name	*√. observation*	*Mean*	*Std dev*	*Median*	*Min*	*Max*
Firm Age (years)	413	10	22	4	0	135
No. Employees	161	122	333	31	1	3 028
Sales (millions €)	531	25.1	126.0	5.4	0	2 480.0
Total Assets (millions €)	590	31.3	165.0	8.7	0.02	3 720.0

b) Industry

Variable Name	*Frequency*	*Percent %*	*Cumulative Percent %*
Industry (SIC Classification)			
Services	242	42.46	42.46
Manufacturing	127	22.28	64.74
Finance, Insurance and Real Estate	61	10.70	75.44
Mining and Construction	58	10.18	85.61
Wholesale Trade and Retail Trade	45	7.89	93.51
Transportation, Communication, Electric, Gas and Sanitary Service	34	5.96	99.47
Agriculture, Forestry and Fishing	3	0.53	100.00
Total	570	100.00	

Table 2.2 - Panel c) – Descriptive statistics at IPO

c) Ownership			
Variable Name	*Frequency*	*Percent %*	*Cumulative Percent %*
CEO Founder			
No	249	51.98	51.98
Yes	230	48.02	100.00
Total	479	100.00	
CEO Past Experience			
No	131	26.95	26.95
Yes	355	73.05	100.00
Total	486	100.00	
CEO Educational Level			
No Graduated Degree	326	79.16	79.16
Post Graduate	61	12.84	92.00
Research	38	8.00	100.00
Total	475	100.00	
CEO Age			
20s-30s	142	29.34	29.34
40s	206	42.56	71.90
50s	117	24.17	96.07
Over 60s	19	3.93	100.00
Total	484	100.00	
N. directors in the board with an academic degree	74	16.41	16.41
	115	25.50	41.91
0	91	20.18	62.08
1	66	14.63	76.72
2	45	9.98	86.70
3	37	8.20	94.90
4	23	5.10	100.00
5			
>5			
Total	451	100.00	
N. Venture Capital			
No	256	52.24	52.24
Yes	234	47.76	100.00
Total	490	100.00	

2.3.2 Specification of the econometric model

The entrepreneurial dimensions behind business performance are investigated through the estimation of the following model:

$$Firm\ Growth\ Rate_{i,t} = \beta_0 + \beta_1\ Firm\ Growth\ Rate_{i,t-1} + \beta_2\ Risk\ Taking_{it} +$$

$$\beta_2\ Education_{it} + \beta_3\ Learning_{i,t} + \beta_4\ Control_{it} + \varepsilon_{it} \qquad (2.1)$$

Where sales growth for firm i in year t is taken as the dependent variable. We control for growth rate autocorrelation by including $Firm\ Growth\ Rate_{i,t-1}$, *i.e.* the lagged value of the dependent variable. $Risk\ Taking_{it}$, $Education_{it}$ and $Learning_{it}$ are groups of variables describing the three entrepreneurial dimensions highlighted in the theoretical framework while $Control_{it}$ is a group of control variables.

The inclusion of the lagged dependent variable in the model requires dynamic estimation techniques. We have a large N and small T panel data set. Following the literature on dynamic panel estimator (Arellano and Bond 1991, Blundell and Bond 1998, Bond 2002), the model is estimated using the generalize method of moments (GMM) methodology. In particular, we use the GMM-System (GMM-SYS) estimator developed by Blundell and Bond (1998) in order to increase efficiency. This approach instruments variables in levels with lagged first-differenced terms. The authors demonstrated dramatic improvement in performance of the system estimator compared to the usual first-difference GMM estimator developed by Arellano and Bond (1991). We choose this estimator for a specific reason. In system GMM it is possible to include time-invariant regressors, which would disappear in difference GMM. Asymptotically, this does not affect the coefficients estimates for other regressors.

2.3.3 Dependent and Explanatory variables

In accordance with the framework we use in this paper, the variables included in our model can be grouped in three classes. The first one refers to the degree of risk associated with the firm, the second one to the education levels of the board, the third represents the learning dynamics. Moreover a set of control variables has been used to provide higher robustness to the analysis. In the remainder of this section we provide an outline of the indicators we used in the econometric test.

Consistently with previous research on small businesses and entrepreneurship (Covin and Covin 1990, Covin and Slevin 1991, Lumpkin and Dess 1996, Sadler-Smith et al. 2003, Swierczek and Ha 2003, Wolff and Pett 2006), the dependent variable of our model is a measure of firms' performance. Actually, different variables can be considered as proxies of firm performance, e.g. sales or market share growth, number of employees and financial outcomes. To our purposes, we choose sales growth for different reasons. First, in the literature on entrepreneurship it is the most widely used measure of firms performance as the entrepreneurial activity is considered mainly as a growth-oriented phenomenon which stimulates economic performance of individual firms and, as a consequence, general economic growth. Furthermore, the IPOs sample under scrutiny is principally composed by young and small companies, which decided to go public for a growth strategy. In many cases, firms listed on the AIM are within the first four years of activity and the aftermarket is a period for high investments. As a consequence, profitability may be a biased measure of such a firms performances. In sum, sales growth is both a measure of firm contribution to the overall economic growth and a proxy of owners and managers propensity to pursue growth trajectories. The dependent variable is, hence, computed as the growth rate of firm sales at each period *t*. Such a rate has been computed as the ratio between sales in two subsequent periods in

logarithmic scale, i.e., the difference between logs of sales yielded in two subsequent periods. In particular we focus on the post-IPO period of time.

As far as independent variables are concerned, we grouped them in three categories: risk-related, education-level and learning variables.

Firstly, the risk-related variables are *Firm Size, Firm Age*, *Leverage* and *Venture Capitalist*. The first two are among the wide range of independent variables used to investigate firms' growth rate determinants and refers respectively to the logarithm of sales (*Firm Size*) and the age of the firm at the moment of the IPO in logarithmic scale (*Firm Age*). The third indicator to measure the propensity for risk taking is the financial leverage of firms, computed as the ratio between financial debts and financial debts plus equity at the moment of the IPO. This ratio is a proxy of companies' risk exposure as generally financing capital via debt is considered riskier than equity financing. By the fourth variable, *Venture Capitalist*, we identify those IPOs, which rely on venture capital investments (Lester et al. 2006); it is a dummy variable which takes value 1 if at the moment of the IPO venture capitalists were in the ownership structure of the firm, 0 otherwise.

Secondly, we introduce in our model the education-level variables to investigate the influence of human capital on business performance. Recent studies show how prestige and educational background of CEO and board of directors may impact firm's performance on the markets (Lester et al., 2006) and firm survival (Bates 1990, Audretsch and Lehmann 2004). Our measures of CEO and Board educational level are *Board Education*, *CEO No Graduate, CEO Postgraduate* and *CEO Research*. The first is a dummy taking value 1 if there is at least one board director having at least a bachelor degree, 0 otherwise. The other variables refer specifically to the CEO. They all are dummies taking value 1 if the CEO holds respectively no graduate degree, post-graduate or PhD degrees as reported in IPO prospectus.

As far as learning is concerned, we explore the role of CEO work experiences and capabilities and try to find if they have some impacts on business performance. The literature in the field of knowledge economics shows how the stock of accumulated learning positively influences the development path of firms. For this reason, firms in the early stages of their life cycle, which do not have a past history and experience, may be supported in their growth by the capability and competence accumulated by the direction in previous experiences. Based on previous works (Lester et al., 2006) in our model we, thus, use the variables *CEO Founder* and *CEO Experience*, which are dummy variables respectively denoting whether or not the CEO is also the firm's founder, and whether or not the CEO has already been in other firm boards of directors. To account for the possible impact of learning dynamics and creativity, the age of the CEO has also been used as an independent variable. The measure of *CEO Age* is the age of the CEO as reported in the IPO prospectus.

In our model we control for both industry and calendar year effects. Following the primary 1-digit standard industrial classification (SIC) code for the IPOs analysed, ten industry dummies were included in the model to control for industry-specific factors, as industry cycles and trends that may influence the rate of growth of individual firms. In our model, we also included a set of dummies variables controlling for calendar year effects. In Table 2.3 the basic features of both the dependent and independent variables of the model are summarized.

Table 2.3 - Variables Typology and Their Measurement Methods

The table reports a description of each variables in the model. Variable class is relative to the entrepreneurial dimensions classification in the theoretical framework. Time variant variables are those variables changing over time. Variables that are not time variant are those which are calculated at the time of the IPO.

Variable Class	*Variable Name*	*Description*
Dependent variable	*Firm Growth Rate*	$Log(Sales)_t$ - $Log(Sales)_{t-1}$
Lagged Variable	*Firm Growth Rate Lag*	Lagged values of the dependent variable
Risk Taking	*Firm Size*	Log(Sales) at the IPO
	Firm Age	Log (Year of IPO - Year of Firm foundation)
	Leverage	Financial Debt/(Financial Debt / Equity)
	Venture Capital	Dummy, 1 for firms that have a venture capitalist in the ownership structure at the moment of the IPO
Education	*Board Education*	Dummy, 1 for firms having at least one director which received ate least an undergraduate degree
	No Academic Degree	Dummy, 1 for firms where the CEO received at least an undergraduate degree
	CEO Post Graduate	Dummy, 1 for firms 1 for firms where the CEO received a post-graduated degree, such as MA, MSC, MBIM, MRPhram, MBE or MBA as reported in the IPO prospectus
	CEO Research	Dummy, 1 for firms 1 for firms where the CEO hold a title such as PhD, Dr, Prof, or OBE as reported in the IPO prospectus
Learning	*CEO Founder*	Dummy, 1 for firms where the CEO is also the founder of the company
	CEO Experience	Dummy, 1 for firms where the CEO has previous experiences in other firms' board of directors
	CEO Age	Age of CEO as reported in the IPO prospectus
Control Variables	*Industry*	Set of dummies, according to the 1-digit SIC code classification
	Calendar Year	Set of dummies, 1 if the calendar year happens to be the year of the IPO

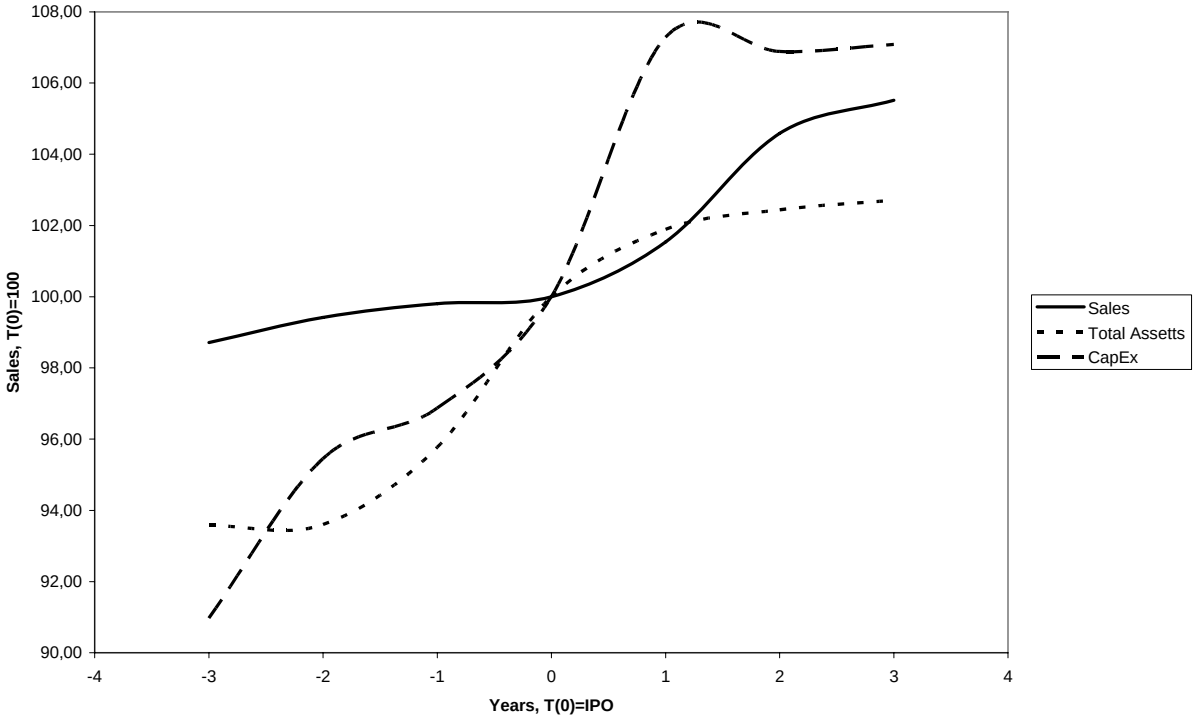
2.4 Empirical Results

2.4.1 Pre- and post-IPO comparison

Figure 2.1 shows the pre- and post-IPO trends of sales, total assets and CapEx for the sample under investigation. Descriptive statistics for the pre- and post-IPO main operating performance in the IPO sample are provided in Table 2.4. The pre-IPO period of time goes from three years before the IPO to the listing year included, while the post-IPO covers the three years after the listing date of each firm. The two periods of time are compared through median comparison test (Mann-Whitney) and mean comparison test (t-statistics). F-test for equal variance is also provided. The results show that firms listed on AIM increase in terms of sales, total assets and capital expenditure (CapEx) after the IPO. It seems such a companies use the capital raised at the listing to realize new investments as the increase in total assets and CapEx shows.

If we move our attention on the measures of firm performance we can refine our considerations. The results show those firms grow at faster rate in terms of sales after the listing on the Alternative Investment Market. This is in line with the findings of Khurshed et al. (2003) for a sample of companies listed on the AIM between 1995 and 1999 emphasizing that the performance of such a firms increased in the three years post-IPO period of time. We find that *Turnover* and *Investments* indexes decrease after the IPO, although the decrease in *Investments* is not significant. This means that total assets increase at a faster rate than both sales and CapEx. This result supports the idea that companies list on the AIM in order to implement a growth strategy.

Figure 2.1 – Average Sales, Total Assets and CapEx of 665 firms listed on the AIM, 1995-2005



Source: Our elaborations on EurIPO data.

Table 2.4 – Descriptive statistics, pre- and post-IPO comparison tests

Descriptive statistics for the pre- and post-IPO main operating performance in the 665 IPO sample are provided in the table. The pre-IPO period of time goes from three years before the IPO to the listing year included, while the post-IPO covers the three years after the listing date of each firm. Statistical significance at 1%, 5%, and 10% as ***, **and * respectively. Variables' definition in brackets.

Variables	*pre-IPO*	*post-IPO*	*Tests (f, t, z statistics)*
Sales (million €)			
N. observations	1563	1264	
Std dev	42.8	71.9	0.3546***
mean	16.0	25.9	-4.3266***
median	4.3	7.7	7.273***
Total Assets (million €)			
N. observations	1743	1328	
Std dev	67.6	84.6	0.6381***
mean	19.3	34.3	-5.3085***
median	5.6	11.5	14.035***
CapEx (million €)			
N. observations	711	543	
Std dev	1.8	4.3	0.1836***
mean	0.7	2.1	-6.8287***
median	0.2	0.5	9.315***
Sales Growth Rate (%)			
N. observations	907	1126	
Std dev	106.7	116.1	0.8443***
mean	33.2	41.2	-1.6327**
median	25.5	29.2	1.760**
Turnover (%)			
(Sales/Total Assets)			
N. observations	1564	1266	
Std dev	357.3	297.9	1.4382***
mean	157.6	114.6	3.4966***
median	93.1	66.5	-6.698***
Investments (%)			
(CapEx/Total Assets)			
N. observations	703	547	
Std dev	60.3	14.3	17.7035***
mean	12.8	9.8	1.2668
median	5.4	4.5	-0.285
ROA (%)			
(Ebitda/Total Assets)			
Observations	1568	1264	
Std dev	648.3	244.9	7.0052***
mean	-58.4	-25.5	-1.8526**
median	3.1	0.1	-4.672***
Leverage (%)			
(Debt/(Debt+Equity))			
N. observations	690	631	
Std dev	502.8	320.7	2.4586***
mean	85.5	35.6	2.1688**
median	26.3	13.7	-6.796***

The measure of profitability and (ROA) is found to be decreasing after the IPO. There is an ongoing debate within the empirical literature concerning post-IPO underperformance. For a discussion of these issues see Schultz (2003), Loughran and Ritter (2000), and Brav et al. (2000). In particular, as far as operating performances are concerned, Jain and Kini (1994) and Mikkelson et al. (1997) find that operating return on assets declines after the IPO while Loughran and Ritter (1997) report post Seasoned Equity Offerings (SEO) underperformance. The literature on this topic tries to give explanation to listed companies underperformances and find three main reasons for this phenomenon, e.g., windows of opportunity, window dressing and change of ownership. However, to our purposes we are analyzing the AIM companies' sample from another perspective, as we are interested in some of the features of fast growing companies. Finally, as expected the leverage diminish in the post-IPO period of time. Indeed, the issue gives firms the opportunity to rise equity capital and consequently to decrease their leverage.

2.4.2 Results of the econometric models

The results of the econometric estimation are presented in Table 2.5.

Both firm-specific and CEO-specific variables proved to be statistically significant. First, the lagged dependent variable proved to be negatively and significantly ($p<0.10$) related to the firm rate of growth. This is an interesting result in its own right. Actually, according to the life-cycle theory, firms' growth path is supposed to follow an S-shaped curve, hence showing an exponential path followed by a logarithmic one (see Figure 2.2).

Table 2.5 - Results of GMM-SYS Regression

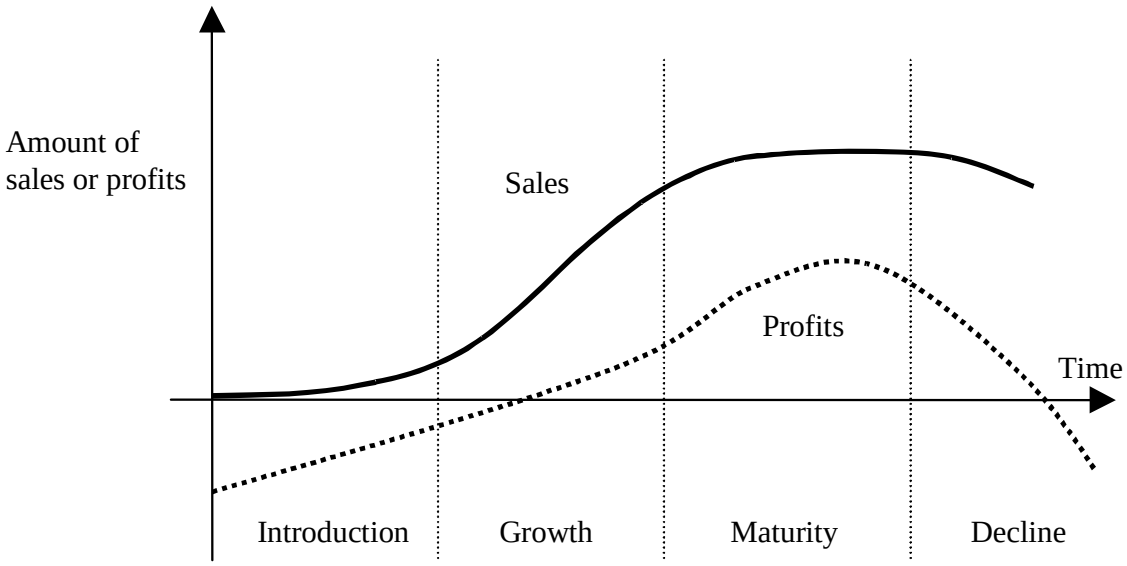
GMM-SYS data estimations are applied using the following regression equation:

$$Firm\ Growth\ Rate_{i,t} = \beta_0 + \beta_1\ Firm\ Growth\ Rate_{i,t-1} + \beta_2\ Firm\ Size_i + \beta_3\ Firm\ Age_i + \\ + \beta_4 Leverage_i + \beta_5\ Venture\ Capital_i + \beta_6 Board\ Education_i + \beta_7\ CEO\ Post\ Graduate_i + \\ + \beta_8 CEO\ Research_i + \beta_9\ CEO\ Founder_i + \beta_{10}\ CEO\ Experience_i + \beta_{11}\ CEO\ Age_i + \\ + \beta_{12} Industry_i + \beta_{13}\ Calendar\ Year_i + \varepsilon_i$$

Where the index i=1,…,665 refers to the companies and t=0,…,3 refers to the year after the IPO. For variables' definition refer to Table II. CEO *No Graduated* is dropped to avoid multicollinearity. Statistical significance at 1%, 5%, and 10% as ***, **and * respectively. z statistics between parentheses.

Dependent variable = $Firm\ Growth\ Rate_{i,t}$			
Variable Class	*Variable Name*	*Estimations*	
	Constant	-1.126	***
		(-2.70)	
Lagged Variable	*Firm Growth Rate Lag*	-0.133	*
		(-1.63)	
Risk Taking	*Firm Size*	-0.044	***
		(-2.74)	
	Firm Age	-0.082	*
		(-1.69)	
	Leverage	0.148	*
		(1.78)	
	Venture Capital	0.002	
		(0.04)	
Education	*Board Education*	-0.023	
		(-0.38)	
	CEO Post Graduate	0.244	**
		(1.97)	
	CEO Research	-0.034	
		(-0.18)	
Learning	*CEO Founder*	-0.127	*
		(-1.77)	
	CEO Experience	-0.011	
		(-0.15)	
	CEO Age	-0.008	**
		(-2.27)	
Control variables	*Industry*	Yes	
	Calendar Year	Yes	
Number of instruments		38	
Wald Test χ^2 (12)		41.67	***
Hansen test χ^2 (8)		6.75	
Prob> χ^2		0.564	
AR(1)		-3.54	***
Prob> z		0.000	
AR(2)		-1.11	
Prob> z		0.265	

Figure 2.2 - S-shaped curve of sales and relative profit curve along the product life cycle



As the AIM is a market dedicated to small firms in the early stages of their growth, at the moment of the IPO firms in our sample are in the first part of the curve, thus characterized by exponential growth rates. In subsequent periods, firms, which were in the birth phase, continue to follow the exponential part of the curve and, thus, increase their rate of growth. On the contrary, firms, which were already in the growth phase and, thus, showing a higher rate of growth, in subsequent periods approach the logarithmic part of the S-shaped curve. This means that, consistently with the life cycle theory, in our specific sample, firms follow a predictable pattern and those which enter the market being in the life cycle stage of birth grow faster than those which instead enter being in the growth phase.

In relation to *risk-taking variables*, as a first result we find a negative and significant ($p<0.01$) relationship between *Firm Size* and *Firm Growth Rate*. This is consistent with previous research, and confirms that smaller firms grow at a greater rate than larger firms. Moreover, *Firm Age* is found to be negatively and significantly ($p<0.1$) correlated with the firm rate of growth. These results are complementary to what we have discussed above, and it also is relevant in the light of the life-cycle literature. We may now reasonably argue that the post-IPO performances of small and young firms listed at the AIM seem to follow the life cycle development path. It is actually well known that higher levels of risk are associated with this kind of firms, and hence they are subject to credit rationing. However, by listing at the AIM firms are able to raise the necessary levels of funds to sustain their growth process along the first part of the S-shaped growth path. To confirm our hypothesis on the positive relationship between risk taking and firm growth for AIM companies, *Leverage* proved to be positively related to firm growth. This means that companies showing a high risk exposure at the moment of the IPO growth more than those, which are considered less risky as less leveraged. We can explain this

result considering that companies in our sample diminish their leverage in the post-IPO period of time as the issue gives firms the opportunity to increase more equity capital. This is in line with the results of the our pre- and post-IPO comparison analysis that shows how in the post-IPO period of time sales reveal a fast increase while the *Leverage* index shows a decrease. From our findings, *Venture Capitalists* is not a significant variable. This result seems to confirm the ambiguous impact of venture capitalists on firm performance, as shown by the literature on this topic.

Secondly, we obtained some interesting findings concerning education-related variables. As far as the CEO is concerned, the educational level proved to be relevant, in that the coefficients on the *CEO Post Graduate* is positive and statistically significant ($p<0.05$). This means that firms' performances are likely to be positively influenced by the CEO educational attainment. This finding is consistent with the literature on the importance of codified knowledge.

For what concern learning-related variables, the *CEO Founder* is a negative and statistically significant variable ($p<0.10$). This result is consistent with previous works. Certo et al. (2001), for example, found that IPO firms managed by founder CEOs perform more poorly than IPO firms managed by non-founder CEOs while Lester et al. (2006) found that investor valuations are negatively affected by the presence of a CEO, which is also the founder of the company. This result can be explained as follows. After an IPO fundamental changes in management style should emerge in response to the demands of an evolving organizational context. However, as Tashakori (1980) concluded, the large majority of entrepreneurial owner-founders do not make the transition to a professional style of management. This is consistent with the critical resources theories stating that while in the initial phase of the life cycle the founder is the critical resource, in the following stages the web of specific investments built around the founder becomes the critical resource.

Next, the *CEO Age* is found negative and statistically significant ($p<0.05$). This means that firms that are managed by young CEOs growth more than those managed by older CEOs. Thus we can infer, that the typical entrepreneurial features like creativity and alertness, which are more likely to be found among young CEOs as previous studies argue, have a positive impact on firm growth.

As the validity of GMM relies on the choice of the appropriate set of instruments and the absence of serial correlation of second order, the results of the post-estimation tests are included in Table IV. The Hansen test for over-identyfing restrictions give us confidence with the validity of the instruments with a probability of 0.6. As expected, negative first-order serial correlation is found in Arellano-Bond AR(1) test. The Arellano-Bond AR(2) test does not allow us to reject the null hypothesis of no higher order serial correlation. This result indicates the validity of instruments with a probability of 0.3.

2.5 Discussion and Policy Implications

In this work the determinants of business performance are inferred from a broad range of variables (e.g., accounting information, CEO and board age, educational background and past experiences). Our results confirm that intangible assets other than traditional ones (e.g., firm age and size) are important factors shaping the performance of firms listed on the AIM. In particular we found that AIM companies follow an S-shaped pattern of growth. Furthermore, age and size have negative effects on firms' growth, consistently with the life-cycle theory. It also seems that CEO educational level and age are critical to the businesses performance, providing further support to the importance of codified and tacit knowledge stocks.

The results of this work could have some policy implications both at national and regional level. At the national level, policy makers could take into account the relevance of an efficient financial system, in particular the emerging role of secondary markets such as the AIM, and try to remove financial constraints that hamper the prospect of new businesses. In their start-up and growth phases, firms need substantial external funding. However, the literature on this topic highlights that small and young enterprises are subject to 'credit rationing' and thus have major difficulty in attracting capital in their initial phase, mainly due to information asymmetries (Stiglitz and Weiss 1981, Fazzari et al. 1988, Winker 1999). Actually, potential investors have in general little information on the entrepreneurial capabilities or about the investment opportunities of such enterprises. Hence, if lenders are not able to identify the quality or the risk associated with the borrower, there will be credit rationing (Jaffe and Russell 1976). Under uncertainty conditions a secondary market as the AIM could help in lowering credit rationing. In this way new businesses may find the funds required to finance their growth.

As far as entrepreneurship is concerned, it is important to look at the process of transformation in the cultural and behavioral attitudes of many countries towards entrepreneurship, in particular on the matter of rewarding propensity to risk, an element that brings with it economic advantages. The increase in the number of new firms and their relative chances of survival and growth is, thus, an important objective for governments action. At the regional level, political intervention could aim at promoting entrepreneurial activities, which ease the local process of change by encouraging the propensity to risk and easing the access to external capital. Education towards entrepreneurship represents an example of how is important the stimulation a more dynamic entrepreneurial culture. In order to increase the population of entrepreneurs, another appropriate policy would be to foster the

participation of young and the unemployed work force in the entrepreneurial process. Our findings support these two achievable intervention as they show how educated and young CEOs positively influence firms growth.

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Chapter 3

How investors evaluate firm entrepreneurial orientation?

Abstract

The aim of this paper is to investigate the relationship between firm performances after the IPO and their entrepreneurial orientation (EO). In our work we want to test if more entrepreneurial oriented firms show better market performances signalling that investors valuate it positively. To this purpose, we focus on a particular sample of entrepreneurial firms, i.e. companies that went public on the Alternative Investment Market (AIM) through IPO during the period from 1995 to 2006. Along the lines of Miller (1983), Covin and Slevin (1991) and Lunpkin and Dess (1996), firms' entrepreneurial orientation is measured in terms of risk taking, innovation and proactivity. Following the literature in management on investor valuation we use the percent price premium as dependent variable of our model. Our results confirm a positive impact of risk-taking and proactivity on investors' valuation.

JEL classification : D21, G3, M13

JEL keywords: Entrepreneurial Orientation, Firm Market Performance, IPOs, Top Management Team

3.1 Introduction

A wide body of literature has focused on the entrepreneur as the main actor of the entrepreneurship phenomenon. In particular, many researches have concentrated on the main attributes of the entrepreneur trying to relate some traits of the individual with firm performance. More recently, a branch of the literature has moved the attention on the entrepreneurial behavior at the organizational level. A firm level model of entrepreneurship seems to be more appropriate as entrepreneurial effectiveness is arguably a firm-level phenomenon that involves the whole organization and goes beyond the abilities of an individual. Following studies such as Miller (1983), Covin and Slevin (1991) and Lumpkin and Dess (1996), firms showing an entrepreneurial orientation are risk taking, innovative and proactive. In this vein, the conceptual model developed to account for the firm behaviour highlights how various combinations of individual, organizational and environmental factors may affect firm performance.

One of the main objective of literature on this topic has been the understanding of the entrepreneurial orientation-performance relationship. Covin and Slevin (1991) and Lumpkin and Dess (1996) developed conceptual models to understand the relationship between entrepreneurial orientation (EO) and firms performance. These models indicate a variety of factors, such as external environment, organizational structure, corporate culture and strategy, which may simultaneously affect the entrepreneurial orientation-performance relationship.

Following the EO framework, scholars have attempted to give empirical evidence to the EO effect on firm performance, mainly measured in terms of sales growth (Wiklund 1999; Lumpkin and Dess 2001, Wiklund and Shepard 2005, Walter et al. 2006, Covin et al. 2006, Keh et al. 2006) but also as employment growth (Wiklund 1999, Walter et al. 2006, Wiklund

and Shepard 2005) and firm profitability (Becherer and Murer 1997, Lumpkin and Dess 2001, Walter et al. 2006, Wiklund and Shepard 2005, Keh et al. 2006). However, literature has yet to consider the effects of EO on market performances.

In our work we extend the literature investigating the relationship between entrepreneurial orientation (EO) and firm market performance in a peculiar entrepreneurial setting, i. e. an IPO on a secondary market. By focusing on companies listed on the Alternative Investment Market (AIM), in our work we want to test whether more entrepreneurial oriented firms show better market performances signalling that investors valuate it positively.

Our research may contribute to the literature in several ways. First, although empirical evidence has shown that the relationship between an EO and performance is not always positive but it varies for different types of business, the general belief is that firms benefit from an entrepreneurial behaviour. On the one hand, this may lead manager to act entrepreneurially in order to increase firm performances. On the other hand, investors may evaluate positively a firm showing an EO in the expectation of high return. For this reason in this paper we want to verify if investor give value to the EO of companies towards entrepreneurship in the prospect of high returns.

Secondly, the literature has shown that the EO-performance relationship is moderate by both external and internal factors. In particular, many studies have postulated a strong EO-performance relationship in hostile and technologically sophisticated environments (Naman and Slevin 1993, Covin and Slevin 1998). Hence, a growing interest has been devoted to companies operating in unique environments such as small businesses (Wiklund 2005, Keh 2006) and university spin-off (Walter et al. 2006). In this work we extend this stream of research by focusing on IPO companies which therefore operate in a peculiar

environment, characterised by high level of uncertainty. Actually, a firm undertaking an IPO and entering the arena of public offerings faces new challenges and pressures, such as the acceptance and monitoring activities from a new variety of stakeholders.

Moreover, our study may also contribute to the literature in enhancing the approach to the measurement of the different dimensions involved in the EO concept as we can rely on IPO prospectuses as a source of data. To the purpose of operationalizing EO and test the conceptual framework of entrepreneurial orientation, empirical researches have adopted mainly three approaches: managerial perceptions, firm behaviours and resource allocations (see Lyon et al. 2000 for an extensive review). The first approach is the most widely used and requires interviews or surveys to measure EO as management perceptions. The second approach, firm behaviours, is focused on competitive behaviours of companies and involves the content analysis of published news. The third approach examines resource allocations to operationalize strategy concepts. The main source of data is company's financial statements. To our purposes the latter approach seems to be the most appropriate. The idea to operationalize strategy concepts looking at resource allocation can be ascribed to Gale (1972) and Miller and Friesen (1978). This approach has pros and cons. On the one hand, an advantage is that measures are standardised and can be compared across time and firms. Furthermore they are easy to confirm. On the other hand, a drawback can be that resource allocation measures may not accurately reflect firm activities and are not suitable for in-depth analysis on managerial practices and strategies. However we can complement this data with information from the IPO prospectus which, accordingly, is the primary source of data for our study. It is an important document which gives detailed information about the firm such as the operating history, firm products and ownership

structure. Additionally, it includes biographical information regarding the founder, CEO and the firm executive management.

The reminder of our paper proceeds as follows. In section two we discuss the theoretical framework and hypothesis. The sample, measure and the econometric model are then presented in the methodological section. Section three describes the results of our analyses. Finally, in the concluding section we discuss our interpretation regarding our findings.

3.2 Two different perspectives seeking for reconciliation

In order to investigate the linkage between entrepreneurial orientation and market performance for IPOs we combine two streams of literature. On the one hand we apply the concept of EO developed in the area of entrepreneurship and management. On the other hand we refer to the literature on IPOs in the area of corporate governance and management. In other words, we use entrepreneurial orientation as a framework for examining the relationship between firm behaviour and market performance within initial public offering firms.

Along the lines of the pioneering and widely cited works by Miller (1983), Covin and Slevin (1991) and Lumpkin and Dess (1996), entrepreneurial orientation refers to the processes as methods, practices, behaviours and strategies managers adopt to act entrepreneurially. Various dimensions have been used for characterising and describing companies' entrepreneurial orientation. Most of the works define firms showing an entrepreneurial orientation as risk taking, innovative and proactive. Risk taking consists of activities such as borrowing heavily, committing a high percentage of resources to projects with high risks but high returns and entering in unknown markets. Innovativeness refers to

attempts to embrace creativity, experimentation, novelty, technological leadership, research and development in both products and processes. Proactiveness relate to forward-looking, first-mover efforts to introduce new products or projects in the market anticipating competitors. Other two dimensions, used to describe EO but less recurrent in the literature, are autonomy and aggressiveness. Autonomy refers to actions aiming at establishing a new business while aggressiveness refers to attempts to overtake rivals.

The works by Miller (1983), Covin and Slevin (1991) and Lunpkin and Dess (1996) contributed to define the theoretical framework for linking entrepreneurial orientation and firm performance. The prevailing and ultimate reason in the topic of entrepreneurship is indeed the idea that entrepreneurial activity stimulates economic performance of individual firms and, as a consequence, general economic growth. In sum, firm performance seems to be affected by i) organizational factors as size, structure, strategy, strategy-making processes, firm resources, culture, and top management team (TMT) characteristics; ii) environmental factors as dynamism, munificence, complexity, industry characteristics, and hostility; iii) entrepreneurial orientation as risk taking, innovativeness, proactiveness, and, in some cases, autonomy and competitive aggressiveness.

Actually, by analysing the literature on IPOs we observe similar findings. First, scholars in this field have highlighted the role of organizational factors as age, size, structure, firm resources, founder and top management team characteristics in enhancing the market performance of initial public offering companies. For example, Welbourne and Andrews (1996) examine how human resource management decisions at the moment of the IPO affect both short-term and long-term performances. The authors found that human resources variables predict both initial investor reaction and long-term survival. Certo et al. (2003)

studied investors reactions to the CEO ownership of stock options and equity. Their study was grounded in behavioural decision theory which suggests that compensation may influence CEO propensity for taking risk. The authors found that both stock and equity ownership interact to influence the premiums that investors applied to the IPO firms. Lester et al. (2006) examined the impact of prestigious top management teams characteristics on investor valuation at the time of an IPO and found that mainly the TMT educational level has a positive influence on IPOs market performance. Second, IPO literature found how also environmental factors as dynamism, munificence, complexity and industry characteristics influence the valuations that investors apply to IPO companies. For example, Lester et al. (2006) suggested the importance of an industry structure on a firm performance. In particular, the authors found that investors apply lower valuations to firms operating in industries with high levels of dynamism and higher valuations to firms operating in industries with high levels of complexity. Certo et al. (2003) found a positive relationship between firms operating in high-tech industries and investor valuation while Welbourne and Andrews (1996) found that investor value positively companies in services sectors.

Despite the literature on entrepreneurial orientation found support for a positive impact of EO on operating and financial performances, literature on IPOs still has to consider the effects of EO on investor valuation. For this reason in this work we claim that entrepreneurial orientation should be taken in consideration in the analysis on IPO performances and enter the model on investor valuation. Concerning the individual dimensions of EO, previous works suggested that each can have a universal positive influence on performance. Since the seminal works by Shumpeter, innovative companies have been recognized as highly competitive and thus shown high performances. Proactive companies have first-mover advantages and thus are able to outperform

competitors. Although risk taking companies have more volatile results, it has been shown that risky strategies are more profitable in the long run.

3.3 Methodology

3.3.1 Dataset and Sample

To the purpose of verify if firm entrepreneurial orientation may influence investor valuations we focus on a particular sample of entrepreneurial firms, i.e. companies listed on the AIM. A number of different reasons make AIM's companies interesting for our purposes. Firstly, the firms listed on the AIM are formed around new business ideas. Hence these firms are in the entrepreneurial phase, characterized by high innovativeness, entrepreneurial creativity, and a high level of uncertainty. Moreover, the AIM is a secondary market dedicated to young and growing companies. They range from young, venture capital-backed start-ups to young international companies looking to use a public market to fund further expansion and raise their global profile. Thirdly, an Initial Public Offering is one of the most notable entrepreneurial settings, being characterized by a high degree of uncertainty. A firm undertaking an IPO and entering the arena of public offerings faces new challenges and pressures, such as the acceptance and monitoring activities from a new variety of stakeholders. Finally, the AIM is the most successful growing market in the world. Since its launch in 1995, over 2,500 companies have joined AIM. Today, more than 1500 companies from any industry sector are quoted on it. Hence, in literature there is a growing interest in this market. For example, Kurshed et al. (2003) shows that the AIM is the first market where operating performance is not found to be declining after the

IPO. On the contrary, they find that the performance of firms on the Official List deteriorates significantly after the issue.

Our main source of data is the EurIPO database which collects data on 3,000 operating companies that went public on the main European markets (London, Euronext, Frankfurt and Milan) through IPO during the period 1985-2006. We focus on the companies listed on the AIM from 1995 to 2006. Our IPO's dataset combines public available information (e.g., year of establishment, industry sector, region), accounting data from balance sheets (the main variables of consolidated financial statements in a range -3, +3 years from the listing date) and data related to both the offer and the ownership structure from IPO prospectuses (e.g., private equity financing, risk factors, biographical information regarding the founder, CEO, the firm's board of directors and management).

The most of data were collected from IPO prospectuses. Companies follow strict rules and guidelines in compiling a prospectus. For this reason a repeatability of information is guaranteed and, thus, it is possible to make comparison across time and across companies. Furthermore, the document is first written by members of the management and then certificated by lawyers and accountants. We thus can reasonably trust in the validity and reliability of data collected.

3.3.2 Methodology

Specification of the econometric model

The relationship between entrepreneurial orientation and investor valuation is investigated through the estimation of the following model:

$$Investor\ valuation_i = \beta_0 + \beta_1\, Risk\ Taking_i + \beta_2\, Innovation_i + \beta_3\, Proactiveness_i + \beta_4\, Control_i + \varepsilon_i \quad (3.1)$$

Where $Risk\ Taking_i$, $Innovation_i$ and $Proactiveness_i$ are vectors of variables describing the three dimensions of the entrepreneurial orientation as highlighted in the theoretical framework while $Control_i$ is a vector of control variables.

Dependent variable

In order to consider the effects of EO on market performances, we refer to the literature in management on investor valuation (Welbourne and Andrews 1996, Rasheed et al. 1997, Certo et al. 2003, Lester et al. 2006) and use the percent price premium as dependent variable of our model. As suggested by Welbourne and Andrews (1996) the absolute stock price at the time of the IPO is misleading since it fails to account for the worth of firm assets. As an alternative, price premium, which is the amount of the stock price considered beyond the book value, allows to control for assets and, thus, provides a more robust estimate of investor perceived future value. We calculated percent price premium as stock price less book value over stock price, where the stock price equals the offer price at the time of the IPO, and book value is the book value of the firm's equity as reported in the prospectus. The offer price is the price paid by institutional investors and determines the capital a firm raises in its IPO. As a consequence, investors tend to reward encouraging prospects with higher premiums. To control for underpricing an alternative measure for stock price is the closing stock price on the first day of trading.

Explanatory variables

As far as independent variables are concerned, we grouped the measures of EO in three categories: risk taking, innovativeness and proactiveness.

Firstly, the risk-related variables are *Risk Factors, Profit* and *Business-risk.* A prospective investor should be aware of the risks of investing in a company and should make the decision to invest only after careful consideration. For this reason, companies are required to mention the factors of risk for the business in the IPO prospectuses. Some examples of risk factors listed in IPO prospectuses include issues related to technological change, retention of key personnel, protection of intellectual property rights and demand volatility. Following previous researches we use the number of *Risk Factors* reported in the IPO prospectus as a proxy for the business risk level as perceived by investors (Beatty and Zajac 1994, Welbourn and Endrews 1996, Certo et al. 2001, Lester et al. 2006). The second risk-related variable included in the model is profit per share before the IPO. Many listing companies report losses, in most of the cases due to their short operating history. As a consequence, a high variance in performances and uncertainty characterise AIM firms. We thus assume that the lower is the profit per share (or loss per share) the higher is the firm's risk position. As such, *Profit* could affect investor perceived firm's value. We also include in our model *Business-risk* as an additional variable. As reported in previous studies, measures of propensity for risk taking include an indicator of business risk, such as the standard deviation of a firm's return on assets over time (Oviatt and Bauerschmidt 1991, Miller and Leiblein 1996, Lyon et al. 2000).

Secondly, we introduce in our model an innovation-related variable to investigate the influence of innovation activity on investor valuation. Actually, innovation is a signal for a firm's strategic competitive value and investors may valuate positively firms' innovation efforts in the expectation of high returns. In our model we, thus, use a measure of innovation output, *IPR,* which represent the number of intellectual property rights held by the company. Although some companies do not disclose this information, we gather data on *IPR* from the prospectus. We

thus assume that investors can valuate the innovation propensity of a company only in the case of disclosure in the IPO prospectus. Graduated refers to the number of members of the board of directors with a post-graduated degree. This is a proxy for innovation input.

As far as proactiveness is concerned, we explore the role of Top Management Team (TMT) characteristics and capabilities and try to find if they have some impacts on investors' valuation. Essentially, the literature on EO shows how firms' proactiveness can be measured in terms of TMT's risk-taking proclivity, decision making style and competitive posture. Firstly, the variable *Past Exp* measures the involvement of the TMT members in other boards of directors in the same position. It is a proxy for proactivity as it measures whether the members are serial entrepreneurs, CEOs or directors. As measures of TMT's risk posture we, secondly, include the variables *Board Equity* in our model, accounting for the share of equity owned by the board of directors. Furthermore, we add a dummy variable, *CEO share*, taking value 1 if the CEO is also a shareholder. As previous researches suggest (Mehran, et al., 1999; Sanders, 2001; Certo et al., 2003), the CEO equity level may influence CEOs' risk-taking behaviour. Consistently with the agency theory (Jensen and Meckling, 1976), high levels of board of directors' ownership align the interests of TMTs and shareholder. Thus TMTs have an incentive to diminish the risk exposure of the company which is, in turn, associated with their portfolio risk level. We suggest that IPO investors are likely to take into consideration the risk properties of directors' equity. Secondly, *CEO founder* is considered as an additional variable for measuring executives' proactive behaviour. Investors can evaluate positively the fact that CEO is also the firm founder, as this gives a signal of executives risk proclivity.

Control variables

We further include a set of control variables which may have an impact on investors' valuation. *Sales Growth* controls for firms performances. Firm size is measured as the logarithm of *Total Assets*. Firm *Age* is measured as one plus the age of the firm at the moment of the IPO in logarithmic scale. By *Venture Capitalist* we identify those IPOs which rely on venture capital investments (Lester et al., 2006); it is a dummy variable which takes value 1 if venture capitalists were in the ownership structure of the firm at the moment of the IPO, 0 otherwise. *Insiders* represents the proportion of executive members on the board of directors affecting market valuations in term of advising and monitor activities (Gompers 1995, Certo et al. 2001). Following the primary 1-digit standard industrial classification (SIC) code for the IPOs analysed, nine industry dummies were included in the model to control for industry-specific factors, as industry cycles and trends, that may influence the rate of growth of individual firms.

In Table 3.1 the basic features of independent variables of the model are summarized.

Descriptive statistics for the sample are provided in Table 3.2. Data in panel a) (Independent and Control Variables*)* summarize the results for both the independent and control variables. Panel b) (Industry) reports the industry classification referring to the 1-digit SIC Classification. The Services companies (e.g., hotels, business services, health, legal and social services) are highly represented in our sample (52.73%). Manufacturing cover more than 20% of the sample while each of the other economic groups gathers about less than 10% of the IPOs.

Table 3.1 - Variables Typology and Their Measurement Methods

Independent and Control Variables		
Variable Class	*Variable Name*	*Description*
Risk taking	*Risk Factors*	Number of Risk factors as reported in the prospectus
	Profit	Average earnings per share in the pre-IPO period of time
	Business-risk	Standard deviation of a firm's return on assets over time
Innovation	*IPR*	Number of intellectual property rights held by the company at the IPO
	Graduated	Dummy
	Past experiences	Dummy
Proactivity	*Board Equity*	Share of equity owned by the board of directors in the post-IPO
	CEO Share	Dummy variable taking value 1 if the CEO is also a shareholder
	CEO Founder	Dummy variable taking value 1 if CEO is also the firm founder
	Sales Growth	Average sales growth rate before the IPO
	Total Assets	Logarithm of total assets at the moment of the IPO
Control	*Age*	Logarithm of one plus the age of the firm at the moment of the IPO
	VC	Venture-backed IPOs
	Insiders	Proportion of executive members on the board of directors at the IPO
	Industry	Set of Industry dummies

Table 3.2 – Descriptive Statistics

a) Independent and Control Variables					
Variable Name	*N. observation*	*Mean*	*Std dev*	*Min*	*Max*
Risk Factors	323	7.985	4.150	0.000	21.000
Profit	315	0.017	1.029	-1.306	17.985
Business-risk	210	0.698	2.690	0.000	28.548
IPR	295	0.495	0.501	0.000	1.000
Graduated	394	0.091	0.289	0.000	1.000
Board Equity	310	0.310	0.221	0.000	0.972
CEO Share	313	0.502	0.501	0.000	1.000
CEO Founder	310	0.519	0.500	0.000	1.000
Sales Growth	325	0.324	1.263	-6.17	8.778
Total Assets	321	15.071	1.422	7.489	19.392
Age	219	1.545	1.118	0.000	4.905
VC	323	0.672	0.470	0.000	1.000
Outsiders	312	0.871	0.710	0.000	5.000

b) Industry			
Variable Name	*Frequency*	*Percent %*	*Cumulative Percent %*
Agriculture, Forestry and Fishing	1	0.36	0.36
Mining and Construction	23	8.36	8.73
Manufacturing	62	22.55	58.91
Transportation, Communication Electric, Gas and Sanitary Service	9	3.27	34.55
Wholesale Trade and Retail Trade	27	9.82	44.36
Finance, Insurance and Real Estate	8	2.91	47.27
Services	145	52.73	100
Total	275	100	

3.4 Results

Table 3.3 reports the correlation matrix of the variables, showing that some correlations should be taken into account in the interpretation of the results. Particularly, *Business-risk* and *Profit* show a correlation index equal to -0.34. Also *Age* and *Risk Factors*, *CEO Founder* and *CEO Share* also turned out to be correlated (-0.38 and 0.4 respectively). However, we also checked for variable dependence by examining the variance inflation factor (VIF). The VIF for of our regression equation is found to be 1.91, below the guideline of ten, suggesting that multicollinearity does not affect the analytical model (Chatterjee and Price 1991). The results of the econometric estimation are presented in Table 3.4.

In relation to *risk-taking* variables, as a first result we find a positive and significant ($p<0.05$) relationship between *Risk Factors* and investor valuation (*IV*). Furthermore, *Profit* proved to be significantly ($p<0.01$) and negatively related to *IV*. This means that companies showing a high risk exposure at the time of the IPO receive a higher valuation by investors than those which are considered less riskier. In other words, the higher the number of risk factors reported in the prospectus and the lower the profit of the company the higher the level of risk and, as our regression results suggest, the higher the investor valuation.

For what concerns proactivity-related variables, the *CEO Share* is a negative and statistically significant variable ($p<0.05$). This result is consistent with the *Risk-taking* variables' finding. The shareholder status of a CEO may give him an incentive to diminish the risk exposure of the company which is, in turn, associated with his portfolio risk level. Investors may valuate negatively the threat of a decrease in CEO risk-taking proclivity. Finally, Innovation, as proxied by the number of intellectual property rights (*IPR*), is not related to investor valuations in our model.

Table 3. 3 – Correlation Matrix

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	*IV*	1														
2	*Risk Factors*	0.19	1.00													
3	*Profit*	-0.27	-0.16	1.00												
4	*Business-risk*	0.07	0.12	-0.34	1.00											
5	*IPR*	0.05	0.14	-0.06	-0.01	1.00										
6	*Graduated*	0.01	0.18	-0.02	0.10	0.04	1.00									
7	*Past exp*	0.01	0.11	-0.10	0.00	0.00	0.05	1.00								
8	*Board Equity*	0.04	0.12	0.02	0.03	0.09	-0.08	0.02	1.00							
9	*CEO Share*	-0.12	-0.09	0.16	-0.10	-0.08	-0.14	-0.07	-0.09	1.00						
10	*CEO Founder*	-0.06	0.06	0.06	-0.03	-0.02	0.00	-0.07	-0.04	0.40	1.00					
11	*Sales Growth*	0.02	0.02	-0.07	-0.03	-0.04	0.04	0.06	0.01	-0.07	0.06	1.00				
12	*Total Assets*	-0.23	-0.01	0.19	-0.35	-0.06	-0.02	0.03	0.04	-0.13	-0.10	-0.01	1.00			
13	*Age*	-0.19	-0.38	0.12	-0.03	-0.10	-0.07	-0.12	-0.04	0.03	-0.16	-0.02	0.08	1.00		
14	*Insiders*	-0.02	0.19	-0.22	0.00	-0.12	0.11	0.01	-0.05	-0.19	-0.11	-0.19	0.12	-0.03	1.00	
15	*VC*	0.10	0.06	-0.08	-0.12	0.21	-0.06	0.07	-0.10	-0.06	0.01	0.07	0.16	-0.09	0.06	1.00

Table 3.4 - Results of OLS Regression

Statistical significance at 1%, 5%, and 10% as ***, **and * respectively. z statistics between parentheses.

Dependent variable = Investor Valuation (*IV*)

Variable Class	*Variable Name*	*Estimations*			
	Constant	1.399	***	1.673	***
	Risk Factors			0.010	**
Risk taking	*Profit*			-0.446	***
	Business-risk			-0.007	
Innovation	*IPR*			-0.028	
	Graduated			-0.025	
	Past experiences			-0.021	
	Board Equity			0.011	
Proactivity	*CEO Share*			-0.082	**
	CEO Founder			-0.018	
	Sales Growth	-0.005		-0.026	
	Total Assets	-0.069	***	-0.045	***
	Age	-0.017	**	-0.028	
Control	*VC*	0.018	**	-0.049	
	Outsiders	0.004		0.038	
	Industry	Yes			
F-test		2.65	***	2.35	***
R2		0.11			0.23
Adj-R2		0.07			0.13

As far as the control variables are concerned, the variable *Total Assets* , which is a proxy for firm size, is negatively and significantly ($p<0.01$) related to investors valuation. Investors expect companies use the capital raised at the listing to realize new investments and, thus, increase total assets. This means that investors give more value to larger companies than their counterpart. We interpret this result in the light of the life cycle theory. According to this theory, firms' growth path is supposed to follow an S-shaped curve, hence showing an exponential path followed by a logarithmic one. As the AIM is a market dedicated to small firms in the early stages of their growth, at the moment of the IPO firms in our sample are in the first part of the curve, thus characterized by exponential growth rates. In subsequent periods, firms which were in the birth phase continue to follow the exponential part of the curve and, thus, increase their rate of growth. In sum, it seems that investors expect an increase in the size expressed by *Total Assets* of larger companies in our sample in the expectation of fast rates of growth and, in turn, of firms' value. This leads to a temporary diminishing in firms' profitability directly affected by the IPO.

3.5 Concluding Remarks

In this work the determinants of business performance are inferred from a broad range of variables. Following the EO framework, we investigated the relationship between entrepreneurial orientation (EO) and firm market performance, measured in terms of percent price premium. To this purpose, we focused on an IPO sample of companies listed on the Alternative Investment Market (AIM). Our results confirm a positive impact of risk-taking and proactivity on investors' valuation. More precisely, a higher risk position of companies, proxied by both number of risk factors and profitability, proved to influence the price

premium paid by investors in the prospect of high returns. Furthermore, CEO risk-taking proclivity seems to have an impact on investor valuation. In particular, CEO equity ownership is negatively related to firm performance, as the prospect of risk-reducing firm strategies have a negative impact on the valuation of investors.

To conclude, we believe that further researches could extend the results of our analysis. The variables we used to explain firms' market performances are just a selection on the wider set of possible independent variables, which may be found in the literature. In this direction in future researches we will introduce further information related to the three dimensions of entrepreneurial orientation, in order to increase the set of explanatory variables and improve the model.

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Chapter 4

The impact of knowledge spillovers on new firms growth

Abstract

The paper investigates the effects of external sources of knowledge on firm growth. In line with the knowledge spillovers literature, we focus on the relationship between firms and universities, considered as a crucial source of knowledge. To this purpose, we apply the Gibrat's Law of Proportionate Effects model on a sample of UK public companies in the period 1995 to 2006. Our findings confirm that both universities knowledge input and output are important determinants of the growth of entrepreneurial firms.

JEL classification : M13, L26, O12, R30

Keywords: Firm growth, Knowledge Spillovers, Initial Public Offering, Gibrat's Law

4.1 Introduction

A wide body of literature has focused on the determinants of the evolutionary process behind firm growth. In particular a growing interest has been devoted to the understanding of the determinants of firms' differential rate of growth.

Empirical works have concentrated mainly the attention on traditional determinants of firm growth, principally firm-specific characteristics such as age, size, legal form and innovation, and have demonstrated that small, young and independent businesses grow at fastest rate (Mansfield 1962, Storey 1994, Audretsch 1995, Sutton 1997, Caves 1998, Almus and Nerlinger 1999). Besides, a growing interest in the literature has been devoted to an additional variable, i.e. location as critical factor shaping firm performance. Storey (1994) argues that some regions are more conducive to firm growth being characterised by high resources and wide market opportunities. The work by Davidsson (1989) suggests that location is an important factor for industry clustering while Davidsson et al. (2002) highlight how change in geographical location seems to exert a positive effect on business rate of growth.

In spite of the interest on the link between location and firm growth, the literature has paid less attention to the identification of the region-specific characteristics that may play a relevant role in determining the growth of firms. More recently, a few contributions emphasize how university-based knowledge spillovers influence firm performances (Audretsch and Lehmann 2005a, 2006, Colombo et al. 2006).

In our work we extend the literature on this topic, investigating the connection between external sources of research, in particular universities, and individual firm growth by focusing on UK public companies listed on the London Stock Exchange (LSE) on both the Official List (OL) and the Alternative Investment Market (AIM). By comparing companies listed on

the two markets, in our work we try to highlight the impact of knowledge produced by universities on the post-issue rate of growth of such a firms. We compare two samples of companies for a specific reason. While companies on the Official List cover all the life cycle phases and all the industry sectors, the AIM is the secondary market dedicated to young and growing companies formed around new business ideas. These firms are in the entrepreneurial phase, characterized by high innovativeness and entrepreneurial creativity, and also by a high level of uncertainty. The literature highlights that small and young enterprises are subject to 'credit rationing' and thus have major difficulty in developing internal research. For this reason, these companies rely mainly on external sources of R&D in order to sustain their innovation activities. We thus expect a greater impact of university research spending and knowledge spillovers on the growth rates of AIM's companies in comparison with companies listed on the Official List.

The reminder of our paper proceeds as follows. In section II we discuss the theoretical framework on the role of external sources of knowledge and highlight the expected impact on firms' rate of growth. The sample, measure and the econometric model are presented in the methodological section. Section IV describes the results of our analyses. Finally, in the concluding section we discuss our findings, also highlighting suggestions for further researches.

4.2 Knowledge spillovers and firms growth

The premise behind our study is that the proactive role of the three local actors, specifically financial institutions, universities and firms, may influence businesses performance. The stream of literature on entrepreneurship and growth emphasizes the link between

entrepreneurial dynamics and economic growth taking into account different units of analysis: firms, industries and regions. In the research area of regional science, concepts like Regional Innovation Systems (RIS) (Freeman 1987, 1991, Lundvall 1992, Nelson 1993) and Triple Helix (TH) (Etzkowitz and Leydesdorff 1997, 2000) emphasize the active role of territorial actors within regional development dynamics and give relevance to the institutional foundations of regions' competitive advantage, for example in the areas of education, research and development and financial services. Since Marshall and until the end of the Nineties, the model of local development has always been bi-polar, built upon two fundamental components of change, firms and local institutions. More recently, Etzkowitz and Leydesdorff (1997, 2000) have highlighted the active presence of an additional variable in the scenario, i.e. the university. These conceptual models develop a framework able to account for the existence of a new configuration of the interactions among different institutional forces (firms, local institutions and universities), which appear involved in a 'spiral' of relations. Within these models the social interaction between different actors aims at the production, diffusion and application of new and economically useful knowledge.

We thus argue that the local environment may directly impact and facilitate the generation of those factors determining firms' growth, in particular through institutional organizations such as universities. The habitat in which firms operate exherts a direct influence on their activity and hence economic development. In sum, institutions provide a framework that guides business activity, lowers uncertainty and facilitates the coordination of knowledge and intangible assets. In this work we mainly focus on one of the local institutional actors, the university, in order to test whether it influences firms' growth.

There is an ongoing debate on the role of universities in fostering business creation and economic growth. The debate on the economics of

knowledge has evolved through different steps based on the different characteristics assigned to knowledge through time (see Antonelli 2005). Following the different phases in the debate, firms and local institutions, in particular universities and research centres, are assumed to play evolving role. Based on the works by Arrow (1962) and Nelson (1959), knowledge has firstly been regarded as a public good. The basic idea behind this assumption is that knowledge is a public good, thus, it may spill over, primarily from universities, and it is freely available to firms. Subsequently, knowledge has been considered as a proprietary good (Nelson and Winter 1982). This concept emphasizes knowledge features such as appropriability and exclusivity. In this view, the firm is regarded as the privileged locus where knowledge is created and accumulated. In turn, universities and public research centres are solicited to protect their research output in order to secure appropriability. Finally, the literature has shifted towards the concept of knowledge as a collective process. This approach centres the attention on external knowledge, generated by interactions among the diverse economic agents (Griliches 1992, David 1993, Cooke 2002). In this line of thought, the firm is regarded as a changing and creative agent, searching for knowledge in the local environment. Interrelation among firms, universities and research centres are now considered vital for the generation, dissemination and absorption of new knowledge. Knowledge can indeed be transferred and disseminated among different actors in the economic system. According to this idea, universities have the incentive to disclose the results of their research activities and as a consequence they are crucial sources of external knowledge to firms. The spillovers of knowledge generate positive externalities to firms by stimulating innovation activities and productivity.

The literature on this topic has mainly focused on two different levels of analysis. First, several works have studied the impact of knowledge

spillovers on innovation and economic growth at regional level. Secondly, a number of analysis have focused on the relationship between knowledge spillovers and the innovative output at firm level of analysis. Compelling evidence was provided suggesting that investments in new knowledge affect both the knowledge spillovers generation (Jaffe, 1989; Audretsch and Feldman, 1996) and the creation of new businesses. Several studies also highlighted a significant positive correlation between firms' concentration and university location (Varga 2000, Audretsch et al. 2004, Audretsch and Lehmann 2005b). For example, Audretsch and Lehmann (2005b), in a study on German public companies and universities, highlight how the number of young and high-tech firms located around universities depends on the knowledge capacity and the knowledge output of the region. This is consistent with previous researches (Jaffe 1989, Audretsch and Feldman 1996, Audretsch and Stephan 1996) which show that knowledge spillovers are geographically bounded. In particular, Audretsch and Stephan (1996) also find that geographic proximity is a prerequisite to absorptive capacity, i.e. the ability of a firm to evaluate and utilize outside knowledge. If we turn our attention on analysis at firm level, great attention has been paid to the influence of spillovers on productivity (Mairesse and Sassenou 1991, Hall and Mairesse 1995, Mairesse and Hall 1996, Chen and Chih-Hai 2005).

Although there exist an extensive literature on the positive effects of knowledge spillovers, there is less evidence on the impact of university spillovers on firms growth. In particular, Audretsch and Lehmann (2005a) in their study on 281 German public companies suggests that both firm-specific and knowledge spillovers influence firm growth. Similarly, Colombo et al. (2006) analyse empirically the impact of university-based knowledge spillovers on the growth of Italian new technology-based firms. The authors find that knowledge spillovers foster the growth of a peculiar sub-sample of new high-tech ventures, i.e. academic start-ups. In

this paper we test whether firm growth is shaped by spillovers of knowledge by universities for a sample of UK IPOs.

In the literature, different mechanisms have been proposed as conducive to knowledge spillovers. First, knowledge from universities flows in the economic system and generates new market opportunities for companies. This is in accordance with the Knowledge Spillover Theory of Entrepreneurship by Audretsch (1995). This theory states that the spillover of knowledge from its producing entity such as universities involves the creation of a new firm. Indeed, new entrepreneurial opportunities are generated by new knowledge left uncommercialized by both research centres as universities and the incumbent companies. As a consequence, new firms are created in a process involving the spillover of knowledge. We assume that a similar process influences firm performance, in particular firm growth in early stages of development, as the access to knowledge in the periods subsequent firm formation still gives a competitive advantage to the company. Following these arguments, we expect that the access to knowledge generated by universities may affect firm propensity to create new economic opportunities, introduce new ideas in the market and, in turn, grow at a fast rate.

The second mechanism for the transmission of knowledge spillovers is based on the distinction between codified and tacit knowledge. On the one hand, knowledge is transferred among firms and universities through knowledge codified in journal publications and seminars. On the other hand, tacit knowledge spills over in oral conversations and face-to-face communication. Indeed, spatial proximity seems to be a prerequisite for the diffusion of this sort of knowledge. As highlighted by Audretsch and Lehmann (2006), it is possible to distinguish also different types of research according to the different kinds of knowledge they are based on. While research in natural sciences largely draws on codified knowledge, social sciences are more tacit in nature. Thus, we expect a greater influence

of research in the fields of social sciences on the rate of growth of companies located in the same area where this research is accomplished.

Finally, mobility of human capital is another mechanism for transferring knowledge. The availability of a higher number of skilled and highly educated resources stemming from universities has a positive effect on knowledge transfer (Powers 2003, O'Shea et al. 2005, Audretsch and Lehmann 2006). We, thus, expect that knowledge embedded in young students and new graduated is likely to foster knowledge transfer and, in turn, firms growth.

4.3 Methodology Design

4.3.1 Dataset and Sample

To the purpose of verify if the access to knowledge from universities may influence firm growth, we focus on a particular sample of firms, companies listed on the London Stock Exchange, comparing the Alternative Investment Market and the Official List.

Our main source of data is the EurIPO, an original database which collects data on 3,000 operating companies that went public on the main European markets (London, Euronext, Frankfurt and Milan) through IPO during the period 1985-2006. We focus on the companies listed on the AIM and Official List from 1995 to 2006. Our IPO's dataset combines public available information (e.g., year of establishment, industry sector, region), accounting data from balance sheets (the main variables of consolidated financial statements in a range -3, +3 years from the listing date) and data related to both the offer and the ownership structure from IPO prospectuses (e.g., private equity financing, risk factors, biographical information regarding the founder, CEO, the firm's board of directors and management).

In order to analyze the influence of universities on firm growth, we pooled the dataset by adding also information on UK regions trying to capture the local features in terms of university quality and new business formation and growth. In our dataset, regional boundary are defined referring to the Nomenclature of Units for Territorial Statistics (NUTS), a hierarchical classification of spatial units that provides a breakdown of the European Union's territory for producing regional statistics which are comparable across the Union. In particular, we used the NUTS level 2 corresponding to individual counties or groups of counties, London boroughs, metropolitan districts and unitary authorities for England, groups of unitary authorities for Wales, groups of whole or part of unitary authorities and/or local enterprise company areas for Scotland and counties for Northern Ireland. Following this classification 37 different UK areas are identified.

As far as university-specific variables are concerned, we added information on grants and research funding available to 116 UK higher education institutions from the HEFCE (Higher Education Funding Council for England) according to the periodic Research Assessment Exercise (RAE). We also collected data on students provided by the Higher Education Statistics Agency Limited. Finally, the numbers of articles published both in natural and social science were hand-collected from the research database Web of Science realised by ISI (Information Sciences Institute).

Our sample consists of 200 companies listed on the AIM and 200 companies listed on the Official List. Figure 4.1.a displays the distribution of sample companies across the 37 NUTS2 regions. The map shows a high concentration of firms in the south east, mainly in the area of Inner London, but also in Outer London, Berkshire, Buckinghamshire and Surrey, East and West Sussex. The distribution of companies per thousands inhabitants reveals similar results (see Figure 4.1.b). Sample

companies are still mainly concentrated in a few key regions of south east, i.e. Inner London, Berkshire, Buckinghamshire, Bedfordshire and Hertfordshire, Surrey, East and West Sussex.

Table 4.1 compares the groups of IPOs by age, size and industry. Data in panel a) (Age and Size) confirm that on average companies going public on the AIM are younger and smaller than companies listed on the Official List. AIM companies are 8 years old in mean while sample companies from the Official List are 18 years old on average. As far as the size is concerned, AIM's firms with about 12 millions of sterling on average are included in the SME segment according to the definition of the European Commission[3]. On the contrary, companies on the Official List, showing an average turnover of 162 millions of sterling, are included in the Large segment. Panel b) (Industry) reports the industry classification referring to the 1-digit SIC Classification. The Services companies (e.g., hotels, business services, health, legal and social services) are highly represented in our sample: 46% on the AIM vs. 41% on the OL. Manufacturing and Wholesale and Retail Trade cover respectively about 24% and 13% for the AIM's companies and 28% and 14% for OL's companies, while each of the other economic groups gathers about 10% or less of the IPOs.

[3] Commission Recommendation 2003/361/EC of 6 May 2003 regarding the SME definition, which replaced Recommendation 96/280/EC as from 1 January 2005.

Figure 4.1 - Distribution of sample firms

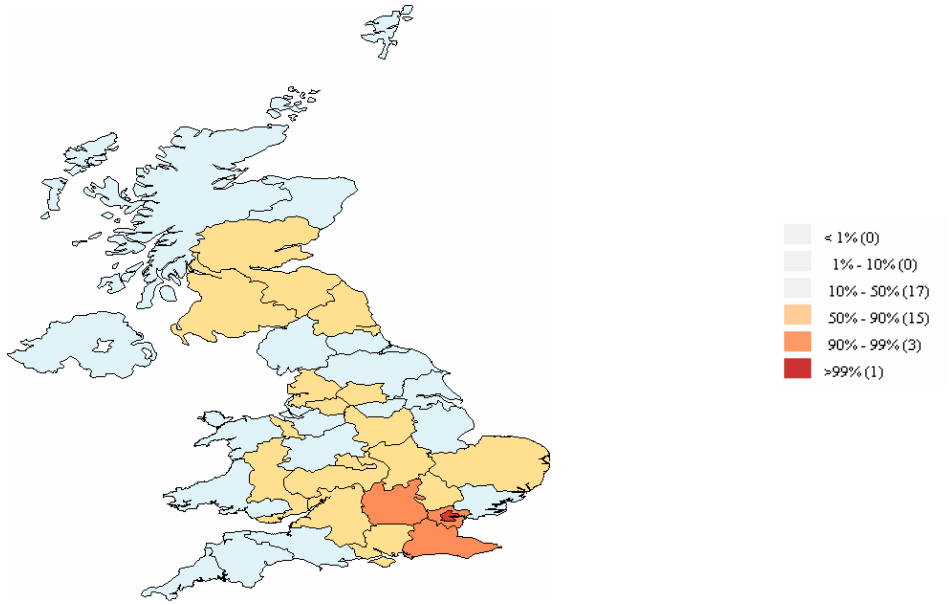

Figure 4.2 - Distribution of firms per thousands inhabitants

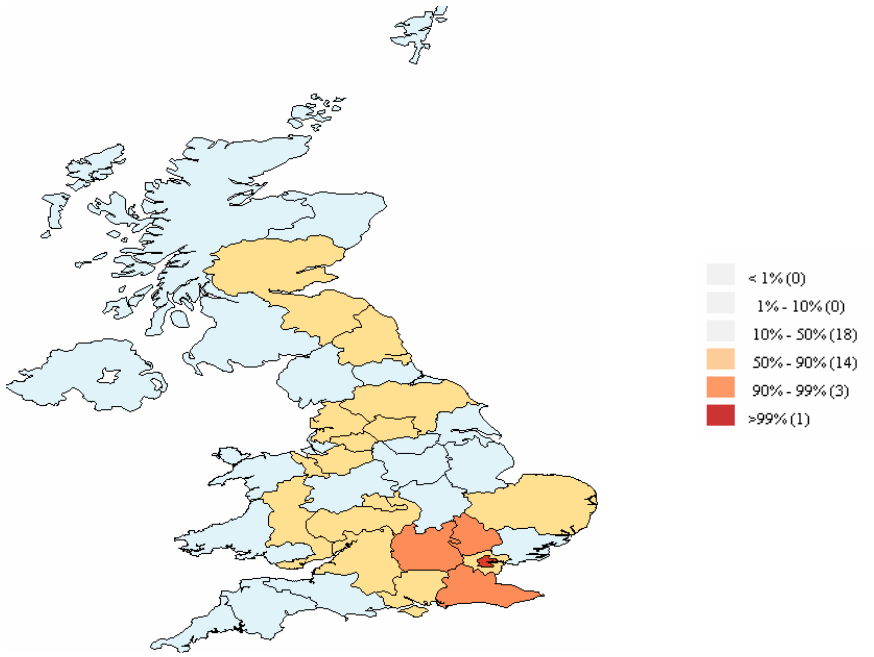

Table 4.1 - Descriptive statistics at IPO

a) Age and Size

	AIM			*Official List*		
Variable Name	*N. Firms*	*Mean*	*Std. Dev.*	*N. Firms*	*Mean*	*Std. Dev.*
Firm Age (years)	200	8	8	200	18	32
Sales (millions £)	200	12.2	38.5	200	162.0	490.0

b) Industry

	AIM		*Official List*	
Variable Name	*Frequency*	*Percent %*	*Frequency*	*Percent %*
Agriculture, Forestry and Fishing	2	1.00	1	0.50
Mining and Construction	18	9.00	7	3.50
Manufacturing	47	23.50	56	28.00
Transportation, Communication, Electric, Gas and Sanitary Service	10	5.00	18	9.00
Wholesale Trade and Retail Trade	25	12.50	28	14.00
Finance, Insurance and Real Estate	5	2.50	8	4.00
Services	93	46.50	82	41.00
Total	200	100.00	200	100.00

4.3.2 The Gibrat's Law

The relationship between firm's growth and external research provided by universities is investigated through the estimation of the Gibrat's law model (Gibrat 1931):

$$LnSize_{i,t} = \beta_0 + \beta_1 LnSize_{i,t-1} + \varepsilon_{i,t} \quad (4.1)$$

where $LnSize_{i,t}$ is the size of firm i at time t, $LnSize_{i,t-1}$ is the size of the same firm in the previous period and $\varepsilon_{i,t}$ is a random variable distributed independently of $LnSize_{i,t-1}$. Following Chesher (1979), if both sides of equation 4.1 are exponentiated, it becomes clear that if β_1 is equal to unity, then growth rate and initial size are independently distributed and Gibrat's Law is in operation. By contrast, if $\beta_1 < 1$, smaller firms grow at a systematically higher rate than do their larger counterparts, while the opposite is the case if $\beta_1 > 1$.

Empirical investigations of Gibrat's law rely on estimation of augmented equations including the *LnAge* of the firm. The resulting models are specified as follows:

$$LnSize_{i,t} = \beta_0 + \beta_1 LnSize_{i,t-1} + \beta_2 LnAge_{i,t-1} + \varepsilon_{i,t} \quad (4.2)$$

$$LnSize_{i,t} = \beta_0 + \beta_1 LnSize_{i,t-1} + \beta_2 LnAge_{i,t-1} + \beta_3 LnSize^2_{i,t-1} + \\ + \beta_4 LnAge^2_{i,t-1} + \varepsilon_{i,t} \quad (4.3)$$

Equation (4.2) and (4.3) can be generalised augmenting them by firm specific variables in the following form:

$$LnSize_{i,t} = \beta_0 + \beta_1 LnSize_{i,t-1} + \beta_2 LnAge_{i,t-1} + \Sigma \beta_j X_{j-2} + \varepsilon_{i,t} \quad (4.4)$$

$$LnSize_{i,t} = \beta_0 + \beta_1 LnSize_{i,t-1} + \beta_2 LnAge_{i,t-1} + \beta_3 LnSize^2_{i,t-1} + \\ + \beta_4 LnAge^2_{i,t-1} + \Sigma \beta_j X_{j-2} + \varepsilon_{i,t} \quad (4.5)$$

The final form estimation model we apply is the following:

$$LnSize_{i,t} = \beta_0 + \beta_1 LnSize_{i,t-1} + \beta_2 LnAge_{i,t-1} + \beta_4 University_{i,t-1} \\ + \beta_5 Growth_{i,t-1} + \beta_6 Industry_{i,t-1} + \beta_7 Year_{i,t-1} + \varepsilon_{i,t} \quad (4.6)$$

Where $Size_{i,t}$ for firm i in period t is a function of $LnSize_{i,t-1}$ and $LnAge_{i,t-1}$ of the same firm at the previous period, in accordance with the Law of Proportionate Effect. In addition, the equation include the independent variable $University_{i,t-1}$, which is a vector of variables defining universities research at regional level. A set of control variables $Growth_{i,t-1}$, $Industry_{i,t-1}$ and $Year_{i,t-1}$ allows to control for industry and calendar effects respectively.

The inclusion of the lagged dependent variable in the model requires dynamic estimation techniques. We have a large N and small T panel data set. Following the literature on dynamic panel estimators (Arellano and Bond 1991, Blundell and Bond 1998, Bond 2002), the model is estimated using the generalize method of moments (GMM) methodology. In particular, we chose the GMM-System (GMM-SYS) estimator developed by Blundell and Bond (1998) in order to increase efficiency. This approach instruments variables in levels with lagged first-differenced terms. The authors demonstrated dramatic improvement in performance of the system estimator compared to the usual first-difference GMM estimator developed by Arellano and Bond (1991). Furthermore, in system GMM it is possible to include time-invariant regressors, which would disappear in difference GMM. Asymptotically, this does not affect the coefficients estimates for other regressors.

4.3.3 Variables description

Dependent variable

Consistently with previous research on small businesses and entrepreneurship (Covin and Covin 1990, Covin and Slevin 1991, Lumpkin and Dess 1996, Sadler-Smith et al. 2003, Swierczek and Ha 2003, Wolff and Pett 2006), the dependent variable of our model is a measure of firms' growth. Actually, different variables can be considered as proxies of firm growth, e.g. sales or market share growth, number of employees. To our purposes, we choose sales growth for different reasons. First, in the literature on entrepreneurial firms it is the most widely used measure of performance as the entrepreneurial activity is considered mainly as a growth-oriented phenomenon which stimulates economic performance of individual firms and, as a consequence, general economic growth. The dependent variable, $LnSize_{i,t}$, is, hence, measured as the natural logarithmic of sales at constant prices for firm *i* at period *t*.

Independent variables

Following the Gibrat's Law, our model include characteristics specific to the enterprise such as firm *LnSize* and *LnAge* at period *t-1*. Firm *LnAge* is measured as one plus the age of the firm at the moment of the IPO in logarithmic scale.

To analyze the impact of universities research on firms' growth in the region, the model comprises measure of knowledge endowment both in terms of knowledge input and output, trying to highlight the different mechanisms for transferring knowledge as reviewed in the literature. *Research funding* reflects the potential knowledge capacity of a region as provided by universities and is a proxy for market opportunities generated by knowledge spillovers. This input-related variable measure the amount of research funds financed by HEFCE and available to each

university. HEFCE research funds are distributed selectively to higher education institutions that have demonstrated the quality of their research by reference to national and international standards. Quality is measured according to the periodic Research Assessment Exercise (RAE). The quality-related research funding are distributed to institutions with reference to both the quality and volume of research activity, where quality is defined by a rating, on a scale of 1 to 5* (five star), and volume is a function of the number of research-active academic staff, research assistants and research fellows.

As far as knowledge output is concerned, we introduced two distinct variables accounting for different impacts of university output at regional level. First we introduced the share of academic publications in social science (*SocialScience)* with respect to the number of publication in both natural and social sciences. This variable gives a measure of knowledge produced by local universities which is appropriable by firms and, thus, represents an important source of entrepreneurial opportunities. More precisely, the proxy accounts for the relative weight of sciences with a high level of tacitness with respect to sciences based on codified knowledge, i.e. natural sciences. Additionally, the model includes the number of total students in local universities, measured in logarithmic scale, as a proxy of human capital available in the region. This variable accounts for the spillovers of knowledge embodied in young and highly educated students.

Control variables

We further include a set of control variables which may have an impact on firm growth. *Growth* between *t-1* and *t* is meant to account for likely interactions between the macroeconomic situation and the performance of the individual firm and, thus, to control for local determinants influencing firm's growth rate. Finally, in our model we control for both industry and

calendar year effects. Following the primary 1-digit standard industrial classification (SIC) code for the IPOs analysed, a set of dummies (*Industry*) are included in the model to control for industry-specific factors, as industry cycles and trends, that may influence the rate of growth of individual firms. In our model, we also included a set of dummies variables controlling for calendar year effects due to the fact that the IPOs in our sample happen to be in different calendar year. Table 4.2 summarizes the variables measurement methods for both the dependent and independent variables introduced in the model while descriptive statistics are presented in Table 4.3 [4].

[4] We also ran analyses using a Gibrat's Law model including squared terms of both Age and Size; this method did not substantively alter our results.

Table 4.2 - Variables Measurement Methods

Variable	Description
$LnSize_t$	Logarithm of the size of the firm at *t* measured by sales
$LnSize_{t-1}$	Logarithm of the size of the firm at *t-1*measured by sales
$LnAge_{t-1}$	Logarithm of 1 plus the number of years from firm's foundation to the IPO at *t-1*
Research funding	Logarithm of total research funding by universities in the firms' region
SocialScience	Ratio between publications in social sciences and total publications by universities in the firms' region
Students	Logarithm of total number of students attending universities in the firms' region
Growth	Annual GDP growth rate of log-normalized sales (constant prices) in the firms' region
Industry	Set of industry dummies according to the 1-digit SIC code classification
Year	Set of calendar dummies

Table 4.3 - Descriptive statistics of independent variables

AIM					
Variable	*Mean*	*Std. Dev.*	*Min*	*Max*	*Observations*
$LnSize_{t-1}$	10.45	2.31	0.06	17.49	1021
$LnAge_{t-1}$	1.97	0.84	0	3.69	1032
Research funding	12.81	0.92	9.58	13.89	1062
SocialScience	0.26	0.08	0.17	0.65	1062
Students	11.67	0.83	8.93	12.49	1062
Growth	0.09	0.07	-0.07	0.27	764
Official List					
Variable	*Mean*	*Std. Dev.*	*Min*	*Max*	*Observations*
$LnSize_{t-1}$	12.78	1.85	5.43	19.99	1181
$LnAge_{t-1}$	2.28	1.13	0	5.25	1126
Research funding	12.81	0.83	10.20	13.89	1184
SocialScience	0.25	0.06	0.18	0.65	1184
Students	11.65	0.78	9.43	12.49	1184
Growth	0.12	0.31	-2.06	2.36	796

4.4 Results

Table 4.4 presents the correlation matrix while the results of the econometric estimations are shown in Table 4.5. The correlation matrix reveals that some rather high correlations should be taken into account in the analysis. Particularly, *Research Funding* and *Students* turn out to be significantly correlated in both the AIM and OL samples. Such high correlations are probably related to one specific reason. The two variables are both measures of size, the former referring to the knowledge input and the latter to the knowledge output available in the region. Given their high correlation, the two explanatory variables are included in separate regressions. Model 1 presents the results using *Research Funding* while Model 2 displays estimation results using *Students* for both AIM and OL. Coefficients for the other variables included in the model are consistent in spite of the university-related variable used, confirming the robustness of estimations for both the samples.

The results of the estimations show that both university input and output influence firm growth for AIM sample while no effects of university-related variables are found for OL companies. The amount of research funding available to universities in the region has a positive impact (significance at 5% in both models) on the rate of growth of AIM's firms, suggesting that for young and growing companies the spillovers of knowledge in the innovation system matter. This result supports the hypothesis that the access to external knowledge sources may have different effects on firms' growth depending mainly on the diverse profile of such a firms. Entrepreneurial companies in early phases of the life cycle widely rely on external sources of research activities as they have major difficulties in developing internal research.

Table 4.4 - Correlation matrix

			AIM			
	LnSizet-1	*LnAget-1*	*Research funding*	*SocialScience*	*Students*	*Growth*
$LnSize_{t-1}$	1.00					
$LnAge_{t-1}$	0.23	1.00				
Research funding	0.00	-0.19	1.00			
SocialScience	0.05	0.08	-0.55	1.00		
Students	-0.01	-0.16	0.95	-0.52	1.00	
Growth	0.02	0.24	0.12	-0.02	0.13	1.00
			Official List			
	LnSizet-1	*LnAget-1*	*Research funding*	*SocialScience*	*Students*	*Growth*
$LnSize_{t-1}$	1.00					
$LnAge_{t-1}$	0.26	1.00				
Research funding	-0.02	-0.12	1.00			
SocialScience	0.00	0.05	-0.44	1.00		
Students	-0.01	-0.13	0.93	-0.44	1.00	
Growth	0.02	0.03	0.02	0.00	0.02	1.00

As far as the university output is concerned, *SocialScience*, measuring the relative weight articles published in the social science, is found to be positively and significantly ($p<0.05$ in both models) correlated with the firm rate of growth confirming that research activity in this field positively impacts the growth of firms in AIM sample. Actually, AIM companies operate mainly in knowledge-intensive sectors, such as business services, health, legal and social services, wholesales and retail trade. These companies are particularly dependent on knowledge in social sciences and thus are motivated to interact with universities conducting research in this field. Conversely, research intensity in natural science is less important for this class of firms. This result lends support to the hypothesis that sciences more tacit in nature positively impact the knowledge spillovers in the innovation system.

The number of students in the region is also positively and significantly correlated ($p<0.05$) to firms rate of growth for AIM companies. This result suggests that knowledge embodied in people and accessible in the region may foster the rate of growth of small and young companies.

As to the remaining variables, *LnSize* shows a statistically significant ($p<0.01$) impact on firm growth, suggesting that smaller firms grow faster than their counterparts, as shown by the coefficient smaller than one in all the four regressions. The coefficient of *LnAge* is statistically significant only for sample companies listed on the Official List. While AIM's sample is quite concentrated on the mean with respect to *LnAge*, OL's companies are more dispersed from the mean value. The OL's rate of growth is thus influenced by *LnAge* effects. It seems that characteristics related with the age of the firm count more than external knowledge effects for the sample of IPO's on the Official List, comprising more mature and stable companies than the AIM sample.

Table 4.5- Results of GMM-SYS Regression

	AIM				*Official List*			
	Model 1		*Model 2*		*Model 1*		*Model 2*	
Constant	1.208		1.623		6.583	***	6.435	***
	(1.21)		(1.50)		(4.84)		(5.02)	
$LnSize_{t-1}$	0.696	***	0.701	***	0.508	***	0.508	***
	(6.55)		(6.80)		(5.61)		(5.63)	
$LnAge_{t-1}$	0.160		0.145		0.120	***	0.120	
	(1.44)		(1.38)		(2.59)		(2.59)	
SocialScience	1.587	**	1.342	**	-0.153		-0.096	
	(2.14)		(1.970)		(-0.27)		(-0.17)	
Research funding	0.150	**			0.010			
	(2.23)				(0.22)			
Students			0.132	**			0.022	
			(2.01)				(0.43)	
Growth	-0.385		-0.382		0.026		0.026	
	(-0.31)		(-0.31)		(0.23)		(0.23)	
Industry	Yes		Yes		Yes		Yes	
Year	Yes		Yes		Yes		Yes	
Number of instruments	42		42		42		42	
Wald Test $\chi 2$ *(12)*	256.51	***	245.43	***	202.04	***	204.08	***
Hansen test $\chi 2$ *(8)*	12.43		12.21		21.75		21.70	
Prob> $\chi 2$	(0.867)		(0.877)		(0.297)		(0.300)	
AR(1)	-5.73	***	-5.79	***	-2.42	**	-2.43	***
Prob> z	(0.000)		(0.000)		(0.015)		(0.015)	
AR(2)	0.05		0.04		0.06		0.06	
Prob> z	(0.960)		(0.964)		(0.955)		(0.955)	

Statistical significance at
**p<0.10*
***p<0.05*
****p<0.01*
z statistics between parentheses

As the validity of GMM relies on the choice of the appropriate set of instruments and the absence of serial correlation of second order, the results of the post-estimation tests are included in Table5. The Hansen test for over-identifying restrictions give us confidence with the validity of the instruments for the overall estimations. As expected, negative first-order serial correlation is found in Arellano-Bond AR(1) test while the Arellano-Bond AR(2) test indicates the validity of instruments for both AIM and OL regressions.

4.5 Discussion

In this paper the determinants of firms' growth are inferred from a broad range of variables. In accordance with the knowledge spillovers literature, the aim of the research has been the understanding of the relationship between universities and new businesses growth, with a particular focus on the role of knowledge spillovers. Our results suggest that the production of new knowledge by universities in a specific region positively impact the rate of growth of entrepreneurial companies in the early stages of the life cycle. Thus, it seems that such a firms are more able to access and absorb knowledge spillovers than their counterparts. In particular, the analysis conducted in this paper give evidence to the positive role of investment in research activities for the process behind small and young firms' growth. Furthermore, university's output derived by these investments in terms of both scientific publication and human capital is also found to be related to firms' rate of growth. In sum, our results support the hypothesis that the interaction between different actors, the importance of codified and tacit knowledge stocks and investment in the creation of new ideas can generate opportunities for growth of entrepreneurial firms.

By analyzing the role played by external knowledge sources such as universities, the paper contributes to the literature on the determinants of firms' growth. Addressing this issue is a significant contribution in the literature as previous empirical studies have mainly focused on the impact of knowledge spillovers on firm concentration while their effects on firms' growth have not been sufficiently investigated. A further contribution is related with the comparison between AIM and OL samples. The results lend support to the idea that knowledge produced and diffused in the local environment is more important for entrepreneurial companies than for companies in more advanced stages of the development process.

The results of this work bring some policy implications. Policy makers could play the key role of setting the basic conditions to entrepreneurship dynamism. Public policy acts as facilitators of the interactions process between firms and universities. By financing research activities policy makers can contribute to nurture the local knowledge capacity and, in turn, promote growth of firms. To conclude, we believe that further researches could extend the results of our analysis. Future analysis need to distinguish the impact of external knowledge on different kinds of business activities, maybe distinguishing manufacturing and services activities in knowledge based sectors.

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Chapter 5

Conclusions

The research carried out in this thesis contributes to the literature linking entrepreneurship and firms performances taking into account the multilevel nature of the entrepreneurship concept. From our study common traits for entrepreneurial companies emerge.

In the first part of the work, the individual level was at the heart of our analysis. By looking at both organizational information and board of directors characteristics, intangible assets were found to play a crucial role in shaping firms rate of growth. According to our results, the educational attainment of key figures managing the company appeared to be an important determinant of firms performances. This finding proved the importance of codified knowledge. Besides, also tacit knowledge seemed to matter as highlighted by the impact of individual learning dynamics on the development path of firms. In addition, organizational factors were investigated. Our result revealed that companies showing a high risk exposure at the moment of the IPO growth more than their counterpart. Furthermore, consistently with the life-cycle theory, we found that entrepreneurial companies follow an S-shaped pattern of growth.

In light of the factors affecting firms growth, in the second part of the thesis we investigated the relationship between EO and firm market

performance with the purpose of verifying whether investors positively evaluate entrepreneurial orientation. Our results confirmed a positive impact of risk-taking and proactivity on investors' valuation. More precisely, the price premium paid by investors in the prospect of high returns is higher for companies showing a higher risk position. Furthermore, proactive behaviours of the top management team seems to have an impact on the valuation of investors.

In the third paper, we moved the attention on external factors affecting firms performance. In accordance with the knowledge spillovers theory of entrepreneurship, the paper contributed to the literature by investigating the connection between external sources of research, in particular universities, and individual firm growth. The analysis highlighted the positive role of research institutions in influencing entrepreneurial activities of small and young companies. Indeed, both university input and output appeared to influence firm growth for AIM companies while no effects of university-related variables are found for OL companies. The results lend support to the idea that knowledge produced and diffused in the local environment is more important for entrepreneurial companies than for companies in more advanced stages of the development process. Indeed, entrepreneurial companies in early phases of the life cycle widely rely on external sources of research activities as they have major difficulties in developing internal research.

The results of this work bring both management and policy implications. At managerial level, it is important to remark the crucial role of key figures attributes and attitudes. The stock of knowledge and learning processes internal to the organization help in increasing firms performances. Additionally, risk taking and proactivity are important traits of both individual and organization for succeeding. Another crucial issue for the top management of companies is related with financial constraints. In their start-up and growth phases, firms need substantial

external funding. However, the literature on this topic highlights that small and young enterprises are subject to 'credit rationing'. The results of the present study revealed the emerging role of secondary markets, such as the AIM, in removing financial constraints that hamper the prospects of new businesses. The existence of markets dedicated to young and growing companies allows such a companies to rise the capital required to finance their growth.

Moving the attention on the policy implications of this work, it is important to remark the key role of policy makers in setting the basic conditions to entrepreneurship dynamism. Political intervention could aim at promoting entrepreneurial activities, which ease the local process of change by encouraging the propensity to risk and easing the access to external capital. Education towards entrepreneurship represents an example of how is important the stimulation a more dynamic entrepreneurial culture. Public policy can also ease the interactions process between firms and universities. By financing research activities policy makers can contribute to nurture the local knowledge capacity and, in turn, promote growth of firms. In order to increase the population of entrepreneurs, another appropriate policy would be to foster the participation of young and the unemployed work force in the entrepreneurial process. It is important to look at the process of transformation in the cultural and behavioral attitudes of many countries towards entrepreneurship, in particular on the matter of rewarding propensity to risk, an element that brings with it economic advantages. The increase in the number of new firms and their relative chances of survival and growth is, thus, an important objective for governments action.

Although we consider this set of articles a valid contribution to the literature on the relationship between entrepreneurship and firms performances, we believe that further researches could extend the results

of our analysis. After some crucial determinants of entrepreneurial companies have been highlighted, an important research question is related with the the basic conditions of firms survival. We believe it is important to veify whether the analysed factors also assure a long term process of growth. Finally, future analysis need to differentiate the impact of diverse kinds of business activities, maybe distinguishing manufacturing and services activities in knowledge based sectors.

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