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THE IMPACT OF TOP MANAGEMENT TEAM CHARACTERISTICS ON FIRMS GROWTH

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Abstract

This study attempts to identify the factors affecting the growth of companies listed on the Alternative Investment Market (AIM), the London Stock Exchange's market dedicated to young and growing companies. We investigate the post IPO growth of a panel consisting of 665 companies listed on the AIM from 1995 to 2006. Our empirical model is estimated using the GMM-System (GMM-SYS) estimator. Our findings confirm that small companies listed on the AIM grow at a faster rate after the IPO. It seems that both human capital and firm characteristics are important determinants of their fast growth. The results of this study carry some policy implications. Policy makers could take into account the relevance of an efficient financial system. Moreover, it is important to look at the process of transformation in the cultural and behavioural attitudes of many countries towards entrepreneurship.

Introduction

An Initial Public Offering (IPO) is one of the most notable phases in the evolution process of a firm and one of the most important entrepreneurial settings, being characterized by a high degree of uncertainty. The IPO involves major managerial, strategic and organizational changes as it represents the evolution towards a public company. 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 and changes in the ownership and governance structure.

Arguments based on the life cycle theory and the resource based view emphasize that along the life cycle path organizational skills, resources and competences evolve for adapting to changing environment. Thus, in the crucial stage as is the case with an IPO, issuing companies rapidly evolve in order to face new challenges. In the area of business and finance authors emphasize the role of critical resources in shaping the evolution and growth of listed companies (Wernerfelt 1984; Zingales 2000; Rajan and Zingales 2001; Kaplan et al. 2009). According to these theories the critical resources change along the life cycle. In particular Kaplan et al. (2009) highlight how firms characteristics and resources evolve from early business plan to IPO and post-IPO and found that while the firm's initial critical resource is the founder, along the life cycle path the investments built around the founder become the critical resource.

In an IPO on a secondary market, such as the Alternative Investment Market (AIM) - which is the London Stock Exchange's international market dedicated to young and growing companies - uncertainty, challenges and changes are even more marked as such an IPO represents the very rapid transition from a start-up to a public company. Indeed, companies listing on the AIM 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. This kind of firm at the moment of the IPO is facing uncertainty and risk as a result of the lack of operating history and

reputation in the market, among other factors. Yet empirical evidence shows that the performances of companies listed on the AIM widely increase in the post-IPO period. As Khurshed *et al.* (2003) show, the AIM is the first market where operating performance, as measured by means of ROA, ROE, ROS and asset turnover, is not found to be declining after the IPO. Cassia and Colombelli (2008) and Cassia *et al.* (2009) find that knowledge spillovers are important determinants of the growth of entrepreneurial firms listed on the AIM. These evidence are intriguing in view of the high level of risk and uncertainty which characterizes the activity of firms listed on the Alternative Investment Market.

Previous empirical works focusing on the relationship between top management teams characteristics and firms' performance after an IPO have mainly relied on performance measures like investor valuations, stock returns or profitability. On the other hand, in the last decade, entrepreneurship scholars have devoted growing effort to the analysis of the determinants of firm growth and factors related to firm founders have figured prominently among these determinants. To our knowledge, however, there is a lack of contributions analysing the impact of top management team characteristics and firms growth after an IPO. We think that the theme is both topical in the academic debate and has practical relevance. Indeed, managing firm start-up and public companies may require different types of capabilities, expertise and knowledge. A better understanding of the drivers of firms growth after the IPO may help in identifying the changes in management style and top management team's composition that should emerge for a company when going public.

In light of this, this study attempts to identify factors affecting the growth of companies listed on the AIM in the post-IPO period. More precisely, we evaluate whether the growth of AIM's companies during the post-IPO period is determined by characteristics of the firm such as top management team human capital and organizational features at the time of going public. For this

purpose, we investigate the post IPO performance in three periods of time of 665 listed firms, which went public during the years from 1995 to 2006.

Our findings can be interpreted in light of existing theories of the firm. Firstly, our finding can be interpreted in light of the resource based view of the firms that emphasize the role of resources critical to the firm's process of growth. Secondly, our results are consistent with the upper echelon theory (Hambrick and Mason, 1984) stating that organizational outcomes, in terms of strategic choices and performance levels, are partially predicted by managerial background characteristics. This view seems of particular importance for companies undergoing an IPO on the AIM as they are in an entrepreneurial phase that requires top managers to make important strategic decisions. Finally, we also relate our results to the life cycle theory as AIM's companies are found to follow a predictable S-shaped pattern of growth. The analysis carried out in this paper also adds to the empirical literature as it provides new evidence on both organizational and CEO characteristics of companies operating in the transitional stage as is the case with an IPO. By focusing on variables relating to both firm and top management history, our results show that both firm and CEO characteristics positively affect firm growth. In particular, the results of our analysis underline how risk taking and CEO educational levels 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 managerial and policy indications.

The paper is organized as follows. Section 2 outlines the theoretical framework underlying the paper and clarifies the research background of the study. In section 3 we describe the AIM and present the dataset and the sample of companies analysed in this work. The model and the variables used in the analysis are presented in the methodological section. Next, in section 5, we describe and discuss the results of the analyses. Finally, section 6 presents the interpretation of our findings and some policy implications.

1. Theoretical framework and hypothesis development

A growing interest in the literature has been devoted to entrepreneurial features 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 firms' innovation capability and strengthening learning skills. The role of entrepreneurship in firm performance has been analysed on different levels. On the one hand, the literature on entrepreneurship has paid attention to 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, some of the literature has focused on firms' entrepreneurial behaviour at the organizational level. In this vein, one of the most important features of a firm showing an entrepreneurial orientation is considered to be 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 unknown markets (Baird and Thomas 1985).

Following these arguments human capital and organisational resources are assumed to play a relevant role in fostering firms' performance. This idea is consistent with the resource-based theory that has its roots in economic theory (Penrose, 1959) and emphasizes the role of critical resources in shaping firms' evolution and growth (Wernerfelt, 1984; Rumelt, 1984; Dierickx and Cool, 1989; Barney, 1991). According to the resource-based view of the firm a critical resource can be either a person or a specific asset that cannot be easily imitated and differentiates a firm from its competitors. A number of works has pointed out that human capital – where human capital refers to the knowledge, skills and experience that foster the growth of firms - is the critical resource at the basis of firm growth (see Alvarez and Busenitz, 2001) and new opportunities exploitation (Teece et al., 1997; Eisenhardt and Martin, 2000). Teece et al. (1997)

develop the concept of dynamic capabilities referring to the ability of adapting organizational skills, resources and competences to changing environment. In this view, capabilities and experiences are the base for firm success. Grant (1996) focus upon knowledge as the primary of firm's resources. According to the author, individuals are the principal repository of knowledge and thus the main actors behind knowledge adoption and application. In this line of thoughts, the educational level of individuals can be regarded as a useful measure of their stock of knowledge. Other authors (Rajan and Zingales, 2001; Kaplan et al., 2009) highlight that while the firm's initial critical resource is the founder, along the life cycle path the investments built around the founder become the critical resource. The idea that human capital and organizational resources exert a preeminent impact on firms' performance is also consistent with the upper echelon theory (Hambrick and Mason, 1984). In the upper echelon model indeed the values and cognitive bases of powerful actors in the organization interact with strategic choices to determine organizational performance levels.

These concepts are also in line 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, pp. 46–48) which defines as 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 this line of reasoning, 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 to the market. Second, they are facing uncertainty, as they

do not have market history. Third, they are making decisions on their form and resource allocation. In accordance with the literature on this topic, we claim that such a firm's growth is affected by both entrepreneurial firm behaviour like 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 capabilities. A brief review of the literature may allow us to identify for each dimension some of the relevant variables influencing firm performance.

First, empirical evidence shows how younger and smaller firms grow more than older and larger ones. Consistent with the life cycle model (see Quinn and Cameron 1983; Miller and Friesen 1984), an enterprise actually 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 argues that the firm shows an exponential growth path over time during the first stages – birth and growth – and this is associated with high level of risk taking; after that, during the maturity and decline phases, the firm starts on a new path showing an asymptotic profile, as soon as sales growth, together with risk taking, slows down. Following these arguments, we expect a negative relationship between age and size and firm growth. Furthermore, concerning the risk level of business, previous research has shown how young and small firms are associated with high risk as they lack past experience and no complete information on their operational activities and quality are available. Due to information asymmetries, small and young enterprises are often subject to 'credit rationing' (Jaffe and Russel 1976; Stiglitz and Weiss 1981; Fazzari et al. 1988; Winker 1999). Similarly, Cressy and Olofsson (1997) finds that smaller businesses are more financially risky than their counterpart and consequently face higher difficulties in accessing external finance. This

may hamper their prospects of growth. However such companies have also the opportunity to attract investments from venture capitalists (VC), which provide equity to those firms with high risk. For this reason, the literature has tried to understand the impact of venture capitalists on firm performances. However, the debate on the effect of venture capitalists' investments on firm performance is still open. On the one hand, recent arguments in the literature support the benefits of VC involvement during the post-IPO phase since venture capitalists are assumed to provide firms with additional dynamic capabilities (Arthurs and Busenitz, 2006). On the other hand, further studies have found a negative effect of VC involvement on the stock returns explained by the fact that, first, VC promote the listing of companies in early stages and, second, they also adopt early exit strategies in order to exploit high initial returns (Brav and Gompers, 1997; Jain et al., 2008). Another dimension of risk taking is related to the borrowing propensity of a company. Entrepreneurial firms are expected to incur high debt and hence to show high leverage ratios in order to obtain high returns. Several studies have focused on the 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, as proxied by firm's age and size, venture capitalists financing and leverage ratio, on the rate of growth of firms listed on the AIM. Formally:

H1: Risk taking propensity, characterising young, small, venture capital financed and leveraged firms, will be positively related to the firm rate of growth.

Secondly, a large body of empirical research supports the existence of a relationship between firms' performances and founders' or top managers' educational background (Bates 1990; Storey 1994; Roper 1998; Carmeli and Tisher 2004; Audretsch and Lehmann 2005; Lester et al. 2006). The board of directors has important roles of governance as, for example, the right to choose and advise the management of the firm. Moreover, directors acquire and evaluate information on the firm's financial situation in order to define its strategies. Their education and skills may thus be

an important asset for the firm. For example Audretsch and Lehmann (2005), in their study of the determinants of the post-IPO performance in the German Neuer Markt, 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 AIM's firm growth. This leads to the following hypothesis:

H2: The CEO and directors' educational level will be positively related to the firm rate of growth.

Finally, previous works highlight how firms' performances may depend on CEOs and executive managers' competences and experience (Lee and Tsang 2001; Carmeli and Tisher 2004). Some contributions (Rotemberg and Saloner 2000; Schutjens and Wever 2000) argue that the survival of the firm is influenced by the capabilities and experience of the board. For example, Lester et al. (2006) find that the prestige of top management teams (TMTs), measured on the basis of previous experience and educational levels at the time of an IPO, enhances firm performances, as measured by means of investor valuations. Yet, managing firm start-up and public companies may require different types of capabilities and knowledge. Thus, while founders may possess entrepreneurial capabilities for starting a new business, professional CEOs may possess managerial skills for leading a firm after an IPO (He, 2008; Jain and Tabak, 2008). In this line of reasoning, a number of works focussing on CEOs and founders highlight that in addition to expertise also attitudes such as creativity, intuition, appetite for growth, typical of young directors and founders, are key determinants of firm performance. In this vein, previous researches have found that older top managers compared to their younger counterparts tend to be more risk averse and less likely to invest in growth strategies (Hambrick and Mason, 1984; Barker and Mueller, 2002; Mudambi and Treichel, 2005). Following these arguments, we finally aim at verifying if companies managed by directors with previous experience and skills will

exhibit higher growth rates than those managed by directors without previous experience and skills. Moreover we investigate the relationship between founder-CEOs and CEO age at the IPO and firm growth. Formally:

H3: CEO capabilities, measured by means of CEO age, previous experience and founder status, will be positively related to the firm rate of growth.

2. The Alternative Investment Market

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. The AIM is the London Stock Exchange's market for smaller and growing companies. In accordance with the corporate life cycle model, these firms are in their entrepreneurial phase, characterized by high innovativeness and entrepreneurial creativity, and also by a high level of uncertainty. Moreover, no specific suitability criteria are required to qualify for the listing on the AIM. Companies do not need a particular financial track record or trading history. There is also no minimum requirement in terms of size or number of shareholders. 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 who 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.

Figure 1 shows the pre- and post-IPO trends of sales, total assets and capital expenditure (CapEx) for companies listed at the AIM during the period 1995-2006. 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. Figure 1 proves that firms listed on AIM

increase in terms of sales, total assets and capital expenditure after the IPO. It seems that companies list on the AIM in order to implement a growth strategy and use the capital raised at the listing to realize new investments, as the increase in total assets and capital expenditures shows.

This market provides a unique setting to study factors affecting the post-IPO growth of listed companies. It is evident that the IPO on the AIM represents a period of discontinuity for firms' performance. Since an IPO it is also a period of major changes in firms' organization, resources and capabilities, we attempt to verify the link between these features and firms' growth.

While we believe that the analysis of AIM's companies leads to novel results and adds to the debate on IPOs characteristics and performances, we are aware that such a sample is a peculiar one in that all the companies included eventually went public. While it would be of some interest to study small and young companies that did not go public, it is difficult to find information for them. Moreover, in this paper we are interested in determining whether firm's characteristics at the time of the IPO influence the post-IPO growth of companies listed on the AIM.

Figure 1 about here

3. Empirical evidence

4.1 Dataset and sample

In order to investigate the impact of firms' characteristics on their growth, we refer to the EurIPO database which collects data on more than 3,000 operating companies that went public in the main European markets (London, Frankfurt, Euronext, and Milan) through IPOs during the period 1985-2006. We focus on the subset of companies listed on the AIM from 1995, year of its launch, to 2006. The dataset combines publicly available information (for example year of establishment, listing date), accounting data from balance sheets and income statements (the main variables of consolidated financial statements in a range from three years before to three years

after the listing date of each firm) and data related to both the offer and the ownership structure, hand-collected from IPO prospectuses.

For the purpose of analyzing the influence of human capital and organizational features on firm performance, we mainly focus on the 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 such as its operating history, products and ownership structure. Additionally, it includes biographical information regarding the founder, CEO and the firm's executive management.

Our sample consists of 665 companies listed on the AIM out of about , companies listed at the time of data collection, for which we were able to collect information. Descriptive statistics for the sample in the IPO year are provided in Tables 1 and 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 as their mean, 4 as median. As far as the size is concerned, AIM firms, with 122 employees, a turnover of 25.1 millions euro and total assets of 31.3 millions euro on average, are included in the SME segment¹.

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

Panel (c) (Ownership) in Table 2 describes the sample in terms of top management related variables such as CEO biographical information, board educational level and number of venture capitalists. The CEO is also the founder of the company for 48% of the sample. On average the

¹ Our study defined SMEs using the definition used by all of the member states of the European Union since January 2005. This definition categorized micro, small and medium-sized enterprises as enterprises that employ fewer than 250 persons, with an annual turnover that does not exceed 50 million euros and/or an annual balance sheet total that does not exceed 43 million euros.

CEO has past experience on other companies' board of directors. Most of the CEO are in their 40s and do not hold a post-graduate title. Most of the companies have on their board at least one director with an academic degree while almost a half of the firms are financed with venture capital funds.

Descriptive statistics for the pre- and post-IPO operating performance in the IPO sample are provided in Table 3. The two periods of time are compared through median comparison tests (Mann-Whitney) and mean comparison tests (t-statistics). F-tests for equal variance are also provided. The analysis confirms that firms listed on AIM considerably increase in terms of sales, total assets and capital expenditure after the IPO.

If we shift our attention to the measures of firm performance we can refine our considerations. The results show that firms grow at faster rates 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 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 capital expenditure. This result supports the idea that companies list on the AIM in order to implement a growth strategy. Finally, as expected the leverage diminishes in the post-IPO period of time. Indeed, the issue gives firms the opportunity to raise equity capital and consequently to decrease their leverage.

Table 1,2 and 3 about here

4.2 Specification of the econometric model

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

$$\begin{aligned}
\text{Firm Growth Rate}_{i,t} = & \beta_0 + \beta_1 \text{Firm Growth Rate}_{i,t-1} + \beta_2 \text{Risk Taking}_{it} + \\
& \beta_3 \text{Education}_{it} + \beta_4 \text{Capabilities}_{i,t} + \beta_5 \text{Control}_{it} + \varepsilon_{it}
\end{aligned}$$

where sales growth for firm i in year t is taken as the dependent variable.

A methodological issue that needs to be taken into account in our analysis is related to serial correlation in firms' annual growth rates. While debate on this issue remains ongoing, previous works have found evidence of persistence in growth rates and that autocorrelation is positive for large firms (Chesher, 1979; Geroski et al., 1997; Bottazzi and Secchi, 2006; Coad, 2007; Coad and Hözl, 2011; Colombelli et al., 2013). We control for autocorrelation among growth by including as an explanatory variable $\text{Firm Growth Rate}_{i,t-1}$, which is the lagged value of the dependent variable. Risk Taking_{it} , Education_{it} and Capabilities_{it} are groups of variables describing the three entrepreneurial dimensions highlighted in the theoretical framework while Control_{it} is a set 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 estimators (Arellano and Bond 1991; Blundell and Bond 1998; Bond 2002), the model is estimated using the generalized 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.

4.3 Dependent and Explanatory variables

In accordance with the framework used in this paper, the variables included in our model can be grouped into three classes. The first refers to the degree of risk associated with the firm, the second to the education levels of the board, the third represents CEO capabilities. Moreover a set of control variables has been used to provide greater robustness to the analysis. In the remainder of this section we provide an outline of the indicators 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 firm performance. Actually, different variables can be considered as proxies of firm performance, for example sales or market share growth, number of employees or financial outcomes. For our purposes, we choose sales growth for several reasons. First, in the literature on entrepreneurship it is the most widely used measure of firm performance as 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 IPO sample under scrutiny is principally composed of 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 firms' performances. In sum, sales growth is both a measure of the firm's contribution to the overall economic growth and a proxy for its owners' and managers' propensity to pursue growth trajectories. The dependent variable is hence computed as the growth rate of firm sales in each period t . Such a rate has been computed as the ratio between sales in two subsequent periods on a logarithmic scale that is the difference between logs of sales yielded in two sequential periods. In particular we focus on the post-IPO period of time.

As far as independent variables are concerned, we grouped them into three categories: risk-, education- and capabilities-related 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 refer respectively to the logarithm of sales (*Firm Size*) and the age of the firm at the time of the IPO on a 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 time 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 that rely on venture capital investments (Lester et al. 2006; Jain and Tabak, 2008; Jain et al., 2008); it is a dummy variable which takes a value of 1 if at the time of the IPO venture capitalists were involved in the ownership structure of the firm, 0 otherwise.

Secondly, we introduce into our model the education-level variables to investigate the influence of human capital on AIM's firm growth. Recent studies show how prestige and educational background of CEO and board of directors may impact firm performance in the markets (Lester et al. 2006, Jain and Tabak, 2008; Jain et al., 2008) and firm survival (Bates 1990; Audretsch and Lehmann 2005). Our measures of CEO and board educational level are *Board Education*, *CEO Non Graduate*, *CEO Business Certificate*, *CEO Postgraduate* and *CEO Research*. The first is a dummy taking the 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 the value 1 if the CEO holds respectively no graduate degree, business certificates, post-graduate or PhD degrees, as reported in the IPO prospectus.

As far as learning capabilities is concerned, we explore the role of CEO work experience 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 directing in previous experience. Based on previous works (Lester et al. 2006; Jain and Tabak, 2008; Jain et al., 2008) 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 on other firms' boards of directors. To account for the possible impact of capabilities and experience, 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.

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, ten industry dummies were included in the model to control for industry-specific factors, as industry cycles and trends may influence the rate of growth of individual firms. In our model, we also included a set of dummy variables controlling for calendar year effects. In Table 4 the basic features of both the dependent and independent variables of the model are summarized.

Insert Table 4 about here

4. Empirical Results

Table 5 presents the pairwise correlation matrix while the results of the econometric estimations are shown in Table 6. As it appears from the pairwise correlation matrix, no high correlations are found among the variables included in the empirical model. Yet, the three groups of independent variables are added in separate regressions (Table 6). Model 1 includes the risk-related variables, Model 2 adds the education-related variables and, finally, Model 3 with the addition of the capabilities-related variables represents the complete model. Coefficients for the variables

included in the model are consistent in all the implementations, confirming the robustness of estimations.

Insert Table 5 and 6 about here

With reference to the baseline model's results, both firm-specific and CEO-specific variables prove to be statistically significant. First, the lagged dependent variable is negatively and significantly ($p < 0.10$) related to the firm's rate of growth. While the debate on serial correlation in firms' annual growth rates is still open, our results support the idea that autocorrelation is negative for small firms. This is an interesting result in its own right and can be interpreted in light of the life-cycle theory according to which the firm's sales 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, in the years after the IPO firms that were in the birth phase continue to follow the exponential part of the curve. This explain why we find that the lower the rate of growth for firm i at time $t-1$, the higher the rate of growth for the same firm at time t . This is also consistent with the descriptive results of pre- and post-IPO comparison tests presented in Table 3 showing that firms grow at faster rates in terms of sales after the listing on the Alternative Investment Market.

In relation to *risk-taking variables*, as a first result and consistently with our first hypothesis we find a negative and significant ($p < 0.01$) relationship between *Firm Size* and *Firm Growth Rate*. This means 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 firms' rate of growth. These results are complementary to what we have discussed above, and are also 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 on the AIM seem to follow a life-cycle development path. It is actually well known that higher levels of risk are associated with this kind of firm, and hence they

are subject to credit rationing. However, by listing on 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 expectations on the positive relationship between risk taking and firm growth for AIM companies as articulated in the first hypothesis, *Leverage* proved to be positively related to firm growth². This means that companies showing a higher risk exposure at the time of the IPO grow more than those that are considered less risky as less leveraged. We can explain this result by considering that companies in our sample diminish their leverage in the post-IPO period of time as the issue gives firms the opportunity to raise more equity capital. This is in line with the results of 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. The result of no performance differential between venture-backed and non-venture IPOs suggests that the mere presence of venture capital investment is not sufficient to influence firms' operational activities and to promote superior post-IPO performance in terms of growth.

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's educational attainment. This finding confirms our second hypothesis and is consistent with the literature on the importance of codified knowledge.

For capabilities-related variables, the *CEO Founder* is negative and statistically significant ($p < 0.10$). 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 who is also the founder of the company. This result can be explained as

² Note that the variable *Leverage* proved to be significant both in Mod 1 ($p < 0.05$) and in Mod 3 ($p < 0.1$).

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. Founders may not possess all the skills needed to lead a company from birth to a complex organization as is the case with a public company (Stevenson and Jarillo, 1990; Jain and Tabak, 2008). This interpretation is consistent with the critical resource 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 (Rajan and Zingales, 2001; Kaplan et al., 2009).

Next, the *CEO Age* is found negative and statistically significant ($p < 0.05$). This means that firms that are managed by young CEOs grow more than those managed by older CEOs. This result suggests that younger CEOs, who are more likely to invest in growth strategies, positively affect firm growth while, on the contrary, the conservative strategic orientation of older CEOs may be detrimental to firm growth after the IPO. This result is in line with upper echelon theory stating that organizations will be a reflection of their top management teams. We can thus infer that the typical individual features like creativity, intuition and alertness and the capabilities in grasping new ideas and learning new behaviors, which are more likely to be found among young CEOs (Hambrick and Mason, 1984; Barker and Mueller, 2002; Mudambi and Treichel, 2005), have a positive impact on firm growth. This result is interesting since IPO issuing firms on the AIM are pursuing growth options to remain competitive and thus the choice of young CEOs may increase the value of these options. Since the coefficient of *CEO experience* is not significant, there is no evidence to indicate that this variable influence AIM's firm growth (see also Jain et al., 2008). It can thus be argued that knowledge accumulated with experience seems less valuable than attitudes associated with young age for the post-IPO rate of growth of AIM companies. Hence, our third hypothesis is only partially confirmed.

As the validity of GMM relies on the choice of the appropriate set of instruments and the absence of second-order serial correlation, the results of the post-estimation tests are included in Table 6. The Hansen test for over-identifying restrictions gives us confidence in the validity of the instruments. As expected, negative first-order serial correlation is found in the Arellano-Bond AR(1) test. The Arellano-Bond AR(2) test indicates the validity of instruments.

5. Discussion and Policy Implications

In this work the determinants of business performance are inferred from a broad range of variables (for example accounting information, CEO and board age, educational background and past experience). Our results confirm that both human capital and organizational features 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 firm growth, consistently with the life-cycle theory. It also seems that CEO educational level and age are critical to firms' growth after the IPO,, providing further support to the resources based view of the firm. On the contrary we did not find evidence to the influence of CEO previous experience in other board of directors on firm growth. It thus seems that individual attitudes like creativity, intuition and alertness associated with young CEOs have a major impact on the post-IPO rate of growth than capabilities accumulated with experiences. In the same vein, our findings also confirm that while entrepreneurial features of founders are critical resources for the firm start-up, individual characteristics of CEOs are critical resources for effectively leading a company in the post-IPO.

The results of this study carry some managerial and policy implications. An important managerial implication relates with the status, age and educational level of CEOs. Managing firm start-ups and public companies may require different types of capabilities, knowledge and expertise. For this reason, after an IPO fundamental changes in management style should emerge. Our results suggest that entrepreneurial firms should take into consideration the option of

changing the composition of their top management teams when going public. In particular, since AIM companies are in their growth phase, the choice of non-founder, young and highly educated CEOs at the IPO could be a good strategy in order to pursue their growth options to remain competitive in the post-IPO period.

As far as entrepreneurship is concerned, it is important to look at the process of transformation in the cultural and behavioural 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 therefore an important objective for government action. At the regional level, political intervention could aim at promoting entrepreneurial activities, through easing 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 important is the stimulation of 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 highly educated work force in the entrepreneurial process. Our findings support these two achievable interventions as they show how educated and young CEOs positively influence firm growth.

Finally, the paper presents some limitations. In particular, while gathering information from IPO prospectuses allowed us to access information on AIM firms and their top management teams, in order to go more in-depth in the analysis of human and organizational characteristics of such firms it could be useful to collect further informations by means of a survey.

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Table 1 – Descriptive statistics for the IPOs (panels a) and b))

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 related 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 lying outside the 1 and 99 percentiles are excluded.

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

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

Table 2 – Descriptive statistics for the IPOs (panel c))

<i>c) Ownership</i>			
<i>Variable Name</i>	<i>Frequency</i>	<i>Percent %</i>	<i>Cumulative Percent %</i>
<i>CEO Founder</i>			
No	249	51.98	51.98
Yes	230	48.02	100.00
Total	479	100.00	
<i>CEO Past Experience</i>			
No	131	26.95	26.95
Yes	355	73.05	100.00
Total	486	100.00	
<i>CEO Educational Level</i>			
Non Graduate Degree	231	48.63	48.63
Business Certificate	46	9.68	58.32
Graduate	99	20.84	79.16
Post Graduate	61	12.84	92.00
Research	38	8.00	100.00
Total	475	100.00	
<i>CEO Age</i>			
20s-30s	142	29.34	29.34
40s	206	42.56	71.90
50s	117	24.17	96.07
Over 59	19	3.93	100.00
Total	484	100.00	
<i>No. directors on the board with an academic degree</i>			
0	74	16.41	16.41
1	115	25.50	41.91
2	91	20.18	62.08
3	66	14.63	76.72
4	45	9.98	86.70
5	37	8.20	94.90
>5	23	5.10	100.00
Total	451	100.00	
<i>No. with Venture Capital</i>			
No	256	52.24	52.24
Yes	234	47.76	100.00
Total	490	100.00	

Table 3 – Descriptive statistics, pre- and post-IPO comparison tests

Descriptive statistics for the pre- and post-IPO operating performance in the 665 IPOs 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% are shown as ***, ** and * respectively. Variable definitions are in brackets.

<i>Variables</i>	<i>pre-IPO</i>	<i>post-IPO</i>	<i>Tests</i> <i>(f, t, z statistics)</i>
<i>Sales (million €)</i>			
Std dev	42.8	71.9	0.3546***
mean	16.0	25.9	-4.3266***
median	4.3	7.7	7.273***
<i>Total Assets (million €)</i>			
Std dev	67.6	84.6	0.6381***
mean	19.3	34.3	-5.3085***
median	5.6	11.5	14.035***
<i>CapEx (million €)</i>			
Std dev	1.8	4.3	0.1836***
mean	0.7	2.1	-6.8287***
median	0.2	0.5	9.315***
<i>Sales Growth Rate (%)</i>			
Std dev	106.7	116.1	0.8443***
mean	33.2	41.2	-1.6327**
median	25.5	29.2	1.760**
<i>Turnover (%) (Sales/Total Assets)</i>			
Std dev	357.3	297.9	1.4382***
mean	157.6	114.6	3.4966***
median	93.1	66.5	-6.698***
<i>Investments (%) (CapEx/Total Assets)</i>			
Std dev	60.3	14.3	17.7035***
mean	12.8	9.8	1.2668
median	5.4	4.5	-0.285
<i>Leverage (%) (Debt/(Debt+Equity))</i>			
Std dev	502.8	320.7	2.4586***
mean	85.5	35.6	2.1688**
median	26.3	13.7	-6.796***

Table 4 - Variables Typology and Measurement Methods

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

<i>Variable Class</i>	<i>Variable Name</i>	<i>Description</i>
Dependent variable	<i>Firm Growth Rate</i>	$\text{Log}(\text{Sales})_t - \text{Log}(\text{Sales})_{t-1}$
Lagged Variable	<i>Firm Growth Rate Lag</i>	Lagged values of the dependent variable
Risk Taking	<i>Firm Size</i>	Log(Sales) at the IPO
	<i>Firm Age</i>	Log (Year of IPO - Year of firm foundation)
	<i>Leverage</i>	Financial Debt/(Financial Debt / Equity)
	<i>Venture Capital</i>	Dummy, 1 for firms that have a venture capitalist in the ownership structure at the time of the IPO
Education	<i>Board Education</i>	Dummy, 1 for firms having at least one director who received at least an undergraduate degree
	<i>CEO Non Graduate</i>	Dummy, 1 for firms where the CEO did not receive any particular degree
	<i>CEO Business Certificate</i>	Dummy, 1 for firms where the CEO received a business certificate, such as FCA FCCA FCMA ACA CA MIMC HND HNC FCIM FCIQB MCIOB FRICS ACII FCIB FCIMA CPA FHCIMA HCA CIPFA SA CFA as reported in the IPO prospectus
	<i>CEO Post Graduate</i>	Dummy, 1 for firms where the CEO received a post-graduate degree, such as MA, MSc, MBIM, MRPharm, MBE or MBA as reported in the IPO prospectus
	<i>CEO Research</i>	Dummy, 1 for firms where the CEO holds a title such as PhD, Dr, Prof, or OBE as reported in the IPO prospectus
Capabilities	<i>CEO Founder</i>	Dummy, 1 for firms where the CEO is also the founder of the company
	<i>CEO Experience</i>	Dummy, 1 for firms where the CEO has previous experience on other firms' board of directors
	<i>CEO Age</i>	Age of CEO as reported in the IPO prospectus
Control Variables	<i>Industry</i>	Set of dummies, according to the 1-digit SIC code classification
	<i>Calendar Year</i>	Set of dummies, 1 if the calendar year happens to be the year of the IPO

Table 5 – Pairwise correlation matrix

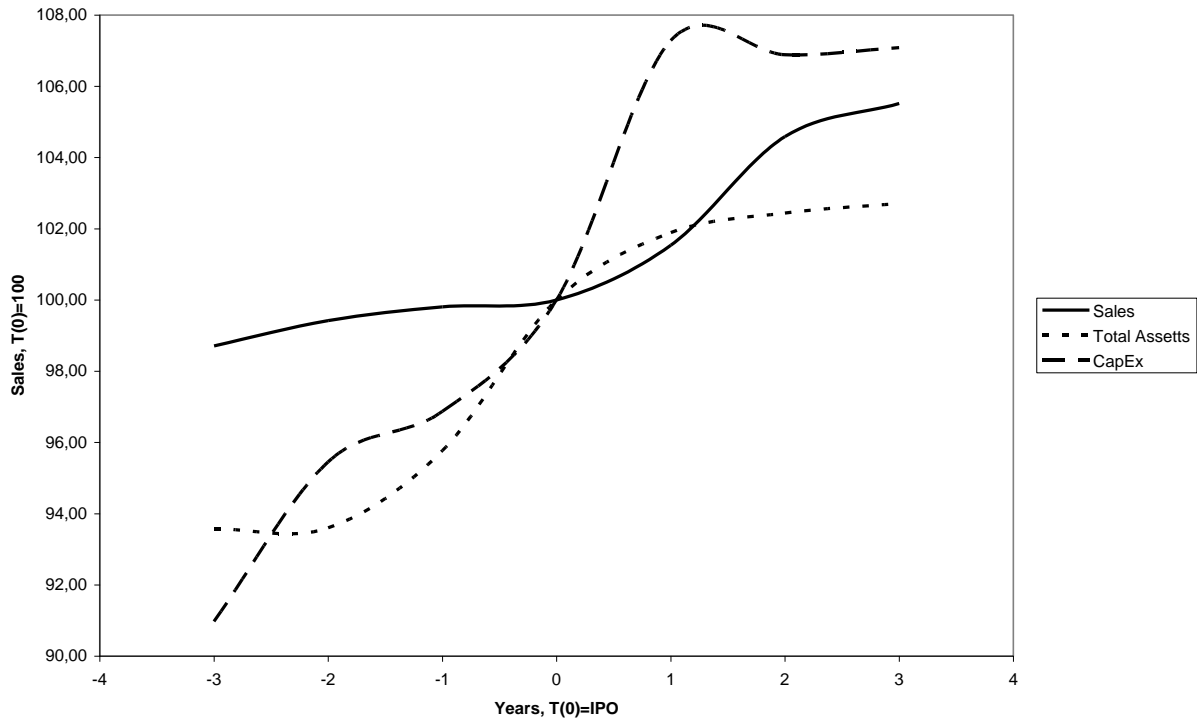
	1	2	3	4	5	6	7	8	9	10	11	12
1 <i>Firm Size</i>	1.0000											
2 <i>Firm Age</i>	0.1912*	1.0000										
3 <i>Venture Capital</i>	-0.0293	-0.1235*	1.0000									
4 <i>Leverage</i>	0.0383	-0.0487	-0.0279	1.0000								
5 <i>Board Education</i>	-0.0753	0.1342*	-0.1492*	0.0098	1.0000							
6 <i>CEO Non Graduate</i>	0.0282	0.0512	-0.0346	-0.0243	-0.0147	1.0000						
7 <i>CEO Business Certificate</i>	0.0126	-0.0491	0.0749*	-0.0272	0.2373*	-0.1658*	1.0000					
8 <i>CEO Post Graduate</i>	-0.1205*	-0.0182	0.0112	-0.0344	0.1493*	-0.1144*	-0.1957*	1.0000				
9 <i>CEO Research</i>	-0.1507*	-0.0150	0.0212	-0.0154	0.1839*	-0.0860*	-0.1470*	-0.1015*	1.0000			
10 <i>CEO Founder</i>	0.0404	-0.1323*	-0.1014*	0.0471	0.1119*	-0.0093	0.0307	0.0416	-0.0338	1.0000		
11 <i>CEO Age</i>	-0.0060	0.1326*	0.0143	0.0628	0.0551	0.1276*	-0.1503*	0.0040	0.0709*	0.0285	1.0000	
12 <i>CEO Experience</i>	-0.0190	-0.1420*	0.1497*	0.0401	-0.1389*	0.0190	-0.0360	-0.1186*	-0.0649*	-0.0416	0.2146*	1.0000

Table 6 - Results of GMM-SYS Regressions

Dependent variable, <i>Firm Growth Rate</i>				
Variable Class	Variable Name	Estimations		
		Model (1)	Model (2)	Model (3)
	<i>Constant</i>	0.713** (0.310)	0.611* (0.347)	0.991*** (0.384)
<i>Lagged Variable</i>	<i>Firm Growth Rate Lag</i>	-0.0858 (0.0548)	-0.133* (0.0805)	-0.138* (0.0811)
	<i>Firm Size</i>	-0.0748*** (0.0213)	-0.0659*** (0.0214)	-0.0615*** (0.0205)
	<i>Firm Age</i>	-0.0710* (0.0409)	-0.0757* (0.0453)	-0.0755* (0.0467)
<i>Risk Taking</i>	<i>Venture Capital</i>	-0.0148 (0.0679)	0.00729 (0.0713)	0.0118 (0.0710)
	<i>Leverage</i>	0.167** (0.0811)	0.123 (0.0779)	0.140* (0.0801)
	<i>Board Education</i>		0.0213 (0.0615)	0.0270 (0.0632)
	<i>CEO Business Certificate</i>		0.0364 (0.107)	0.124 (0.128)
<i>Education</i>	<i>CEO Post Graduate</i>		0.264** (0.132)	0.314** (0.135)
	<i>CEO Research</i>		0.00519 (0.195)	0.0278 (0.187)
	<i>CEO Founder</i>			-0.120* (0.0706)
<i>Capabilities</i>	<i>CEO Age</i>			-0.00880** (0.00371)
	<i>CEO Experience</i>			-0.0134 (0.0701)
<i>Control variables</i>	<i>Industry</i>	Yes	Yes	Yes
	<i>Calendar Year</i>	Yes	Yes	Yes
Number of instruments		32	37	40
Wald Test χ^2 (12)		43.97***	42.53***	42.20***
Hansen test χ^2 (8)		4.68	7.91	4.37
Prob> χ^2		0.791	0.443	0.823
AR(1)		-3.52***	-3.52***	-3.51***
Prob> z		0.000	0.000	0.000
AR(2)		-1.11	-1.11	-1.12
Prob> z		0.269	0.266	0.264

For variables definitions refer to Table 4. Statistical significance at 1%, 5%, and 10% are shown as ***, ** and * respectively (Robust standard errors in parentheses). *CEO Non Graduated* is dropped to avoid multicollinearity.

Figure 1 – Average Sales, Total Assets and CapEx firms listed on the AIM, 1995-2006



Source: Our elaborations on EurIPO data.