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**TOWARDS AN EVOLUTIONARY MODEL OF THE ENTREPRENEURIAL
FINANCING PROCESS: INSIGHTS FROM BIOTECHNOLOGY STARTUPS**

TOM VANACKER

SOPHIE MANIGART

Sophie.Manigart@vlerick.be

MIGUEL MEULEMAN

Miguel.Meuleman@vlerick.be

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TOM VANACKER

Ghent University, Department of Accounting and Corporate Finance

SOPHIE MANIGART

Vlerick Leuven Gent Management School

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Contact:

Miguel Meuleman

Vlerick Leuven Gent Management School

Tel: +32 09 210 97 70

Fax: +32 09 210 97 00

Email: Miguel.Meuleman@vlerick.be

ABSTRACT

Using multiple longitudinal case studies of young biotechnology firms, we study differences in the financing process between high and low performing firms. Findings suggest that initial differences in the specialization of the investors with whom entrepreneurs affiliate early on, affect the ease with which firms attract (specialized) follow-on financing and firm performance. We demonstrate the role of the social context in shaping initial financing outcomes, as entrepreneurs limit their search for financing to one or a few investors with whom they have pre-existing ties. Additionally, our research provides a dynamic view of the financing process. We identify isolating mechanisms, including entrepreneurial learning and homophily and network considerations in investor syndication, which limit entrepreneurs when trying to adopt successful financing strategies implemented by competitors later on. A core contribution is that we theorize on evolutionary processes in the financing process. This new perspective advances our knowledge on dynamics in the financing process and opens multiple avenues for future research.

Key words: entrepreneurship; new venture finance; financing process; venture capital; performance

INTRODUCTION

Why and how do firms differ in their conduct? Why do they perform differently? These are some of the most fundamental questions that lie at the very core of business management and strategy research (Nelson, 1991). Recent studies suggest that the financing process is one of the key external prompts initiating differences in development between high and low performing entrepreneurial firms (Beckman & Burton, 2008; Maurer & Ebers, 2006). It is proposed that the financing process influences the structure and experience of the management team (Beckman & Burton, 2008) and initiates changes in how firms arrange and reconfigure their social capital (Maurer & Ebers, 2006) amongst other. Despite its importance, our understanding of the characteristics of the entrepreneurial financing process causing differences in performance between firms remains limited.

Researchers have extensively examined different financing decisions, such as whether a firm will raise debt or equity (see Harris & Raviv, 1991 for an overview), public or private finance (Denis & Mihov, 2003), bank debt or trade credit (Nilsen, 2002) and bank debt or venture capital financing (Ueda, 2004). The majority of prior research, however, focuses on the type of financing raised and builds on two competing theoretical frameworks, namely the *static trade-off theory*¹ and *pecking order theory*² (Fama & French, 2005; Frank & Goyal, 2005; Shyam-Sunder & Myers, 1999; Myers, 1984). While prior research focuses on the differences between these two theoretical frameworks, they typically ignore the similarities. As a result, much of the literature on the financing process rests on a few common assumptions.

First, financial theories assume that entrepreneurs are economically rational. Economic rationality implies that entrepreneurs make financing decisions in such a way that wealth is maximized (Myers, 1984). In the case of young entrepreneurial firms, additional goals and constraints have been identified, such as the willingness to remain independent and keep control over the business (Sapienza, Korsgaard, & Forbes, 2003) and knowledge about financing alternatives (Van Auken, 2001).

¹ The static trade-off theory posits that firms will trade-off the benefits of debt (i.e. tax benefits) against the costs of debt financing (i.e. bankruptcy costs). Firms will raise financing across time in such a way that an optimal target capital structure is obtained (Modigliani & Miller, 1963; Titman, 1984).

² The pecking order theory posits that firms will rank financing alternatives, because of asymmetric information, and the resulting underpricing. Firms will prefer internal funds, if internal funds are insufficient they will raise debt financing and they will only raise external equity as a last resort (Myers, 1984; Myers & Majluf, 1984). In a pecking order framework, firms have no target capital structure and financing decisions merely dependent on the availability of internal funds and access to debt financing at the time (Myers, 1984).

Furthermore, once entrepreneurs have decided to attract outside financing it is assumed that they will explore the entire range of investors and investors have access to the entire pool of firms willing to raise external financing (Sorensen, 2007; Eckhardt, Shane, & Delmar, 2006).

Second, financial capital is typically considered to be a commodity good (Janney & Folta, 2006; Janney & Folta, 2003) as opposed to a unique resource. Traditional finance models, such as the static trade-off theory and pecking order theory, portray financial intermediaries as passive actors (Myers, 1984). This explains the current focus in the literature on the type of financing firms attract, while the decision from which source to attract financing has received considerably less attention (Cassar, 2004; Kochhar & Hitt, 1998). However, intermediaries specialized in financing growth-oriented entrepreneurial firms, such as venture capital investors and business angels, are highly selective in the firms they are willing to invest in, play an active role as monitors and add value after they have invested in the company (Sapienza, Manigart, & Vermeir, 1996)³. This makes private equity a source of finance that is scarce, distinctive and imperfectly mobile across companies and it indicates that financial capital is not necessarily a commodity good, but might create sustainable differences in development between firms.

Third, it is assumed that financing decisions are based solely on economic optimization at the time with no influence from prior financing decisions and outcomes (see, for example, Fama & French, 2005; Frank & Goyal, 2005). Nevertheless, previous experiences with particular types of financing and prior contacts with particular investors may influence financing decisions. Helwege and Liang, for example, show that once firms obtain external financing they are more likely to obtain it in the future. However, whether this is due to external financing needs that are correlated across time, learning by entrepreneurs or other processes, remains unclear. Overall, dynamics in the financing process remain poorly understood (Eckhardt, Shane, & Delmar, 2006).

The resulting image is one of entrepreneurs that make optimal financing decision at one point in time under a number of constraints, such as the willingness to remain independent and information processing limits. Where financial capital gives access to other critical resources, such as human capital and physical capital, but is in itself not a unique resource.

³ Also more traditional financial intermediaries, such as banks, have been proposed to monitor loans by firms who borrow from them (Diamond, 1984).

This is in contrast with recent organizational studies indicating that the financing process may be a key external prompt initiating sustainable differences in development between high and low performing firms. This tension motivates us to study the financing process from a different theoretical lens, namely an evolutionary model of development. An evolutionary theory posits that differences will exist between firms in the same industry and that those differences are likely to persist across time (Nelson & Winter, 1982). The following three interrelated research questions are addressed: (a) how does the financing process differ between high and low performing firms, (b) how do those differences originate and (c) why do those differences persist?

METHODS AND RESEARCH DESIGN

The research design is a longitudinal, multiple case study involving nine young biotechnology firms. Case studies allow us to broaden existing findings by pointing to gaps and beginning to fill those gaps by generating new insights in a underexplored research area (Siggelkow, 2007). We employ longitudinal case studies, as these are particularly suitable to study process issues. Multiple cases enable a replication logic in which cases are treated as a series of experiments, each serving to confirm or disconfirm inferences drawn from the others (Yin, 1984; Eisenhardt, 1989b). The results of multiple-case research are typically better grounded than those of single-case studies. The research also uses an embedded design (i.e. multiple levels of analysis) that includes both the entrepreneur and investor. Although an embedded design is complex, it permits richer and more reliable models (Yin, 1984).

We chose young biotechnology firms as our research setting for two reasons. First, it allows us to focus the study on one type of financing, namely private equity, such as venture capital and business angel financing. The characteristics of the biotechnology setting limit the use and availability of other financing alternatives. Traditional sources of financing, such as internal financing or debt financing are typically unavailable or even unsuitable (Pisano, 2006). In order to get at a stage where it is possible to raise other types of outside equity financing, such as public equity and private equity from large pharmaceutical companies (if that is part of the strategy of the firm), it is typically necessary to first raise private equity from other external sources, such as venture capitalists and business angels (Nilsson, 2001). Second, given the difficulty to attract financial capital, financing decisions are decisions of heightened importance in young biotechnology firms (Greene, 1999).

Therefore, biotechnology entrepreneurs are expected to pay considerable effort and time in raising financing.

We selected cases opportunistically based on a theoretical sampling procedure (Eisenhardt, 1989b). In order to generate insight on how differences in the financing process relate to firm performance, we selected matched pairs of biotechnology firms that operated under similar conditions but differed considerably with respect to their performance (Table 1). Young biotechnology firms were labeled as high or low performing based on widely applied proxies, such as employment growth, total asset growth and patenting rate (Maurer & Ebers, 2006). These dimensions gauge biotechnology startups' growth across a diverse range of dimensions critical to early success: success in recruiting human capital, investments in tangible and more importantly intangible assets, and development of intellectual property (Baum, Calabrese, & Silverman, 2000).

All cases are pure biotechnology firms active in research and development (R&D). Pure biotechnology firms are founded with the *main purpose* of exploiting opportunities provided by modern biotechnology. We do not consider firms from traditional sectors whose activities only partially involve biotechnology. Biotechnology firms had to undertake R&D to (partially) develop new innovative products and services to be introduced on the market. Requiring all firms to be active in R&D ensures that we are studying a more homogenous group of growth-oriented firms with high financing needs (Nilsson, 2001)⁴.

Insert Table 1 About Here

We control for the following contextual factors in our sampling that might have an effect on the financing process: location, characteristics of the founders, firm origin and market sentiment at the first financing round. In order to control for location and corresponding differences in the legal context and development of financial markets, we restrict our cases to Flemish biotechnology firms. The Flemish biotechnology cluster is vibrant, but developing. The number of biotechnology firms per inhabitant and the number of employees per biotechnology firm lies above the European average (Flanders Interuniversity Institute for Biotechnology, 2002).

⁴ We ensure that the sampled biotechnology firms are active in R&D by (a) asking a filter question through preliminary telephone interviews (b) checking if the respective cases appeared in a listing of firms that applied for R&D subsidies from the most important R&D subsidy granting agency in Flanders.

The biotechnology industry, however, is relatively young. Most of the medical biotechnology firms have been founded in 1995 or later. This implies that Flemish biotechnology firms are typically founded by pure scientists. There is still no well-developed market of 'second-generation' biotechnology managers (Flanders Interuniversity Institute for Biotechnology, 2002). This stands in contrast to the UK and US biotechnology industry, where scientific entrepreneurs accumulated founding and management experience through earlier foundings (Maurer & Ebers, 2006). Hence, limiting our cases to Flemish biotechnology firms has the additional advantage that founding teams are rather similar and are all characterized by limited prior business experience and limited formal education in business administration.

We include firms from different origins, such as academic spin-offs, corporate spin-offs and spin-offs from specialized research institutes (Table 1) as the origin of the firm may influence the financing process (Lindelof & Lofsten, 2005)⁵. Furthermore, it is well established in the literature that private equity investments show a cyclical pattern (Gompers & Lerner, 1998). We controlled for the availability of private equity financing by sampling matched pairs raising their first private equity financing during hot markets and cold markets (Table 1). Pharmaleads and Theraptosis raised start-up financing during 2000. This was a record year; both in terms of amount of financing raised by private equity investors and in terms of amount invested in their portfolio companies (EVCA Yearbooks). Entomed, Myosic, AC Pharma, Irogen, Genom, I-Zyme and Aptanomics raised private equity financing for the first time after 2000, a period during which investments by venture capitalists decreased dramatically, especially in high technology sectors (EVCA Yearbooks)⁶.

The characteristics of the cases are summarized in table 2. Firms are founded between 1999 and 2003. The cases are all pure biotechnology firms active in areas, as diagnostics, therapeutics, technology platforms and environment. At start-up, the average firm employs 4.8 people and has an average asset base of €2,031,000. Based on figures from the most recent fiscal year (2006) the cases currently employ on average 25.6 people and have an average asset base of €18,069,000. All firms start with an (exclusive) license on a patent or patent portfolio from the university or parent company, but have no patents (granted) on their own name yet.

⁵ A popular image in the entrepreneurship literature is that of an entrepreneur starting an independent business from his garage (Bhide, 1992). This image is unlikely in our setting. Given the research and development intensive nature, biotechnology firms typically originate from academia or the business community.

⁶ Most of our matched cases raised financing during cold markets. This is because our research interest was in studying dynamics in the financing process of *young* biotechnology ventures that were maximum five years old at the start of data collection.

The average number of patents granted to the firm up until 2006 equals 7.8. The median number of equity financing rounds equals two, with a minimum of one and maximum of four. In none of the cases had the investor exited when the firm was selected for the purpose of this study. However, in some cases a (partial) exit was realized while we followed the cases in real time and this under different forms such as an IPO, trade sale or failure. Therefore, our results do not suffer from a success or survivorship bias. This is an important advantage compared to prior studies that only focus on quoted (Gompers, 1995) or surviving firms (Beckman & Burton, 2008) due to data constraints.

Insert Table 2 About Here

There is a large difference in growth and development between the cases that were selected as high versus low performing biotechnology firms. High performing firms employ between 10 and 67 people, while low performing firms employ between three and four people. The amount of assets lies between €2,248,000 and €119,559,000 for high performing firms, while the maximum amount of assets in the low performing cases equals only €894,000. The high performing firms were granted a minimum of 10 and a maximum of 22 new patents up to 2006. Low performing firms have not been granted patents since founding, except Entomed with two patents granted since founding.

DATA SOURCES

We used several data sources (Table 3): (1) quantitative and qualitative data from semi-structured interviews with key financial decision makers from both biotechnology firms and biotechnology investors, (2) e-mails and phone calls to follow-up interviews and track the financing process in real time, (3) financial statement data⁷ and statutory required publications on capital increases and shareholder structure and (4) archival data, including Web sites, business publications and materials provided by informants. The use of multiple data sources increases the validity and reliability of the evidence (Yin, 1984).

Insert Table 3 About Here

⁷ All Belgian firms, irrespective of their size, are required to file detailed yearly financial statements.

We conducted more than 40 interviews. All interviews were conducted by at least two researchers, where one researcher exclusively dealt with making field notes. Additionally all interviews were taped and then transcribed in the hours following the interview. The first phase included pilot interviews with biotechnology entrepreneurs, biotechnology investors, policy makers within the biotechnology domain and members of the biotechnology association. During the pilot interviews, we fine-tuned the interview guides targeting entrepreneurs and investors. The pilot interviews indicated that financing decisions within biotechnology firms are typically made by the Chief Executive Officer (CEO) eventually helped by a Chief Financial Officer (CFO). Other individuals within the biotechnology firms, such as senior scientists, typically have limited detailed knowledge about the financing events taking place.

In the primary data collection, we conducted 15 semi-structured interviews with key informants within the biotechnology firms. The interviewees who were our informants were the founding entrepreneurs and senior management. The interviews were 90-120 minutes and followed an interview guide that had variations for the different biotechnology cases. The interviews began with background information, such as management team composition and prior experiences, core technology, products in the pipeline, market characteristics and alliances. We then asked informants to chronologically discuss the history of the firm with respect to its financing process. Based on yearly financial statements and statutory required publications on capital increases, interviewers prepared a financing timeline in advance of the interview. This financing timeline captured the history of the financing obtained and was used during the interview to crosscheck information provided by our informants. During the interviews, we additionally discussed the financing unsuccessfully applied for and financing which entrepreneurs were not willing to consider.

We also conducted nine semi-structured interviews with selected biotechnology investors that offered financing to the cases studied. Given the sensitive nature of the financing process, we did not require investors to discuss individual portfolio companies. We focused on the general investment process and discussed the different phases in the investment process from deal origination through exit. This strategy allowed us to link detailed investor characteristics to the cases. Furthermore, despite the sensitive nature of the topic studied, some investors while discussing the general investment process, offered examples involving the cases studied. Other investors even provided confidential reports on their portfolio companies at the end of the interview.

We interviewed independent and private, independent and quoted, university-related, bank-related and corporate venture capital funds that invested as little as €500,000 to as much as €194,000,000 in biotech.

The transcriptions alone totaled 700 double spaced pages. We asked follow-up questions via phone or interview when clarification was needed. Part of this study is historical, in the sense that we rely on interviews and archival data to obtain a retrospective account of the financing process. Following Van de Ven (2007), however, we initiated a historical study before the ultimate outcomes of the financing process became apparent. The IPOs, trade sale and failure of the cases all occurred in the years following the interviews. As important changes took place in the financing process after our interviews, we tracked change in the financing process in real time. We collected additional financial statements, statutory required publications and new press releases. Additionally, we attended management road shows and asked short additional questions through e-mail or telephone.

Throughout our data collection, we took steps to minimize informant biases. Given that we study young biotechnology firms -that are maximum 5 years old at the time of the first interview- and that capital acquisition decisions are major decisions, we limit recall bias (Neisser, 1982). If informants had difficulties in accurately remembering financing events, we would expect differences in the information they provided with data from other sources. This was not the case, however. We also focused on facts during the interview process. An emphasis on facts is likely to be less subjective to both cognitive biases and impression management (Miller et al., 1997). The information given was quite objective (e.g. whether a company applied for different sources of funding, whether investors had prior ties to the investors from which they raised financing and how investors helped the firm with raising follow-on financing). To further motivate interviewees to give accurate data we promised confidentiality.

DATA ANALYSIS

We analyzed the data by first building individual case studies synthesizing the interview transcripts and archival data (Eisenhardt, 1989b). A central aspect of case writing was “triangulation” between interview and archival sources to create a richer, more reliable account. Case histories were used for two analyses: within-case and cross-case. The within-case analysis focused on the financing timeline, which summarized all financing events, unsuccessful financing events and important facts and conclusions for the individual cases. Within-case analysis allowed us to describe the financing process in detail as experienced by a single firm. Through this process, we noted patterns within each case. Next, the conclusions from each individual case were considered to be information needing replication by other individual cases (Yin, 1984).

Cross-case analysis began after all cases were finished (Eisenhardt, 1989b). Using cross-case analysis techniques, we looked for similar constructs and relationships across cases. We heavily relied on cross-case synthesis by using (word) tables and graphs that display the data according to a uniform framework. The tables were used to study whether different groups of cases were more similar and whether particular subgroups or categories of general cases could be identified (Yin, 1984).

MAIN FINDINGS

How does the Financing Process Differ between High and Low Performing Firms?

Prior studies typically portray the financing process as a teleological model where firm history and previous financing decisions have limited, if no, influence on subsequent financing decisions (see, for example, Frank & Goyal, 2005 and Fama & French, 2005). Our data suggest that the source from which firms attract financing during the startup phase, the financial resources they can subsequently access during the development phase and firm performance are interrelated. Historical financing decisions have a substantial impact on the subsequent financing process and firm performance as a whole.

Table 4 shows the type of investors and the financing round in which they participated. We differentiate between the high and low performing cases. Specialized venture capital funds (VCFs) are funds that (a) actively invest in biotechnology firms and (b) have a team dedicated to biotechnology proposals. The non-specialized VCFs comprise university funds, private equity subsidiaries of banks and other non-specialized VCFs (funds investing infrequently in the biotech sector without a team dedicated to this sector). Besides formal venture capital, our cases received financing from business angels (BAs) defined as wealthy individuals investing their personal funds in privately held firms. Finally, the parent company in case of corporate spin-offs generally offered start-up financing.

It is remarkable that all cases receiving specialized venture capital during the startup phase are also those firms classified (prior to collecting the data and knowing the final outcome of the cases) as high performing. The high performing firms also raise the largest amount of pre-exit financing. Aptanomics, Genom, Theraptosis and AC Pharma have all raised over €6,000,000. Aptanomics, Genom and Theraptosis have even raised a cumulative amount of private equity exceeding €25,000,000. Firms backed by specialized investors during the start-up phase are also more likely to conduct an Initial Public Offering (IPO). Aptanomics, Genom and Theraptosis, all financed by specialized VCFs, have conducted an Initial Public Offering (IPO). Going public is a momentous event for biotechnology firms: it gives the firm access to well-needed capital, increases legitimacy and is an important exit mechanism (Deeds, Decarolis, & Coombs, 1997). This is in sharp contrast to the firms starting with non-specialized financing. These firms raise significantly smaller amounts of follow-on financing, if any. Furthermore, not one firm conducted an IPO. We observed only one exit, which was a failure (case Myosic).

Insert Table 4 About Here

Aptanomics is a good illustration of a firm significantly benefiting from its early affiliation with a specialized investor. Mid 2001, Aptanomics received seed financing (only 62,000 euro) from a specialized Belgian venture capital fund. This fund previously invested in other spin-offs from the research institute from which Aptanomics spun-off. The specialized fund helped in searching for an experienced manager.

The venture capital fund found a Belgian manager in the US, who previously held key management positions in four European and US biotechnology firms and had nearly 25 years of experience in the biotechnology sector. According to this manager, who joined Aptanomics, the fund was also instrumental in helping to attract specialized financing from international funds later on. By August 2002, the company raised some 5 million euro in start-up financing.

Entomed, in contrast, is a good illustration of a firm constrained by its initial non-specialized investor. The firm started in 2002 by two science professors as a university spin-off. One of the founders contacted a business professor in his network to help in the search for start-up financing. This professor personally knew a local VCF manager, who subsequently decided to offer financing. Expectations at start-up were high: the firm would develop into a professional biotechnology firm in two to three years, employing 25 to 30 people (Source: university report). The initial investor, however, was not specialized. Although the investor previously invested a couple of times in biotechnology firms, the CEO mentioned that the investor “*is not very selective*” and that “*specialized investors would be better for the expertise and management support*”. The investor also made it clear that the fund was unlikely to offer follow-on financing. However, Entomed would need at least an additional 1 million euro within the next three years. Today, more than four years after founding, the firm employs four people (FTE), which is far below expectations. The CEO did not receive much support from the founding investor and was unable to attract specialized venture capital. Instead, the CEO once more resorted to pre-existing ties and received financing from the university seed fund.

We claim that specialized investors help their portfolio firms in raising large amounts of specialized follow-on financing. Furthermore, specialized investors contribute indirectly to the ease with which their portfolio firms can attract specialized follow-on financing. Consistent with Hellmann and Puri (2002), we illustrated how they play a key role in professionalizing the firm by shaping the management team. Access to large amounts of follow-on financing and firm professionalization subsequently benefit firm performance. We observe different processes in the firms starting with non-specialized investors. Although some non-specialized investors helped their portfolio firms with raising follow-on financing, this follow-on financing typically comes from other non-specialized investors. The portfolio firms of non-specialized investors are at a competitive disadvantage when targeting specialized investors, because of the limited network and lack of reputation in the biotech investment community of the early investor.

Furthermore, also non-specialized investors initiate changes in the management team, although less prevalent. However, it typically involves part-time managers or managers where the track record of building young biotechnology firms is less obvious, which is different from the additions made by specialized investors.

We considered several alternative explanations. One is that the cases differed in quality and growth potential at start-up. Firms with higher potential might search financing from specialized investors (Sorensen, 2007) or specialized investors might be better at selecting firms with the highest potential (Zacharakis & Meyer, 2000). However, this explanation seems unlikely in our setting. Predicting firm success in high technology industries is very difficult (Lerner, 1999). When analyzing the growth of startups, Audretsch (1995) shows how no firm nor industry characteristics are able to predict growth in high-technology industries. Our cases support this view as early signals of firm potential do not differ systematically between firms backed by specialized versus non-specialized investors. First, nearly all firms are founded by pure scientists with limited or no business experience. Hence, there is little variance in initial human capital. If experienced managers are recruited after start-up, this is typically under the impetus of the initial investor. In the case of Aptanomics, for example, a highly experienced manager was attracted, who was known by the founding venture capital fund from prior investments. Second, no consistent differences are observed in terms of alliance capital, amount of pre-founding R&D, maturity of the technology and market orientation (Table 5). Important differences between the two groups of firms only become apparent in the development stage, approximately three years after founding, when follow-on financing is raised. Hence, we found no indications that the cases differ in quality at start-up.

Insert Table 5 About Here

A second explanation is that differences in motivation between entrepreneurs and more in particular differences in growth ambition drive our findings. Not all entrepreneurs are growth-oriented and the majority of entrepreneurs set up new businesses to provide an income or support a desired lifestyle (Berger & Udell, 1998). In many cases, these entrepreneurs will even sacrifice growth for lifestyle choices (Manigart & Struyf, 1997). Prior research confirms that growth motivation has a positive impact on realized growth (Delmar & Wiklund, 2008; Wiklund & Shepherd, 2003).

Nevertheless, even the entrepreneurs in the low performing cases were initially high growth oriented. Entomed, for example, planned to develop into a professional biotechnology firm in two to three years after founding, employing 25 to 30 people (Source: university report). The CEO of Myosic envisioned to raise some 10 million euro in follow-on financing and subsequently conduct an IPO (Source: initial business plan). The CEO of Pharmaleads compared its firm with another academic spin-off from the same university, which experienced dramatic growth and conducted an IPO (Source: university report). Despite their high growth ambitions at start-up, all of these firms seem unable to realize high growth.

How do Initial Differences in the Financing Process Originate?

In the previous section, we demonstrated how the initial financing source plays a critical role. Firms starting early with specialized investors attract large amounts of follow-on financing and exhibit high subsequent performance, while firms starting with non-specialized investors attract limited amounts of follow-on financing and exhibit poor performance. A key question that emerges is why some firms start with specialized financing while others start with non-specialized financing?

Most prior research assumes that once entrepreneurs are willing to attract outside financing they will consider the entire range of investors and investors will consider investing in the entire pool of firms trying to raise outside financing (Sorensen, 2007; Eckhardt, Shane, & Delmar, 2006). In a heterogeneous market with more experienced investors, experienced investors are able to select from the entire pool of good and worse quality proposals. When entrepreneurs are confronted with multiple offers, they will engage in an optimization exercise, where they will rank investors by experience and eventually accept the offer of the most experienced investor (Hsu, 2004). A given investor with less experience will be pushed down in the relative ranking and will be left with firms of worse quality (Sorensen, 2007).

Our cases indicate a different behavior. Entrepreneurs typically limit their search for financing to only one or a few alternatives, especially at founding. The social context within which resource decisions are embedded and more specifically pre-existing ties between entrepreneurs and investors influence the entrepreneur's search for financing. The pre-founding situation has an important impact on resource acquisition at start-up. Firm origin and existing contacts of the entrepreneur through previous employment, for example, determine to a large extent which investor is targeted. Table 6 presents objective information and facts, which are supplemented with illustrative quotes from our cases, on the relationship between the social context and financing decisions.

Table 6 indicates that the search for financing is local. The notion of local search is a relative term and presumes a broader context (Stuart & Podolny, 1996). We define local search in the financing process as the search for financing from investors with whom the entrepreneur or firm has pre-existing ties as opposed to unrelated investors. Why do entrepreneurs limit their search for financing to one or a few investors with whom they have pre-existing ties despite the strategic nature of their decisions? The cases suggest that the social context is important as (a) it helps in locating potential investors, (b) it shapes norms, values and taken-for-granted assumptions about what constitutes appropriate economic behavior and (c) helps in assessing the quality and intentions of investors.

Insert Table 6 About Here

Locating investors. Prior research typically assumes that entrepreneurs are aware of the full spectrum of financing alternatives (Sorensen, 2007), as there is free and directly available information in perfect markets (Brealey & Myers, 2000). However, the acquisition of financial capital is a function of the amount of information that is available to the entrepreneur. Information deficiencies limit entrepreneurs' set of choices and inexperienced entrepreneurs are therefore expected to have a more limited set of financing choices (Van Auken, 2001). Biotechnology firms are a typical example of firms that are founded by entrepreneurs with limited business and financing experience. However, social capital benefits firms in identifying where the needed resources are available (Hite & Hesterly, 2001; Rangan, 2000). As a result, entrepreneurs are more likely to search for financing from investors with whom they have pre-existing ties, as these ties increase the likelihood that the entrepreneur will identify these investors as potential exchange partners.

Taken-for-granted assumptions. An institutional view indicates that the motives of human behavior extend beyond economic optimization to social justification and social obligation (Zukin & DiMaggio, 1990). When managers justify actions with the claim that "we've always done it this way", "everybody does it this way" they are referring to institutionalized activities (Oliver, 1997). Once entrepreneurs have located investors through a network search, they typically do not engage in a broader search outside their network and consider network search as appropriate economic behavior.

In Pharmaleads and Theraptosis, two university spin-offs, for example, the CEOs justified why they only searched for financing from the university seed funds at startup by indicating that it is the norm for spin-offs. In Genom, a corporate spin-off, the CEO indicated that he did not need to look further for financing, because the parent companies were willing to offer finance (Table 6). However, later the CEO recognized that the firm was too dependent on its parent companies and therefore he targeted independent venture capital investors in a second round of financing.

Evaluation of investors. Informational asymmetry between entrepreneurs and investors may lead to a failure in the financial market (Shane & Cable, 2002). Adverse selection and moral hazard problems, which relate to the existence of informational asymmetry, are often viewed as a problem of the investor (Eisenhardt, 1989a). Entrepreneurs are typically portrayed as possessing private information, which they may use to mislead investors (Eisenhardt, 1989a). However, entrepreneurs also need to evaluate investors and informational asymmetry is also a problem for them (Sahlman, 1990). For instance, as the entrepreneur and venture capitalist interact, the venture capitalist will become more informed and may continue the project without the entrepreneur (Ueda, 2004). The risk of expropriation may make entrepreneurs reluctant to disclose information (Himmelberg & Petersen, 1994) and will restrict the search for financing. The following quotes illustrate:

“Particularly pre-investment, entrepreneurs are wary to disclose all information to us. Information transfer is always very delicate. We live in an extremely competitive world and we have a large number of portfolio companies. It happens that a business that looks for financing is a competitor of one of our portfolio companies or that there is at least a partial overlap. Even when two companies start very different, they may gradually become more similar over a 4-5 year timeframe. Therefore, information transfer is often a problem... However, when we do not receive all the information, we will not make the investment.” (Senior biotechnology investment manager, Investor F, Specialized VCF)

“Unwillingness to provide information is something which happens more often with external entrepreneurs. It is less of a problem if we work with scientist from our own university.” (Managing Partner, Investor A, Academic VCF)

Our results offer additional evidence on the importance of the social context in the financing process. Prior studies indicate that investors are more likely to offer financing to entrepreneurs with whom they have pre-existing ties (Shane & Cable, 2002; Uzzi, 1999). We claim that the demand side of the market might also explain these findings.

More in particular, entrepreneurs are also more likely to target investors that are known to the entrepreneur from prior direct or indirect contacts.

Hence, the social context within which financial decisions are embedded determines from whom entrepreneurs will search for financing and explains initial differences in the financing process.

Why do Initial Differences in the Financing Process Persist?

Although prior research described financial capital as a commodity product (Janney & Folta, 2006; Janney & Folta, 2003), as opposed to a unique resource, our cases indicate that the source of initial financing influences the subsequent financing process and firm performance as a whole. Why is it that the initial financing source plays such a critical role? We identify a number of isolating mechanisms, which limit the ability of firms to imitate others or duplicate the success of others (Rumelt, 1984). The first mechanism relates to learning by entrepreneurs. As entrepreneurs interact with investors, they accumulate specific knowledge with respect to the financing process. The second and third mechanism refers to syndication preferences by investors. It is common for firms to receive funding from multiple investors (a syndicate) over several investment rounds. Homophily and network considerations play an important role in investors' decisions with whom they want to syndicate.

Entrepreneur: Local Learning. Many of the cognitive limits that constrain rationality in search behavior will also affect learning (Levinthal & March, 1993). A first characteristic of learning is that it tends to happen locally (Levitt & March, 1988), i.e. entrepreneurs are more likely to learn from their own past experiences rather than from experiences from others such as competitors. When searching for financing entrepreneurs are likely to learn many facets of dealing with investors, such as how to present a project to investors and negotiate with investors. Furthermore, once the financing is received entrepreneurs are likely to learn more about the characteristics of the financing and of investors as interactions occur between investors and entrepreneurs.

Second, learning is cumulative in nature (Cohen & Levinthal, 1990). This means that entrepreneurs will develop knowledge based on past experiences that will benefit them in their search for future financing. Repetition of the same task benefits entrepreneurs in performing those tasks and knowledge gained from interacting with investors is expected to accumulate.

The following quote illustrates:

“During the seed stage, half of the entrepreneurs are unaware of our expectations and requirements. I clearly notice progress in the quality of the business plans between the first and second financing round. Later on entrepreneurs are better prepared, have informed themselves adequately and have thought about alternative financing sources...”. (Senior investment manager, Investor D, Academic VCF)

“The first financing round helped me to improve the way I present and negotiate with investors. I now feel it will be easier to locate new financing sources for the second financing round.” (CEO Myosic)

The pre-investment process of VCFs is a lengthy process containing several hurdles, such as initial screening, due diligence, valuation and contracting (Fried & Hisrich, 1994). Prior research has shown that VCFs exhibit significant heterogeneity in their selection behavior (Muzyka, Birley, & Leleux, 1996), level of experience (Hsu, 2004) and goals for investing in firms (Hellmann et al, 2008). Because of this heterogeneity, the investment process will be different between VCFs and approaching different investors requires different strategies, knowledge and skills.

Learning performance is greatest when the object of learning is related to what is already known. As a result, learning will be more difficult in novel domains (Cohen & Levinthal, 1990). Hence, entrepreneurs are more likely to use those financing strategies that were successful in the past and are expected to target similar investors to those that offered financing in the past. Similar investors are defined as investors that are similar to prior investors in terms of degree of specialization and ownership amongst other dimensions. Furthermore, as the frequency of using a strategy increases, the efficiency and likelihood of success of that strategy will increase (Levitt & March, 1988). Entrepreneurs will become more capable at attracting financing from similar types of investors. This will further enforce the application of prior strategies in the search for new financial resources and as a result, entrepreneurs will be more likely to search financing from similar investors for future needs.

We argue that entrepreneurs that move through the investment process of specialized investors, for example, will learn and absorb different knowledge compared to entrepreneurs starting with non-specialized investors. The entrepreneur interacting with specialized investors is more likely to learn how to approach other specialized investors compared to an entrepreneur that previously received non-specialized financing.

This because the entrepreneur initially backed by specialized investors can use its repertoire of routines that proved to be successful during past searches for financing from specialized investors. Entrepreneurs getting non-specialized financing early on will have developed a repertoire of routines that is significantly different and not necessarily apt to approach specialized investors.

Investor Syndication Preferences: Homophily. Homophily implies that investors prefer to form an investment syndicate with similar others. Prior research shows that high status financial intermediaries are more likely to cooperate with other high status financial intermediaries, but avoid forming a syndicate with low status intermediaries (Podolny, 1993). Our cases illustrate, for example, how experienced investors attract other experienced investors. The following quotes illustrate:

“Assume we receive two similar proposals: one from company X and one from company Y. However, in company X we have an experienced investor and in company Y we have a fund that invested for the first time in biotechnology. We will definitely select company X and I believe we will be very hesitant to invest in company Y.” (Senior biotechnology investment manager, Investor F, Specialized VCF)

“If you start with experienced and well networked investors it is easy to attract similar investors in the future. If you start with inexperienced and poorly networked investors, nobody wants to join the syndicate later-on.” (CEO Aptanomics)

The above argument further enforces the implications of the learning argument on the demand side of the market. While entrepreneurs become more capable at raising financing from investors similar to their early investors, investors themselves are more willing to collaborate with investors that are similar to them. Hence, these isolating mechanisms work in tandem and reinforce each other.

Investor Syndication Preferences: Network Considerations. Prior research on the selection of alliance partners indicates that the social context is one of the key factors shaping partner selection (Gulati, 1995). Similarly, research studying founding teams indicates the social context plays a key role in the composition of these groups (Ruef, Aldrich, & Carter, 2003). We find a similar mechanism to operate in the composition of investment syndicates.

Investors are more likely to collaborate with investors they know from previous investments. Our cases consistently illustrate how investors form a syndicate with the same group of local and foreign investors.

The following quote illustrates:

“You always see particular funds investing together...You almost always see investor F investing first [a Belgian fund] and investors X and Z [non-Belgian, Continental European funds] offering follow-on financing.” (Investment manager, Investor H, Specialized VCF)

Why do investors prefer to form a syndicate with other investors they know from previous investments? Embedded relationships are preferred as they enhance information transfer through the development of relationship specific heuristics and reduce the uncertainty surrounding other investors' behavior (Gulati, 1995). One important risk perceived by biotechnology investors is that other investors do not allocate sufficient funds for follow-on financing. By deciding to co-invest with investors known through previous mutual investments in the biotechnology sector, investors limit this risk. This is especially important in our setting, as the uncertainty surrounding an investment is high. The risk of inappropriate financing or an unsuccessful financing round is high given the requirement of a series of crucial capital injections over a long period of time (Pisano, 2006). An unsuccessful financing round may cause distress and even failure and consequently increases the risk to any single finance provider (Oakey, 1995). The following quote illustrates:

“It is important to know who your co-investors are...You want to know before you enter a venture how your co-investors will react when problems emerge, follow-on financing is needed at a later stage... If you look at our investment portfolio you will see a number of co-investors emerging frequently...” (Senior biotechnology investment manager, Investor F, Specialized VCF)

DISCUSSION AND CONCLUSION

We began by noting that recent research advanced the financing process as a key external prompt initiating differences in development between high and low performing firms (Maurer & Ebers, 2006). Despite extensive research, the literature on the financing process rests on a few common assumptions. First, financing decisions are guided by economic rationality. Entrepreneurs make value-maximizing financing decisions (Myers, 1984) within some constraints, such as the willingness to remain independent and keep control over the firm (Sapienza, Korsgaard, & Forbes, 2003) and knowledge about financing alternatives (Van Auken, 2001). Furthermore, it is assumed that external investors have access to the entire pool of firms willing to attract external financing (Sorensen, 2007; Eckhardt, Shane, & Delmar, 2006). Second, financial intermediaries are typically portrayed as passive actors. Hence, financial capital is a commodity product (Janney & Folta, 2006; Janney & Folta, 2003), allowing the firm to buy other key resources, such as additional human resources and physical resources. Finally, financing decisions involve an optimization at one point in time, where prior financing decisions play a limited or no role (Fama & French, 2005; Frank & Goyal, 2005). These assumptions make it difficult to understand why organizational studies indicate that the financing process is a key external prompt initiating sustainable differences in development between firms.

In contrast to the most influential theoretical frameworks in the finance literature, which can be classified as teleological models, our findings form an emergent framework of the financing process as an evolutionary process. First, differences in the initial source of financing matter. The initial source from which firms attract financing influences the subsequent financing process and firm performance as a whole. All our high performing cases start with specialized investors, while all low performing cases start with non-specialized investors. We demonstrate that differences in performance are unlikely to be explained by differences in firm quality or growth potential nor by differences in growth ambitions at startup.

Second, despite the difficulty to attract financial resources and the importance of financing decisions in the biotechnology setting (Greene, 1999), entrepreneurs do not perform an elaborate search for financial resources at startup. They typically limit their search to one or a few investors, with whom they have pre-existing ties. Ties help in locating investors, create taken-for-granted assumptions about what constitutes appropriate search behavior and help in evaluating investors. Hence, prior studies researching financing decisions in isolation, irrespective of firm history and previous decisions, miss a lot of the contextual background to fully understand these decisions.

Third, we identify isolating mechanisms that make it difficult for firms to replicate successful financing strategies from their peers. As entrepreneurs interact with investors, they learn about the characteristics of financing and investors. We claim that entrepreneurs interacting with specialized investors early on absorb different knowledge and develop different heuristics for searching follow-on financing compared to entrepreneurs starting with non-specialized investors. It makes entrepreneurs backed by specialized investors more likely and better able to attract financing from other specialized investors in subsequent financing rounds. Syndication preferences by investors strengthen differences between firms starting with specialized versus non-specialized investors. Investors prefer to syndicate with similar investors in future financing rounds and are more likely to form a syndicate with investors known through prior investments.

This research contributes to work on path dependence by extending it to the financing process. We demonstrate how initial financing decisions are influenced by the origin of the firm and pre-existing ties between the founding team and investors. Furthermore, we show how early financing decisions influence the subsequent financing process and firm performance. While prior studies illustrate path dependence in organizational strategies (Boeker, 1989), R&D activities (Helfat, 1994), cooperation in strategic alliances (Doz, 1996), employment systems (Baron, Hannan, & Burton, 2001) and the structure and experience of top management teams (Beckman & Burton, 2008), we are not aware of prior research illustrating path dependence in the financing process. Furthermore, we theorize on how entrepreneurs and investors enforce path dependence in the financing process.

Additionally, our study demonstrates how network closure theory (Coleman, 1990) and structural hole theory (Burt, 1992) play a complementary role in explaining the impact of cohesive ties on firm development. Network closure theory proposes that cohesive ties are valuable to firm development, while structural hole theory proposes that cohesive ties act as a source of inertia and weak ties are more important to firm development (Gargiulo & Benassi,

2000). We have illustrated the importance of cohesive ties and more specifically the institutional origin and pre-founding networks in the search for start-up financing. Some firms got trapped in their own network of cohesive ties which is consistent with structural hole theory. However, in other cases firms resorted to network leverage and cohesive ties to initial investors allowed firms to gain access to resources, such as large amounts of international venture capital, that are generally thought to be unavailable. Whether cohesive ties hinder or foster firms in their development and ability to raise future financing is contingent on the compositional quality of these ties. Compositional quality refers to the extent to which a particular tie can provide the needed resources such as financing, but also expertise and legitimacy (Hite & Hesterly, 2001). Specialized investors have more experience in the biotechnology sector and are therefore better linked in the biotechnology (investment) community compared to non-specialized investors. Hence, the compositional quality of a tie to specialized investors is higher. Our cases illustrate how initial ties to specialized investors typically stimulate firm growth, while ties to non-specialized investors typically constrain firm development.

Our study also adds to recent studies acknowledging heterogeneity between venture capital investors. Prior research shows that industry-specific experience by venture capital firms benefits their portfolio companies (Sorensen, 2007; Dimov & Shepherd, 2005). However, the mechanisms behind the superior performance of firms backed by specialized investors compared to those backed by non-specialized investors remain unclear (Gompers et al. 2008). Our research answers the call by Gompers and colleagues to disentangle the relative importance of investment selection and value adding. In our setting, superior investment selection by specialized investors is unlikely. Biotechnology firms applying for venture capital at start-up show no systematic differences in terms of management experience, alliance capital, stage and scope of the technology and market orientation, which are all early signals of firm potential. Important differences between the portfolio companies of specialized versus non-specialized investors only become apparent at the beginning of the development stage, approximately three years after founding. This finding is remarkably consistent with Maurer and Ebers (2006), who argue that biotechnology firms have quite similar social capital configurations during the start-up phase, but exhibit very different routes with respect to how they develop and manage their social capital from the development phase onwards.

An important consideration is whether evolutionary trajectories in the financing process are limited to our research setting. We believe our findings relate to a broader set of entrepreneurial firms for multiple reasons. Biotechnology entrepreneurs are typically scientists who have limited financing experience. This may constrain their search for financing. However, prior empirical research indicates that entrepreneurs of small technology based firms are typically less familiar with financing sources commonly used to fund growth, such as venture capital financing, compared to traditional financing sources, such as internal finance and bank debt (Van Auken, 2001). Furthermore, biotechnology entrepreneurs typically have strong ties with universities and research institutes, making them more likely to attract financing from funds related to those institutions. However, it remains remarkable that biotechnology entrepreneurs only search startup financing from those investors with whom they have close ties. Practitioner contributions in leading biotechnology journals, such as *Nature Biotechnology*, stress the importance of the source of financing and indicate that financing decisions within the biotechnology context are decisions of heightened importance (Greene, 1999). So, if even in this setting entrepreneurs limit their search for financing then what should we expect from entrepreneurs in the average “mom and pop” business where financing decisions are thought to be less critical? Indeed, the concept of local search in the search for financing corresponds with the stylized fact that the majority of entrepreneurs start with financing from family and friends (Berger & Udell, 1998). Although we briefly touched the question of generalizability of our case study evidence, we leave it up to theory testing research to determine whether our ideas survive empirical test.

Since the seminal work of Modigliani and Miller (1958), teleological models of the financing process, such as the static trade-off theory and pecking order theory, have advanced our knowledge about the financing process immensely. However, much remains unknown about the financing process and current frameworks are not able to explain all stylized facts on financial decision making (Frank and Goyal, 2005). Current frameworks also seem to have difficulties in explaining observations in organizational studies, such as the impact of initial differences in financing on the subsequent financing process and firm development. It was our purpose to show how we might further advance our knowledge by using a different theoretical lens, such as an evolutionary theory.

This study contributes to management practice by improving entrepreneurs' understanding about the financing process. Entrepreneurs should balance the pressure of running out of cash and the time needed to search for appropriate sources of financing. Cash may be king in the biotechnology sector, but from whom you get the money may be far more important as it influences the ease with which the firm is able to attract follow-on financing. All this is essential, as inadequate financing decisions at startup can limit the future growth potential of a firm. Entrepreneurs should realize that not all private equity investors are the same. Not all private equity investors have the same value added potential and inappropriate decisions about which private equity investor to attract as a shareholder can hamper the future growth of the firm.

Our results are important for VCFs as well. First, non-specialized VCFs sporadically contributing capital to biotech firms may question their current investment strategy. Given the required expertise and network structure to guide young biotechnology firms, it might be a better strategy for generalist investors to only act as a non-lead investor in a syndicate. We do note that in particular cases when large amounts of financing are needed, specialized VCFs invite generalist investors to join an investment syndicate. Second, VCFs should realize that, even if they are specialized in a specific sector, such as biotechnology, they do not have access to the entire range of investments. The entrepreneurs search for financing is typically local. Consequently, active deal origination remains an important mechanism to increase the supply of proposals of sufficient quality and diversity.

Finally, government policy may benefit from our research findings. Currently, government agencies are primarily focusing on programs to increase the supply of financing for especially innovative and growing companies. Because of the finance constrained setting in which biotechnology firms operate in Europe, the biotechnology sector has received particular attention. One potential avenue for government is to contribute funds to local venture capital funds. However, an important insight for government officials is that the impact of venture capital on a firm's growth path is not uniform. Specialized local venture capital funds with investment teams dedicated to biotechnology firms, which are well linked in the broader financial community, may be critical for local biotechnology firms to gain access to large amounts of international and specialized private equity financing. Consequently, contributing government funds to non-specialized venture capitalist funds may only marginally contribute to the development of the biotechnology industry or may even harm the development of this industry.

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TABLE 1**Theoretical Sampling Procedure^{a, b}**

MARKET SENTIMENT	ORIGIN FIRM	LOW PERFORMING FIRMS	HIGH PERFORMING FIRMS
HOT MARKET (1999-2000)	ACADEMIC	<i>Pharmaleads</i>	<i>Theraptosis</i>

COLD MARKET (2001-2003)	ACADEMIC	<i>Entomed, (Myosic)</i>	<i>AC Pharma</i>
	CORPORATE	<i>Irogen, (Myosic)</i>	<i>Genom</i>
	RESEARCH INSTITUTE	<i>I-Zyme</i>	<i>Aptanomics</i>

^a Note that all cases are Flemish biotechnology firms active in R&D. This allows to (partially) control for other contextual factors such as location, institutional and cultural environment and financing need.

^b The names of the firms are disguised to guarantee anonymity.

TABLE 2

Description of Biotechnology Cases Studied

Case	Founding year	Activity profile	Length first reporting period (months)	Employment (first reporting period, FTE)	Employment (2006, FTE)	Total Assets (first reporting period, in 000 EUR)	Total Assets (2006, in 000 EUR)	Cumulative number of patents granted (until 2006)	Number of financing rounds	First round financing (in 000 EUR)	Pre-exit financing (in 000 EUR)	Exit
High Performing Firms												
Theraptoxis	2000	Therapeutics	23	3	33	691	9,848	17	3	600	28,800	IPO (2007)
AC Pharma	2002	Platform technologies and therapeutics	12	2	10 (2005)	4,081	2,248 (2005)	19	2	4,500	6,740	Trade Sale (2006)
Genom	1999	Platform technologies and therapeutics	18	16	67	4,550	119,559	10	2	6,000	29,400	IPO (2005)
Aptanomics	2001	Platform technologies, diagnostics and therapeutics	18	6	59	6,207	29,285	22	4	63	70,060	IPO (2007)
Low Performing Firms												
Pharmaleads	2000	Therapeutics (later transferred to spin -off) and platform technologies	14	5	3	604	81	0	2	1,100	2,600	No
Entomed	2002	Platform technologies	13	1	4	536	657	2	2	469	854	No
Myosic	2003	Diagnostics	7	1	3 (2005)	1,140	894 (2005)	0	1	1,500	1,500	Failure (2006)
Irogene	2002	Therapeutics	14	4	N.A.	371	31	0	1	350	350	No
I-Zyme	2002	Industrial and environmental	7	N.A.	N.A.	101	18	0	1	63	63	No

Source: financial accounts, interviews, European Patent Office and company websites

TABLE 3

Sources of Data Biotechnology Cases

Case	Interviews:			Archival Documents:
	Entrepreneurs	Follow-up Entrepreneurs	Investors	
High Performing Firms				
Theraptoxis	CEO (2 interviews)	2	Investor B, D & G	Detailed yearly financial accounts, statutory required publications, press releases, prospectus, slides management road show
AC Pharma	CEO (2 interviews)	-	Investor B & D	Detailed yearly financial accounts, statutory required publications, press releases, confidential reports private equity investor
Genom	CEO	1	Investor F	Detailed yearly financial accounts, statutory required publications, press releases, (slides) presentation CEO at Belgian Biotechnology Association, (slides) presentation CFO at university seminar
Aptanomics	CEO and Business Developer	-	Investor F & H	Detailed yearly financial accounts, statutory required publications, press releases, (slides) presentation CEO at Belgian Biotechnology Association
Low Performing Firms				
Pharmaleads	CEO and CSO	-	Investor D & G	Detailed yearly financial accounts, statutory required publications, press releases
Entomed	CEO (2 interviews)	-	Investor C & I	Detailed yearly financial accounts, statutory required publications, press releases, internal university reports
Myosic	CEO	1	Investor A & E	Detailed yearly financial accounts, statutory required publications, press releases, initial business plan, confidential reports private equity investor
Irogene	CEO (2 interviews)	-	-	Detailed yearly financial accounts, statutory required publications, press releases
I-Zyme	CEO	1	-	Detailed yearly financial accounts, statutory required publications, press releases
Total Number: (excl. pilot interviews)	15	5	9	

TABLE 4

Financing Process by Type of Investor and Firm Performance

Case	Type of investor and financing round in which they participated ^a :						Start-up financing (in 000 EUR)	Pre-exit financing (in 000 EUR)	
	Academic VCFs	Bank VCFs	Other non- specialized VCFs	BAs	Parent company/ institute	Local Specialized VCFs			International (Specialized) VCFs
High Performing Firms									
Theraptoxis	1,2,3	2, 3	<i>3</i>	-	-	2,3	2, 3	600	28,800
AC Pharma	1,2	1,2	-	-	-	1,2	-	4,500	6,740
Genom	-	-	-	-	1	-	2	6,000	29,400
Aptanomics	-	<i>4</i>	-	-	-	1,2,3,4	2,3,4	62	70,060
Low Performing Firms									
Pharmaleads	1,2	2	-	-	-	-	-	1,100	2,600
Entomed	2	-	1, 2	2	-	-	-	469	854
Myosic	1	-	-	-	1	-	-	1,500	1,500
Irogene	-	-	-	-	1	-	-	350	350
I-Zyme	-	-	-	-	1	-	-	62	62

^a The numbers in bold indicate financing rounds that occurred before the main data collection (the initial interviews). The numbers in italics indicate financing rounds that occurred afterwards. All cases were monitored in real time up until the end of 2007. If the cases raised new financing from private equity investors, we would have noticed this in the statutory required publications or financial statements which firms are obliged to complete.

TABLE 5

Early Signals of Growth Potential and Firm Quality: Alliance Capital, Technology and Target Market *

Case	Alliance capital at startup			Technology at startup		Target market at startup
	Commercialization activities	Technical development activities	R&D with universities or research institutes	Stage in product development cycle	Technology scope	
High Performing Firms						
Theraptoxis	0	0	2	Idea Phase	4	Niche market
AC Pharma	0	0	0	Proof of concept	1	Mainstream market
Genom	N.A.	N.A.	0	Idea Phase	5	N.A.
Aptanomics	1	0	1	Proof of concept	5	Mainstream market
Low Performing Firms						
Pharmaleads	0	0	1	Proof of concept	4	Niche market
Entomed	0	0	0	Concrete market-ready product	2	Niche market
Myosic	0	0	1	Idea Phase	N.A.	Niche market, move to mainstream market later
Irogene	0	1	1	Idea Phase	5	N.A.
I-Zyme	0	0	1	Proof of concept	5	Niche market, move to mainstream market later

Source: Structured interviews research-based start-ups.

* N.A. indicates that data was not available for the case. Technology scope at founding was measured on a five-point scale with 1= focus on one specific product and 5 = very broad technology platform with several applications.

TABLE 6

The Impact of the Social Context on Initial Financing

	Facts	Illustrative Quotes
Theraptosis	University spin-off getting financing from university fund. Did not look for other potential equity investors.	"It was the logical choice in the case of a spin-off."
AC Pharma	University spin-off getting financing from university fund.	
Genom	Corporate spin-off getting financing from parent company Did not look for other potential equity investors.	"The CEO did not need to look for money, it was provided by the two parent companies"
Aptanomics	Aptanomics raised financing from a specialized investor. This specialized investor has financed nearly all spin-offs from the research institute.	
Pharmaleads	University spin-off getting financing from university funds. Tried to obtain bank financing unsuccessfully. No other equity investor looked for besides the university fund	"It is the norm for spin offs from universities to start talking to the seed funds of universities. With the university fund we had the most obvious link." "No independent venture capital fund <i>would have</i> accepted to give funds because they only favor later stage companies. BAs <i>would have</i> been a possible alternative, but the company did not need to contact BAs because it received funds from the university fund."
Entomed	Entomed's CEO contacted a university professor he knew. There was a friendship between the university professor and the senior investment manager of the initial investor. Relied solely on university professor to locate a financing source.	
Myosic	Corporate/University spin-off getting financing from a corporate fund and university fund. No other equity investors considered	"When searching for funding it appeared to be logical to have resources from the investors with whom the company and entrepreneur already had contacts."
Irogene	Corporate spin-off getting financing from parent company. Tried to attract financing from banks unsuccessfully. Tried to attract financing from a small number of investors, besides the mother company, but was unsuccessful.	"Contacts were first initiated with a university seed fund. When they were not willing to invest the parent company provided financing."
I-Zyme	Spin-off getting start-up financing from research institute. Did not look for other potential equity investors.	"The institute had the idea to spin-off the company and was therefore willing to invest. Afterwards, there were some contacts with business angels, but not more, things did not get any further."