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Does VC Involvement Affect Branding Strategies in Technology Ventures?

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Abstract

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Abstract

New technology ventures spend considerable resources to develop a commercialization strategy while lacking brand awareness and legitimation among consumers and other relevant audiences. Venture capital firms (VCs) support investee companies to enhance their growth trajectories. Yet it is not clear whether VCs have an impact on startups' branding capabilities. We analyze nanotechnology startups to understand whether VCs help or have no effect on the development of brands for the commercialization of products and services. We find that VC involvement increases the number of brands for which firms seek trademark protection. We also find that, after receiving VC support, firms consolidate their marketing efforts by leveraging the same brand across multiple different market categories. Instrumental variable estimation and different model specifications confirm our results.

Keywords

Technology Ventures; Venture Capital; Branding; Trademarks; New Ventures Strategies

Introduction

Technology ventures are often established to develop and bring to market new products and services stemming from scientific breakthroughs. Such companies spend considerable time and resources to convert a promising technology into a commercial application while lacking external legitimacy and acceptance (Stinchcombe 1965). Furthermore, the founders of new technology ventures often have science/technological backgrounds with competences mainly related to R&D rather than marketing and commercialization (Rindova et al. 2012). Studies focusing on the effects of ownership on firm performance have shown that venture capital firms (VCs) can substantially support new technology ventures to enhance their growth trajectories (e.g. Hellman and Puri, 2002; Hsu 2006; Fitza, Matusik and Mosakowski 2009). Yet there is a limited understanding on whether VCs have an impact on how new firms develop and deploy market-related capabilities. Our paper aims to investigate whether VCs help or have no effect on the branding capabilities of technology ventures—i.e., the ability to build and deploy brands for the commercialization of products and services.

We believe that our research question is important for both management research and practice. Research on the impacts of VCs on their portfolio companies shows that early-stage ventures that secure VC funding receive valuable monetary and non-monetary support from their investors (Hellman and Puri, 2002). VC support has been shown to enhance ventures' innovative productivity (Dushnitsky and Lenox, 2005; Engel and Keilbach, 2007; Croce, Marti, Murtinu, 2013), accelerate scaling up and recruitment (Davila, Foster and Gupta 2003), foster cooperative technology development and licensing (Hsu, 2006), and increase financial performance (Sørensen, 2007; Fitza, Matusik and Mosakowski 2009). The general press often depicts the

event of receiving funding from VCs as a key transition in the lifecycle of technology ventures. A watershed event that will impact both the quantity and direction of their R&D and marketing activities (e.g., TechCrunch, 2012). Nevertheless, in spite of mounting evidence on the importance of downstream capabilities to convert promising innovations into sought-after products (e.g., Eisenhardt and Martin, 2000), we still have little understanding on whether VC support helps or has no effect on the development and deployment of market-related capabilities.

Market-related capabilities can provide technology ventures with a source of competitive advantage (Nerkar and Roberts 2004; Morgan, Vorhies and Mason 2009) and marketing managers have been shown to spend a considerable portion of their budgets to build and manage brand equity (Madden, Fehle, and Fournier 2006).

Developing brands and protecting them via trademarks can impact in a number of different ways the prospects of new technology ventures, from legitimizing the company to potential investors to attracting new talent and customers. Trademarks also complement and extend the advantages and protection mechanisms offered by patents because they can be renewed indefinitely (Rujas, 1999) and the brands they protect can foster consumer loyalty (Krasnikov et al., 2009; Vomberg, Homburg and Bornemann 2014). As trademarks protect the distinctive signs which identify products or services of a particular organization from those of others, they can provide an incentive for firms to invest in further developing and exploiting the quality and reputation of their products and services (Landes and Posner, 1987).

New firms need to sustain considerable efforts to build brands and to enhance consumers' awareness and trademarks have been shown to capture a significant portion of the outcomes of these efforts (Krasnikov, Mishra and Orozco 2009; Mendonça et al., 2004). However, an analysis of the antecedents of branding activities in new technology ventures is almost entirely absent in

the literature (see Helmers and Rogers, 2012 for a notable exception).

This omission is at odds with those studies that show how different forms of financing can shape the upstream innovation processes and outcomes of startups (Dushnitsky and Lenox, 2005; Engel and Keilbach, 2007; Fitza, Matusik and Mosakowski 2009; Hall & Lerner, 2009). This stream of studies has shown that VCs have an impact on the development of technology ventures. However, no study so far has empirically assessed the impact of VC involvement on the development and deployment of new ventures' downstream market-related capabilities. Scholars frequently resorted to patent data to proxy the innovative performance of new technology ventures, generally showing a positive impact of VC funding on the number inventions (e.g., Arque-Castells, 2012; Kortum & Lerner 2001). However, innovation is a complex process leading from invention to commercialization and many patented inventions are rarely converted into commercialized innovations (Mendonça, Pereira, & Godinho, 2004; Hsu 2006; Chandy et al. 2006; Gambardella et al., 2007). While patent counts are fairly effective proxies for characterizing the upstream side of firms' innovative processes—i.e., the creation of inventions—they poorly represent the downstream side—i.e., the commercialization of innovations in the form of new products and services (Griliches, 1990). In this paper we try to complete the picture by studying whether VC funding has an impact on the branding strategies employed by technology ventures.

Our empirical study exploits a hand-collected panel dataset related to 192 new ventures from the micro and nanotechnology sector in the United Kingdom to compare the branding activities of VC-backed startups vis-à-vis a control group of other (non-VC-backed) new ventures. To capture branding activities and outcomes we observe trademarking activity in VC-backed companies before and after their first round of VC funding and draw comparisons vs. the control

group along two different dimensions: the number of new brands protected with trademarks and the number of different product-markets targeted by the same brand (as measured by the number of different goods and services classes covered by a trademark). Results show a positive influence of VC funding on both dimensions.

Our study makes two novel contributions on the effects of VCs on the development and deployment of market-related capabilities in technology ventures. First, we provide an estimate of the effect of VC funding on the creation of new brands that are protected via trademarks. Second, we show that upon receiving VC funding technology ventures tend to consolidate their marketing efforts by leveraging a common brand to market different kinds of products.

The remainder of this paper is organized as follows. The next section identifies a key tension in the innovation and entrepreneurship literature concerning the antecedents of brand building activities in technology ventures and the role of VC funding. We then introduce the empirical setting, data, and variables. We proceed by discussing our analysis, robustness checks, and results. Our conclusion section builds on our contributions to map out directions for richer theorizing about the effects of VC funding on technology ventures and the use of trademark data in strategic management research.

THEORETICAL BACKGROUND

Brands, Trademarks, and Innovation

In recent years, the share of budget dedicated to branding has seen a great expansion in the context of technology ventures, reflecting a need for increasingly elaborated marketing strategies to lure consumers away from more established firms as well as to generate demand for novel

products and services (Lambert-Pandrau and Laurent 2010; Vomberg, Homburg and Bornemann 2014). Developing strong brands spurs firms to provide products or services of a consistent and reliable quality and to continuously improve them to avoid depreciating the value of the brand (Ramello, 2006). Moreover, in the specific context of technology ventures, brands and the trademarks that are used to protect them can provide some form of advantage over competitors even after a patent has expired because a trademark can be renewed indefinitely (Rujas, 1999). The rationale underlying the use of trademarks has its roots in economic theories of information and reputation (Landes and Posner, 1987; Menell and Scotchmer, 2007; Ramello, and Silva 2006). The function of trademarks is often linked to the brands that trademarks protect and their signaling role (Keller & Lehmann 2006; Vomberg, Homburg and Bornemann 2014).

Trademarks grant the exclusive right to use a sign and can thus be used as entry barrier, effectively providing the firm with a temporary monopoly (Greenhalgh & Rogers, 2005). Also, when a trademark protects a strong brand it becomes a strategic resource that can enhance a technology venture ability to acquire legitimation among relevant audiences and generate returns from future products or services (Mendonça et al., 2004; Ramello, 2006; Rujas, 1999; Sandner & Block, 2011). This second dimension of trademarks, connected with the impact on consumers of the meanings conveyed by the brands they protect (Ramello and Silva, 2006) highlights the strategic role of brands for the downstream market-related activities of technology ventures.

Technology ventures have been usually considered to be patent- rather than trademark-intensive, reflecting their focus on inventions and the relative high costs of R&D (Jaffe 2000). However, trademarks and the brands they protect are increasingly important assets both in consumer and industrial markets (Millot, 2009). Both trademarks and patents give the owner a temporary monopoly on the protected entity (Mendonça et al., 2004), but while patents

are directly related to the technological aspects of innovation, trademarks are mostly associated with its commercialization side and firms' downstream market-related capabilities (Rujas, 1999; Schmoch and Gauch, 2009). Finally, trademarks can be registered in both service and manufacturing sectors whereas patents are mostly used to protect actual products (Greenhalgh, Longland, & Bosworth, 2001). Previous literature has suggested that trademark activity captures a significant portion of the companies' branding efforts, as it signals the orientation to build brand awareness among consumers (Krasnikov et al., 2009). Studies that have focused on the consequences of trademarking activities have found a strong correlation between trademark usage and the share of turnover generated with new products or services (Schmoch, 2003), new ventures' growth and survival (Helmers and Rogers, 2012) and financial returns (Sadner and Block, 2011).

Antecedents of Branding Activities in Technology Ventures

Empirical literature on technology ventures' branding activities is still limited and in an early stage of development, with only a few studies analyzing the determinants of the use of trademarks (Amara et al., 2008; Gallè and Legros, 2012; Mendonça et al., 2004; Jensen and Webster 2011) and a more sizeable number of studies looking at the consequences of trademarking such as economic performance (Helmers and Rogers, 2011; Krasnikov et al., 2009), market value (Greenhalgh and Rogers, 2006; Sandner and Bloch, 2011), or employment levels (Greenhalgh and Rogers, 2012).

There is significant variation across industries in the propensity to use brands that are protected with trademarks—i.e., highest in the retail sector and lowest in real estate (Greenhalgh et

al. 2001)—while the propensity to apply for trademark protection across multiple countries—a proxy of the international scope of a brand—is lower than the likelihood to register national trademarks in all sectors (Greenhalgh & Rogers, 2007). Surprisingly, companies classified by the OECD as operating in “higher-tech” sectors use trademarks more than firms in “lower-tech” sectors. In contrast with patents though, trademarks seem diffused also in sectors where patenting activity is particularly limited, such as in low-tech industries or service sectors (Mendonca et al., 2004).

Looking at firm-level determinants of trademarking activities, larger firms have a higher propensity of protecting brands with trademarks (Amara et al., 2008; Bordoy et al., 2007; Galliè and Legros 2012)¹. Other factors positively associated with trademarking are market share (Galliè and Legros, 2012), the affiliation with a business group (Galliè and Legros, 2012; Hanel, 2006), and the degree of internationalization of the company (Thoma and Birker, 2012).

branding activities present both direct and indirect costs for technology ventures, including the investment required to develop a brand name and a brand identity, the fees associated with filing trademark applications, the opportunity cost of time devoted to the filing process, as well as other administrative costs, such as the costs to understand trademarking rules and filing procedures to file a trademark application for multiple classes of goods or services, to file a statement of use, and to demonstrate a brand’s commercial use (Ramello & Silva 2006).

The individuals with technical and scientific backgrounds that often give birth to new technology ventures rarely possess capabilities related to marketing and brand development (Rindova et al. 2012). Second, the direct and indirect costs outlined above are not one off— over

¹A partial exception with regard to trademarks appears in work of Jensen and Webster (2011), who compare the intensity of IP usage (ratio of IP applications to the number of employees) between large firms and SMEs in a large sample of Australian firms over 1994–2001. Their regression analyses, controlling for technology, production and supply characteristics, show no significant differences in the rates of patenting and trademarks by firm size.

time to keep protecting a brand via trademarks the owner needs to prove that a brand is actively in use in commerce for consecutive years and pay fees for renewal (Giarratana & Torrisi, 2010). Finally, similar to other IPRs, even if a brand is protected by a trademark, this can be costly to enforce—both in terms of direct legal costs and in terms of indirect business costs of litigation.

In light of such observations, small companies, and technology ventures in particular, should face in principle significant constraints in their ability to develop brands and protect them with trademarks. However, there is still very limited research on brand creation strategies for start-ups and young SMEs (Bresciani and Eppler, 2010). This is surprising since the specific area of start-up branding and trademarking provides an interesting and unique context for research, for several reasons.

On the one hand, technology ventures have no established identity at the outset and marketing strategies have to be built from scratch. On the other hand, branding and trademarking activities are extremely important for customer acquisition and therefore for the survival of the company (Helmers and Rogers, 2010). Inductive studies addressing the issue have shown that startups follow a brand creation sequence in their brand development process, and that entrepreneurs seem to be the major driving actors in this process. In an in-depth study of 15 startups in Switzerland, Bresciani and Eppler (2010) show for example that trademark registrations are intensively used in the brand creation phase to protect the main elements of the brand design (name, logo, colors and visual elements). Moreover, brand design choices seem to be extremely unstable over the first years of existence of startups, as they mirror the often rapid pace of strategic and organizational change in such companies (Rode and Vallaster, 2005). No study so far has analyzed the role exerted by active investors, such as VCs, in this process.

HYPOTHESES

VC Funding and the Intensity of Firms' Branding Activity

Research on the effects of VC involvement on growth and innovation in young technology ventures generally agrees that, beyond a simple transfer of financial resources, VC firms provide an important form of support that can help to shape both the R&D and commercialization strategies of investee firms (Fitza, Matusik and Mosakowski 2009; Baum et al., 2004; Bertoni et al., 2011; Boeker and Wilkbank 2005; Hsu 2006; Engel and Keilbach 2007). We argue that in the case of decisions related with branding, the involvement of VCs may help technology ventures via two distinct mechanisms: financial resources and mentorship.

On the one hand, VCs can intuitively provide a source of funding that can help technology ventures to meet the direct costs of brand development and trademarking. On the other hand, VCs also act as mentors for their investees providing valuable suggestions on strategic planning and business development in a period of their life in which they generally lack these capabilities (Fitza, Matusik and Mosakowski 2009; Boeker and Wilkbank 2005). In particular, the development and deployment of downstream market-related capabilities is a critical issue for technology-based startups, because founders often have science/technological backgrounds with competences mainly related to R&D rather than commercialization (Rindova et al. 2012). Technology ventures must sustain considerable efforts to build brand awareness among relevant audiences and trademark activities have been shown to capture a significant portion of these efforts (Krasnikov et al. 2009).

VC funding have been shown to foster product ramp up and launch (Krishnan and Ulrich 2001). Similarly, we argue that VC funding will foster the development of branding capabilities in new technology ventures. VCs' accumulated experience with early stage startups can allow a

transfer of tacit knowledge about potential partners and customers (Sorenson and Stuart 2001; Hsu 2006) and about the benefits and drawbacks of trademarking and the management of the trademark application process (Block et al 2012), effectively mitigating technology ventures' learning cost.

In addition to that, by participating in strategy setting (Hellman and Puri 2000) and facilitating the professionalization of the firm (Fitza et al 2009; Hellman and Puri 2002), VC involvement will foster new ventures to reach business development milestones—such as product development and/or the preparation of an appropriate marketing plan. VCs' involvement has been shown for example to help in recruiting scientific personnel that in turn enhances startups' innovative output (Arqué-Castells, 2012) and to improve firms' human resource management and corporate governance structures (Hsu 2006). Similarly, Hellmann and Puri (2000) show that VC-backed technology ventures bring new products to market faster compared to non VC-backed firms while Sørensen (2007) shows that ventures funded by more experienced VCs are more likely to go public. VC involvement will thus spur portfolio companies to develop viable commercialization strategies for specific products and services.

Moreover, VCs usually rely on staged capital infusion mechanisms to alleviate the information asymmetry problem and reduce the investment risks (Gompers & Lerner, 2001; Gompers, 1995; Munari and Toschi, 2014). The brands that technology ventures can protect via trademarks are intangible assets that can incorporate, at least in part, the potential economic worth of their innovations and can play a role in VCs subsequent funding decisions. For example, strong brands can improve the likelihood of appropriating the returns on innovation by complementing the protection conferred by patents beyond their expiration (Ramello 2006) and often serve as important predictive cues of product performance to consumers (Krashinkov et al.

2009). Also, developing brands can contribute to increase the perceived value of portfolio companies to external audiences and signal reputation to potential partners with which to engage in cooperative commercialization strategies (Hsu 2006). Finally, to receive subsequent rounds of funding, startups are expected to signal progress on achieving set goals (milestones). VCs can set as a condition the development of brand equity and related property-based resources that could be protected via law, such as trademarks and copyrights (Block et al., 2012). In line with this view, recent evidence also suggests that VCs seem to value trademarks as a signal of the start-up's market orientation as the presence and number of trademarks in new ventures relates positively to their financial valuation by VCs (Block et al 2012).

In short, the monitoring and coaching functions performed by VCs in terms of development and deployment of downstream market-related capabilities, coupled with increased funding is likely to affect both a firm's marketing activities (Heimonen, 2012). It is reasonable to believe that upon receiving VC funding, startups will be more likely to increase their efforts to build brand awareness to commercialize future products and to file trademarks to protect their brand. Accordingly, we expect VC involvement will lead to an increase in trademarking registrations.

H1: VC involvement increases the number of brands for which technology ventures seek trademark protection.

VC Funding and Brand Breadth

Another important dimension of branding activities, which is likely to be affected by VC involvement in the case of new ventures, is the number of different market categories that will be targeted by a company with the same brand. In technology ventures, the use of a common brand

to market different types of products can contribute to signal strategic moves or changes in corporate identity and market scope to internal and external audiences, inducing economies of scope in both R&D and marketing, and facilitating the acquisition of capital as well as specialist personnel (Ramello and Silva 2006; Economides, 1998).

Technology ventures often operate through capital-intensive activities, which require considerable expertise and are characterized by highly uncertain outcomes (Gersick 1994). As they try to develop and commercialize potential applications of a technology those firms face trade-offs between depth and breadth in their objectives (Ambos and Birkinshaw 2010). In principle, since firms do not know ahead of time the ultimate payoff associated with a particular technology (and a particular commercial application of the technology), they can improve their odds of success by pursuing multiple parallel objectives. However, as the number of R&D and marketing objectives increases, the marginal cost of adding an objective increases (Leiponen and Helfat 2009), the organization and coordination of R&D and marketing activities becomes more difficult and cumulative learning may be hampered (Nelson and Winter, 1982). Targeting multiple product markets with different brands can also impact the internal organizational structure and reduce the scope for synergies across departments. Simulation studies show for example that firms undergoing reorganization miss more opportunities relative to those that are not reorganizing, lowering resources and increasing their hazard of mortality (Hannan, Polos and Carrol 2003).

We argue that the monitoring and mentoring role of VCs may be particularly valuable because managers of technology ventures face choices about whether to focus on exploration—to try realize an innovation's full potential—or whether to focus on exploitation—to ensure the commercial success of a limited number of products based on a particular application of their

technology platform (Choi et al. 2008; Kotha et al. 2011). These are critical choices in the early years of technology ventures because the capabilities firms need to exploit opportunities differ from the skills required to identify them (Hitt et al. 2001; Ketchen et al. 2007). Moreover, these are choices managers face in the organization of activities across both their organizations' functional domains of R&D and marketing (Slotegraaf & Atuahene-Gima 2011).

Once providing investment, VCs have a direct interest to help investees and drive them toward economic success by focusing on converting promising technologies into commercial products and new commercial applications of technologies with high potential economic returns. Leveraging a common brand across different product-market categories can allow a young technology venture to concentrate limited resources on the development of one or few strong brands, signalling a viable pipeline of future applications of its technology to external audience while its busy doing the groundwork for launching a first product or service. Given that VC firms are particularly interested in high-growth companies, it is likely that they place emphasis on the pursuit of related diversification strategies by investee companies. Thanks to a diversified product portfolio, startups' resources are bundled and it becomes more difficult for competitors to imitate their products (Wan, Hoskisson, Short, & Yiu, 2011). Also, related diversification can sometimes lead to high levels of profitability (Rumelt, 1982).

Unfortunately, diversification is often a risky strategy for resource constrained startups. Focus and tight coupling between R&D and marketing is often required because the coordination costs generated by decoupling upstream R&D and downstream marketing activities can increase risks and delay much needed revenues from one first launched product. Research suggest that young technology ventures should commit to one major application of a technology and resist the urge of diversification until a first major application of their technology is launched and starts to

generate revenues (Bergelman & Siegel 2007; Posen & Levinthal 2012).

By extending the breadth of a brand, multiple commercial applications of a common underlying technology under a common brand can be effectively “optioned” without major impacts on a firm’s current operations. It is worth noting that trademark applications with more than one class of goods or services are usually subject to additional fees for each additional class, but the marginal contribution of adding additional classes on the baseline costs that a firm needs to face to file a trademark is likely to be modest. Accordingly, by filing a broad trademark a firm can secure space for future growth of a product line without actually diversifying both R&D and marketing activities in the present. Accordingly, we expect that the mentorship role of VCs will lead VC-backed startups to be more likely to leverage a single brand across multiple different product-market categories resulting in trademarks with wider breadth.

H2: VC involvement increases the number of different market categories that a company targets with the same brand.

METHODS

Empirical Setting: the Micro- and Nano-technology Sector in the United Kingdom

Nanotechnology has been defined as “the design, characterization, production, and application of structures, devices, and systems by controlled manipulation of size and shape at the nanometer scale (atomic, molecular, and macromolecular scale) that produces structures, devices, and systems with at least one novel/superior characteristic or property” (Bawa et al, 2005).

The micro- and nano-technology sector (MNT) sector in the United Kingdom is an

interesting and appropriate setting to study the relationship between VC and trademarking activity for several reasons. First, the UK market is second only to the US in the world for what concerns the development of the venture capital industry (Lockett, Murray, & Wright, 2002). Moreover, the MNT sector in the United Kingdom has been characterized by a significant growth over the last two decades, largely driven by the emergence of innovative start-ups and the infusion of equity by VC funds (Libaers et al., 2006), and paralleled by a general increase in the number of trademark applications from UK firms (Greenhalgh & Rogers, 2012). Finally, this setting has been already studied by other academic works, providing a useful benchmark for our research (Munari & Toschi, 2011).

Sample and Data Sources

We constructed the dataset through the following six steps. First, we identified the population of startups operating in the UK MNT sector from 1996 according to the “Industrial Map of UK MNT”, an exhaustive map compiled in 2004 by the MNT Network in association with the UK Department of Trade and Industry (DTI). From this source, it was possible to identify 193 new ventures founded from 1996 and onwards. Detailed information about these companies in the report includes the year of foundation, the registered address and a brief company description. Second, we use Companies House (the register including information on all limited companies in England, Wales, Northern Ireland and Scotland) to check for name changes and status for all the startups included in this first sample. Since company name may be altered with time and both VC funding information and trademark information should be retrieved according to company name, we obtained information on all the names in history used by each startup. Third, Thomson One was used to collect VC funding information for all the startups. In this way, we were able to

ascertain whether a startup received VC funding or not, and the date of first round of VC financing. Through Thomson One, we were able to identify 9 additional startups operating in the nanotechnology sector.

Fourth, to capture the branding activities of startups we collected UK trademark and community trademark data respectively from the online databases of the UK Intellectual Property Office and of the OHIM (Office for the Harmonization of Internal Markets). We use filing rather than registration date in our analyses to minimize the lags between trademarking decisions and firms internal deliberations about branding strategies.

Information on the directors of each startup was gathered from Bureau van Dijk FAME, a database containing comprehensive economic and legal information on companies in the UK and Ireland. 10 startups not covered by FAME were excluded from our sample. Therefore, our final sample includes 192 firms. Detailed director information from FAME include current and previous list of directors with title, appointment date, resignation date and birthday for each director. Based on the appointment date and resignation date, we manually computed the tenure of each director with the company. We also used the database Company Director Check in order to collect information on each director's previous work experience as directors in other firms.

In short, we were able to construct an unbalanced panel dataset on 192 startups established from 1996, including 67 VC-funded (around 35% of our sample) and 125 non VC-funded startups. 70 startups (36% of our sample) filed at least one trademark during the observation period.

Dependent Variables

The branding activities of startups are measured using three variables: the likelihood to file

trademarks (*Trademark_Propensity_{it}*), the number of filed trademarks (*Trademark_Number_{it}*), and the breadth of trademarks (*Trademark_Breadth_{it}*). *Trademark_Propensity_{it}* is a dummy which takes the value 1 if company *i* filed at least one trademark in a year *t*, and zero otherwise. *Trademark_Number_{it}* captures the number of brands for which a firm applies for a trademark protection. It is measured as the number of trademark applications filed by company *i* in year *t*. The breadth of trademarks *Trademark_Breadth_{it}* capture the extent to which a technology venture leverages a single brand across multiple different product-market categories. It is measured by the total number of different NICE classes on all the trademarks filed by the focal startup in year *t*. When filing a trademark the applicant and examiners will define the scope of application of a trademark using the NICE classification of goods and services. This taxonomy indicates the market scope of a protected brand by specifying a limited set of market segments in which the legal protection of a trademark is valid. The goods and services to which a registered trademark applies are classified in the same way in all countries that have adopted the NICE Classification. Trademarks with a broader scope tend to protect different kinds of products or wider product lines (Sandner & Block, 2011).

Independent Variables

Our main explanatory variable— *VCFunding_{it}*— is a dummy taking value 1 for VC-backed startups from the year of first round of VC funding onwards, and zero otherwise.

We also include in our regression analyses several control variables that may be expected to influence trademarking activity. The age of a company influences its propensity to innovate and ultimate innovation results (Arqué-Castells, 2012). Therefore, we included a variable *Age_{it}* in

order to measure the age of the company (since its founding year) in each year t . Concerning the characteristics of a startup's directors, prior experience as directors in other firms is likely to positively influence their ability to strengthen the competences of the startups, including the innovation and marketing competences. The educational levels of the directors can also have a positive impact on the firms' innovative results. Therefore, $dumexperience_{it}$ is a dummy variable taking value 1 if any director of the focal startup in a given year has had prior directorship experience in other firms. Another dummy variable $dumPhD_{it}$ takes value 1 if any director of the focal startup in a given year has a PhD title.

Moreover, old directors and young directors have different experiences shaping their different attitudes and values. Diversity of attitudes and values facilitate creativity (Bantel & Jackson, 1989). We expect the more diversified are the ages of the company directors, the more ability a startup has for dealing with innovation and trademarking activity. We thus computed a variable $ageheterogeneity_{it}$ by dividing directors into 5 groups with respect to their ages: directors with ages between 20 and 30; ages between 31 and 40; ages between 41 and 50; ages between 51 and 60; and ages older than 60². Then age heterogeneity is calculated with the following formula (Bantel & Jackson, 1989):

$$ageheterogeneity = 1 - \sum p_i^2$$

where p is the proportion of team members in each of the five age categories, and i each category.

More than 80% startups received their first VC round and filed their first trademark between the year 2000 and 2007 (see Table 1). To control for potential unobserved factors related to business and technological cycle, we include a set of year dummies. Similarly, we include a set of dummies to capture potential factors tied to the geographic location of each company, such as spillover effects and local networks that can influence resource acquisition and innovation

²The youngest director in our sample is 21 years old.

(Almeida & Kogut, 1997). Table 2 provides a summary of all variables and data sources.

-----| Table 1 and Table 2 about here |-----

ANALYSIS & RESULTS

Descriptive Analysis

Table 3 presents descriptive statistics for all the variables used in this paper. The mean likelihood of trademarking for a startup in a given year is 0.068. On average each firm filed to protect 0.136 brands during the observed period with an average breadth of 0.205.

-----| Table 3 about here |-----

Table 4 shows that 67 startups received VC funding and 70 startups filed trademarks. It suggests that VC-backed startups tend to receive the first round of financing and file their first trademark when they are very young. Moreover, it suggests that VC-backed startups are more likely to receive the first round VC first and then file their first trademark (e.g., at the founding year, 22% startups received their first round VC but only 15% filed their first trademark).

-----| Table 4 about here |-----

Table 5 shows that 51% of venture-backed startups filed at least one trademark; whereas only 29% of non VC-backed funded ones filed trademarks. The chi-squared test confirms that the difference in the frequency levels between the two groups is statistically significant at 1% level.

-----| Table 5 about here |-----

Moreover, for the sample of VC-backed companies the propensity to trademark is higher after the first round of VC financing rather than before (see Table 6). 29 VC-backed firms (43%) file trademarks after the first round of VC funding, as compared to only 12 (18%) that file trademarks before VC involvement. Even more striking, the average number of trademarks filed

after VC funding is more than twice the number of trademarks filed before VC funding (4.38 after vs. 2.08 before).

-----| Table 6 about here |-----

Taken together, Table 5 and Table 6 seem to suggest that VC-backed firms are in general more active in trademarking activities than non VC-backed startups, and that a significant increase in trademarking activities occurs after VC funding. However, firm-specific characteristics, which may affect trademarking activity, are not considered in these statistics. We therefore undertake more systematic regression analyses in order to investigate whether VCs help or have no effect on the trademarking activities of technology ventures.

Multivariate Regressions

Three dependent variables are used in our analyses to capture technology ventures' branding strategies: the likelihood of trademarking in each year, the number of trademark applications per year and trademark breadth. Given the longitudinal nature of our data we estimate different regression models using panel data approaches to study the effect of our main explanatory variable—*VC Funding*—on the three dependent variables. To study the likelihood of trademarking we used a logit model. Conversely, to study the number of trademark filings and their breadth we use a model that is suitable to count data: a negative binomial (as robustness check we also used a Poisson model, as shown in the next section of the paper). The correlation matrix reported in Table 7 does not indicate multicollinearity issues.

-----| Table 7 about here |-----

To choose between fixed effect and random effect models we run a Hausman test. Results of

this test reveal that a random effect model is appropriate for all the models. Table 8 thus presents our regression results using the random effects specification.

Results

We analyze the effect of *VCFunding* on three dependent variables (Model 1, 2 and 3) starting with a univariate regression which only includes *VCFunding* as explanatory variable (Column 1 of Model 1, 2, and 3). Then in Column 2 of each model, we control for management characteristics. We then include in Column 3 of each model the remaining control variables—startup age, regional dummies and year dummies—to see whether results change.

-----| Table 8 about here |-----

The coefficients of the variable *VCFunding* are all positive and statistically significant at the 10% level in all the different specifications of Model 1 and with a more pronounced statistical significance at the 1% level in Model 2. This provides support to H1 suggesting a strong positive effect of VC funding on the number of trademark applications.

Finally, the results in Model 3 indicate a positive and statistically significant effect (at the 5% level) of *VCFunding* on trademark breadth, supporting H2. After receiving VC funding firms tend to file broader trademarks that are used to protect different types of products and services with a common brand.

Directors' age heterogeneity has a positive and significant effect on the likelihood of trademarking. Even though other control variables are not significant, they enter with the predicted sign. In model 2 and 3, year 1996 has a significant and positive influence on the number of trademark applications and the breadth of trademarks. A potential explanation for this effect is that the community trademark application system was first introduced in 1996.

In short, after controlling for a set of potential confoundings, our results support our hypotheses, suggesting that VC involvement is positively related with an increase in startups' branding activities and in the use of a common brand for multiple different products and services.

Robustness Checks

VCs do not invest randomly, therefore we need to address potential selection concerns. Firms that actively build brands and protect them using trademarks could differ in unobservable ways from firms that do not, such as in the quality of their underlying products and technologies, leading to a higher probability to receive VC funding (Sørensen, 2007). We use an instrumental variable approach to address the possibility that VC funding is endogenously determined.

A technology venture's reputation can provide a theoretically useful instrument. Various studies have shown that a firm's reputation is correlated with financial performance and that VCs value firm reputation during their investments decisions (Lange, Lee, & Dai, 2011). Following previous studies, we capture reputation as the amount of favorable media coverage of the company before VC funding (Deephouse, 2000; Pollock and Rindova, 2003). More precisely, we compute the coefficient of media favorableness (Deephouse, 2000). Its formula is:

$$\text{Coefficient of media favorableness} = \begin{cases} (f^2 - fu)/(\text{total})^2 & \text{if } f > u \\ 0 & \text{if } f = u \\ (fu - u^2)/(\text{total})^2 & \text{if } u > f \end{cases}$$

where "f" is the stock of favorable news; "u" is the stock of unfavorable news; "total" is the stock of total news³.

³We used Lexis-Nexis in order to gather information on the coverage in the media of the new ventures included in our sample. We identified citations in the news in the UK newspapers. We coded an article as favorable if it praised the startup for its actions or involvement in some events that may increase its reputation, such as receiving an award for its technology; we coded an article as unfavorable if it criticized the startup for its actions or involvement in some events that may decrease its reputation, such as massive layoffs; and we coded an article as neutral if there was no

To validate our choice of instrument we first estimate a bivariate probit regression (see Table 9). Results show that reputation is positively associated with the likelihood of receiving VC funding, but not with the likelihood of building brands that are protected using trademarks. These results also confirm that VC funding and the likelihood of building brands are significantly related with each other. We can therefore rely on startup reputation as an instrumental variable to control for potential endogeneity issues. The results of our estimates based on the instrumental variable approach (see Table 10) confirm a positive and statistically significant effect of VC funding on the likelihood of building brands that are protected using trademarks for our sample of technology ventures.

-----| Table 9 and Table 10 about here |-----

Finally, to check the robustness of the results involving count dependent variables we used a Poisson model instead of a negative binomial. The estimates reported in Table 11 are largely in line with the results emerging from the previously reported negative binomial model. For the effect of VC funding on the number of brands that are protected using trademarks, the coefficient of *VCFunding* is significant at 1% level. The effect of VC funding on trademarks breadth is also confirmed. Both results remain virtually unchanged when we use different models.

-----| Table 11 about here |-----

DISCUSSION AND CONCLUSIONS

Building on innovation and entrepreneurship literature concerning market-related capabilities and the relationship between VC firms and their investee companies, we examine the effects of VC support on the branding strategies of technology ventures. Specifically, we argued,

evaluations about the startup.

and found empirical support for the idea that VC support can foster brand building activities in technology ventures.

Our results provide strong evidence that VC support increases the number of new brands for which technology ventures seek trademark protection. We also find that, after receiving VCs support, technology start-ups consolidate their marketing efforts by leveraging the same brand across different kinds of products and services and/or wider product lines.

Although the results of this study should be interpreted with caution, they add to existing perspectives on technology and innovation management in major ways.

First, we contribute to those studies that have investigated the importance of venture capital funding for the growth of startups (Hellman and Puri 2000, 2002; Dushnitsky & Lenox, 2005; Engel & Keilbach, 2007; Hall & Lerner, 2009; Fitza et al. 2009). Although the effect of VC on innovation has been extensively studied, most researchers have relied on patent data as a proxy of innovative productivity (e.g., Arque-Castells, 2012). In contrast, we extend the literature about the relationship between VC and their investee companies by leveraging trademarks to characterize downstream market-related capabilities, important for the commercialization and marketing of innovations.

Scholars have shown that market-related capabilities can provide firms with a source of competitive advantage (Morgan, Vorhies and Mason 2009; Krashinov et al 2009) and that different sources of funding (e.g., public, private, CVC) can shape the R&D processes and market outcomes of technology ventures (Dushnitsky and Lenox, 2005; Engel and Keilbach, 2007; Fitza, Matusik and Mosakowski 2009; Hall & Lerner, 2009). We extend previous theorizing and empirical observations on the effects of VC involvement on investee companies by providing evidence of a positive association between VC funding and startups' branding efforts as captured

by their trademarking activities. More specifically, our analyses support a positive effect of VC funding on the number of brands for which firms seek trademark protection and the breadth of the resulting trademarks.

Second, highlighting VCs' role in the scope of technology ventures' branding initiatives we also contribute to those studies that have highlighted the importance of downstream marketing activities to convert promising innovations into sought-after products (e.g., Eisenhardt and Martin, 2000; Chandy et al 2006; Morgan, Vorhies and Mason 2009). Our result on the positive effect of VC funding on brand breadth suggests that VC funding is shaping strategic decisions such as the choice of product market combinations. As trademarks report a list of goods and services categories for which the registered mark will be used, we can infer that after VC funding technology ventures seem more oriented towards targeting multiple applications of their technology to be marketed under a common brand.

We finally contribute to an emerging stream of literature on innovation and entrepreneurship that is focusing on trademarks to characterize the downstream market-related activities of firms (e.g., Mendonça et al., 2004; Amara et al., 2008; Gallè and Legros, 2012; Krasnikov et al., 2009; Greenhalgh and Rogers, 2006; Sandner and Bloch, 2011; Greenhalgh and Rogers, 2012). Our focus on VCs extends this stream of research by identifying how VC funding shapes strategic choices about branding during the early years of new ventures. An ongoing debate about management scholars is that patents are a good proxy for the upstream side of innovative performance—the creation of inventions—, but less good at capturing the downstream side of innovative performance—the commercialization of products and services. We believe the impact of VC involvement on the strategic use of different IPR mechanisms in new ventures is an issue that deserves further inquiry by future research. We make a first step in this direction by

leveraging trademark data as a proxy for technology ventures' branding activities.

The paper also has some limitations that can be investigated by future researches. First, while using data from a single sector—micro and nanotechnology—ensures internal validity, caution should be applied in generalizing our results to other sectors, especially low technology sectors.

Second, we studied the impact of VC funding on the branding activities of technology ventures. However, we do not know the impact of the amount of VC funds startups received on their subsequent trademarking activities. In addition, our results indicate that VC funding does have positive influence on trademarking activities, but we still know little about the specific organizational mechanisms through which VC involvement affects technology ventures' branding strategies, such as what activities they undertake or what type of involvement and support VCs actually provide in order to facilitate the development of branding capabilities in new technology ventures.

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TABLES & FIGURES

Table 1 – Years in which Startups Received their First Round of VC-Financing and their First Trademark

Year	Receiving First VC Funding			Filing First Trademark		
	Frequency	Percentage	Cumulative	Frequency	Percentage	Cumulative
1996				1	1.43	1.43
1997	2	2.99	2.99	0	0	1.43
1998	2	2.99	5.98	1	1.43	2.86
1999	2	2.99	8.97	2	2.86	5.72
2000	14	20.9	29.87	6	8.57	14.29
2001	7	10.45	40.32	12	17.14	31.43
2002	6	8.96	49.28	6	8.57	40
2003	7	10.45	59.73	7	10	50
2004	6	8.96	68.69	9	12.86	62.86
2005	8	11.94	80.63	5	7.14	70
2006	2	2.99	83.62	9	12.86	82.86
2007	5	7.46	91.08	7	10	92.86
2008	2	2.99	94.07	2	2.86	95.72
2009	1	1.49	95.56	0	0	95.72
2010	2	2.99	98.55	2	2.86	98.58
2011	1	1.49	100	1	1.43	100
Total	67	100		70	100	

Table 2 – Summary of Variables and Data Sources

Variable	Description	Source
Dependent Variables		
Trademark_Propensity	Dummy taking the value of 1 if the focal startup filed at least one trademark at year t	OHIM and UK IPO
Trademark_Number	Total number of filed trademarks by the focal startup at year t	OHIM and UK IPO
Trademark_Breadth	Average number of different goods and services classes reported in the trademarks filed by the focal startup at year t	OHIM and UK IPO
Independent Variables		
VCFunding	Dummy with value 1 for VC-funded startups from the year of VC entry onwards	Thomson One
Control Variables		
Dumexperience	Dummy with value 1 if any company director has previous directorship experience in other firms	FAME; Company Director Check
DumPhD	Dummy equal to 1 if any director received a PhD	FAME; Company Director Check
Ageheterogeneity	Top management team age heterogeneity of the focal startup at year t	FAME
Year dummies	A set of 16 year dummies	MNT
Region dummies	A set of 12 region dummies	MNT
Age	Startup age	MNT

Table 3 – Descriptive Statistics (Main Variables)

Variable	Obs.	Mean	Std. Dev.	Min	Max
Trademark_Propensity	2074	0.068	0.252	0	1
Trademark_Number	2074	0.136	0.651	0	15
Trademark_Breadth	2074	0.205	1.024	0	19
VCFunding	2074	0.274	0.446	0	1
Dumexperience	1868	0.865	0.341	0	1
DumPhD	1963	0.678	0.467	0	1
Ageheterogeneity	1895	0.432	0.261	0	1
Age	2074	5.261	3.633	0	15

Table 4 – Distribution of Startup Age when Receiving First Round of VC Funding and when Filing First Trademark

Age	Received First Round of VC Funding			Filed First Trademark		
	Frequency	Percentage	Cumulative	Frequency	Percentage	Cumulative
0	15	22.39	22.39	11	15.71	15.71
1	16	23.88	46.27	11	15.17	31.42
2	8	11.94	58.21	15	21.43	52.85
3	9	13.43	71.64	4	5.71	58.56
4	3	4.48	76.12	9	12.86	71.42
5	8	11.94	88.06	6	8.57	79.99
6	4	5.97	94.03	4	5.71	85.7
7	2	2.99	97.02	1	1.43	87.13
8	0	0	97.02	1	1.43	88.56
9	1	1.49	98.51	5	7.14	95.7
10	1	1.49	100	1	1.43	97.1
11				1	1.43	98.56
14				1	1.43	100
Total	67	100		70	100	

Table 5 – Likelihood of Trademarking: VC-Backed vs. Non VC-Backed Startups

Variable	Group	VC-Backed Startups		Non VC-Backed Startups	
		Frequency	Percentage	Frequency	Percentage
Trademark_Propensity	Yes	34	50.75	36	28.8
	No	33	49.25	89	71.2
	Total	67	100	125	100
	Pearson			9.0688	
	Chi-square				
	P value			0.003	

Table 6 – Venture Capital Funding, Number of Trademarks Filed and Timing of Trademarking Activity

	VC Funded Startups			Non VC Funded Startups		
	Total Number of Trademarks	Number of Startups Trademarking	Average Number of Trademarks per Startup	Total Number of Trademarks	Number of Startups Trademarking	Average Number of Trademarks per Startup
Trademarking activity:						
...before VC funding	25	12	2.08	-	-	
...after VC funding	127	29	4.38	-	-	

Table 7 – Correlation Matrix (Main Variables)

Variable	1	2	3	4	5	6	7	8
1 Trademark_Propensity	1							
2 Trademark_Number	0.77*	1						
3 Trademark_Breadth	0.75*	0.65*	1					
4 VCFunding	0.08*	0.08*	0.05*	1				
5 Dumexperience	0.08*	0.07*	0.06*	0.16*	1			
6 DumPhD	0.06*	0.05*	0.03	0.13*	0.03	1		
7 Ageheterogeneity	0.06*	0.05*	0.02	0.20*	0.36*	0.27*	1	
8 Age	-0.01	-0.01	-0.004	0.18*	0.05*	-0.01	0.07*	1

* significant at 5% level.

Table 8 – Main Regression Results

Dependent Variable	(1)			(2)			(3)		
	Propensity to File Trademarks			Number of Trademarks			Trademark Breadth		
Model	Logit RE	Logit RE	Logit RE	Negative binomial RE	Negative binomial RE	Negative binomial RE	Negative binomial RE	Negative binomial RE	Negative binomial RE
VCFunding	0.69** (0.28)	0.51* (0.28)	0.54* (0.3)	0.77*** (0.23)	0.66*** (0.23)	0.65*** (0.25)	0.71*** (0.23)	0.62*** (0.23)	0.56** (0.26)
Dumexperience		0.85 (0.56)	0.79 (0.58)		0.95* (0.52)	0.92* (0.53)		1.02** (0.52)	0.88 (0.54)
DumPhD		0.36 (0.29)	0.22 (0.31)		0.37 (0.25)	0.19 (0.25)		0.26 (0.25)	0.07 (0.26)
Ageheterogeneity		1.04* (0.57)	1.15** (0.59)		0.58 (0.47)	0.69 (0.49)		0.26 (0.47)	0.49 (0.49)
Age			0.03 (0.08)			0.02 (0.06)			0.05 (0.06)
Region Dummies	No	No	Yes	No	No	Yes	No	No	Yes
Year Dummies	No	No	Yes	No	No	Yes	No	No	Yes
Constant	-3.43*** (0.22)	-4.87*** (0.59)	-5.42*** (1.17)	-1.92*** (0.22)	-3.33*** (0.56)	-3.56*** (0.7)	-2.62*** (0.2)	-3.87*** (0.54)	-6.28*** (1.35)
Observations	1820	1820	1820	1820	1820	1820	1820	1820	1820
N. startups	178	178	178	178	178	178	178	178	178
Log Likelihood	-444.22	-438.36	-420.97	-639.63	-634.44	-615.4	-686.83	-683.01	-653.79
Prob > chi2	<0.01	<0.01	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Hausman Test	0.198	0.11	0.85	0.59	0.26	1	0.87	0.6	0.89

*** p<0.01, ** p<0.05, * p<0.1 Standard errors in parentheses.

Table 9 – Biprobit Regression

	Propensity to Trademark	VCFunding
Dumexperience	0.57** (0.23)	0.52* (0.29)
DumPhD	0.07 (0.15)	0.15 (0.18)
Ageheterogeneity	0.18 (0.35)	0.86** (0.35)
Age	-0.02 (0.02)	0.05*** (0.02)
Coefficient of Favorableness	0.18 (0.14)	0.54*** (0.22)
Constant	-2.05*** (0.22)	-1.97*** (0.33)
Observations	1695	1695
Rho		0.19 (0.09)
Prob> chi2		0.04

*** p<0.01, ** p<0.05, * p<0.1 Standard errors in parentheses.

Table 10 – Instrumental Variable Estimation

	Propensity to Trademark
VCFunding	0.26*** (0.09)
Dumexperience	-0.005 (0.03)
DumPhD	0.004 (0.02)
Ageheterogeneity	-0.003** (0.04)
Age	0.0007 (0.005)
Constant	-0.06 (0.06)
Region Dummies	YES
Year Dummies	YES
Observations	1695
N. startups	178
R ² (overall)	0.02
Prob > chi2	0.02

*** p<0.01, ** p<0.05, * p<0.1 Standard errors in parentheses.

Table 11 – Poisson Regression

Dependent Variable	Trademark Number[^]	Trademark Breadth[°]
VCFunding	0.94*** (0.24)	0.54** (0.24)
Dumexperience	1.12** (0.55)	0.56 (0.47)
DumPhD	0.28 (0.23)	0.18 (0.19)
Ageheterogeneity	1.05*** (0.41)	0.85** (0.36)
Age	0.03 (0.07)	0.09 (0.09)
Constant	-4.04*** (1.06)	-5.9*** (1.31)
Region Dummies	YES	YES
Year Dummies	YES	YES
Observations	1820	1820
N. startups	178	178
Log Likelihood	-693.43	-894.05
Prob > chi2	<0.01	<0.01
Hausman test (p value)	0.73	0.99

*** p<0.01, ** p<0.05, * p<0.1 Standard errors in parentheses. [^] Random effects model. [°] Random effects mode.