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Trademarks and venture capital funding

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Abstract

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Jelcodes:O34,G24

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Keywords: Venture capital; innovation finance; trademarks; entrepreneurial marketing; patents; intellectual property

JEL classifications: O34, G24, L26

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1. Introduction

Venture capitalists (VCs) have problems to observe the quality of start-ups as investment targets. These problems result from considerable information asymmetries that exist between VCs and start-ups. To overcome these information asymmetries, VCs evaluate, amongst others, start-ups' intellectual property (IP) assets. Prior research regarding the role of IP assets in VC financing, however, has focused primarily on patents (Lerner, 1994; Baum and Silverman, 2004; Engel and Keilbach, 2007; Hsu and Ziedonis, 2007; Mann and Sager, 2007; Haeussler et al., 2009; Cao and Hsu, 2011). While patents are of course an important criterion to be considered when investing in start-ups, particularly technology start-ups, research shows that other IP assets, in particular trademarks, also have a considerable effect on firm's market values (Greenhalgh and Rogers 2006, 2007; Sandner and Block, 2011). Trademarks grant its holders the right to exclude others from the use of the trademarked word, sign, or symbol (Landes and Posner, 1987; Besen and Raskind, 1991). This way, trademarks serve as a means to protect a firm's brands and marketing assets (Barth et al., 1998; Wood, 2000; Mendonca et al., 2004; Sandner and Block, 2011). Even though this exclusion right may not have an immediate value for an early-stage start-up, the filing of trademarks reflects a start-up's degree of marketing orientation and willingness to protect its current and future marketing efforts against impairment from others. Studying the role of trademarks in VC financing decisions is therefore also a highly relevant marketing topic.

There is already an established research stream on the marketing-finance interface (for an overview see e.g., Srinivasan and Hanssens, 2009) that provides empirical evidence for the link between a broad range of marketing assets and marketing actions on investments decisions. However, these studies have only focused on large, established firms and changes in stock market valuations. Research in the field of entrepreneurial marketing (for overviews see e.g., Gruber, 2004;

Kraus et al., 2011), however, suggests that marketing is also highly relevant for the success of young entrepreneurial ventures. Also VCs consider marketing orientation as an important investment criterion. Still, to date, little empirical research exists on the VC-entrepreneurial marketing interface. This paper aims to address this research gap. We seek to analyze the role of trademarks as IP and marketing assets regarding VCs valuation of start-ups. More specifically, we investigate whether the availability and breadth of trademarks influences start-up valuation by VCs and how such an effect changes over the venture cycle. We also compare the respective effects of trademarks on start-up valuation against those of patents.

Using a large, U.S. firm-level transaction dataset from 1998 to 2007, we are able to show that the presence and number of trademarks of a start-up is related positively to its valuation by VCs. This positive effect, however, is nonlinear and decreases with the number of trademarks filed. Our regressions also show that trademark breadth is associated positively with start-up valuation and that the effect of trademarks decreases over the venture capital cycle. The effect of trademarks on start-up valuation is higher than the respective effect of patents.

The remainder of the paper is organized as follows: Section 2 reviews related literature. Section 3 presents our data, while Section 4 provides descriptive and multivariate results. Section 5 discusses our results and concludes.

2. Related literature

2.1 Research on IP rights and VC funding

VC funds typically support high-risk innovative start-ups, holding mainly intangible assets. To minimize the risk of failure, VCs perform intensive pre-investment screening, using a variety of evaluation criteria (Zacharakis and Meyer, 2000). Examples of such evaluation criteria are the quality of a start-up's business plan, the venture team, the start-up's network and alliance capital, IP rights, and the venture idea (e.g., Macmillan et al., 1985; Hall and Hofer, 1993; Baum and

Silverman, 2004; Franke et al., 2006; 2008). Within this literature, several studies focused on the role of patents in VC funding. Start-ups filing patents were found more likely to receive VC funds in the first place (Engel and Keilbach, 2007; Haeussler et al., 2009; Cao and Hsu, 2010), and were valued higher by VCs (Lerner, 1994; Baum and Silverman, 2004; Hsu and Ziedonis, 2007). Also, start-ups with patents showed superior performance throughout the VC cycle compared to other start-ups (Mann and Sager, 2007; Cao and Hsu, 2010). From these studies, it remained unclear whether VCs value patents as a signal of the start-up's quality, or whether they value the patent per se (i.e., the exclusion right). If patents have a signalling function, VCs would attach higher quality to a patented start-up in case the quality of technology is unobservable. In a recent study, Hoenig and Henkel (2012) disentangled these two effects, finding that patents are relevant in VC decision making, yet solely through its function as a property right.

While the patent-VC interface has received attention in the literature, little is known about the role of trademarks in VC funding. The paucity of research on trademarks in VC funding is surprising given the strong increase in trademark applications over the last years. Similar to patents, trademarks provide exclusion rights securing competitive advantage but also the identity of the start-up in its relation to customers (Chasser and Wolfe, 2010). Where patents relate to a start-up's technological base, trademarks reflect advancement in marketing activities and willingness to protect marketing assets. Both aspects are highly relevant and complementary in generating and securing returns from innovation (Teece, 1986).

2.2 Research on trademarks

A trademark is defined as "a distinctive sign, which identifies certain goods or services as those produced or provided by a specific person or enterprise" (World Intellectual Property Organisation (WIPO), 2011). A trademark is most typically a word, phrase, symbol or logo, but can also reflect color, sound, or smell, as long as a graphical representation is feasible (Mendonca et al., 2004).

Trademarks allow consumers to identify a company from its competitors, and provide a legal basis on which a company can develop its brand, securing the benefits of future marketing investments (Economides, 1988; Phillips, 2003; Mendonca et al., 2004). The breadth of legal protection of a trademark is determined by the number of Nice classes in which a trademark is filed. Trademarks can be filed in 34 goods and 11 service classes (WIPO, 2006). Application fees increase with the number of Nice classes covered. Trademark Nice classes can be compared to the IPC classes of a patent (Lerner, 1994). Yet, where Nice classes reflect a trademark's breadth of legal protection, IPC classes form solely a classification scheme. The protection of a patent is determined only through its claims.

Only few empirical studies addressed patents and trademarks jointly (Bosworth and Rogers, 2001; Greenhalgh and Rogers, 2006; Sandner and Block, 2011). Prior research proposed trademarks as an indicator of innovative activities, suggesting that trademarks capture the commercial side of innovation, supporting its market diffusion (Mendoca et al., 2004; Malmberg, 2005). It is also argued that, in later stages, after patent protection has expired, through trademarks, a firm can continue to appropriate returns from its previous invention (Rujas, 1999). Over time, a bond of familiarity and trust can be established with consumers, which can continue to exist in later stages. Trademarks can be renewed indefinitely.

With respect to the value reflected in trademarks, prior research shows that trademarks relate positively to the market values of large, publicly traded firms (Greenhalgh and Rogers 2006, 2007; Sandner and Block, 2011). Sandner and Block (2011) showed that the heterogeneous value of trademarks can be decomposed by trademark value indicators, e.g., trademark seniorities (references to earlier trademarks registered in other jurisdictions), number of oppositions filed by competitors, and trademark breadth (captured by the number of goods and service Nice classes). Contributing to this literature, we analyze in this study whether trademarks reflect value in earlier firm development stages, considering the case of VC-backed start-ups.

3. Data and variables

3.1 Data

We created our dataset from different sources as we needed to reconcile start-ups and VC investments with IP portfolios. Information on VC funded start-ups was obtained from the VentureXpert database (see also Dimov and Milanov, 2010; Sorenson and Stuart, 2008; Hochberg et al., 2007). Trademark and patent portfolios were compiled through a manual process using the start-up names and former aliases. Imperfect matches were verified using start-up location and industry records. Trademark data were gathered through the United States Patent and Trademark Office (USPTO). For patent data, the worldwide patent database PATSTAT was used.[1]

3.1.1 Sample and VC data

Our observation unit is the funding round in which the start-up received VC funding. From VentureXpert, we extracted 49,055 funding rounds backing US-based start-ups over the period from 1998 to 2007. More recent funding rounds were dropped from the data, since complete patent portfolios could only be compiled until 2007. That is, because the process from filing patent applications to getting protection through international patent protection is a lengthy process. For example, where patents are filed, these filings are kept secret for 18 months. So, filings made in 2007 become only "visible" in the data after 2009. Additionally, gaining international protection for a specific invention can take further years due to complex processes on the national level to achieve international patent protection.

In a next step, we excluded those funding rounds with missing values of VC or start-up founding dates[2], amount of funds invested, and start-up valuation. Following these data cleaning

[1] The version of April 2011 was employed. The EPO Worldwide Patent Statistical Database (PATSTAT) is available under license from the OECD-EPO Task Force on Patent Statistics.

[2] We excluded cases where the founding date was reported later than the investment date (626 cases).

steps, our sample comprises of 12,571 funding rounds, involving 6,732 start-ups. To avoid extreme outliers affecting our estimates, we excluded observations beyond the 99th percentile with respect to the valuation of the start-up, and the age of the start-up and the investing VCs. 200 start-ups were excluded, leaving a final sample of 6,532 start-ups, for which we then compiled both trademark and patent portfolios.

3.1.2 Trademark and patent data

The scope of trademark and patenting activities could be identified for 5,739 of the start-ups in our sample (87.9% of the start-ups taken from VentureXpert). Observations were excluded in case a start-up's name or one of its former aliases did not generate a correct, unique search result. Those start-ups, however, that did not file a trademark or a patent were kept in the dataset. We consider only trademark and patent applications in the US.

Trademark data were gathered through the USPTO. Of the start-ups in our sample, 84.4% filed at least one trademark application until 2007. About half of these start-ups filed a trademark application before acquiring initial VC funds, the other half did so during the VC cycle. Further descriptive statistics are provided below. Due to missing information regarding the trademark Nice classes, 17 start-ups had to be excluded from our sample.

Patent data were taken from the PATSTAT database. Patent applications were less common compared to trademark applications but still more than half of the start-ups sought patent protection: 60.3% of the start-ups in our sample filed at least one patent application until 2007. The variance in applications per start-up was larger for patents relative to trademarks. For established firms in the UK, Greenhalgh and Rogers (2006) reported similar patterns in their data, analyzing trademark and patenting activities. Further, the allocation of trademark and patent applications across industries was intuitive. Patents were most common for start-ups operating in the biotech industry, followed by start-ups from the semiconductor industry. Trademarks were most common for start-ups engaged

in consumer products, followed by start-ups from computer software and service related industries. This is in line with extant work, arguing that trademarks play a more prominent role in consumer and service intensive industries, holding larger numbers of buyers and sellers (Mendoca et al., 2004; Malmberg, 2005).

Extreme outliers (beyond the 99th percentile) for the number of patent and trademark applications were excluded (109 start-ups). Our final estimation sample thus comprises 10,362 VC funding rounds involving 5,613 start-ups.

3.2 Variables

3.2.1 Dependent variable

Our regression analysis is on the funding round level. Our dependent variable is *start-up valuation* as provided by VentureXpert. This variable discloses the post-money valuation of the start-up at its funding date, i.e. the equity value of the start-up including the amount of funds provided in the round. At the occurrence of a VC funding round, the start-up is valued in order to calculate the equity shares acquired by the investors (Hsu, 2004). Start-up valuation data has been available in VentureXpert since April 2010, and is reported back to the early 80s.

3.2.2 Independent variables

Table 1 gives an overview of the variables. Our key independent variables are the number of *trademark applications*, and the number of unique *trademark Nice classes* in which a start-up filed trademarks. Both variables are calculated at the time of funding, measuring past trademark activities up until the start-up receives funds. Conversely, trademarks filed after funding date are not considered. A *trademark dummy* variable is used to compare the expected valuation of start-ups that filed at least one trademark to other start-ups. Lastly, the interaction term *trademark applications X*

round number tests for a potential diminishing effect of trademarks on start-up valuation over the VC cycle, spanned by series of funding rounds.

We include the following control variables. The number of *patent applications* is included, as previous empirical work showed that a start-up's patent application affects VC valuation (e.g., Haeussler et al., 2009; Hsu and Ziedonis, 2007). *Round number* relates to the subsequent amount of times a start-up received VC funds. Start-ups reaching later stages are likely to be more successful and are therefore valued higher. *Syndicate size* captures differences in valuations related to the number of investors investing in a round. *Investment year* dummy variables indicate the year in which the funding round occurred. Changing conditions on the VC market over time, such as the amount of capital inflow into VC funds, can affect VC-backed start-up valuations (Gompers and Lerner, 2000).

The different types of investors are captured using six dummy variables. We distinguish between the presence of *VC firms, business angels, industrial firms, financial firms, governmental,* and *other actors*. As these actors can be investing jointly in one funding round, these categories are not mutually exclusive. *VC age* and *VC experience* control for the skills and experience of the investors. Older, more experienced VCs may have developed strong management skills and extensive networks contributing to the success of the start-ups in their portfolios. *VC age* is calculated at the funding round date in years. *VC experience* counts the number of previous deals a VC conducted up until the funding round date. In case of a syndicate, we calculate the average age, and average experience of the investing VCs. In 8.7% of the observations, we were not able to compute VC experience as at least one of the investors was anonymous. We replace these cases with the average VC experience of our sample. In our regression analysis, we use the logarithm of age and experience because variables are highly skewed.

Start-up age is also included, measured in years at the time of funding. Further, the development stage of the start-up is controlled for using seven dummy variables, ranging from

'seed stage', during which a start-up's idea or product is developed and tested, to 'later stage', in which the main goal is to achieve an exit vehicle for the start-up to go public. The categories 'acquisition' and 'public market' relate to funding rounds of relatively mature start-ups that were acquired by another firm or were listed on the public market. Finally, variation in start-up valuation across different industries and regions are captured by ten industry dummies and 17 US region dummies (see Table 1).

[*Table 1 here*]

4. Results

4.1 Descriptive results

Table 2 compares the start-ups trademark and patent applications over the VC cycle. That is, we compare IP portfolios by different VC funding round stages. Table 2 shows that filing trademark applications was more common than filing patent applications. At the time of receiving a first funding round, 43.7% of the start-ups have previously filed at least one trademark application, compared to 32.3% of the start-ups that have filed at least one patent application before getting funded. These shares increase when arriving at later funding stages: For 5th and later funding rounds, 87.3% had filed a trademark application, and 70.2% a patent application. Also the breadth of a start-up's trademark portfolio increases over funding round stages, covering on average 1.5 Nice classes at the time of first rounds, and steadily increasing to 1.9 Nice classes at 5th and later funding rounds thereby representing an increasing diversification of start-ups. Finally, when comparing the numbers of trademark and patent applications, we see that patents are more dispersed, reflected by larger mean and maximum values. In other words, trademark-filing strategies are more homogeneous among start-ups whereas patent filing strategies appear to me more diverse.

[*Table 2 here*]

Descriptive statistics for the different variables in our regressions are provided in Table 3. The average start-up valuation was USD 52.9 million. Relatively low valuations (minimum: USD 10,000) relate typically to a first financing round, and a classification of the start-up in seed and early development stages. Relatively high valuations are associated with start-ups in later development stages that had received investments over a series of preceding funding rounds (highest valuation = USD 612 million).

On average, a funded start-up had filed 4.0 trademark and 4.9 patent applications up until a respective funding round. NanoBio, a biotech start-up, tops the list as it filed most trademark applications[3] (63 trademarks). Interestingly, NanoBio developed anti-infective products and vaccines, and focused heavily on commercialization to bring these therapies to the market. The start-up filing most patent applications was Astellas Pharma (125 patents), specialized in therapeutic antibody research and drug development against cancer.

Concerning investors types, VC firms were – not surprisingly – the most active, participating in 93.9% of the funding rounds followed by industrial firms (including corporate venture capital) (22.6%), and financial companies (16.9%). The most common industries invested in were Internet specific, and computer software industries, together covering nearly half (49.6%) of the funding rounds.

Correlations and variance inflation factors (VIF) are presented in Table 4. As the largest VIF was only 2.41, multicollinearity was not an issue in our analysis.

[*Tables 3 and 4 here*]

[3] This biotech startup was an exception. Startups with a large number of trademark applications were mainly from computer software, semiconductors, and consumer related industries.

4.2 Multivariate results

We use simple OLS regression techniques using the natural log of *start-up valuation* as the dependent variable in order to compress the highly skew distribution of start-ups' valuations. Table 5 estimates the effect of the number of trademark applications on start-up valuation. Model 1 is the baseline model including only control variables and, more important, no IP variables. The stock of patent applications is introduced in Model 2. The reported effects in our baseline models are intuitive: expected start-up valuation increased with the funding round number, start-up age, and syndicate size. More experienced VCs are associated with higher start-up valuations. The groups of industry, region, investor type, and start-up stage dummy variables show significant effects ($p < 0.01$). A single patent application is estimated to increase expected start-up valuation with 1.3% ($p < 0.01$).[4] This positive relation complies with the existing literature addressing patents and VC start-up valuation (e.g. Lerner, 1994; Baum and Silverman, 2004; Hsu and Ziedonis, 2007; Haeussler et al., 2009).

In Model 3, we introduce the *trademark dummy* variable. A 24% higher valuation is estimated for start-ups that applied for at least one trademark. Model 4 uses the *number of trademark applications*, indicating that each subsequent trademark application was associated with a 2.3% increase in start-up valuation. Its squared term is accommodated in Model 5, showing that the positive effect of a trademark on start-up valuation is decreasing with the number of trademarks filed. The optimal number of trademark applications can be calculated as 17, thus rendering the effect clearly curvilinear without being truly inverse U-shaped in nature. All estimated effects of our hypothesized variables are highly significant ($p < 0.01$).

[*Table 5 here*]

[4] Applying an alternative specifying and using a patent dummy variable would result in a 14.4% higher valuation for startups that filed at least one patent.

Table 6 presents the effect of trademark breadth on start-up valuation, and examines trademark applications across the VC cycle spanned by series of funding rounds. Model 1 shows that an additional Nice class covered by the start-up's trademark portfolio increases expected start-up valuation with 6.3%. Including the squared term of Nice classes covered in Model 2, we find a diminishing positive effect, the optimum exhibiting 2.8 Nice classes. Finally, the effect of trademarks over the VC cycle is examined in Model 3. The interaction term *trademark applications X round number* indicates that the increase in valuation from an additional trademark application diminishes with 0.4% when moving into a next funding round. Again, all effects regarding our hypothesized variables are highly significant ($p < 0.01$). Also, in Table 5 and 6, the model fit increases with each subsequent model with regard to its previous nested model (see likelihood-ratio tests in Tables 5 and 6). This underpins the importance of IP in investment processes.

[*Table 6 here*]

4.3 Additional analyses and robustness checks

We conducted several robustness checks, presented in Table 7. Model 1, 2 and 3 show the main regression results for only first funding rounds (N = 2,857). It might be argued that investors influence the start-up's trademarking activities through their capital injection. Thus, it could be the case that we have an endogeneity problem for later funding stages. Model 1 therefore reduces the sample and only includes first funding rounds. The effect of trademarks is slightly smaller compared to our main analysis (e.g. 0.20 for *trademark dummy* in Model 1, Table 7; compared to 0.24 in Model 3, Table 5).

Table 7 also shows quantile regressions (Model 4 – 6), using *start-up valuation* as a dependent variable, estimating the effect of trademarks on absolute start-up valuation. We use a quantile

regression framework because the distribution of *start-up valuation* is highly skewed as outlined above. A quantile regression is more robust to outliers compared to a regression on the mean (Koenker and Hallock, 2001). An additional trademark increases start-up valuation with approximately USD 1 million (see Model 5), where increasing the breadth of the trademark portfolio, i.e. filing a trademark in a "new" Nice class, increases valuation with USD 677,000.

Ultimately, we checked our results when altering the treatment of missing observations for *VC experience*. In our main analysis, we replaced missing values for VC experience with the sample mean. We conducted additional regressions, replacing these missing values with first the minimum and secondly the maximum values in our sample.

[*Table 7 here*]

5. Discussion and conclusion

Our results can be summarized as follows. The presence and number of trademarks of a start-up positively relates to its valuation by VCs. This positive effect is nonlinear and decreases with the number of trademarks filed. Further, trademark breadth is associated positively with start-up valuation and also shows a nonlinear diminishing relationship. Finally, the effect of trademarks decreases over the venture cycle.

We explain our findings by the argument that trademarks are likely to reflect the start-ups' advancement in marketing activities, described in the stage models of marketing in new ventures (Tyebjee et al., 1983; Carson, 1985; Boag, 1987; Gruber, 2004). Besides the quality of a start-ups invention, the marketing of this invention is critical in order to allocate returns (Teece, 1986). Emphasis on the marketing dimension is also reflected in the VC cycle. VCs are likely to focus and relate value to the progress on this dimension when making financing decisions. Start-ups with more developed marketing activities appear more "investor ready" to VCs (Douglas and Shepherd,

2002; Wright et al., 2004). Yet, after picking the most promising ideas from the pool of entrepreneurs, the relationship between a VC and its start-up is for a large share focused on the startup's growth, i.e., the strategy of commercializing the invention, finding initial customers, generating sales, and managing and expanding market share (Zider, 1998; Hellman and Puri, 2002; Engel and Keilbach, 2007). Thus, we can observe that the competitive advantage of the already market oriented start-ups diminishes due to the counseling activities of the VCs.

Start-ups that file "broad" trademarks likely have a broad marketing strategy and want to be present in several markets. This broad marketing strategy has the advantage that it decreases the risk that is associated with a particular market. VCs therefore reward such a strategy in general and start-ups showing marketing activities and filing trademarks in more than one market get higher valuations as compared to start-ups that file trademarks in an only very limited range of markets. Yet, there is a certain threshold and an optimal number that start-ups should not exceed. Our data show that start-ups that exceed this threshold and file trademarks in "too" many markets obviously are perceived as being unfocused.

Overall our paper contributes to several literature streams. Firstly, we contribute to VC literature. VCs perform pre-investment screening on start-ups in order to minimize the risk of failure. Contribution to the existing VC evaluation criteria addressed in current works (Macmillan et al., 1985; Hall and Hofer, 1993; Baum and Silverman, 2004; Franke et al., 2006; 2008), we find empirical evidence that a start-up's advancement in marketing activities, reflected through trademark applications, is positively valued by VCs, and hence likely to influence VC investment decisions. Regarding the role of intellectual property in VC financing, we are the first to address the role of trademarks. Where the positive relationship of patent applications to VC valuations is confirmed in our study (see also Lerner, 1994; Baum and Silverman, 2004; Hsu and Ziedonis, 2007; Haeussler et al., 2009), we find that the effect of trademark applications is approximately twice as

large in size. This underscores the importance of marketing activities to a start-ups potential success.

Second, we contribute to the growing literature on the value of IP assets, in particular trademarks. We extend the findings of Sandner and Block (2011) and Greenhalgh and Rogers (2006; 2007) who show that trademarks have a positive effect on the market valuation of large, publicly listed technology firms. Our study shows that this positive effect of trademarks on a firm's market value also holds for VC financed start-ups. This is surprising given that such start-ups usually do not have marketable products when seeking VC financing. The actual current value of the right to exclude others from the use of the trademarked word, sign, or symbol should therefore be low. Yet, particularly in this early stage, filing trademarks reflects that the start-ups have a strong orientation on marketing and that they not only have started to build marketing assets but also are aware of the importance of protecting these assets (Sandner and Block, 2011). The fact that we furthermore show that trademarks are even stronger signals than patents underlines the relevance of a strong marketing orientation of start-ups for VCs financing decisions. Further, our work is one of the first to utilize trademarks Nice classes as an indicator of the breadth of market strategy. For large, publicly listed firms, trademark breadth was not related significantly to an increase in market value (Sandner and Block, 2011). Analyzing VC valuations, this study finds a positively significant relationship. A possible explanation can be the relative risky environment in which innovative startups operate. In this context, having alternative development routes available in several markets is likely to greatly reduce the risk of failure (Berkery, 2008).

Finally, our paper contributes to the marketing finance interface literature (see e.g., Srinivasan and Hanssens, 2009) and particularly to research on entrepreneurial marketing (see e.g., Gruber, 2004; Kraus et al., 2011). We build on prior research on the effect of marketing assets and marketing actions on the evaluation of publicly traded firms (for an overview see Srinivasan & Hanssens, 2009) and show that even in very early stages of a firm building and defending marketing

assets as reflected by the filing of trademarks has positive effects on firm evaluations. We even show that this effect is even more relevant than the effect of patents. Whereas prior research in entrepreneurial marketing has already stressed the relevance of the marketing competency of young firms (e.g., Gruber, 2004), our findings are the first to proof and quantify this effect.

Future research could address the role of trademarks for innovative startups across different industries and customer types. Advancement in marketing activities may be more relevant in consumer intensive, service related industries, holding larger numbers of buyers and sellers (Mendonca et al., 2004, Malmberg, 2005). With respect to customer types, the value reflected by trademarks may differ for startups serving consumers, compared to startups serving other business (i.e., “business to consumer” vs. “business to business” relations). Another research direction related to this could be the type of Nice classes in which trademarks are filed. Trademarks filed in Nice classes relating to goods (34 classes), may show a different relation to VC valuations compared to trademarks filed in service Nice classes (11 classes). Further, beyond the VC valuation of startups, it would be interesting to examine the relation of IP to a startups progress through the VC cycle. Where Mann and Sager (2007) examine patents in relation to several measures such as a start-up’s longevity, reaching later development stages, and total amount of funds and rounds received, it would be interesting to examine these measures for trademarks and patents jointly. Lastly, future research could analyze patterns in early stage development of IP, and how IP development may speed up when VC funds become available. It is suggested that trademarks and patents are complementary (Rujas, 1999). Yet, thus far, no empirical work has addressed this relationship.

References

Barth, M.E., Clement, M.B., Foster, G., Kasznik, R., 1998. Brand values and capital market valuation. *Review of Accounting Studies* 3(1), 41-68.

Baum, J.A.C., Silverman, B.S., 2004. Picking winners or building them? Alliance, intellectual, and human capital as selection criteria in venture financing and performance of biotech start-ups. *Journal of Business Venturing* 19(3), 411-436.

Berkery, D., 2008. Raising venture capital for the serious entrepreneur. McGraw-Hill, New York.

Besen, S.M., Raskind, L.J., 1991. An introduction to the law and economics of intellectual property. *Journal of Economic Perspectives* 5(1), 3-27.

Boach, D.A., 1987. Marketing control and performance in early-growth companies. *Journal of Business Venturing* 2(4), 365-379.

Bosworth, D., Rogers, M., 2001. Market value, R&D and intellectual property: an empirical analysis of large Australian firms. Economic Record 77 (239), 323-337.

Cao, J. and Hsu, P.H., 2011. The informational role of patents in venture capital financing. Working paper. Available at: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1678809

Carson, D.J., 1985. The evolution of marketing in small firms. *European Journal of Marketing* 19(5), 7-16.

Chasser. A.H., Wolfe, J.C., 2010. Brand rewired. John Wiley & Sons, Inc. Hoboken, New Jersey.

Dimov, D., Milanov, H., 2010. The interplay of need and opportunity in venture capital investment syndication. *Journal of Business Venturing* 25(4), 331-348.

Douglas, E.J., Shepherd, D., 2002. Exploring investor readiness: Assessments by entrepreneurs and investors in Australia. *Venture Capital: An International Journal of Entrepreneurial Finance* 4(3), 219-236.

Economides, N., 1988. The economics of trademarks. Trademark Reporter 78, 523-539.

Engel, D., Keilbach, M., 2007. Firm-level implications of early stage venture capital investment – An empirical investigation. *Journal of Empirical Finance* 14(2), 150-167.

Franke, N., Gruber, M., Harhoff., D., Henkel, J., 2006. Wat you are is what you like – similarity biases in venture capitals' evaluations of start-up teams. *Journal of Business Venturing* 21(6), 802-826.

Franke, N., Gruber, M., Harhoff., D., Henkel, J., 2008. Venture capitalists' evaluations of start-up teams: Trade-offs, knock-out criteria, and the impact of VC experience. *Entrepreneurship Theory and Practice* 32(3), 459-483.

Gompers, P.A., Lerner, J., 2000. Money chasing deals? The impact of fund inflows on private equity valuations. *Journal of Financial Economics* 55, 281-325.

Greenhalgh, C., Rogers, M., 2006. Trade marks and market value in UK firms. Melbourne Institute Working Paper Series. Available at: http://economics.ouls.ox.ac.uk/13545/1/Item.pdf

Greenhalgh, C., Rogers, M., 2006. The value of innovation: the interaction of competition, R&D and IP. *Research Policy* 35(4), 562-580.

Greenhalgh, C., Rogers, M., 2007. Trade marks and performance in UK firms: evidence of Schumpeterian competition through innovation. Discussion Paper. Department of Economics (University of Oxford). Available at: http://economics.ouls.ox.ac.uk/13545/1/Item.pdf

Gruber, M., 2004. Marketing in new ventures: theory and empirical evidence. *Schmalenbach Business Review* 56(2), 164-199.

Haeussler, C., Harhoff, D., Muller, E., 2009. To be financed or not: the role of patents for venture capital financing. Working paper.

Hall, J., Hofer, C.W., 1993. Venture capitalists' decision criteria in new venture evaluation. *Journal of Business Venturing* 8(1), 25-42.

Hellman, T., Puri, M., 2000. The interaction between product market and financing strategy: the role of venture capital. *The Review of Financial Studies* 13(4), 959-984.

Hochberg, Y.V., Ljungqvist, A., Lu, Y., 2007. Whom you know matters: venture capital networks and investment performance. *Journal of Finance* 62(1), 251-302.

Honig, D., Henkel, J., 2012. Productive assets or quality signals? The role of patents and alliances in VC financing. Working paper.

Hsu, D.H., 2004. What do entrepreneurs pay for venture capital affiliation? *The Journal of Finance* 59(4), 1805-1844.

Hsu, D.H., Ziedonis, R.H., 2007. Patents as quality signals for entrepreneurial ventures. Working paper, available at: http://www2.druid.dk/conferences/viewpaper.php?id=1717&cf=9

Koenker, R., Hallock, K.F. 2001. Quantile regression. *Journal of Economic Perspectives* 15(4), 143-156.

Landes, W.M., Posner, R.A., 1987. Trademark law: an economic perspective. *Journal of Law and Economics* 30(2), 265-309.

Lerner, J., 1994. The Importance of Patent Scope: An Empirical Analysis. *The Rand Journal of Economics*, 25(2), 319-333.

Macmillan, I.C., Siegel, R., Narasimha, P.N.S., 1985. Criteria used by venture capitalists to evaluate New venture proposals. *Journal of Business Venturing* 1(1), 119-128.

Malmberg, C., 2005. Trademark statistics as innovation indicator – a micro study. Working paper No 2005/17, Centre for innovation, Research and Competence in the Learning Economy.

Mann, R.J., Sager, T.W., 2007. Patents, venture capital, and software start-ups. *Research Policy* 36(2), 193 – 208.

Mendonca, S., Pereira, T.S., Godinho, M.M., 2004. Trademarks as an indicator of innovation and industrial change. *Research Policy* 33(9), 1385 – 1404.

Phillips, J., 2003. Trade mark law: a practical anatomy. Oxford University Press, Oxford.

Rujas, J., 1999. Trade marks: complementarity to patents. *World Patent Information* 21, 35-39.

Sandner, P.G., Block, J., 2011. The market value of R&D, patents and trademarks. Research Policy 40(7), 969-985.

Sorenson, O., Stuart, T.E., 2008. Bringing the context back. Settings and the search for syndicate partners in venture capital investment networks. *Administrative Science Quarterly* 53(2), 266-294.

Srinivasan, S., Hanssens, D.M., 2009. Marketing and firm value: metrics, methods, findings, and future directions. *Journal of Marketing Research* 46 (June), 293-312.

Teece, D.J., 1986. Profiting from technological innovation: implications for integration, collaboration, licensing, and public policy. *Research Policy* 15(6), 285-305.

Tyebjee, T.T., Bruno, A.V., McIntyre, S.H., 1983. Growing ventures can anticipate marketing stages, *Harvard Business Review* 61(1), 62-66.

WIPO, 2006. International Classification of Goods and Services Under the Nice Agree-ment, 9th ed. World Intellectual Property Organization, Geneva.

WIPO, 2011. Intellectual property – some basic definitions. Available at: http://www.wipo.int/about-ip/en/studies/publications/ip_definitions.htm

Wood, L., 2000. Brands and brand equity: definition and management. *Management Decision* 38(9), 662-669.

Wright, M., Vohora, A., Lockett, A., 2004. The formation of high-tech university spinouts: The role of joint ventures and venture capital investors. *Journal of Technology Transfer* 29, 287-310.

Zacharakis, A.L., Meyer, D.G., 2000. The potential of actual decision models: can they improve the venture capital investment decision? *Journal of Business Venturing* 15(4), 323-346.

Zider, B., 1998. How venture capital works. *Harvard Business Review* 76(6), 131-139.

Tables to be inserted in the text

Table 1
Definition of variables

Variable	Description
Dependent variable	
Start-up valuation	Post-investment valuation of start-up at date of funding round (in million USD), i.e., the equity value of the start-up, plus the amount of funds invested.
Independent variables	
Intellectual property characteristics	
Trademark applications	Number of US trademark applications filed by start-up until investment date.
Trademark Nice classes	Number of unique Nice classes covered by the trademark portfolio (i.e., by trademark applications filed by start-up until investment date).
Patent applications	Number of US patent applications filed by start-up until investment date.
Investment characteristics	
Round number	Refers to the subsequent number of times that a start-up received VC funds.
Syndicate size	The number of actors investing jointly in a syndicate within a particular funding round (i.e., conducting a joint funding round).
Investment year dummies (10 cat.)	10 dummy variables referring to the year in which the funding round occurred, ranging from 1998 to 2007.
VC characteristics	
VC age	Age of VC in years at funding round date. When multiple VCs are investing in a round jointly in a syndicate, the average age is taken.
VC experience	Number of deals conducted by VC until investment date. When multiple VCs are investing in a round jointly in a syndicate, the average experience is taken.
Investor type dummies (6 cat.)	6 dummy variables indicating which actors are investing within a funding round, ranging from: 'VC firm', 'business angel', 'industrial company', 'financial company', or 'other' actor is investing in funding round.
Start-up characteristics	
Start-up age	Age of start-up in years at date of funding round.
Start-up stage dummies (7 cat.)	7 dummy variables referring to the stage of funding. Stages are categorized as 'start-up/seed stage', 'early stage', 'expansion stage', 'later stage', 'aquisition', 'public market' or 'other stages'.
Start-up industry dummies (10 cat.)	10 dummy variables indicating the industry category of the start-up: 'biotechnology', 'communications and media', 'computer hardware', 'computer software and services', 'consumer related products', 'industrial/ energy', 'internet specific services', 'medical/ health care', 'other products', 'semiconductors/other elect'.
Start-up US region dummies (17 cat.)	17 dummy variables indicating the location of the start-up within the US: 'Colorado', 'Washington Area', 'Los Angeles/Orange County', 'Midwest', 'New York Area', 'New England', 'North Central', 'Northwest', 'Philadelphia Area', 'Sacramento/North California', 'San Diego', 'Silicon Valley', 'South Central', 'Southwest', 'Southeast', 'Texas', 'Upstate New York'.

Table 2
Descriptive statistics: Trademark and patent applications of VC funded start-ups

	VC investment stage: funding round number				
	1st round	2nd round	3rd round	4th round	Rounds 4+
Trademarks					
Share of start-ups with TMs (in %)	43.7	64.7	77.4	83.0	87.3
Mean trademark applications	1.7	3.0	4.5	5.5	7.3
Median trademark applications	0	1	3	4	5
Max. trademark applications	63	53	51	45	53
Mean trademark Nice classes[1]	1.5	1.6	1.7	1.8	1.9
Patents					
Share of start-ups with patents (in %)	32.3	45.2	55.6	63.7	70.2
Mean patent applications	1.6	2.9	4.7	7.2	11.05
Median patent applications	0	0	1	2	3
Max. patent applications	62	99	108	120	125
N start-ups	2,857	2,536	1,827	1,238	1,904

Data sources: VentureXpert (accessed October 28, 2011); trademark data from United States Patent and Trademark Office (USPTO); patent data from worldwide patent statistical database (European Patent Office). Sample includes years 1998-2007.
[1]Regarding start-ups that filed for at least one trademark, indicating the number of unique Nice classes covered by the trademark portfolio.

Table 3
Descriptive statistics

Variables	Mean	S.D.	Median	Min	Max	Skewness
Start-up valuation	52.9	70.8	28	0.01	612	3.3
Trademark applications	4.0	5.9	2	0	63	3.0
Trademark dummy (in %)	67.5		1	0	1	
Trademark Nice classes	1.2	1.2	1	0	10	1.5
Patent applications	4.9	11.2	1	0	125	4.3
Round number	3.0	2.1	2	1	21	
Syndicate size	3.3	2.3	3	1	23	
Start-up age (in years)	4.0	4.0	2.9	0	31.2	2.4
VC age (in years)	15.9	12.75	13.7	0	91.7	1.3
VC experience	280.3	436.2	130	1	3,149	3.2
Investor types[1] (in %)						
VC firm	93.9		1	0	1	
Business angel	13.4		0	0	1	
Industrial company	22.6		0	0	1	
Financial company	16.9		0	0	1	
Governmental actor	5.9		0	0	1	
Other actor	8.8		0	0	1	
Start-up stage (in %)						
Start-up/seed stage	7.6		0	0	1	
Early stage	27.8		0	0	1	
Expansion stage	41.8		0	0	1	
Later stage	19.0		0	0	1	
Acquisition	0.9		0	0	1	
Public market	2.3		0	0	1	
Other stage	0.6		0	0	1	
Start-up industry (in %)						
Biotechnology	9.0		0	0	1	
Communications and media	10.2		0	0	1	
Computer hardware	2.8		0	0	1	
Computer software and serv.	23.8		0	0	1	
Consumer related products	2.1		0	0	1	
Industrial / energy	1.9		0	0	1	
Internet specific services	25.8		0	0	1	
Medical / health care	14.1		0	0	1	
Other products	3.0		0	0	1	
Semiconductors / other elect.	7.3		0	0	1	

Notes: N = 10,362 observations of 5,613 start-ups. Data sources: VentureXpert (accessed October 28, 2011); trademark data from United States Patent and Trademark Office (USPTO); patent data from worldwide patent statistical database (European Patent Office). Sample includes years 1998-2007.
[1] Indicates the actor(s) that invested (jointly) within the funding round. In case of a syndicate with participating different actors, multiple categories take on value 1, i.e., the categories are not mutually exclusive.

Table 4
Correlations

Variables	1	2	3	4	5	6	7	8	VIFs[1]
1. Start-up valuation									
2. Trademark applications	0.274*								2.11
3. Trademark Nice classes	0.237*	0.680*							1.97
4. Patent applications	0.202*	0.299*	0.174*						1.49
5. Round number	0.266*	0.338*	0.271*	0.312*					1.73
6. Syndicate size	0.316*	0.118*	0.114*	0.154*	0.242*				1.84
7. Start-up age	0.130*	0.286*	0.238*	0.238*	0.392*	0.017			1.78
8. VC age	0.056*	0.029*	0.017	0.065*	0.078*	-0.062*	0.052*		2.37
9. VC experience	0.100*	0.038*	0.030*	0.072*	0.092*	-0.040*	-0.010	0.433*	2.41

Notes: N = 10,362 observations of 5,613 start-ups. Data sources: VentureXpert (accessed October 28, 2011); trademark data from United States Patent and Trademark Office (USPTO); patent data from worldwide patent statistical database (European Patent Office). Sample includes years 1998-2007.
* Significance level $p \leq 0.01$
[1]For start-up age, VC age, and VC experience, the VIF factors relate to their logged values in the regression.

Table 5
Trademark applications and VC start-up valuation

Dependent variable:	***Log (start-up valuation)***				
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
Independent variables					
IP variables					
Trademark dummy			0.240**		
			(0.023)		
Trademark applications				0.023**	0.035**
				(0.002)	(0.003)
Trademark applications squared					-0.001**
					(0.000)
Patent applications		0.013**	0.012**	0.010**	0.010**
		(0.001)	(0.001)	(0.001)	(0.001)
Investment related variables					
Syndicate size	0.124**	0.120**	0.117**	0.119**	0.118**
	(0.006)	(0.006)	(0.006)	(0.005)	(0.005)
Round number	0.046**	0.037**	0.032**	0.028**	0.026**
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Investment year dummies	p < 0.01	p < 0.01	p < 0.01	p < 0.01	p < 0.01
VC related variables					
Log (VC age)	0.006	0.002	0.007	0.001	0.001
	(0.025)	(0.025)	(0.024)	(0.024)	(0.024)
Log (VC experience)	0.110**	0.109**	0.106**	0.109**	0.108**
	(0.013)	(0.013)	(0.013)	(0.012)	(0.012)
Investor type dummies (6 cat.)	p < 0.01	p < 0.01	p < 0.01	p < 0.01	p < 0.01
Start-up related variables					
Log (start-up age)	0.137**	0.113**	0.090**	0.086**	0.078**
	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)
Start-up stage dummies (6 cat.)	p < 0.01	p < 0.01	p < 0.01	p < 0.01	p < 0.01
Start-up US region dummies (17 cat.)	p < 0.01	p < 0.01	p < 0.01	p < 0.01	p < 0.01
Start-up industry dummies (10 cat.)	p < 0.01	p < 0.01	p < 0.01	p < 0.01	p < 0.01
N of funding rounds	10,362	10,362	10,362	10,362	10,362
N of start-ups	5,613	5,613	5,613	5,613	5,613
F value	152.81**	147.03**	152.37**	147.82**	145.84**
R-squared	0.440	0.452	0.461	0.464	0.466
Increases in model fit (LR-test)[1]		229.93**	166.38**	232.47**	40.73**

Notes: Standard errors are clustered on start-up firms (in parentheses). Reference group for investment year: 2000; reference start-up stage: 'expansion stage'; reference US region: 'Silicon Valley'; reference industry: 'computer software and services'. Data sources: VentureXpert (accessed October 28, 2011); trademark data from United States Patent and Trademark Office (USPTO); patent data from worldwide patent statistical database (European Patent Office). Sample includes years 1998-2007.
[1]Likelihood ratio tests relate to the preceding nested model.
* Significance level $0.05 > p \geq 0.01$.
** Significance level $p \leq 0.01$.

Table 6:Trademark breadth, and trademarks over VC round stages

Dependent variable:	***Log (start-up valuation)***		
	Model 1	**Model 2**	**Model 3**
Independent variables			
IP variables			
Trademark applications	0.015**	0.015**	0.021**
	(0.003)	(0.002)	(0.003)
Trademark app. X round number			-0.004**
			(0.001)
Trademark breadth	0.063**	0.096**	0.082**
	(0.012)	(0.014)	(0.015)
Trademark breadth squared		-0.017**	-0.016**
		(0.004)	(0.004)
Patent applications	0.010**	0.010**	0.011**
	(0.001)	(0.001)	(0.001)
Investment related variables			
Syndicate size	0.119**	0.118**	0.116**
	(0.005)	(0.005)	(0.005)
Round number	0.028**	0.027**	0.036**
	(0.008)	(0.008)	(0.008)
Investment year dummies	$p < 0.01$	$p < 0.01$	$p < 0.01$
VC related variables			
Log (VC age)	0.001	0.003	0.004
	(0.024)	(0.024)	(0.024)
Log (VC experience)	0.108**	0.108**	0.107**
	(0.012)	(0.012)	(0.012)
Investor type dummies (6 cat.)	$p < 0.01$	$p < 0.01$	$p < 0.01$
Start-up related variables			
Log (start-up age)	0.080**	0.076**	0.068**
	(0.021)	(0.021)	(0.021)
Start-up stage dummies (6 cat.)	$p < 0.01$	$p < 0.01$	$p < 0.01$
Start-up US region dummies (17 cat.)	$p < 0.01$	$p < 0.01$	$p < 0.01$
Start-up industry dummies (10 cat.)	$p < 0.01$	$p < 0.01$	$p < 0.01$
N of funding rounds	10,362	10,362	10,362
N of start-ups	5,613	5,613	5,613
F value	147.67**	146.99**	147.93**
R-squared	0.467	0.468	0.471
Increases in model fit (LR-test)[1]	46.78**	31.71**	45.70**

Notes: Standard errors are clustered on start-up firms (in parentheses). Reference group for investment year: 2000; reference US region: 'Silicon Valley'; reference industry: 'computer software and services'. Data sources: VentureXpert (accessed October 28, 2011); trademark data from United States Patent and Trademark Office (USPTO); patent data from worldwide patent statistical database (European Patent Office). Sample includes years 1998-2007.
[1]Likelihood ratio tests relate to the preceding nested model.
* Significance level $0.05 > p \geq 0.01$.
** Significance level $p \leq 0.01$.

Table 7: Robustness checks

	Sample: first rounds only			**Quantile regressions**		
Dependent variable:	***Log (start-up valuation)***			***Start-up valuation***		
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**
Independent variables						
IP variables						
Trademark dummy	0.203**			3.973**		
	(0.030)			(0.552)		
Trademark applications		0.045**	0.024**		1.031**	0.819**
		(0.006)	(0.005)		(0.064)	(0.056)
Trademark applications squared		-0.001**			-0.012**	
		(0.000)			(0.003)	
Trademark breadth			0.074**			0.677*
			(0.021)			(0.319)
Trademark breadth squared			-0.028**			-0.283**
			(0.010)			(0.086)
Patent applications	0.010*	0.008*	0.008*	0.631**	0.589**	0.597**
	(0.004)	(0.004)	(0.004)	(0.025)	(0.023)	(0.025)
Investment related variables						
Syndicate size	0.169**	0.169**	0.168**	4.556**	4.550**	4.576**
	(0.012)	(0.011)	(0.011)	(0.136)	(0.123)	(0.133)
Round number				1.906**	1.736**	1.675**
				(0.147)	(0.134)	(0.145)
Investment year dummies	$p < 0.01$	$p < 0.01$	$p < 0.01$	$p < 0.01$	$p < 0.01$	$p < 0.01$
VC related variables						
Log (VC age)	-0.082*	-0.081*	-0.083*	-0.117	-0.276	-0.256
	(0.033)	(0.033)	(0.032)	(0.567)	(0.513)	(0.555)
Log (VC experience)	0.164**	0.161**	0.162**	2.551**	2.470**	2.489**
	(0.016)	(0.016)	(0.016)	(0.279)	(0.252)	(0.272)
Investor type dummies (6 cat.)	$p < 0.01$	$p < 0.01$	$p < 0.01$	$p < 0.01$	$p < 0.01$	$p < 0.01$
Start-up related variables						
Log (start-up age)	0.161**	0.150**	0.149**	1.009*	0.449	0.506
	(0.025)	(0.026)	(0.026)	(0.458)	(0.416)	(0.450)
Start-up stage dummies (6 cat.)	$p < 0.01$	$p < 0.01$	$p < 0.01$	$p < 0.01$	$p < 0.01$	$p < 0.01$
Start-up US region dummies (17 cat.)	$p < 0.01$	$p < 0.01$	$p < 0.01$	$p < 0.01$	$p < 0.01$	$p < 0.01$
Start-up industry dummies (10 cat.)	$p < 0.01$	$p < 0.01$	$p < 0.01$	$p < 0.01$	$p < 0.01$	$p < 0.01$
N of funding rounds	2,857	2,857	2,857	10,362	10,362	10,362
N of start-ups	2,857	2,857	2,857	5,613	5,613	5,613
F value	35.43**	35.29**	35.33**			
R-squared	0.381	0.388	0.389			
Pseudo R-squared				0.191	0.195	0.195

Notes: Reference group for investment year: 2000; reference US region: 'Silicon Valley'; reference industry: 'computer software and services'. Data sources: VentureXpert (accessed October 28, 2011); trademark data from United States Patent and Trademark Office (USPTO); patent data from worldwide patent statistical database (European Patent Office). Sample includes years 1998-2007.
* Significance level $0.05 > p \geq 0.01$.
** Significance level $p \leq 0.01$.