

# ***The Role of IPR in the Venture Capital process and The Role of Venture Capital in the IPR process***

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## **1. Introduction**

This paper explores the relationship between venture capital and the IPR-system, in the following taken primarily as the patent system. A number of studies have mapped the importance of motives to patent including both the traditional motive to patent that the IPR-system grants opportunities to exploit a potential temporary, super-normal profit from new products or processes and what have been denoted strategic motives to patent (Arundel and Patel, 2003, Arundel et al., 1995, Cohen et al., 2002, OECD, 2003, Blind et al., 2006). Included in the strategic motives is that patents may improve access to capital markets. Most studies only consider this motive either as included in a broad category of e.g. exchange motives encompassing all motives related to relations to other organisations, or the more specific but still rather broad category 'capital market'. The present paper goes into a specific type of financial institution, which is often particular relevant to innovative, patenting firms, i.e. venture capital. The paper also contributes with highlighting the potential role of venture capital firms (VCFs) in the patenting process rather than only the initial motives and decision to patent.

The main research question is thus – aside of traditional benefits from collaboration and intermediation, what is the rationale for dyads between pat-

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enting firm and venture capital firm (VCF) dyads? And do the changes towards a knowledge based economy render new perspectives on the VCF-patentee relationship, including the motive to patent?

Admittedly this is a special and rather specific aspect of the strategic motives to patent. The above mentioned empirical surveys of (strategic) motives to patent generally find that the main motive to patent is still protection from imitation followed by the more strategic motive of (offensive or defensive) blocking competitors. In some surveys the exchange potential of a patent is a highly ranked motive, but generally most strategic motives are ranked much lower than protection and blockade (Blind et al., 2006). Access to the capital market is rarely included in surveys as a separate category. In OECD (2003) this was ranked lowest among the motives to patent<sup>2</sup>. Blind et al.(2006) find that the importance of access to the capital market was ranked 12<sup>th</sup> among 15 possible motives. However, 26 per cent of the firms in that survey list this as either of high or very high importance. This indicates that if not of prior importance then patents as spurring access to capital is still of considerable importance to a number of firms. Moreover, in the patenting literature there is a general opinion that the strategic motives to patent have gained in importance and widened in scope (Arundel, 1995, Blind et al., 2006, Arundel and Patel, 2003). Additionally, other motives to patent asked in surveys are closely related to the aspect of access to financing. This goes e.g. for motives as 'increase of company value', 'reputation/image', 'negotiation position', 'asset for exchange'.

The above are arguments why the issues discussed in this paper may be important even if it at first sight may seem a very special case. In summation, the access to capital markets may not be very highly ranked in importance compared to other motives to patent. But strategic motives have generally gained in importance. Moreover, many studies see access to capital markets as a factor in the initial decision to patent or not. This paper further argues that the financier-patentee dyad may also be important in the management of the patenting process and in the valuation of the invention, which may be very difficult, especially in new, emergent markets and products.

Even if the existing literature on this is limited, the research is primarily based on combining insights from previous studies, although an empirical survey of the issue among 1000 Danish firms, and some interviews are included. The paper attempts to combine elements from two strands of literature, which hitherto has been rather separate. The one angle, i.e. the

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<sup>2</sup> In that survey it was asked about changes in importance during the last 10 years. Firms pointed to that increasingly they felt a pressure to patent because of patent practises of others. What has been described as a 'patent race' in the 1990s may explain this.

incentives for venture capital firms to engage with patenting firms, resembles discussions within the literature on the commercial value of patents, but is in that literature not really developed and targeted neither to the value, other than monetary, financiers attach to patents nor to the role financiers may play in getting the IPR in place. The other angle, the rationale for patenting firms to relate to venture capital firms, is close to the discussions on equity gaps and on possible disadvantages of SMEs or entrepreneurs in their possibilities of obtaining capital. It also overlap with literature on the value added of venture capital as well as with literature on investment criteria for financing decisions, nor these discussions are rarely unfolded and targeted to the IPR-aspect other than a simple ranking of the broad category IPR among a number of other possible investment criteria. Therefore, this explorative paper<sup>3</sup> tries to contribute to developing our understanding of this relationship.

The paper is structured as follows. A brief discussion of theories within the above-mentioned types of literature follows this introduction. Trends in the trade, use and value of patents are highlighted in section 3. Section 4 discuss if the size of firm impact the VCF-company dyad, or if the industry is of importance. Investment criteria by VCFs are laid down in section 5 in a general manner. Section 6 then goes a step further in that respect by pointing to the specific requirement for entering a deal. Empirical illustration is provided in section 7, before a brief wrap up taking a knowledge-based economy perspective.

## **2. Theoretical insights on the contribution of VCFs to the IPR process**

At least for SMEs and / or new firms resource constraints in the patenting process require an external partner. In some cases, and increasingly so, the external partner involved is taking a financial stake in the company. Specialised organisations in this domain are venture capital firms (VCFs). VCF-firm dyads unfold in multiple ways of which the IPR-issue is just one, and possible even one which is to some extent beyond the core competences of VCFs. This type of equity investor is particularly interesting in this connection due to their special characteristics. VCFs are said to be focused upon SMEs, high-tech firms, high-growth firms, and they are particular good at screening, monitoring and advising firms. It may even be said that they exist because of their abilities to disclose information otherwise hidden or asymmetric (Amit et.al., 1998). An additional, but related aspect is that VCFs are networkers, they have extensive knowledge on who-knows-what, that is, they may efficiently guide firms to the right external advice if they

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<sup>3</sup> The author recognizes that many of the ideas in this paper are speculative and calls for validation. Comments and suggestions are therefore particularly welcome.

have shortcomings themselves. Firms may therefore have incentives to engage with VCFs to carry through their patenting process. These two aspects, the contribution in the process and the role as intermediary, are unfolded below.

Theoretically, the relationship between entrepreneurship and the financing of the process has been described by applying models of asymmetric information, leading to principal-agent problems (Myers and Majluf, 1984; Leland and Pyle, 1977; Stiglitz and Weiss, 1981; and numerous later models)<sup>4</sup>. The principal-agent theory discusses how a principal (e.g. a provider of funds for a venture capital firm) can set up a compensation system to motivate an agent (e.g. the management of a venture capital firm) to act in the principal's interests (Reid, 1999). It is presupposed that there are potential conflicts of interests and that the principal cannot directly observe the actions of the agent.

In the present connection it is important to note that VCFs are in a double principal-agent role: they act as principals in relation to their portfolio companies, as explained above, but they are also agents vis-à-vis their back-funding institutions, typically banks and pension funds. The decisions made by a VCf may thus be on behalf of a back-financier, even though managers of VC funds often have a stake in the return. Contractual arrangements may alleviate some of the uncertainties associated with a deal. However, it is generally recognized in the literature that financing barriers related to asymmetric information may be mitigated by the hands-on character of venture capital financing, involving close interaction between the firm and the venture capital firm, which facilitates the build-up of trust and mutual understanding between the parties (de Clercq and Sapienza, 2001; Shepherd and Zacharakis, 2001).

Even during the screening process, VCFs identify how they can add value after investment, and consequently allocate the relevant type and amount of resources to these areas (Kaplan and Strömberg, 2001), as well as design the financing arrangements accordingly (Gompers, 1995). DeClercq and Fried (2005) find that value-adding activities are more efficient when venture capital firms are clear about their commitment to interaction with the portfolio firms. This commitment not only adds resources and time, it also makes portfolio firms more open to the advice of the venture capital firm (Barney et al., 1996).

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<sup>4</sup> Interestingly, the asymmetry is almost always described as an information gap on the part of the financier: a bank – or other financier – does not have as much information as the entrepreneur about the true nature of the entrepreneurial firm and the potential moral hazard of the entrepreneur. Therefore, the financier needs to set up incentive schemes to ensure alignment between his interests and those of the entrepreneur.

VCFs increasingly act as networkers, both in networks of portfolio firms and in networks with other VCFs and business services. This makes opportunistic behaviour more costly, because excessive reputation effects spread rapidly between members of the network. Although learning effects have been partly integrated, by way of game theory, using repeated games, pure economic theories now increasingly are deemed inadequate for analysing the VCF-firm dyad. Studies sceptical of the dominating principal-agent approach (Landström, 1992; Sapienza and De Clercq, 2000) point to the importance of mutual trust but also that the contingency in which the interaction takes place may impact on the content of the interaction (Wijbenga et al., 2003, Landström, 1992).

In sum, a positive VCF-entrepreneur dyad may require not only structural and contractual arrangements, but also a cognitive platform and a relational dimension establishing common norms, trust and expectations.

As mentioned, a number of studies have emphasized that the venture capital firm may have an important intermediary role. Venture capitalists are important parts of networks, and are both in between and central to several different types of networks. The intermediating role may hence be different according to the type of activity VCFs are engaged in. They are not just intermediaries between savings and investments as ordinary financial institutions and as the main function of financial institutions are described. They are also fulfilling other intermediating roles as they give access to networks and expertise. Traditional dyad-descriptions of the total process may therefore be inadequate. Rather, and increasingly, the typical relationship is one of more complex structure such as firm-to-firm-to-many; many-to-one-to-many (Howells, 2006).

Florida and Kenney (1988) group such networks into four types. First a financial network, which includes the venture capital fund and its back funding to syndication partners such as other venture capital funds and business angels, as well as complementary financing sources. Second, a network is used in spotting investment opportunities and their screening. Organisations in this network ranges from other venture capitalist and business angels to accountants and universities. A third network consists of accounting firms, lawyers, consultants, and other professional service firms. Fourth, a personal network is used to ensure the human resources in the innovation process, on both the management and technical side.

Lately, there has been a tendency, at least in Denmark, for VCFs to focus on second-round investments in selected existing portfolio firms rather than new investments. This situation calls for new types of competencies, since it is important to be able to merge and facilitate synergy between the portfolio firms. This includes facilitating cross-licensing. In this situation, both

the first and third type of the Florida & Kenney network become more important.

The assessment of the value of IPR often involves potential divergent interests and differences of opinion. But also, the need for external expertise often implies problems of asymmetric information on choosing the best external expertise. Intrinsically, this is a classic informational problem going back to Arrow (1974), who analyse the market for knowledge, claiming that sellers of knowledge, such as consultants and patent agents, may have difficulties in articulating the true value of their services. This is caused by the fact that the seller will have to reveal some of the knowledge before the contract is entered. Revealing too much may, however, decrease the incentive for buyers to purchase the service. Also, when the knowledge needed is to be used as mediating two parties, there may be problems of the validity of the knowledge when this is paid for by one of the parties.

Many venture capital firms (VCFs) do not have adequate technical skills to assess the full technical potentials of firms, IPR and projects/products in their deal flow. In the literature on value added of venture capital firms there is consensus that the primary contribution of VCFs is not in the contribution to R&D, rather this is ranked low in what is added from VCFs. They rely instead on referrals or external expertise called in. This external expertise may find themselves in a difficult working situation. Assessing the technologies of a project may not only prove difficult if part of the knowledge or technology is tacit, which increasingly may be the case in a knowledge-based economy. Also the information may be asymmetrically distributed giving room to moral hazards as discussed in theories on credit rationing. In a similar vein there may be reluctance with the firm to let in an external part due to confidentiality. A patent may resolve these two problems. A patent requires a process of codification, which if not giving full description of the technology involved then it does provide a basis for technological assessment. Moreover, the potential problem of getting too close to the firm in question may also be resolved. The external assessment can be done anonymously.

Once patents are granted there may be an important signalling effect of patents in a knowledge-based economy. It is known from the IPR-literature that patents signal niche and expertise on a technological front level. It is also a signal of being an interesting partner for collaboration. Moreover, it may signal to VCFs that assessment of technologies may be pursued less costly, and more precise. In this vein it may be argued that the assessment of the IPR is key; likewise at the exit stage, which is so important to VCFs, the valuation of IPR is essential when pursuing IPO or M&A. Finally, the uncertainties associated with assessing the management of a technology-based firm, such as the risk of moral hazard, may be alleviated by the existence of a patent. The relative weight of patents versus hard to judge in-

tangibles such as the competences of the management, quality of R&D etc. – may therefore shift.

### 3. Trade, use and value of patents

Trade with patents and licences has recently boomed. The EU-Commission estimates the global trade to be EURO 100 billion<sup>5</sup>, a 40-fold increase in the past 20 years. Even if the Danish share of this trade is still very small, then a substantial increase has occurred, according to both the Danish Patent- and Trademark Office and the association of patent agents in Denmark. This development accentuates that a patent may in this sense act as collateral, as it may represent a value in its own right, unrelated to the inventing firm.

Today intellectual property is not only a legal asset it may also represents a commercial value and may thus be a financial instrument. The ways to reap the commercial benefits vary. A patent may e.g. be sold, licenses may be sold, or a patent may be used as collateral<sup>6</sup>. Finally, a direct way of monetizing a patent is to base a company on this patent and develop a business around the technology in question.

It is well known that many patents are never used neither internally in the firm or licensed out (Lemley and Shapiro, 2005, Moore, 2005). For example, the US PTO issue yearly 200,000 patents, however, there is only a commercial use of a minority, and the revenues are highly skewed<sup>7</sup>. Debate prevails as to why so many patents are not used<sup>8</sup>. Reasons for this mentioned in the literature includes that it is difficult to know a priori which patents will show to be valuable<sup>9</sup>. Related, the value of patents may be poorly understood (Rivette and Kline, 2000). Whereas these reasons relate

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<sup>5</sup> This may even be a conservative estimate. Moore (2005) cite sources that claim that this is the amount earned in licensing fees by U.S. firms alone. The Cohen-Boyer patent on gene splicing alone has generated licensing revenues of 155 million \$, and Texas Instruments earn licensing revenues of \$ 800 million annually.

<sup>6</sup> One example of this is the securitization of the royalty streams from the copyrights of David Bowie.

<sup>7</sup> Lemley and Shapiro (2005) mention that the top 1 percent of patents generate more than thousand times the revenues as the median patent. As many patentees do not know which patents will be commercially valuable in the future patents an excess number of patents are taken out despite knowing that this is like a lottery ticket – the majority of patents will be worthless, but maybe one or two may give significant commercial value.

<sup>8</sup> An empirical study of maintenance fees (Moore, 2005) in the US finds that the renewal rate of 100,000 patents is 46 percent.

<sup>9</sup> It may, though, be very easy to forecast the (poor) commercial value of many of the patents described at these websites: <http://totallyabsurd.com/absurd.htm>; <http://www.crazypatents.com/>; <http://www.delphion.com/gallery>. <http://www.around.com/patent.html>; <http://www.patscan.ca>

to a perception of 'value' as commercial, monetary value, the reasons for taking out patents also influence the valuations of patents. For example, if firms take out patents to signal quality of R&D or to make the company more attractive to venture capital, this may be a render a positive effect, but not necessarily a commercial one, which may have justified to pay maintenance fees of the patent. Defensive blocking of competition can also be strategically valuable, but may not imply use of the patent.

A recent survey of the value of patents in 7 EU countries (Germany, Spain, France, Italy, The Netherlands, UK, Denmark) (Kaiser, 2006) finds that in Denmark the share of patents used for commercial or industrial purposes are (together with France) substantially above the average. Also with respect to share of patents licensed out the Danish share is the highest in the survey. Consistent with this, Danish firms more frequently than firms in the other 6 countries list commercial exploitation as an important motive to patent. Finally, the UK and Denmark are ranked highest in terms of the share of patents used to start a new company.

These trends may both impact on the relationship between VCFs and patentee and vice versa the way the relationship unfolds may be reflected in the data. The growth in the market for knowledge in terms of trade with patents and licensees obviously make VCFs put even more emphasis on the value of formal IPR when financing the firm. The patent may itself be a source of revenues even if the firm itself fails to be as profitable as expected. The above-mentioned theories of asymmetric information and moral hazards causing reluctance among VCFs point to particular problems in assessing the quality and intentions of the owner/management. By evaluating something tangible, a patent, the VCF reduces much of the uncertainty associated with investing in knowledge-based firms. It does require, though, that the patent is useable if applied in another context; the differences in the use of patents may indicate this.

A complicating factor in this connection is the fact that there is considerable time-lag between application and patent grant. Problems of time to patent may imply that appropriating the returns may happen several years after the invention, as there is usually a time element in the patent application process; not least when an EPO-patent is processed and granted. Danish patents filed at the EPO in 1996 had average (and median) time-lag of 4.7 years before grant (Kaiser et al., 2005). Since then the workload at the EPO has increased rendering even further delays.

It is also possible that differences in the way VCFs interact with firms render differences in the statistics of use of patents. In other words, the requirements and contribution of VCFs may mean different propensities to use and value patents. The literature on added value of venture capital is not clear about if the basics and practice of the value-adding process by

venture capital firms is the same regardless of the differences in institutional context, e.g. between US and European markets as specific cross-country evidence is sparse (deClercq and Fried, 2005; Sapienza et.al., 1994, Sapienza et.al., 1996).

#### **4. The impact of sectoral affiliation and size of patenting company**

Patents involve costs in the form of pure fees for the patent but also as external expertise (patent agents) and language translation. For many firms, especially small, and medium sized enterprises (SMEs), both the timely process and the costs involved in the patenting process pose a problem for these firms and may decrease the incentives for patenting inventions. Thus, some surveys have found differences in the motives to patent between large and small firms; Blind et al. (2006) e.g. find that strategic exchange and incentive motives are more important for large firms<sup>10</sup>. But there are also generic differences between large and small firms in their ways of managing the patenting process and their preconditions for doing so. Specifically, even if small firms may be relatively more innovative than large firms (measured as the number of new products per employee) (Christensen et al., 2004) then large firms produce, in absolute terms, more products and processes that may be patented. This may in turn justify establishing an internal patent department, and will enhance the build up of internal competences in managing the patenting process.

In light of the increase in patenting activity the demand for patent engineers has increased substantially. This has caused Danish firms to head-hunt patenting expertise (which is visible in the development of the salaries of these). In turn, this makes firms with an internal patent department attractive to external financiers as these have a higher degree of supply security.

Moreover, in addition to scale effects, the economic muscles of a large firm are important in at least three respects. First, the mere costs of patenting may better be covered by the large firm, which in turn may imply that larger firms may pursue a patenting strategy that is broader in terms of both the number of patents and the geographical coverage of patents around each invention. Harhoff and Reitzig (2004) estimates a typical cost of a patent to be EURO 29.800, of which application fees make up a small share, the bulk being translation costs and related professional assistance.

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<sup>10</sup> Davis (2006) finds though, that in spite of resource constraints small, Danish firms often replicate the patenting behaviour of larger firms.

The same source provides estimates from patent attorneys that costs of an opposition case may range between EURO 15.000 and 25.000 for each party. Second, the large firm may afford to enforce their rights. Third, and related to the second point, the ability and strategy of large firms to fiercely enforce their rights may in itself prevent infringement of the patent.

While not being an advantage directly related to size then it may be argued that the increase in trade with IPR and the increasing recognition of IPR as collateral is more advantageous for small, technology-based firms. VCFs often require returns of minimum 25% and if the small firm – who may be more dependent upon external finance – could save the costs of this equity financing by leveraging the IPR for loan financing they will be much better off. A complicating factor enters the picture in this connection. As the lender is interested in the cash-flows from the licensed IPR it is of utmost importance that the licensing firm is credit worthy rather than the IPR owner. A small entrepreneurial firm licensing to a large, established firm may thus be granted better loan conditions than a larger firm licensing out to a small firm.

The extent to which the technology is protected by a patent may thus be carefully examined and mirrored against the costs of obtaining and maintaining the patent. This assessment is most often very difficult to make and may for the small firm require external competencies.

The challenges for small firms in handling the patenting process by themselves are not only economical, but also technical. A number of legal issues arise in the patenting process, which often are beyond the capabilities of small firms. To take an example, the choice of legal scope of the claims is far from trivial. The commercial value of a patent may be jeopardized if the scope of the submitted claims are too narrow, thus enabling determined competitors to avoid these claims. Blocking competitors from this by submitting broad claims is for a small firm not an easy task as it requires a sense of future directions of technology, industry and markets. Under spending on patent counsel may for the firm be tempting, but may eventually fall back on the firm. On the other hand, costs and speed in the time to granting of the patent may be arguments for keeping claims narrow.

There are clear indications of sector differences in the need for clearly documented and extensive IPR to make firms attractive to external financiers. In case VCFs go into biotech investments<sup>11</sup> there is a particular strong

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<sup>11</sup> Which they do to a large extent. For example, the share of Danish venture capital devoted to life science investments make up a little above half of all investments in the first half of 2006 (both when measured in amount of capital and number of investments) (VækstFonden, 2006).

demand for IPR<sup>12</sup>. This has to do with the large size of such investments, the greater risk of copying, and the long time horizon until commercialisation; the time horizon for bio-tech firms to produce something which is possible to commercialize may be a minimum of 5-7 years. Regarding the latter time horizon it is important to note that patents are lasting, whereas management and R&D-personnel may change during a 7-year period.

At the same time many VC funds are fixed-end funds with duration of typically 10 years. This poses a pressure to go into the biotech investment early in the life of the fund. Therefore, the VCF will require to have settled an exit strategy already at the time of initial investment. This, in turn, calls for an evaluation of the value of the IPR and the potential commercial benefits from the invention.

## **5. Investment criteria for venture capital firms**

Generally the investment criteria of VCFs differ from those of banks and other financiers. An extensive amount of literature has evolved on credit-scoring and other models for aiding investment decision. However, venture capital investments usually involves investments in firms with non-deployable assets as well as greater uncertainties. This implies greater need for sensitivity analyses, and careful examination of the value of the firm in an exit situation, rather than the cash flows. Another fundamental difference is that investments by traditional corporate financiers are done at a one-time basis, whereas venture capital investments are multi-stage investments often undertaken as either performance based milestone payments or options of re-investment specified at the time of the initial investment and based upon the results from close post-investment monitoring.

Also the existing portfolio may impact differently in VCFs compared to other financing mechanisms. In traditional corporate finance the dominant strategy is to diversify the portfolio in order to minimize risk. Contrary, VCFs would tend to specialize in order to enhance their competences in screening and monitoring specific types of firms (Christensen, 2007). Also, corporate financiers would to a higher extent rely on historical accounts on performance of special types of investments, e.g. specific industries. VCFs need an exceptional return on a few 'star-investments', which make them more willing to go into investments involving disruptive innovations and emergent markets.

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<sup>12</sup> In the studies on motives to patent there is no uniform opinion on whether there are generally differences among sectors. Cohen et al., (2002) do find such differences, whereas Blind et al. (2006) argue that technology has become less relevant.

Not only have these differences implications for how far existing models of valuation of investment opportunities can be used, as many of the information requirements of these are not present in venture capital investments, they also have implications for the assessment of the IPR<sup>13</sup>.

One such implication is that of the value of a patent as a stand-alone asset compared to the value when it is an integrated use of a technology into a specific business, and tied up to the human capital. In other words, if patents are highly valued as collateral it must be presumed that the patent may be used in another context without the original owner. If the management fails to perform and is required by the VCF to be replaced the skills related to the use of the patent must be easy to substitute. Therefore the patent must also be assessed in relation to the degree of competence specificity related to the use of the patent. The literature on value added of venture capital has found that technical skills are not a major contribution.

Venture capitalists and other financiers may be more reluctant to finance companies only based on intangibles rather than a documented portfolio of IPR. Investments and production in the knowledge-based economy entail characteristics, which may both spur and limit the incentives to prefer financing patenting firms. To take factors limiting the value of patenting in the eyes of VCFs first, it is generally believed that the length of product life cycles has decreased. The shorter product life cycles combined with the fact that there is a considerable and increasing time lag between application and grant of patents means that the incentives for patenting decreases. Second, investments tend to be still more cross-disciplinary, not only incorporating knowledge from different scientific fields, but also combining existing, known technologies in new ways. Innovations also tend to be of a still broader type involving not only technology based products or processes, but also new organisational forms, new marketing concepts, distribution channels and –forms, and business models. As this in some cases may not represent sufficient novelty to qualify for at patent other appropriation methods becomes more relevant. Third, events at the venture capital market, such as the burst of the IT-bobble, have taught investors that in some technologies and industries the investments in innovation efforts are often sunk. This implies that in many cases patents may rationally be of decreasing value as collateral as the technology quickly becomes obsolete. This means that e.g. secrecy may become of increasing relative importance as appropriation method. Despite these arguments against the importance of IPR in venture capital assessments of investments then VCFs still value highly the reduction of uncertainty concerning knowledge-based firms and

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<sup>13</sup> Empirical studies ranking VCF decision criteria (e.g. MacMillan et al., 1985), generally find that this aspect is not listed high in VCFs decisions.

they regard IPR as an tradable asset. Moreover they legitimise investment decisions, as explained later.

## **6. Getting the paper work done**

The above indicates that there may be incentives for VCFs to be more willing to invest in firms with a patent or patentable invention. These firms may be more attractive because they precisely are technology-front companies, and because an issued patent implies that a technology search has already been undertaken, reducing the likelihood that another patent will block the commercial exploitation of the technology. The patent may be a source of super-normal profits and growth, which is a precondition for VCFs to enter.

In addition, a patent is important for exit from the investment. Some investors fear taking over an empty shell when investing in knowledge based firms. Part of the due diligence of a firm is to assess the threats of competitors, something immensely reduced if the core technology is protected. A patent is therefore an important documentation and core of a company otherwise based on intangibles. When the firm is valued in the market place a core and broad patent may be an advantage because it represents a bargaining power vis-à-vis acquire licensing agreements or other IPR from other firms. Firms with a patent may thus be attractive also because the patent in itself may represent a value, even if the firm fails to bring the technology to a production or licensing agreement.

The legal status of the patent is important in this connection. As part of their due diligence venture capital investors go through the possible scenario for disruption of the business. One such scenario is that the patent holder leaves the company and starts a business on the basis of the patent – or sell/license the patent rights. Therefore, it makes a difference if the patent legally belongs to the company or an individual investor, founder or present or former employee. As venture capital investors typically invest in the company rather than an individual, a company ownership of the patent eliminates this risk. Therefore, the due diligence must include clarity of the ownership of rights and possibly ensuring that all inventors assign rights to the company.

Written agreements establishing the ownership of the invention may even be necessary with contractors, advisers and consultants especially if the invention was a result of a joint development agreement. Universities may also have rights in the IP of the firm if the technology on which the firm is

based is developed by universities or in collaboration with universities<sup>14</sup>. It may indeed also be the case that government may be entitled to shared ownership of IPR if government supported the firm. This makes it important not only to secure the ownership, but also to minimize the risk of inventorship disputes, which may delay the use of the patent as well as being very costly. This will in turn devalue the patent of the firm considerably.

This point to the other content of venture capital investment documentation with respect to IPR. The most important of such documentation is probably that VCFs require documentation of 'freedom to operate'. This includes that patentability of not yet patented products must be investigated and that the firm will be able to operate without risk of infringement claims from outsiders. By incorporating the patent landscape already in the product development process the firm may be able to design around existing patents, or to license these other patents. Investors are thus not only interested in the IPR of the firm, but also in the rights of others. VCFs thrive to minimize risks. When we talk about SMEs the risk of a lawsuit may mean that the VCF will not invest as this may close down the SME<sup>15</sup>. To provide such documentation of no actual or potential litigation against the company external counselling should be called in to provide a non-infringement opinion and possibly also an opinion of freedom-to-operate and validity of patents. The choice of this external counsel may be done to ensure independence and would ideally be done after consulting the potential investor.

The integration of the IPR and the business strategy is an often overlooked aspect of IPR, especially among small firms. It is also one where VCFs may contribute. The development of the IPR of the firm needs to be done in accordance with both the internal competences and technology development and with the external business context in which the value of the IPR is to be tested. A footloose development of science may not be attractive to investors no matter how much it is leading edge technology. The documentation and description of the IPR must demonstrate the commercial potential of the technology rather than only the scientific achievement.

Other means to minimize the risks for investors may be judged positively and in some cases may even be decisive for the decision to invest. In particular insurance may stimulate investor interests. Enforcement insurance pays a percentage of the costs associated with prosecuting an infringement

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<sup>14</sup> A special case, which has received immense research and policy interest, recently is the case where the patent holder is a university. With the implementation of a Bay-Dole Act-like legislation in several European countries there is also a change in the institutional setting of the investment situation.

<sup>15</sup> Silverman (1989) list that, even by then, patent lawsuits in the US cost about \$ 500.000 per claim. This means that if the firm only has a weak patent, this may represent a risk, which VCFs take into account in their decision process.

suit, whereas defence insurance covers costs of defending and infringement suit.

A related aspect is considering whether the optimal measure of appropriation has been selected. In some cases and industries patents may not be the only or most relevant method. In Internet businesses and software copyright protection may be better suited whereas firms in biotech and life sciences are likely to be starved of external financing without patents. Trademarks are often particularly important to consumer products. In some cases the combination of different IPR provides the best solution. Both patents and copyrights protect some computer software. Again, the IPR must be carefully considered in relation to the business strategy and – environment. Even the scope of claims may be assessed in relation to the business development. Normally, one would think that broad claims would make up the best blocking of competitors, and most patent agents would probably advise firms to take out broad claims. However, narrow claims may alleviate the time constraints as the issue of a patent may then be faster. In industries with rapidly changing technologies and short product life cycles this may be an important consideration, which is only taken in if the external business environment impact on the IPR strategy.

## **7. A special case – how special?**

Having established that there are incentives on both sides to engage in venture capital financing of patenting firms the question arises whether this is a pervasive phenomenon, and whether the above-mentioned reasons for venture capital firms investing in patenting firms, are valid explanations, in particular if the knowledge based economy poses different specific considerations on the VCF-patentee relationship.

The former part of the question may call for survey methodologies, whereas the latter part requires more in-depth studies. Consequently, these two different types of research strategy have been implemented.

### **7.1. Survey on the VCF-patentee dyad**

It was claimed in the introduction that the issue in this paper is admittedly probably a special case, which is of relevance to a small fraction of the population of firms. To test this a broad survey is used.

The data are based on telephone interviews with the management of private firms in North Jutland. This data collection is part of a quarterly regional business cycle indicator established in 1998 and still ongoing in

North Jutland, Denmark<sup>16</sup>. Every 3 months, a representative panel of managers in 1000 firms in the private sector are interviewed about their view of the past and future development of, among other things, production, employment, profits and competitiveness. A minimum of 10% of the panel is replaced in each round to avoid panel effects. Only firms with at least 5 employees are selected. The interviewed firms represent approximately 30% of employment in the region. The data are weighted to make the real-ised sample representative of the population. As part of the survey a small set of questions on patents and trademarks were asked in mid-2006. These questions were specially designed to the purpose of this paper. Firms were asked to list if they either possessed IPR in the form of patents or trademarks, or if they applied for one of these within the past 5 years. In case of confirmation of this respondents were asked to state if

- decisions on IPR were influenced by a priori belief of potentially easier access to external finance or
- decisions and process on IPR were pushed by existing or negotiating financier
- an open ended 'how'-question followed confirmation of one of these questions.

It was expected that a minority of firms would claim to have IPR or IPR-applications. This is based upon the fact that all private firms are included, and also relatively small firms (down to 5 empl.). Also, firms in trade, ordinary services, primary production etc., which are industries that traditionally are not very frequently patenting, are part of the survey. Second, the patenting activity of the region as such is generally low. According to CFA (2006) who map innovation and patenting activity in Denmark the share of innovating firms in the region is 45%, which is around average. However, the expenditures for innovation is considerable below the share of Danish firms (4% as compared to 11% of the firms). This indicates that patentable, radical inventions are underrepresented in the region. Out of the innovating firms 10% have applied for at patent and 15% for a trade mark in that survey.

Our own survey largely confirmed these numbers. 6% of the 1000<sup>17</sup> respondents claim to posses patents, and 5% to have applied, which roughly corresponds to the 10% with a patent application out of 45% innovative firms found in the CFA-survey. Likewise, the frequency of firms with a trademark is in accordance with the CFA-figures, although a bit higher: 12% in our survey applied for a trademark. The four possibilities – applied or possession of either patent or trademark – are not mutually exclusive.

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<sup>16</sup> The results of the business cycle forecasts and further explanation of method etc. (in Danish) can be obtained from [www.business.aau.dk/njk](http://www.business.aau.dk/njk)

<sup>17</sup> At the time of writing the very last part of data collection was still going on. Therefore the numbers presented here is based on 781 interviews, not 1000.

Moreover, 25% claim to have at least one registered trademark. This means that a relatively large number (225) of respondents were asked the above-mentioned questions about the potential role of VCFs or other financiers. This is where the frequency of the patentee-VCF dyad is tested. It was found that 3% of the 225 firms (=6) found that the IPR of the firm was important to attract financing. One firm found that external financier helped or pushed the patenting process. Quite many, 14%, answered 'do not know', which is not surprising as the motives and reasoning of an external partner may be difficult to grasp. These few respondents were asked the open-ended question on how the IPR-financier relationship made a difference. Answers included

- 'made the firms more credit worthy'
- 'a prerequisite for external financing'
- 'alleviates financial constraints'

and the one respondent who pointed to the help of financiers in carrying the IPR process through said that 'the project would not have succeeded without the help of the financier'.

A somewhat similar survey was implemented in sept. 2001 (Christensen, 2006). The firms registered as having at least one patent with the Danish Patent and Trademark Office were interviewed by telephone, rendering 77 interviews. Only a small share – 10 firms – claimed to have VCFs among the owners. 6 of these thought that venture capitalists stimulated the patenting activity of the firm. 5 were confident that the venture capital firms became interested in the firm in the first place because of the patents in the firm. These are surely also too small numbers to render solid conclusions, but the results do indicate that the problem area is relevant, but for a small share of firms.

## 7.2 Interviews on the content of the dyad<sup>18</sup>.

In order to get closer to the content of the process, interviews were done with a general manager (but with hands-on experience with the IPR-aspect of VC-deals) and an investment manager in two venture capital firms. These VCFs were selected because they focus upon small, technology-based firms where the problem is expected to be present. The interview persons were selected through referral from a member of the board of a VCF. Interviews were semi-structured both testing out the ideas developed in this paper and asking openly about the role of IPR in investment criteria and the potential aiding management of the IPR-process.

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<sup>18</sup> In the present version of the paper the interviews are not sufficiently exploited.

Summarizing the insights from the interviews the trends discussed above were largely confirmed. The importance of a patent stands out in the decision criteria and due diligence. If proper IPR is not in place the VCFs may help the process, however, this is often done by calling in external counseling.

A further aspect was discussed; the investment managers make their opinion on the screening of investment opportunities, which afterwards is decided upon by the board. Following an increased emphasis on patents the trend is that the presence of a patent is used as a legitimisation of decisions. The double-principal-agent role as mentioned in the theoretical section is felt strongly.

## **8. Conclusions**

This study has dugged into a special case, the access to capital as a strategic motive to patent. It was found that empirical studies rank this motive relatively low among motives to patent, but that strategic motives generally have increased in importance. It was also found that trade with IPR has increased and, related, that IPR increasingly is seen as a financial asset.

The role of VCFs in the IPR process was found to be important in relation to securing the value of the patent and to put the IPR into a business context and adjust this in accordance with market and competitor development. Another important role is to function as an intermediary to technology specialists and potential cross-licensing deals.

Small firms were found to be particular dependent upon IPR when evaluated by VCFs and they also need external help to manage the process to a larger extent. Likewise firms in life sciences were seen as more reliant on IPR, and the valuation of this IPR is especially important.

Generally investment criteria for VCFs are different from other traditional financiers. In this connection especially the valuation of IPR becomes key because VCFs emphasize more the increase in the value of the firm rather than cash flows. The VCF must ensure ownership of the IPR as well as clear the road for commercial exploitation of the patent, including making sure that the patent is not infringing other IPR.

Trends in the knowledge-based economy means that incentives for patenting may decrease. On the other hand, there has been a huge increase in both patenting and trade with patents. This may reflect another trend – that firms are increasingly based on intangibles, therefore financiers value

the ownership of a patent high as it eliminates some of the risks of investing in knowledge-based firms and they value patents as collateral higher when there is a vibrant market for knowledge assets.

The paper has been highly explorative and further research is called for to validate the ideas in this paper. The nature of the problems addressed makes qualitative research design the most relevant to pursue.

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