

The Impact of Intellectual Property on Venture Capital Financing of Start-ups: A Research Review

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Abstract

Venture capital financing is generally regarded as an important channel for start-ups' financing. In recent years, the important influence of intellectual property on venture capital financing of start-ups has aroused extensive research interest among scholars. This article combs the domestic and foreign literature on the impact of intellectual property on venture capital financing of start-ups, deepens the understanding of the role of start-ups' intellectual property signals, and put forward future research directions such as strengthening the research of intellectual property portfolio, exploring possible mediating mechanisms, and exploring intellectual property signal research in the Chinese context.

Keywords

Intellectual Property; Start-ups; Venture Capitals; Signal Theory.

1. Introduction

With the wave of "mass entrepreneurship and innovation", many favorable policies have been introduced, and a large number of start-ups have emerged, which have become an important part of the market economy. However, the newness weaknesses brings start-ups many difficulties in the early stage, such as financial difficulties [1]. As the new blood of the economic market, start-ups are of great significance to the future prosperity of the economic market, so it is particularly important to help their growth and development. External investors cannot directly observe the "quality" of start-ups, which also makes it difficult for start-ups to obtain the funds needed for development through traditional financing channels. Venture capitals have the skills that traditional financing institutions lack in screening, identifying, supervising and mentoring high-risk enterprises, which makes venture capitals an important channel for start-ups to obtain funds [2]. However, start-ups are established for a short time and lack of market transaction records. Therefore, there is information asymmetry between start-ups and venture capitals, which affects the valuation of start-ups by venture capitals [3].

In order to alleviate the information asymmetry between start-ups and venture capitals, some information that can show the "quality" of start-ups has become very important. As the key intangible assets of enterprises, intellectual property can form the unique competitive advantage of enterprises so as to occupy the technical position and market position, which plays an important role in the operation and development of enterprises. Will intellectual property have an impact on start-ups? If so, what impact and how? Based on these problems, this paper combs the relevant research at home and abroad, explores the impact of intellectual property rights on venture capital financing of start-ups, summarizes and concluded them, and puts forward some future research directions.

2. Research Status

2.1. Research on Venture Capital Financing of Start-ups

Spence (1973) believes that the signal is visible and plays the communication function [4]. So when start-ups attract venture capitals' investment, some signals from different sources indicating the "quality" of start-ups have become very important, which can alleviate the information asymmetry between start-ups and venture capital.

First of all, from the perspective of start-ups, founder and founding team factors are important factors for start-ups to attract venture capitals. Specifically, a questionnaire survey conducted by Macmillan et al. (1985) on 14 venture capital companies in the United States shows that entrepreneurs' experience and personality of start-ups are the most important criteria for venture capital to decide investment [5]. In addition, the experience of the management team of start-ups is also an important decision-making factor for venture capital companies [6]. Moreover, previous entrepreneurial experience, founders' social networks and founding teams with doctoral degrees are positively correlated with the possibility of higher valuation for start-ups [7].

Secondly, the characteristics start-ups' strategic alliance are also important factors for venture capitals' decision. Hoenig and Henkel (2015) point out that the characteristic of start-ups alliances could be a factor in the investment decisions of venture capital [8]. In addition, a research, based on data on venture capitals' transactions, shows that the number of alliances a start-up has is proportional to the amount of venture capital funding it receives [9]. Besides, Zhang et al. (2015) also point out that venture capitals are more inclined to invest in politically connected enterprises [10].

In further research, scholars also consider the factors of venture capitals. The study of Nikolaus et al. (2008) states the relationship between venture capitals' experience and team characteristics of start-ups. The results show that novice venture capitals tend to be the qualification of individual team members, while experienced venture capitals pay more attention to team cohesiveness [11]. What's more, the geographical distance between venture capital and start-ups is also an important factor affecting venture capitals' investment [12-14]. Among them, Huang et al. (2015) point out that the farther the geographic distance between venture capitals and start-ups, the less the amount of venture capitals' investment in start-ups, the later the investment time, and the lower the probability of participating in corporate governance after investment [14].

In addition, as an important type of intangible asset in enterprises, in recent years, more and more scholars have proved that intellectual property plays an important signal role in venture capital financing of start-ups.

2.2. Research on Intellectual property and Venture Capital Financing

Intellectual property can become a more important "quality" information for start-ups, transmit positive information to venture capitals about the future value-added space of start-ups, promote start-ups' venture capital financing and improve start-ups' valuation by venture capitals. The research on the role of intellectual property in venture capitals' investment mainly focuses on the role of patents.

2.2.1. Patent and Venture Capital Financing

Nadeau(2010) points out that patent innovation has proved to be a key resource for start-ups, which can help to reduce the inherent selection risk associated with information asymmetry, bring sustainable competitive advantage to start-ups, and enable venture capitals to avoid business failure as an insurance [15]. In other words, patents can show the technological capability of start-ups and hinder other enterprises from entering the field through patents

exclusivity, so as to enable start-ups to obtain excess returns, improve start-ups' profits and enhance the confidence of investors.

Previous literatures show that patents is an important standard of measurement for venture capitals' investment decision-making. The signal effects of patent application include the probability of obtaining venture capitals' investment [16, 17], the possibility of attracting well-known venture capitals' investment [18], the total amount of venture capitals' investment obtained by the start-up [19, 20], and the number of venture capitals [21].

Moreover, through the further study of patent characteristics, the results show that the number of patent applications [22, 23], the number of patent authorizations [24] and patent quality [25] are positively correlated with the total amount of venture capitals' investment. In addition, Hsu and ziedonis' study has shown that for start-ups with less entrepreneurial experience, patents can increase the possibility of obtaining venture capitals' investment; and the earlier the investment round, the stronger the positive effect of patents on VC valuation [26]. Similarly, considering the dynamic effect, Higgins uses the time series model to study the different roles of patents in multiple rounds of financing, and puts forward that the role of patent signals in rear wheel financing is decreasing [27]. By the way, some documents produced during the patent application (such as the search report of the inspector and the record of the objection) also have an important role in investors' decisions [28]. Venture capital not only prefer start-ups with patent applications, but also through those documents reduce the information asymmetry of investment, making it more accurately identifying and judge the value of start-ups. As a result, start-ups will take the initiative to use these patent information to attract venture capitals' investment. In addition, in China, some researchers have analyzed the impact of three possible signals from patents — technical signals, commercial signals and legal signals — on venture capital financing of start-ups. Through empirical research, it is shown that the legal signals of patents have the greatest impact on the financing level, followed by technical signals, and the impact of commercial signals is the least [29].

However, some scholars have put forward different views that there will be a negative correlation between patents and venture capitals' investment. A study of Heeley et al. points out that in machinery, electronics, information and some other related industries, the relationship between enterprises' patents and business returns is opaque so that the increase in the number of enterprises' patents will increase the information asymmetry between enterprises and the capital market, and even underestimate the enterprises' value [30]. Similarly, in a study by Smith and Cordina, an interview with VC investors shows that 79% of respondents do not think that the patent is the main reliable signal of technological value of start-ups [31].

2.2.2. Trademark and Venture Capital Financing

In addition to patents, some scholars' studies show that trademarks may also have a great impact on venture capitals' investment. Trademarks have signal value because they represent the progress of start-ups in marketing [32], the preparation for product or service development [33], and market positioning and the level of market access [34]. These show that trademarks can convey the quality of start-ups and have strong signal value. Zhou et al claim in their research that trademarks play an important role in attracting venture capital for start-ups. That is, start-ups can prove to venture capital that they have clear business objectives (through owning trademarks) so as to gain more attention to investment in risk capital, and have higher probability to obtain venture capitals' investment and even a higher investment amount [35]. Block et al. also investigated the role of trademarks in the valuation of venture capital on start-ups. Interestingly, the research results show that there is an inverted U-shaped relationship between the number and width of trademarks and the valuation of venture capital on start-ups [36].

2.2.3. Other Intellectual Property and Venture Capital Financing

Other major intellectual property rights include trade secrets and copyrights. Malyy points out that Trade secret is an informal intellectual property right. It is difficult to obtain the main information and statistical data about trade secret in the enterprise's intellectual property strategy, so the role of trade secret in venture capital investment is not obvious [37]. Nevertheless, some scholars have proved the positive impact of trade secret protection on the amount of follow-up venture capital [38]. In addition, copyright is rarely studied as an intellectual property right of start-ups, and there are few studies on the impact of copyright as an intellectual property right on venture capital financing of start-ups. Mann considered copyright in his research, but at the beginning of the paper, the author pointed out that "copyright has relatively little value in protecting start-ups from competitors".

2.2.4. Intellectual Property Portfolio and Venture Capital Financing

The term "intellectual property portfolio" comes from the idea of "portfolio" in the financial field. The portfolio management theory was first put forward by American economist Harry Markowitz in 1952. He discussed how to reduce investment risk through portfolio based on the concept of investment diversification and risk avoidance. At the end of the 20th century, with the development of enterprise technology management activities, patent portfolio theory was produced based on portfolio theory, which was a set of method of technology portfolio using patent data proposed by Holger Ernst in 1998. PCT (Patent Cooperation Treaty) interprets patent portfolio as a collection of patents owned by a single entity. These patents can be related or even irrelevant. It can be seen that the biggest feature of patent portfolio is to realize synergy by connecting individual patents [39].

The concept of intellectual property portfolio is not clearly defined, but it has been used in research. At present, in the domestic research, the research on intellectual property portfolio mainly focuses on its classification and dynamic management. Liu Guoxin and Chen Shanshan mainly listed four intellectual property combination modes: patent combination, patent (+ trademark) + trade secret combination, patent + trademark combination and trademark + trade secret combination, and put forward the dynamic management idea of intellectual property combination [40]. According to the value and enforceability of intellectual property, Zhou Ling divides intellectual property into patent portfolio, trade secret portfolio, patent + trade secret portfolio and technical and commercial publication portfolio, and describes the process framework of dynamic management of intellectual property portfolio [41]. In addition, through the investigation of the sample of new companies in many industries in the United States, the results show that there is an important correlation between the intellectual property portfolio of start-ups and venture capital financing. [42].

In previous studies, some scholars point out that patents and trademarks usually have important complementary effects. Patents can indicate the technological capabilities of enterprises, while trademarks can indicate the non-technological capabilities of enterprises (such as marketing capabilities and service capabilities). Therefore, a comprehensive analysis of the intellectual property portfolio of patent and trademark portfolios should be able to better understand the extent to which enterprises introduce technology and non-technology innovation into the market and the strategic behavior of enterprises. Zhou et al. point out that compared with the situation that enterprises only use single intellectual property rights, start-ups applying for trademark and patent portfolios can significantly increase the probability of obtaining large amounts of venture capital. This study innovatively combines patent + trademark intellectual property portfolio with venture capital investment, and examines the important role of this intellectual property portfolio in venture capital financing of start-ups, which has important theoretical and practical significance.

3. Main Research Conclusions and Research Prospects

3.1. Main Research Conclusions

By reviewing the existing research, this paper finds that:

Start-ups' intellectual property of start-ups plays an important signal role, which can transmit the "quality" signal of enterprises, attract venture capitals' investment and promote the growth of start-ups. However, in domestic current researches on intellectual property to venture capital financing of start-ups is still not much, and these papers focus on the study of patents, and mostly stay in the quantitative characteristics of patents, and lacks the research on the signal function of the combination of trademarks in the Chinese context.

Scholars have discussed the important role of patents or trademarks in venture capital financing of start-ups, and shown that patents or trademarks are an important signal to transmit the "quality" of enterprises. While there is a complementary role between patents and trademarks, and some enterprises have two types of intellectual property rights at the same time. In the existing literature, there is little research on the impact of intellectual property portfolio on venture capital. What's more, it lacks the impact of the characteristics of intellectual property portfolio (such as the number and width of intellectual property portfolio) on venture capital.

As for the impact of intellectual property on venture capital financing of start-ups, the current research literature mainly discusses the direct effect between them and the moderating effect under some conditions. It is not clear whether there are some mediating mechanisms between intellectual property and venture capital financing of start-ups.

3.2. Research Prospects

Based on the above research conclusions, the future research can be expanded from the following aspects:

Study the signal role of different intellectual property in China. Trademark is also an important intellectual property right of enterprises, which can reflect the market tendency and marketing ability of enterprises. The development of Chinese intellectual property is different from that of other countries. In recent years, China has continuously strengthened intellectual property protection and improved the level of intellectual property law enforcement. In Chinese institutional environment, whether and how trademarks can also play a good signal role as well as patents, which is worth discussing in the future.

Focus on the impact of the characteristics of intellectual property portfolio on venture capital financing of start-ups. Patents and trademarks have important complementarities. Now more and more enterprises have applied for patents and trademarks at the same time, forming the intellectual property portfolio of enterprises. And in the existing research, the quantitative characteristics and quality characteristics of variables are two basic characteristics commonly used. Therefore, in the future, we can explore the impact on venture capital financing of start-ups by studying the quantitative and qualitative characteristics of intellectual property portfolio to expand the research on the signal function of intellectual property.

Explore the possible mediating mechanism between intellectual property and venture capitals' investment. In the current research, it is mainly based on the signal theory to study the direct effect between intellectual property and venture capital investment. In the future research, it may be possible to deeply explore the possible intermediary mechanism or other influence mechanism in this direct effect based on other theoretical perspectives.

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