

Financing SMEs and Innovation

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Keywords: SMEs, Informational symmetries, Collaterals, VC, Securitization.

Abstract. R&D intensive SMEs have been the one of major pillars of world economy. Thus, the financing constraints they are facing are worthy of studying thoroughly. Basically, innovative SMEs mainly face two major problems: the scarcity of collaterals and informational asymmetries with lenders or investors. The existing solutions, such as increase liquidity of intangible assets, the signaling effect of patents and credit rating tools of banks, could be widely used. VC and BA eliminate partial informational asymmetries. Securitization of intellectual properties require too much to realize for SMEs. At present, there are not effective methods solve financing problems of innovative SMEs.

Introduction

SMEs represent about 90% of enterprises in the world (World Intellectual Property Organization [1], and SMEs, mainly high-technology firms, are the main drivers of innovation and improvement of technology of society [2]. To overcome the liability of smallness, SMEs put a lot of resources on R&D and innovation to pursue the technical efficiency [3]. Presently, innovation has become more important based on its contribution to GDP. Industries based on intellectual properties could contribute 5.8 trillion dollars to the GDP of the United States [4]. Therefore, SMEs should be paid more attention especially when they are struggling to get money from capital markets [5], because the shortage of capital impedes the development and innovation of SMEs overwhelmingly [6]. The financing problems of SMEs are quite urgent. In EU, only about 10% SMEs could successfully raise funds and commercialized their innovative ideas [4].

Generally, there are two issues hindering financing of SMEs, the demand for tangible collaterals and the information asymmetries between SMEs and lenders [7]. Lenders need collaterals as threat to force debtors to repay the loan and in case of default lender could get their principle back by asset liquidation. However, statistics shows that in many start-up and SMEs, intellectual properties are only valuable assets [8]. Additionally, information asymmetries between the SMEs and lenders impede the financing activities severely. SMEs lack efficient ways to convincingly convey their credibility to lenders, resulting in the increase of financing cost increase considerably [7]. If the SMEs are new established, the financial constraints will be more severe [9].

In the following sections, the solutions to financing problems will be discussed in detail. The Section 2 will briefly introduce the financing problems and solutions for SMEs. Section 3 will discuss the existing methods settling the financing problems and Section 4 will discuss alternative methods to address these problems. Section 5 is the conclusion.

The Brief Review of Financing Problem and of Solutions

To connect SMEs to capital they needed from financial intermediaries, the two major obstacles stated above must be addressed. The collateral is always important for lenders who value collateral from two aspects: the liquidity and particularity of the collateral [10]. Generally, lenders will not accept collaterals with few potential (low liquidity) buyers and high transaction cost or high redeployment cost (high particularity), and thereby, will not offer loans to borrowers. Moreover, lenders have difficulties to value the intangible assets that SMEs could offer, and it also will be hard

to liquidate the assets [11]. In addition, to settle information asymmetries, patents could do the great favor for SMEs. Considering its publicity and strong credibility, outsiders can learn the condition of SMEs with minimized cost.

As the alternative financing method to borrow money from financial intermediaries, venture capital and business angles could finance SMEs with certain criteria, which will be discussed in Section 4. Besides, securitization of intangible assets allows innovative companies to obtain immediate financing by packaging and transferring their intellectual properties generating stable cash flow to third parties [12]. However, securitization contains too much transaction cost comparing to traditional financing channels. Securitization also is a complicated financing tool requiring mature business and law environment [13]. The more detailed discussion will be conducted in section 5. In addition, when the direct and indirect financing methods don't work, it's necessary for government to play a role in financing SMEs. The intervention of government could help to allocate resources more efficient for public goods in case of market failure. There are two major interventions of government on financing SMEs, the subsidiaries and coordination on supplier's trade credit[14]. Subsidiaries have been proved less effective than the coordination on supplier's trade credit.

Solving Problems Appeared in Financing SMEs from Bank

Employing incomplete contracting and financial intermediation theory, we mainly discuss two mechanisms to mediate the information asymmetry: the improvement of liquidity of intangible assets, and the join of a creditable third party testifying the credibility of borrowers.

Increase Liquidity of Intangible Assets

Gavazza [15] found that frequent trading of collaterals in markets improved liquidation value and thereby increased the willingness of lenders to make loans. Hochberga et al. [7] have found evidence that increase of patent trading do ameliorate financing condition of innovative SMEs: 1 percentage increase in patent trading results in 1.1 percentage of predicted debt rate increase, or 15% increase of average annual debt rate in sample companies. The founding is persistent with Gavazza [15] who asserted that as increase of redeploy-ability of patents of stat-ups to alternative users, the lending situation improved substantially. Additionally, some scholars claimed that if collateral includes patents, lenders must record the security interest with the US Patent and Trademark Office (USPTO) to ensure their priorities to be paid if assets are liquidated. However, the existing business and law environment is too far to satisfy the demands of expected patent trading market [7].

Signaling Effect of Patents: Eliminating Informational Asymmetry

The introduce of credible third party does mediate the informational asymmetry between financial intermediaries and SMEs [7]. Business angles and venture capitalists both could be the credible third parties decreasing frictions in SMEs' lending [16]. However, it is not just about who they are, but also how to attract them to testify the credibility of SMEs. In the following sections, BA and VC will be elaborated. The mechanism to attract them will be the focus of this section.

Patents are the core to attract credible third parties and decrease the informational asymmetries with low cost of conveying information to outsiders and of certificating value of companies [17]. Patents unlike other information in private firms, could be known easily and credibly by searching in institutions like US Patent and Trademark Office (USPTO) [17]. The effect of patents to attract third parties like VC has been attested that there is a positive relationship between patents and Venture Capital (VC) financing. Patents are not only have effect on attracting VC, but also on later stage financing and IPO [18, 19]. Although patents work more like a signal of quality, it does represent the quality of companies. Hottenrott et al. [20] have found that companies owing patents grow faster and more efficient than the ones without.

However, despite the significant effectiveness of patents, patents work less efficient in SMEs than in big companies. Large companies generally have more patents, more utilization rate, and more resources to maintain and protect patents than SMEs [8, 21].

SMEs sometimes must cooperate with large peers and Universities on developing patents considering their limited resources and ability. However, as partners, large companies mostly took more benefits from cooperation by their scale of economy. In case of cooperating with Universities, because of liability of smallness of SMEs, universities usually dominate the research and lead it to their favorable direction [5]. Therefore, collaboration and co-patenting mostly are just signaling activities for SMEs to get financed by government and upstream suppliers and reduce perceived uncertainty by investors [5, 22].

Rating Tools of Banks

As a matter of fact, banks have been working on financing SMEs. Because of the inaccessibility to operating records of SMEs, the traditional lending methods don't work, which are financial statement lending, asset-based lending, credit scoring method and the relationship lending [23]. Thus, banks use non-financial criteria to assess the credibility of SMEs [24, 25]. For example, banks consider the business plan of borrowers and evaluate the market trends and quality of management teams [23]. However, banks, especially big banks, still hope to make lending decision based on hard information (financial information), because it will be much easier. Thus, it's necessary to create convenient tools for banks.

The research in developing evaluation models has been abundant. Many models are using utility function to differentiate non-defaulted companies from the ones defaulted [26]. Also, multicriteria methodologies adopting qualitative credit rating model have been created, like MACBETH [27]. Besides, credit rating models using outranking relation like ELECTRE TRI employ quantitative approaches, and PROMETHEE II [28] applied for banks' rating evaluation [29]. Voulgaris et al applied UTADIS [30], an analysis tool using financial ratios, to assess operation situation of SMEs. Recently, the Flow-Sort method has been adopted to analyze innovation of SMEs. SMAA-TRI [31] analysis could rate SMEs regarding to risk they contain, and it take account of preference parameters and uncertainty in the data with Monte Carlo simulations. ELECTRE TRI, however, employs judgmental rating system to assess the risk of SMEs.

In fact, the methods that don't reply on the financial information have been developed. The issues left are the practicality of these tools and the willingness of banks to put them into use.

Based on the evidence that innovative SMEs are struggling for survival and mainly replying on their own financial resources, the willingness of banks may be the real issue.

The Alternative Financing Methods

Venture Capital, PE and Business Angles

For SMEs, VC and PE mostly have equivalent benefits, despite the difference of financing timing. VC and PE have a robust effect on decreasing the information asymmetry of companies, because their investment is a strong positive signal about the condition of firms, facilitating to external financing ways [16]. Moreover, VC and PE usually provide considerable additional services to companies they invested, such as the access to capital, consulting, monitoring and so on [32].

It needs to be noted that foreign VC and PE are especially efficient in providing additional financing channels and improving information transparency of investee firms [33]. Foreign investment mostly demands higher degree of information disclosure, which decrease information asymmetry of the companies [34]. Also, companies invested by foreign VC or PE are regarded as results of great management and governance by other investors [35].

In addition to venture equity investment, venture debt also plays a significant role. Venture loans are loans provided to innovative SMEs by banks and other financial institutions like VC. According to Ibrahim [36], venture lenders supply about \$5 billion to SMEs annually. Robb and Robinson [37]

have similar finding that venture debt weights 25% of start-up capital of SMEs, and it is still increasing with a surprising speed [38].

The prosperity of venture capital market is inseparable to venture capitalists. As intermediaries, venture capitalists who usually committed to supply the necessary capital to start-ups effectively facilitate the friction in venture lending [38]. In addition, the effect of patents is undeniable in the process of venture lending. GAÉTAN [38] proved that the significance of patents is almost equivalent to tangible assets as collateral for venture lending. Although the valuation of patent has been an issue, the venture lender always considers the salvage value of patents the borrowers own [38]. Besides, the borrowers mostly have to offer warrants to lenders, which usually are “bonus”, and the warrants play the core role in the venture lending business [38]

Business Angles have been one of most important financing channels for SMEs and start-ups. The amount of business angles (BA) are almost 20 times of start-ups in US market [39]. The BA market have similar size to VC market: VC market is \$18.3 billion (\$5.3 billion) in US (EU) and BA market is \$17.7 billion (\$5.6 billion) in US (EU) [40]. Unlike VCs, BAs mostly are individuals who have substantial business experiences and great amount of wealth. They are patient and focus on long-term, because they don't have the limitations like venture capitalists.

BA has been proved effectively at value-enhancing on IPO firm performance, and importance is unquestionable. The companies received BA, have been found that have more chance to get subsequent funding by VC. Freear and Wetzel [41] claimed that BA and VC play complementary role in financing SMEs or start-ups. Additionally, it should be noted that co-localization of BA investors and investees in the same place facilitates to attracting VC capital, and investment from both VC and BA will increase the chance of ultimate success for SMEs [42].

Securitization of Intangible Assets

Innovative SMEs could raise money directly from public through secondary market by securitizing their intellectual properties. As a great alternative method of raising money, securitization of intellectual property has been growing continuously. Securitization of IP is a financing method that generates the stable cash streams of royalties to get the circulating capital from the secondary market.

Generally, during the securitizing, the originator will separate the IP assets with the corresponding future cash flow, and transfer the right of cash flows and IP to a SPV (Special Purpose Vehicle) to get a sum of money immediately. In recent years, the trading structure of IP securitization has evolved to more complex. Compared with the basic structure that only one originator participates in, the complex structure includes a multi-seller securitization conduit where a great amount of originators joined in [43]. In such structure, originators transfer their IP rights to one SPV that is responsible for issuing securities that backed by the rights of IP and cash flow the originators transferred to it. The security, thereby, back by the IP rights that come from diverse sources, which makes the investment in IP securities has been diversified since the beginning [44]. The Figure 1 has shown the whole process of securitization.

The securitization of IP has many advantages comparing to other financing approaches. The originators who initial the securitization could get an interest much lower than bank could render [45]. Moreover, the securitization could be regarded as off-balance-sheet, which have certain advantages for some investors. In addition, by setting maturities, the term of securitization could span from months to years, which is preferable to VCs. However, considering the allotted time of IP, the maturities generally will not be long as 10 or 20 years.

As a matter of fact, there are some problems still need to be addressed in IP securitization like patent valuation. Traditionally, there are three basic approaches to patent valuation: cost approach, the market-value approach and the income approach [46]. The cost approach values the patent according to the total spending regarding to develop the IP. It is obvious that cost approach has flaws that only take into account the past cost and ignore the future cash flow the IP could generate. Market approach values patents by referring the similar patent transactions, which is not easy. The patents unlike general products, are not homogenous and thus, transactions may not be such useful

for reference [47]. Also, transaction involving patent generally are closed and thereby, hard to have access to exact information. Nonetheless, the market approach may work if the IP exchange could be used, as long as the transaction data could be available [48]. In addition, the income approach estimates the value of patent by predicting the future cash-flow the patent could yield over the whole period of patent's validity according to the present and past data.

Besides, there are some IP valuation methods have been developed by option pricing theories from option markets, for example, Denton and Heald used the Black and Scholes equation for patent valuation [49]. The merits of these new methods are their flexibility and consideration for the future risk, but still, the data of patent regarding to volatility of underlying assets could be a problem. Some scholars claim that patent exchanges help to have access to data.

Securitization of IP have never been perfected. The separation of originators and securitized assets always raise the doubts that the originators may have not much incentives to make sure the quality of asset qualified, or is able to generate stable cash flow. With the increasing of complexity by financial engineering, the connection between originators and infringement their IP assets have been further weakened and thereby, enlarge the risk. Besides, patent, intangible assets are different from tangible assets; their value could change substantially over short period, making the valuation difficult [4]. Also, the patent law is another factor hindering the development of IP securitization, not matter the legislation or the enforcement. The frequent infringement may be one of classic example of law enforcement [4]. In fact, maybe the considerable transaction cost is the real issue regarding to development of IP securitization. IP securitization always need collaboration of multi parities, including valuation, issuance, insurance and so on[13], and none of them contribute for free, which causes the transaction cost nonnegligible. Based on the amount of successful cases, securitization is too far to really put into use.

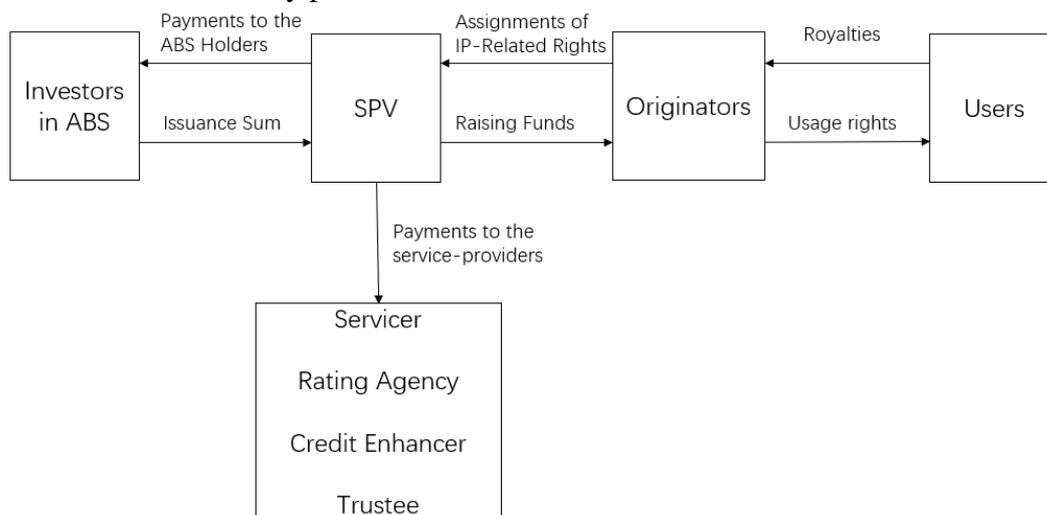


Figure 1. Diagram: intellectual property securitization: transaction structure and payment streams.

Intervention of Government

In the section above, we only discussed market mechanism of funding innovative SMEs. As another important mechanism regulating the market, government has been helping financing SMEs for years. Government has the duty to increase the wellbeing of the country, and thus, it has enough reason to help SMEs that support economic of the nation.

There are two major means of interventions of government on helping financing SMEs, the subsidiaries and coordination on supplier's trade credit. Supplier's trade credit has been proved quite efficient in easing the financial pressure on SMEs. Compared with the financing institutions like banks, upstream suppliers are more aware of the condition of the companies according to their years' collaboration [50]. With the exclusive strength, upstream suppliers could provide companies the credit with lower prices, which at certain extent help SMEs overcome the liability of smallness. Randall and others concluded that the profit the suppliers generated from trade credit on downstream companies will eventually spread over the whole supply chain by cash flow cycle and

improve the profitability of all players in the industry [51]. Upstream suppliers in the supply chain eventually will have more clients through the expansion of the industry [52].

However, due to the limitation of production scale, SMEs have limited influence in the supply chain [53]. Therefore, government should intervene in the cooperation between SMEs and upstream suppliers. The positive externalities the improvement of the whole supply chain will help the government to achieve its economic and political objectives (e.g., more tax) [54].

By contrast, subsidies seem to lead to unfavorable results. As the allocator and distributor of the subsidies, local government need to evaluate the companies and choose the ones that could effectively use subsidies and maximize their social value [55]. However, it is hard for government to allocate the resources to companies that have great potential and bright prospects, because government has not the information advantage as suppliers [56]. As a result, the local government usually give subsidies to firms conducting socially desirable R&D projects. There has been research proved that, to get the subsidies, companies are keen at releasing signals that they are capable to take more social responsibility and willing to align themselves as government wishes [57]. Thus, it usually turned out that companies prioritize to consider the projects with great social value, leaving the project with great commercial value behind, which hurts the profitability of companies for a long run [58].

Other than subsidies and supplier's credit, connection to government also is important in SMEs financing. Fan et al. [59] assert that the connection to local government could bring great convenience, facilitating to the development and innovation of companies. Enterprises usually need get loans from financing institutions like banks, and in the process, government always could be a "middleman" and help firms to get a better deal with bank. Faccio [60] also has the similar founding that companies with connection to government could get more advantageous interest and term regarding loans with those without. In the study of Malin et al. [61], the effect of connection to government could be referred as "indirect effect". However, the connection also needs to be paid attention. Anokhin and [62] found that firms need to trust government and make such connection; if not, it will cost more because they need to pay attention to any moves the government made regarding to them. Eventually, it will damage the innovation and production activities of companies.

Conclusion

Although there are quite abundant channels for innovative SMEs to raise money, none of them really could settle the financing problem for SMEs. The reason summarized could be very simple: the informational asymmetry that between the suppliers having resources and the demanders needing money has never been really settled, no matter the signaling effect of patents, or the join of third parties. All these methods only could reflect the condition of the companies indirectly and kind of subjectively. The pure just judge attesting quality of SMEs is needed, and the demand is impossible to be satisfied by existing mechanisms. For the innovative SMEs, they may have collateral (intangible) but value of collateral couldn't be known or they have nothing worthy to be collateral but a group of intelligent team members and promising ideas. However, the soft information can't satisfy financing institutions like bank. The alternative financing methods including Bas, VC, securitization, subsidiaries and suppliers' credit are still not enough to address the financing demands of SMEs based on their limited capital scales. Overall, the financing situation of SMEs is still severe. To build a trustworthy mechanism reflecting the real condition of SMEs for financial institutions, the new technology like blockchain may be the future.

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