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RISK CAPITAL'S ATTITUDE TO FINANCING INNOVATION

KAPITAŁ RYZYKA W FINANSOWANIU INNOWACJI

DOI: 10.15611/pn.2018.529.21

JEL Classification: D81, E22, G24, O33

Summary: In hereby article the author discusses the problem of financing innovation, especially the disruptive (or breakthrough) innovation. High uncertainty, capital intensity, but also high profit perspective make investing in innovations potentially attractive. There is a common perception that venture capital has become an intermediary in financial markets, providing capital to firms that might otherwise have difficulty attracting financing. As these firms are thought to be small, young and innovative, plagued by the “liability of newness”, venture capital is expected to fulfill an important role in the economy – it is meant to be a tool of financing to novel and risky ventures and, hence, it is a drive of the technological and economic progress. The goal of the article is an attempt to answer the question if the venture capital is a risk loving or risk averse capital. Methods used are: critical analysis of literature and data analysis.

Keywords: innovation, risk, uncertainty, venture capital.

Summary: W niniejszym artykule autor mierzy się z problemem finansowania innowacji, w szczególności innowacji przełomowych. Wysoki poziom niepewności, kapitałochłonność lecz również i perspektywa wysokich zysków sprawiają, że inwestowanie w działalność innowacyjną jest potencjalnie interesująca dla inwestorów. Uważa się, że kapitał venture stał się instytucją pośredniczącą na rynku kapitału, zapewniającą dopływ funduszy do ryzykownych, innowacyjnych przedsięwzięć, które bez kapitału ryzyka nie będą miały szansy na wejście na rynek. Firmy te – małe, młode, innowacyjne, w swoisty sposób „skażone” odium nowości i niepewności, potrzebują kapitału, którego źródłem miały stać się fundusze venture. Celem niniejszego opracowania jest próba odpowiedzi na pytanie – czy kapitał ryzyka (VC) jest faktycznie kapitałem inwestowanym w ryzykowne, innowacyjne przedsięwzięcia.

Keywords: innowacje, ryzyko, niepewność, kapitał venture

1. Introduction

As provided by Oslo Manual, innovations are understood as the result of creative application of knowledge, and they play a leading role in economies today. Knowledge became the main asset, and nations able to actively create and manage this asset are international markets leaders.

The most important features of innovation are newness (or better – freshness), value creation and market application. New ideas can be inventions, but without originality and market application they do not constitute innovation.

As literature shows the word *innovation* can be explained by a variety of definitions. One can say about product or process innovations and marketing or organizational ones. Innovation is defined as: “new products, business processes and organic changes that create wealth or social welfare”, or – according to P. Drucker, innovation is “...the specific instrument of entrepreneurship... the act that endows resources with a new capacity to create wealth.” Schumpeter [1934] defines innovation as carrying out new combinations – launch of a new product or new species, an application of new methods, opening of a new market, acquiring new sources of raw material supply, or creation or destruction of a monopoly organization. Innovation is seen as the process of generation, acceptance and implementation of new ideas, processes, products or services as well as an outcome – any thought, behavior or thing that is new, new ideas [Van de Ven 1986], new technology or practice [Nord, Tucker 1987]. Important contribution to innovation was made by Altshuller [2007] defining the levels of innovation.

Literature shows numerous examples of innovation definitions, but from the viewpoint of goals of contemporary economies one should identify twofold innovations: disruptive and sustaining ones. Disruptive innovations are those that create new markets and break the current development cycle. Desirable features are these from the viewpoint of creating innovations in knowledge-consuming fields. The other characteristics of disruptive innovations is the fact that the emergence of disruptive innovation causes the degradation of products functionality. Products built on disruptive technologies usually have worse efficiency characteristics than products of stable market position. The consequence is the lack of demand for “disruptive” products – market leaders are usually not in forefront of disruptive innovation creation. Sustaining (also called evolutionary) innovations are very different from disruptive ones. This kind of innovations improves parameters of existing products. Opposite to disruptive innovations incremental ones do not create new markets. They rather develop existing ones. Some of them can be radical ones and the others introduce improvements gradually. The innovation landscape is completed by imitative innovations which are new solutions to an enterprise but already introduced in other enterprises.

The mainstream economics treats entrepreneurs as entities able and willing to innovate. In 1942 Schumpeter introduced the “creative destruction” notion. Whi-

le explaining this phenomenon he argued, that these were innovations based upon a new order, very often set on ruins of past one. A new idea can be a starting point of a new enterprise (a startup). And can also be a reason of the bankruptcy of one. Innovation (fresh) outcomes are often new to the market, and they are not market blockbusters with skyrocketing sales, but rather smart, strongly undercapitalized start-ups. This state-of-affairs causes uncertainty of future and risk of loss.

Innovation creates growth. This notion is broadly described in literature. Due to the fact that nowadays innovation is often a result of laboratory invention, we may say that innovation is a knowledge-based process (product, method). Laboratory invention is a product of company's R&D activity.

Due to Schumpeter's idea of creative destruction innovation is based upon a new order. It is very often set on the ruins of the past one. A new idea can be a starting point of a new enterprise (a startup). It can also be a reason of the bankruptcy of one that has not met market needs. It has to be noticed that innovation process is highly uncertain, and its uncertainty is driven from risk. Innovation outcomes are often new to the market, and they are not market blockbusters with skyrocketing sales, but rather smart, strongly undercapitalized start-ups. This state-of-affairs causes uncertainty of future and risk of loss. Innovation has the ability to create growth and wealth. However, being so-far unknown, a fresh solution of a problem (often undefined one) also brings risk. A risk is necessary to be taken to create (at first) value for risk-loving entrepreneur (and after that) economic growth. In knowledge economies' conditions innovation is more and more often created inside scientific laboratories and is a result of laboratory's R&D activity. The high costs of research discourages investors from investing in innovation activity.

Financial markets have always been mirroring the state of real economy. Well-functioning financial markets are crucial for economic growth, mainly because of their ability to determine technological innovation. Due to Schumpeter's creative destruction idea these are the capital markets that find the most promising projects. But is it true? If capital markets tend to find innovation in enterprises why the early stage of innovation is a highly undercapitalized one? Do capital markets "like" innovations on every stage of development? Do they really love risk, or are they rather risk-averse?

2. Financial markets in financing innovation

It is noteworthy that well-functioning financial markets play a central role in driving economic growth through their ability to spur technological innovation. One of the ways financial markets are believed to play this role is by allocating capital to firms with the greatest potential to implement new processes and to commercialize new technologies. The idea of financial market indicating "winners" (the most promising projects) can be traced back at least to Schumpeter's notion of "creative destruction" [Schumpeter 1934].

One of the channels that can be used by financial markets to impact technological development and innovation is financing innovation itself [Hall, Lerner 2010]. It causes that academic literature focuses more on the commercialization and implementation of promising ideas than shaping the nature of R&D that is undertaken, and on the way it could impact technological innovation and growth [Akcigit, Kerr 2012].

Uncertainty is the inherent feature of innovation process. As literature shows [Knight 1921] uncertainty is different from risk not only because of probabilities associated with outcomes, but also because of lack of certainty what forms of potential outcomes are expected. From financier's perspective it is hard to evaluate innovation projects that may need funding, especially because of the fact that the only way to discover the potential of an innovation is to invest in it. In addition, the payoffs associated with making an investment and the way it is structured (e.g., debt vs. equity) can have important effects on the subject of investment as well as on the shape and the direction of R&D and innovation [Kerr, Nanda 2014].

Often neither the innovator nor the financier knows the true potential of the project, but the innovation project is always closer to an innovator than to a financier. It is often impossible to precisely measure inputs into the innovation process [Holmstrom 1989], and one cannot write complete, state-contingent contracts when they do not even know what the output might be [Grossman, Hart 1986; Hart, Moore 1990; Aghion, Tirole 1994]. These conditions allow for agency costs to arise in the financing of innovation that can be significantly greater than those present in standard settings between financiers and entrepreneurs.

Finally, firms engaged in innovation have a high percentage of intangible assets, where knowledge is embedded in the human capital of the firm's employees. This key resource is lost if employees leave or are laid off [Hall, Lerner 2010]. Firms therefore tend to smooth R&D spending over time in order to avoid having to lay off their research scientists and knowledge workers, leading R&D spending at the firm-level to behave as if it has high adjustment costs [Hall et al. 1986].

3. Financing startup innovation?

Due to Schumpeter's "creative destruction" idea one can say that innovation (with an emphasis put on the disruptive or breakthrough innovations that are based upon a new order of a firm) is closely linked to young, small firms formation. Start-ups established on the basis of a new patent, new idea and new product are responsible for driving the most radical innovations to the economy.

Small start-up companies are key sources of new ideas and industrial innovation and, not surprisingly, are gaining prominence in the innovation system. In emerging areas where demand patterns are not settled, the technologies are not fully worked out and risks are substantial, small firms outperform large ones by a wide margin. Small firms have the advantage under these difficult conditions because they are more flexible, more focused and provide a better combination of incentives for

fostering creativity than their larger counterparts. Clearly, a country characterized by a greater number of innovation start-ups and business success stories will gain the advantage in the knowledge-based economy [Kerr, Nanda 2014].

Financing innovation startups is mainly based upon equity financing. Debt financing (especially by banking credit) is a very problematic issue in case of innovation start-up. First of all it is almost impossible for a start-up to get a credit because of too high risk (young firm with a huge level of novelty is not a good client of a bank that needs some debt payoff warranty). The other risk-related problem is that the risk of innovation activity is hard to estimate because banks usually have problems with new technologies of risk assessment. Another important issue in this field is the fact that small innovating, knowledge-based start-ups base their existence on human capital (and often suffer the lack of physical capital). Human capital is difficult to be evaluated by banks as a loan collateral. Another difficulty in start-up-bank dialog is the fact that in case of young firms there is no chance for long-time experience if firm-bank relation often discriminates the loan issue. Undoubtedly one of the most important factors diminishing the attractiveness of bank loan is the fact that loan interest has to be paid from the moment a credit has been granted.

Equity financing significantly differs from debt financing. Investors that “give” the money for innovating project do not expect the payoff but they accept share in profits in return and, of course they take off the control. Thus, the risk of financing innovation is mainly taken by an investor who plays the role of an intermediary that assesses risk and potential profitability of innovation, and invests in it or not. It means that thanks to own assessment methods investors point the winners. Ownership of the enterprise changes. Investors take over shares, and control of a company. Reporting is more critical and time consuming. Investors need a regular accounting how their money is spent unlike a bank that only cares if the payments do not show up. Investors want detailed looks into business at all times.

4. Venture capital in financing innovation

Venture capital funding has long been a source of financing for entrepreneurs, breakthrough technologies and start-ups. Venture capital supports companies, ideas, and products that carry significant risks and therefore may have difficulty securing more traditional sources of capital support. Many innovative products and services supported by venture capital funding have very long development cycles (time the innovative idea needs to transfer into product and get to the market) and are not appealing to investors seeking quicker returns on their investment. Venture capital funding is responsible for financing many innovations in information technology, biotechnology, life sciences, and health care. It seeks out radically innovative ideas (also called disruptive technologies). Top areas where venture capital funding has enabled the development of many innovations is IT, health care and life sciences. However, it is healthcare and life sciences that remain a favorite area of VC funding

and the value of venture capital financing is well documented in the social and economic benefits that have come about through venture capital backing.

This category of investment known as “risk” or “venture capital” is the investment in companies by specialized venture capital firms. It is a part of “private equity”, that is equity investment in companies not listed on a stock market, as opposed to equity investment in publicly traded companies. Venture capital firms act as principals, managing the funds of individuals, institutions and their own money. There are six main financing stages in the venture capital process, related to the stages of development of venture-backed companies:

- The “early stage” is financing before a venture initiates commercial manufacturing and sales, and before it generates a profit. This includes “seed” and “startup” financing. The former one is provided to research, evaluate and develop an initial concept, and the latter to support product development and initial marketing.
- “Expansion” financing supports growth and expansion of a company’s manufacturing and sales capacity in order to generate profits.
- “Replacement” involves the sale of a portion of existing shares to other venture capital companies or to other shareholders.
- “Management buy-out” is financing provided to enable current operating management and investors to acquire the whole company, a product line or business. “Management buy-in” is financing provided to outside managers to buy the company.
- “Exit” is the final stage, achieved either through an initial public offering of the shares in a primary stock market or through an arranged sale to a financial or strategic buyer of the company.

The most restrictive definition of venture capital excludes management buy-outs and buy-ins, while a more expansive conception includes both. In Europe the extended definition is preferred while the more restrictive one is widely used in the United States. In the US market, the range of activities encompassed by the extended definition is referred to as “private equity”.

5. Venture capital in enterprises

In the majority of countries for which data is available, venture capital investments represent a very small percentage of GDP, which is often less than 0.03%. (Figure 1) Exceptions are Israel and the United States where the venture capital industry is more mature and represents 0.5% and 0.2% of GDP respectively [OECD 2013].

There is no other as transparent production factor as capital (here – financial capital). It completes economy’s architecture (beside the physical capital). Its ability to foster growth is widely used by enterprises. The specificity of venture capital seems to bring the interesting notion about its geographical distribution. Despite capital’s transparency the venture capital distribution is uneven. Companies based in the USA receive around 2/3 of venture capital funds invested globally. European

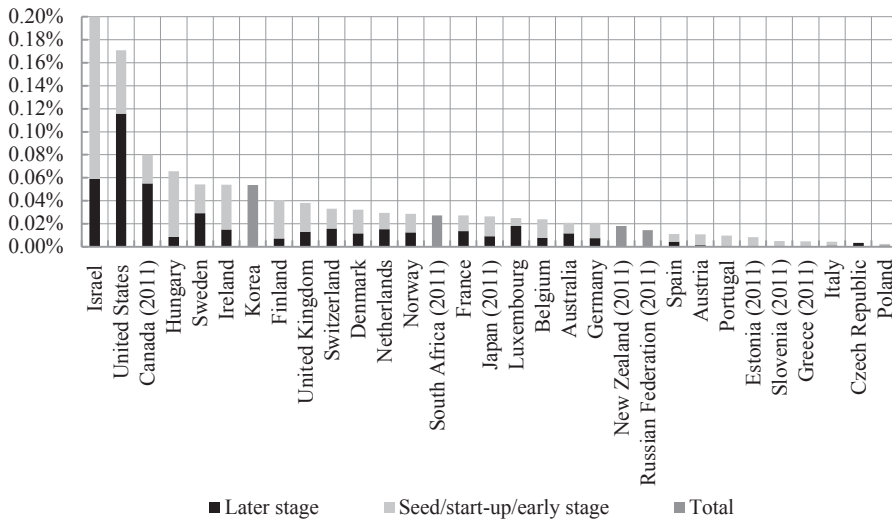


Fig 1. Venture capital investment as a percentage of GDP (USA dollars), 2012

Source: [OECD 2013].

firms take the second place in terms of venture capital investments, and they receive around 15% of global venture capital backing [Nepelski et al. 2016]. The reason of this inequality is being widely discussed in the literature, with accents put on the small business ethos in the USA, stock development and characteristics in both regions and so on [de la Dehesa 2002].

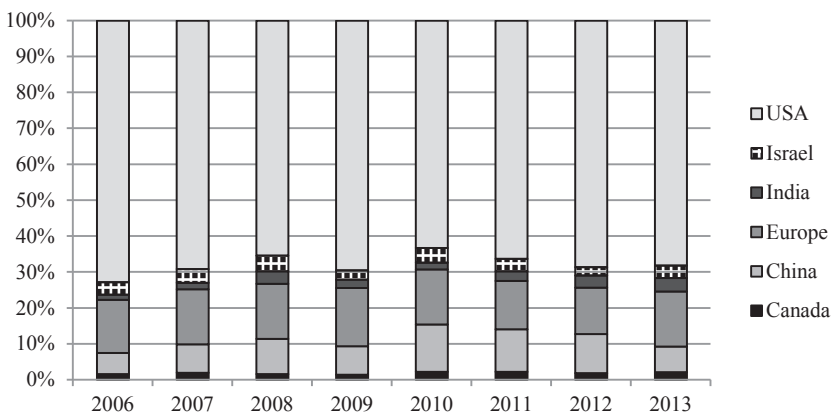


Fig 2. Global annual amount raised by VC-backed companies by world regions

Source: [Nepelski 2016].

The story of venture capital involvement in young, high-potential enterprises' development is a short one. It started in the 90s during the dot.com burst and venture capital hit the top profits in that period. In the mid-90s, there were only around 100 European companies that were backed by this sort of funds. In 2000 this number increased to over 3,200 companies that received EUR 19 billion from venture capital funds. However, after the dot.com burst, the activity of venture capital in Europe decreased considerably and has never regained its top levels. Between 2002 and 2014, European companies received on average EUR 4.4 billion annually. In 2014, this quota increased to EUR 5.8 billion [Nepelski 2016]. The countries with the highest shares of European companies backed by venture capital are: the United Kingdom, Germany and France. For example, companies from the United Kingdom represent nearly one quarter of all European venture capital-supported companies. In the period 1995–2014, these companies also received one third of all venture capital funds invested in Europe. The top ten European countries constitute 90% of the total number of VC-backed companies and the total amount raised in Europe between 1995 and 2014 [Nepelski 2016].

Also the age structure of enterprises backed by venture capital has changed. Venture capital funds in Europe moved from seed to later stage financing during the period of their existence [Nepelski 2016]. In 1995, 7% of all VC funds were allocated to seed, and only 10% to later stage financing. Two decades later, 0.5% of all venture capital funds were allocated to seed and 56% to later stage financing. Companies from the IT industry dominated the venture capital companies in Europe twenty years ago. In the 2010–2014 period, 44% of VC-backed firms in Europe belonged to the Business, Consumer and Retail industry and 26% to the IT sector. The Healthcare industry raises the highest levels of VC-financing. The Business, Consumer and Retail and the IT industry raises a median of around EUR 1.5 million EUR per company [Nepelski, De Prato 2014].

The employment up to 100 employees is typical for 92% of all venture capital supported companies based in Europe. Only 1% of the European companies that received venture capital in the last 20 years has 450 or more employees. The size of VC-backed companies is decreasing, while their age is increasing. While the median size of a company that received venture capital backup in the later financing stage in the period 1995–1999 was 74 employees, in 2010–2014 this number dropped to 35 employees. Nearly 90% of all VC-backed companies based in Europe are up to 8 years old. In general, the age of VC-backed companies has increased over the last twenty years.

Due to the detailed study of the VC-supported companies in Europe, besides very small number of VC-backed companies in Europe, extreme geographical concentration of VC activity can be observed [Nepelski et al. 2016]. For example, companies located in the UK represent nearly one quarter of all European venture capital supported companies and one third of all venture capital money invested in Europe. To compare – the UK accounts for only 17% of the EU 28 GDP. This pattern

of geographic concentration continues at the country level. In 2014, the European start-up hotspots, i.e. the top 20 European cities by the number of VC-backed companies, accounted for 58% of all European VC-backed companies and 69% of all the money received by those companies [Nepelski et al. 2016]. Paris, London and Berlin lead this ranking.

The geographical concentration of start-ups does not come as a surprise. It is the predictable result of agglomeration, a process widely described in economic literature and also observable in the US (Silicon Valley, North Carolina knowledge triangle, Boston route 128) and elsewhere (Bangalore in India or Changzhou in China). Factors such as the spatial proximity of similar and related firms and industries and the general tendency of people and economic activity to locate in large cities and economic core regions all lead to agglomeration. The agglomeration of R&D, innovation and business activity facilitates local knowledge spillovers and fosters the local business system [Nepelski, De Prato 2014].

The location of a start-up does not only matter for the probability of receiving VC funding, but also for its volume and continuity. Start-ups based in the major European start-up hotspots have higher chances to both receive more VC-money and to be backed by VC more frequently, as compared to an average European VC-backed start-up. The median amount raised by a VC-backed company in Europe was EUR 1.5 million. In contrast, the same value for a company based in the European hotspots was close to EUR 2 million.

As the continuity of VC funding is highly indicative for the growth potential of firms [Gompers, Lerner 2002; Lerner 1999], it is interesting to know if start-ups based in the European hotspots exhibit also higher growth potential, as compared to firms created in other parts of Europe. This raises a question of whether European start-ups migrate to the venture capital hotspots in order to improve their funding prospects.

6. Conclusions

In conclusion, the overview of venture capital activity in Europe shows that it is extremely scarce, geographically concentrated and has become increasingly more risk-averse. Venture capital funds have focused on mature companies with established technologies and market presence and set up in certain locations. This challenges the image of VC funds as providers of financing to young, innovative and high-risk enterprises and raises a question of the position of venture capital funds in the process of financing innovation in general and innovative ventures without previous commercial record in particular. In other words, a large share of European companies, even extremely innovative ones, needs to rely on other than VC funds sources to finance their innovative activity. This raises the issue of other sources of innovation financing, including the public sector. The latter one is said to have an important role in supporting early-stage innovative activity by small firms given the

tenuous nature of the venture capital cycle at this preliminary, yet critical, stage of firm activity.

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