

# “Features of venture capital funded enterprises: evidence from Slovakia”

<b>AUTHORS</b>	Magdaléna Freňáková Oľga Kmeťová Pavel Blaščák
<b>ARTICLE INFO</b>	Magdaléna Freňáková, Oľga Kmeťová and Pavel Blaščák (2019). Features of venture capital funded enterprises: evidence from Slovakia. <i>Problems and Perspectives in Management</i> , 17(3), 111-121. doi: <a href="https://doi.org/10.21511/ppm.17(3).2019.09">10.21511/ppm.17(3).2019.09</a>
<b>DOI</b>	<a href="http://dx.doi.org/10.21511/ppm.17(3).2019.09">http://dx.doi.org/10.21511/ppm.17(3).2019.09</a>
<b>RELEASED ON</b>	Thursday, 01 August 2019
<b>RECEIVED ON</b>	Friday, 07 December 2018
<b>ACCEPTED ON</b>	Thursday, 14 February 2019
<b>LICENSE</b>	 This work is licensed under a <a href="https://creativecommons.org/licenses/by/4.0/">Creative Commons Attribution 4.0 International License</a>
<b>JOURNAL</b>	"Problems and Perspectives in Management"
<b>ISSN PRINT</b>	1727-7051
<b>ISSN ONLINE</b>	1810-5467
<b>PUBLISHER</b>	LLC “Consulting Publishing Company “Business Perspectives”
<b>FOUNDER</b>	LLC “Consulting Publishing Company “Business Perspectives”



NUMBER OF REFERENCES

**27**



NUMBER OF FIGURES

**1**



NUMBER OF TABLES

**3**

© The author(s) 2019. This publication is an open access article.



BUSINESS PERSPECTIVES



LLC "CPC "Business Perspectives"  
Hryhorii Skovoroda lane, 10,  
Sumy, 40022, Ukraine

[www.businessperspectives.org](http://www.businessperspectives.org)

**Received on:** 7<sup>th</sup> of December, 2018

**Accepted on:** 14<sup>th</sup> of February, 2019

© Magdaléna Freňáková, Oľga  
Kmeťová, Pavel Blaščák, 2019

Magdaléna Freňáková, Ing.,  
Assistant Professor, Faculty of  
Business Economics with seat in  
Košice, Department of Corporate  
Financial Management, University  
of Economics in Bratislava, Slovak  
Republic.

Oľga Kmeťová, JUDr., CSc.,  
Assistant Professor, Faculty of  
Business Economics with seat in  
Košice, Department of Corporate  
Financial Management, University  
of Economics in Bratislava, Slovak  
Republic.

Pavel Blaščák, Ing., Doctoral Student,  
Faculty of Business Economics  
with seat in Košice, Department of  
Corporate Financial Management,  
University of Economics in Bratislava,  
Slovak Republic.



This is an Open Access article,  
distributed under the terms of the  
[Creative Commons Attribution 4.0  
International license](https://creativecommons.org/licenses/by/4.0/), which permits  
unrestricted re-use, distribution,  
and reproduction in any medium,  
provided the original work is properly  
cited.

Magdaléna Freňáková (Slovak Republic), Oľga Kmeťová (Slovak Republic),  
Pavel Blaščák (Slovak Republic)

# FEATURES OF VENTURE CAPITAL FUNDED ENTERPRISES: EVIDENCE FROM SLOVAKIA

## Abstract

This article contains an exploratory study of micro, small and medium sized enterprises (SMEs) funded by venture capital in conditions of the Slovak Republic. Their features specifically the number of employees and the affiliation to the industry branch in compliance with technological or knowledge demandingness were investigated. For that purpose two scientific hypotheses were verified. Verification of hypotheses was performed by the exact tests on the research sample consisted of 61 venture capital funded SMEs in the Slovak Republic in the time period 2001–2006. According to affiliation of enterprises to the category of micro, small and medium sized enterprises in our research sample, our assumption that the micro and small sized enterprises are more venture capital driven than medium sized enterprises was confirmed. The results showed that the majority of venture capital funded SMEs are micro-enterprises representing 60.66% and small sized enterprises with a share of 27.87%. According to affiliation of enterprise to the industry branch in compliance with its technological or knowledge demandingness in our research sample, our assumption that venture capital is related especially to the enterprises in high-tech sector was not confirmed and we can conclude that venture capital is related more to the enterprises operating in low-tech or medium low-tech sector than to the enterprises operating in high-tech or medium high-tech sector. The share of enterprises in high-tech sector was the lowest (only 3.28%) among all the sectors (low-tech, medium low-tech, medium high-tech and high-tech).

## Keywords

private equity, venture capital, start-up, venture capital investment, technological demandingness, knowledge demandingness, technology-intensive sector, knowledge-intensive sector

**JEL Classification** G24, M13, O34

## INTRODUCTION

Micro, small and medium sized enterprises (SMEs) represent a heterogeneous group with many different characteristics. Their diversity also entails many different financing needs, as well as their different financing possibilities (for example, credit financing, mezzanine financing, venture capital or public funding).

From a long-term point of view, the importance of SMEs in the economy can be characterized by several indicators, for example, job generation, local economy support, innovation activity, balancing the regional development disparities, etc.

According to Sba (2017), we can talk about the importance of SMEs in the Slovak economy based on these facts: "Even in 2016, they represented 99.9% of the total number of business entities in the Slovak economy, employed circa three quarters (74.1%) of the active labor force in the corporate economy, and contributed to the added value generation by more than a half (52.7%). The positive development of the national economy has also been reflected in positive impacts on the development of the said indicators, when, as compared to 2015, the

number of employees in SMEs increase of 3.5%, the added value of 4.3% and the generated profit of 3.3%. The export of SMEs goods remained at the level of 2015 only” (p. 12).

As we stated, SMEs play a key role in the economy. However, they often have difficulties in obtaining capital or credit, particularly in the early start-up phases. At these stages, SMEs can use venture capital financing and exploit its advantages.

Private equity (including venture capital) in all its forms represents an external capital invested by investor or fund (venture capitalist) in company, when invested financial sources became a part of equity capital of the company, into which the investor (fund) came. According to Freňáková (2011), “The investment of private equity capital means for the company not only financial sources, but also non-financial benefits in form of time, effort, experience and contacts of private equity investor” (p. 22).

This article focuses especially on venture capital in conditions of the Slovak Republic and contains an exploratory study of micro, small and medium sized enterprises funded by venture capital in conditions of the Slovak Republic. In this article, we understand “venture capital” as venture capital investments, which as an external financial source become a part of equity capital of enterprise with innovative or extraordinary idea and these investments are put into the enterprise in seed, start-up or early development stages. In this article, we use classification of micro, small and medium sized enterprises according to the Commission Recommendation 2003/361/EC of the European Commission. The decisive criterion for the classification of an enterprise in the relevant category of micro, small and medium sized enterprises is the number of employees less than 250.

The objective of this article was to find out in condition of the Slovak Republic, if according to affiliation of enterprise to the category of micro, small and medium sized enterprises (SMEs), by venture capital are funded more micro and small sized enterprises than medium sized enterprises and if according to affiliation of enterprises to industry branch in compliance with its technological or knowledge demand- ingness venture capital is related especially to the enterprises in high-tech sector.

---

## 1. LITERATURE REVIEW

The definition of venture capital, according to which venture capital means the investments only to the young (seed stage or start-up), rapidly growing, innovative and often technology-based companies with the aim not only to start-up their operations, but also to secure their eventual expansion, is typical more in the conditions of USA, where venture capital and private equity are considered to be two different types of investments. In Europe, venture capital is a form of private equity funding and priority lines in the early stages of business development.

According to Evca (2007), the definition of venture capital and private equity is as follows: “Private equity provides equity capital to enterprises not quoted on a stock market. Private equity refers mainly to management buyouts, management buying, to replacement capital and venture purchase of quot-

ed shares. Venture capital is, strictly speaking, a subset of private equity and refers to equity investments made for the launch, early development, or expansion of a business” (p. 328).

According to Invest Europe (2016), private equity includes the following investment stages: venture capital, growth capital, replacement capital, rescue/turnaround and buyouts. Venture capital is a subset of private equity and refers to equity investments made for launch (seed), early development (start-up), or expansion (later stage venture) of business.

Attention paid to the economic category venture capital is primarily at the macro level, where the authors examine private equity market activities and the determinants of private equity financing, calculate forecasts of private equity or venture capital market, try to recognize the factors impacting the private equity or venture capital in-

vestments, etc. We are familiar with the analysis of several authors who apply the macroeconomic aspect when looking at venture capital (Gompers & Lerner, 1999; Jeng & Wells, 2000; Romain & van Pottelsberghe, 2004; Ughetto, 2010; Soloma & Jedlicka, 2013; Bernoth & Colavecchio, 2014; Bertoni et al., 2015; Sokolowska, 2016, and others).

Bernoth and Colavecchio (2014) based on their research suggest that economic activity, inflation rate, equity market capitalization, unit labor costs, unemployment rate, as well as institutional and legal environment, are significant determinants of private equity activity. Sokolowska (2016) determines to what extent the growth of wealth, on a global scale, contributes to stimulating investments in high-risk ventures.

At the micro level, less attention has been paid to venture capital, but at present, the studies of the venture capital funded enterprises take on importance (Timmons & Bygrave, 1986; Sapienza, 1992; Amit et al., 1998; Kortum & Lerner, 1998; Kortum & Lerner, 2000; Manigart & Hyfte, 1999; Bürgel et al., 2000; Hellmann & Puri, 2000; Engel, 2002; Engel & Keilbach, 2002, and others). The reason is that venture capital is generally considered to be a significant source of funding for new innovative enterprises.

Venture capital as a form of business finance is suitable especially for young innovative and fast growing small and medium sized enterprises, which struggle with insufficient equity capital, managerial experience, possibly they are not able to attract debt financing and thus are not able to finance their growth and launch their innovative thoughts to the market. Experience shows, however, that venture capital can also be a source of funding for non-innovative businesses.

Engel and Keilbach (2002) examined the impact of venture capital investments on growth and innovation activities of young German companies. Their research confirmed the assumption that obtaining of venture capital financing is more likely for innovative companies. This fact also confirmed the research of Hellmann and Puri (2000) who using a unique hand-collected database of Silicon Valley high-tech start-ups found that innovator firms are more likely to obtain venture capi-

tal than imitator firms and they provided evidence that venture capital is also associated with a significant reduction in the time to bring a product to market, especially for innovators. The results of research conducted by Kortum and Lerner (2000) in the United States did not confirm the presumption that the venture capital should be more widely used by innovative firms, but these authors found that increase in venture capital activity in an industry is associated with significantly higher patenting rates.

Some authors argue that venture capitalists are able to support the enterprise much more and help it to grow faster over the duration of the investment compared to other investors (Amit et al., 1998; Engel, 2002). Others point out that the contribution of venture capital investors depends on the innovation degree of the new enterprise (Timmons & Bygrave, 1986; Sapienza, 1992). The findings of the research conducted by Manigart and Hyfte (1999) who examined 187 Belgian companies financed by venture capital are different. Belgian venture capital backed companies do not achieve significantly higher employment growth than companies without venture capital in the same industry, size, and similar age. However, these authors recorded higher rates of growth in total assets and in cash flow. Other authors (Bürgel et al., 2000) who conducted research in British and German high-tech start-ups did not see any significant effect of venture capital investment on corporate turnover and employment growth.

According to Gompers and Lerner (2001), "Venture capital is primarily a source of funding for start-ups, often technology-oriented small and medium sized enterprises (SMEs), with innovative ideas allowing them faster progress" (p. 1). On this basis, we have assumed that even in the Slovak Republic primarily the micro and small sized enterprises will be venture capital funded (financed).

Lyasnikov et al. (2017) derived the following major inferences: "Venture capital financing is a modern institution whose activity is aimed at accumulating and redistributing temporarily available investment resources that are sought after in the sphere of innovation entrepreneurship. Countries whose economy may currently be recognized as transitive are characterized by a set of uniform is-

sues: underdeveloped infrastructure in the national innovation system; lack of sources of venture capital financing; businesses reporting decreased innovation activity levels due to lack of economic incentives; lack of personnel resources. The evidence from the experience of more economically developed countries suggests that to enable the proper making of the institution of venture capital financing in countries with a transitive economy a set of interrelated objectives may need to be undertaken, namely: ensuring legal optimization; boosting investment attractiveness; altering the nature of partnership between the state, business, and science-and-education sector; reducing state participation in economic and research activity” (p. 111).

Economy of the Slovak Republic can be recognized as transitive, so despite the argument that firms in technology-intensive or knowledge-intensive sectors receive venture capital much more than firms operating in less technology-intensive and knowledge-intensive sectors, we expect that in Slovakia, the situation will be reversed in this regard. In the Slovak Republic, there is in fact a lack of investment opportunities in high-tech sectors and in addition priority financial resources of venture capital in the Slovak Republic are public resources, which in most cases prefer the promotion of employment prior to the innovation. On this basis, we have assumed that in the Slovak Republic, venture capital is related more to the enterprises operating in low-tech or medium low-tech sector than to the enterprises operating in high-tech or medium high-tech sector.

## 2. RESEARCH METHODOLOGY

Our exploratory study of SMEs funded by venture capital in conditions of the Slovak Republic was conducted on the research sample consisted of 61 SMEs. We have verified two scientific hypotheses (No. 1 and No. 2); each of them has been transformed into a statistical hypothesis. Verification of hypotheses was performed by the exact tests. We investigated venture capital investments realized in the time period 2001–2006.

The objects of our investigation were SMEs operating in the Slovak Republic funded by venture capital. In this exploratory study, venture capital is understood

as only seed, start-up or early stage development capital investments made within 3 years from the date of entry of SME into the Business Register of the Slovak Republic. The decisive criterion for the inclusion enterprise funded by venture capital to the research sample was the number of employees less than 250.

A set of enterprises that have used or currently use venture capital included in the research sample have been obtained from the websites of venture capital funds operating in the Slovak Republic and dealing with venture capital investments. The enterprises listed on the websites of venture capital funds were supplemented by our own online search through the Business Register of the Slovak Republic, where we entered as shareholder companies providing venture capital funding. We were looking for these venture capital companies:

- Fund of Funds respectively Seed Capital Company respectively funds in the fund management of Fund of Funds with legal personality;
- Slovak American Enterprise Fund (SAEF);
- GCP Gamma Capital Partners;
- Arca Capital Slovakia;
- MCI Management.

This way, we created a set of 84 enterprises. As 4 enterprises appeared twice (once as current and once as historical investments), the set was reduced to 80 enterprises. Additional data were obtained for all 80 identified enterprises from the paid database provided by Creditinfo Slovakia. After obtaining additional data, we excluded 15 unidentified and inactive enterprises from a set of 80 enterprises, and 65 enterprises were available for further investigation. As only SMEs were surveyed, out of the set of 65 enterprises, 4 enterprises (which did not meet the size criterion of the number of employees less than 250) were eliminated, and 61 SMEs have been left to carry out the research.

Using the convenience sampling, all enterprises that have been identified as being funded by venture capital and are at the same time SMEs were included into a research sample. Despite the fact

that random sampling was not performed during the creation of our research sample, we consider the results found as unbiased and relevant, because according to the data from the Yearbooks of European Venture Capital Association, we can state that during the time period 2001–2005, there were realized 110 investments in the Slovak Republic in category private equity (seed, start-up, expansion, replacement and buy-out), with no investment of replacement capital and only two buy-out investments. In this respect, our sample of 61 SMEs, which were and are currently funded by venture capital, can represent a significant proportion of the population. In addition, we state that according to Evca (2007), venture capital is considered to be a private equity subset that relates to equity investments in an enterprise (seed or start-up investments in newly created enterprises or investments for start-up, development or innovation in business activities or for expansion of the business).

### 3. RESULTS AND DISCUSSION

#### 3.1. Affiliation of venture capital funded enterprises to the category of SMEs

In this article, we use classification of SMEs according to the Commission Recommendation 2003/361/EC of the European Commission. This classification introduced by the European Commission is binding and uniformly accepted in all the EU countries and has entered into force on January 1, 2005.

According to European Commission (2006), the definition of SMEs is as follows: “The category of micro, small and medium sized enterprises (SMEs) is made up of enterprises, which employ fewer than 250 persons and which have an annual turnover not exceeding 50 million euro, and/or an annual balance sheet total not exceeding 43 million euro” (p. 5).

Under that definition, the number of employees is the decisive criterion for the classification of an enterprise in the relevant category of SMEs and the enterprise has to adhere to boundary values regarding the number of employees.

The relevant categories of SMEs are as follows:

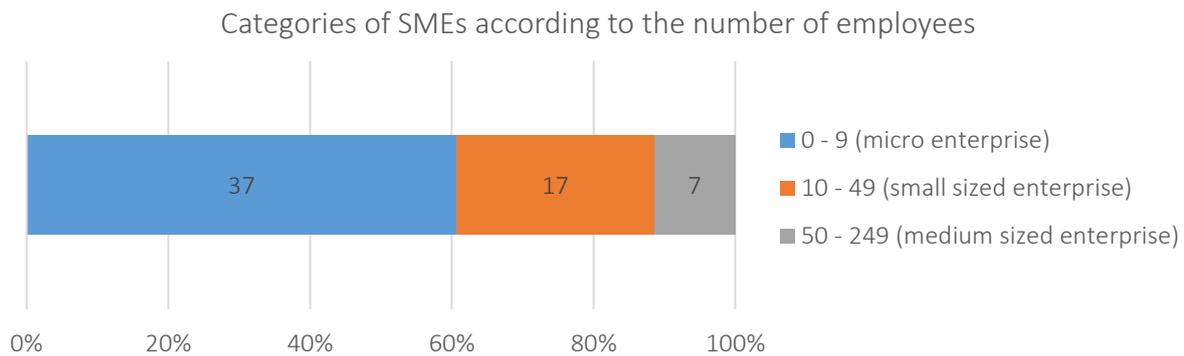
- micro enterprise with a number of employees from 0 to 9;
- small sized enterprise with a number of employees from 10 to 49;
- medium sized enterprise with a number of employees from 50 to 249.

Because venture capital is mainly directed to start-ups, which can be expected to have a small number of employees, we expect that micro and small sized enterprises will be financed by venture capital to a greater extent than medium sized enterprises. We transformed our assumption (our expectation) into scientific hypothesis No. 1, which was formulated as follows: “In the Slovak Republic, micro and small sized enterprises are more venture capital funded than medium sized enterprises”.

Verification of scientific hypothesis No. 1 was conducted on the research sample of 61 SMEs. We investigated whether the percentage of micro and small sized enterprises funded by venture capital in the Slovak Republic exceeds 50% of all known SMEs, which were funded by venture capital in the Slovak Republic.

Affiliation of enterprises funded by venture capital to the category of micro, small and medium sized enterprises in conditions of the Slovak Republic in our research sample is shown in Figure 1. The decisive criterion for the inclusion of venture capital funded enterprise in the research sample was the number of employees less than 250.

Figure 1 shows the structure of the research sample in terms of number of employees. The overwhelming majority of SMEs to which venture capital investment was directed are micro enterprises with a share of 60.66% (37 enterprises), small sized enterprises are represented by a share of 27.87% (17 enterprises) and medium sized enterprises have a share of 11.48% (7 enterprises). By comparing the percentage of enterprises in our research sample, we find that the percentage of micro and small sized enterprises financed by venture capital (54 enterprises) in our research sample (61 SMEs) is 88.52%, which is more than 50% predicted.



**Figure 1.** Categories of SMEs funded by venture capital in the research sample according to number of employees

If we base on the our abovementioned assumption that our research sample of 61 SMEs represents a significant part of all SMEs, which were funded by venture capital in the Slovak Republic, we could, on the basis of the results in our research sample, accept the scientific hypothesis No. 1 that in the Slovak Republic, micro and small sized enterprises are more venture capital financed than medium sized enterprises.

Regarding to fact that we do not know the real number of all SMEs that were/are in the Slovak Republic funded (financed) by venture capital, verify in order to scientific hypothesis No. 1, we will perform exact test.

The scientific hypothesis No. 1 was reformulated into the statistical hypothesis the following: “the percentage of micro and small sized enterprises funded by venture capital is more than 50% of total SMEs funded by venture capital”. Then, we set null and alternative hypotheses.

- null hypothesis ( $H_0$ ): “the percentage of micro and small sized enterprises funded by venture capital is  $\leq 50\%$ ”,
- alternative hypothesis ( $H_1$ ): “the percentage of micro and small sized enterprises funded by venture capital is  $> 50\%$ ”.

The hypothesis was verified by calculating the probability according to equation (1). We used the relation for calculating the probability of hypergeometric distribution. From the final population with  $N$  units (enterprises), in which  $m$  units (en-

terprises) have the examined (monitored) characteristic (for example, a small sized enterprise or a high-tech enterprise), a random sample of size  $n$  is selected.

The probability that  $n$  units (enterprises) from the sample in the selection without repetition have exactly  $k$  units (enterprises) monitored characteristic is calculated as follows:

$$P(k; N, m, n) = \frac{\binom{m}{k} \binom{N-m}{n-k}}{\binom{N}{n}}, \quad (1)$$

where

$k \in \max \langle 0; n + m - N \rangle, \dots, \min \langle m; n \rangle$ .

In view of the fact that we do not know the final set of SMEs funded by venture capital, we will assume that  $N$  (the final number of SMEs funded by venture capital) will be at least 110 enterprises (as mentioned in EVCA Annual Reports). Furthermore, we will assume that  $m$  enterprises from  $N$  SMEs have the monitored characteristic (these are micro and small sized enterprises).

According to our assumption, that the proportion of micro and small sized enterprises funded by venture capital is  $\leq 50\%$ , we perform the exact test for  $m = N/2$ , while  $m \in \bar{N}$  and  $N \geq 110$  (the number of all SMEs funded by venture capital will be gradually increased and we will calculate the probabilities of occurrence of the phenomenon at different sizes of the final population  $N$ . We will start with a first variant (version), in which  $N = 110$  and  $m = N/2 = 110/2 = 55$ ; then a

second variant (version), in which  $N = 111$  and  $m = N/2 = 111/2 = 56$ , etc.).

Under these assumptions we calculate the probability of occurrence of the phenomenon that exactly  $k$  units (in our case  $k = 54$  enterprises) is micro and small sized enterprises in the sample of  $n$  enterprises (in our case  $n = 61$  enterprises) chosen at random (without repetition) from  $N$  enterprises (SMEs). Calculation was carried out by simulating using Excel for the increasing  $N$  ( $N \geq 110$ ) under condition that  $m = N/2$ . The probability of selecting just  $k$  micro and small sized enterprises (just 54 micro and small sized enterprises) in the sample of  $n$  SMEs (61 SMEs) from  $N$  SMEs ( $N \geq 110$ ) is calculated according to equation (1) and provided in Table 1.

On the basis of the calculated probability, we can reject the hypothesis that the share of micro and small sized enterprises funded by venture capital of all SMEs funded by venture capital is equal to 50%, because, according to Table 1, if we assume that micro and small sized enterprise, on the one hand, as well as medium sized enterprise, on the other hand, have the same chance to be funded by venture capital (to get a venture capital investment), which is alternative 50:50, so when this assumption is fulfilled, then the probability of phenomenon that 54 times out of 61 SMEs in our research sample, was funded by venture capital exactly micro and small sized enterprise (if the final set (population) is 110 enterprises (SMEs), of which 55 enterprises currently are micro and small sized enterprises), is very small  $P(54; 110, 55, 61) = 2,16968E-22$ .

We execute the exact test under assumption that in the final set of SMEs funded by venture cap-

ital there is 50% of micro and small sized enterprises. But null hypothesis ( $H_0$ ) says that the share (percentage) of micro and small sized enterprises funded by venture capital is  $\leq 50\%$ .

If we execute the exact test under assumption that we will reduce the number of enterprises in the final set of  $N$  SMEs ( $N = 110$ ), which have monitored characteristic ( $m$ ), which means that these enterprises are micro and small sized, so  $m < N/2$ , in our case  $m = 54$ , probability calculated according to equation (1) for  $m = 54$ , would have been even lower  $P(54; 110, 54, 61) = 4,50843E-24$ . For this reason, the null hypothesis can be rejected for less than originally projected 50% of micro and small sized enterprises funded by venture capital.

On the basis of exact test, we have confirmed scientific hypothesis No. 1 and we can conclude that in the Slovak Republic, micro and small sized enterprises are more venture capital funded than medium sized enterprises. Therefore, our finding confirms the theory of Gompers and Lerner (2001) that venture capital is primarily a source of funding for start-ups, often technology-oriented SMEs, with innovative ideas.

### 3.2. Affiliation of venture capital funded SMEs to industry branch in compliance with their technological or knowledge demandingness

Technological or knowledge demandingness of the industry branch in which venture-backed SME operates was divided into four groups: high-tech, medium high-tech, medium low-tech and low-tech.

**Table 1.** Exact test – hypergeometric distribution – hypothesis No. 1

(option 50:50), for  $N = 110$ ,  $m = N/2 = 110/2 = 55$

Source: Own calculations.

$k$	$n$	$\binom{m}{k}$	$\binom{N-m}{n-k}$	$\binom{N}{n}$	Probability $\frac{\binom{m}{k} \binom{N-m}{n-k}}{\binom{N}{n}}$
54	61	$\binom{55}{54} = 55$	$\binom{110-55}{61-54} = 202927725$	$\binom{110}{61} = 5,14408E+31$	2,16968E-22

Our research sample consisted of 61 SMEs. Our objective was to find out if according to affiliation of enterprise funded by venture capital to industry branch in compliance with its technological or knowledge demandingness in conditions of the Slovak Republic, venture capital is related especially to the enterprises operating in high-tech or medium high-tech sector. Our assumption is that in conditions of the Slovak Republic, the situation would be reverse. Therefore, we transformed our assumption into scientific hypothesis No. 2.

Scientific hypothesis No. 2 was formulated as follows: “In the Slovak Republic, venture capital is leading more to SMEs operating in low-tech and medium low-tech sectors than to SMEs operating in high-tech and medium high-tech sectors”.

Verification of scientific hypothesis No. 2 was conducted on the research sample of 61 SMEs. We investigated whether more than 50% of SMEs funded by venture capital in our research sample operate in low-tech and medium low-tech sectors.

Affiliation of SMEs funded by venture capital to industry branch in compliance with their technological or knowledge demandingness in conditions of the Slovak Republic in our research sample is shown in Table 2.

**Table 2.** Affiliation of SMEs funded by venture capital to industry branch in compliance with their technological or knowledge demandingness in conditions of the Slovak Republic

Source: Own calculations.

Technological or knowledge demandingness of sectors (industry branch)	Number of SMEs	Percentage
Low-tech	19	31.15%
Medium low-tech	27	44.26%
Medium high-tech	13	21.31%
High-tech	2	3.28%
Total	61	100.00%

By comparing the percentages of SMEs in our research sample operating in low-tech and medium low-tech sectors (Table 2), according to affiliation of enterprise to industry branch in compliance with their technological or knowledge demandingness (or intensity), we found out that the share of SMEs funding by venture capital operating in low-tech and medium low-tech sectors was 75.41%,

representing 46 enterprises, which is more than we expected. We expected limit 50% of SMEs.

If we base on the assumption that our research sample of 61 SMEs represents higher proportion of all SMEs funded by venture capital in Slovakia, than we could adopt (based on our research sample) scientific hypothesis No. 2, and could state that in the Slovak Republic, venture capital is leading more to SMEs operating in low-tech and medium low-tech sectors than to SMEs operating in high-tech and medium high-tech sectors.

Regarding the fact that we do not know the real number of all SMEs that were/are in Slovakia funded by venture capital, we use the exact test to verify scientific hypothesis No. 2. This scientific hypothesis was reformulated into statistical hypothesis as follows: “the percentage of SMEs funded by venture capital in low-tech and medium low-tech sectors is more than 50% of total SMEs funded by venture capital”. Then, we set null and alternative hypotheses.

- null hypothesis ( $H_0$ ): “the percentage of SMEs funded by venture capital in low-tech and medium low-tech sectors is  $\leq 50\%$ ”;
- alternative hypothesis ( $H_1$ ): “the percentage of SMEs funded by venture capital in low-tech and medium low-tech sectors is  $> 50\%$ ”.

The hypotheses were verified by calculating the probability according to equation (1).

According to our assumption that the proportion of SMEs funded by venture capital in low-tech and medium low-tech sectors is  $\leq 50\%$ , we perform the exact test for  $m = N/2$ , where  $m$  represents SMEs with monitored characteristic (in our case SMEs operating in low-tech and medium low-tech sectors), while  $m \in N$ . Furthermore, we assume that  $N$  (final number of SMEs funded by venture capital) will be at least 110 enterprises, and that exactly  $m$  enterprises from  $N$  SMEs have the monitored characteristic (operating in low-tech and medium low-tech sectors).

Under these assumptions we calculate the probability of occurrence of the phenomenon that exactly  $k$  units (in our case  $k = 46$  enterprises) operate in low-

**Table 3.** Exact test – hypergeometric distribution – hypothesis No. 2(option 50:50), for  $N = 110$ ,  $m = N/2 = 110/2 = 55$ 

Source: Own calculations.

k	n	$\binom{m}{k}$	$\binom{N-m}{n-k}$	$\binom{N}{n}$	Probability $\frac{\binom{m}{k} \binom{N-m}{n-k}}{\binom{N}{n}}$
46	61	$\binom{55}{46} = 6358402050$	$\binom{110-55}{61-46} = 1,18997E+13$	$\binom{110}{61} = 5,14408E+31$	1,47088E-09

tech and medium low-tech sectors in the sample of  $n$  enterprises (in our case  $n = 61$  enterprises) chosen at random (without repetition) from  $N$  enterprises (SMEs). Calculation was carried out by simulating using Excel for the increasing  $N$  ( $N \geq 110$ ) under condition that  $m = N/2$ . Probability calculated according to equation (1), for the first version, in which  $N = 110$  and  $m = N/2$ , is provided in Table 3.

According to Table 3, assuming that the SMEs operating in the low-tech or medium low-tech sectors are funded by venture capital in the same way as SMEs operating in high-tech and medium high-tech sectors (industries), what is alternative to 50:50, the probability of phenomenon that 46 out of 61 SMEs in our research sample were funded by venture capital are exactly the enterprises operating in low-tech or medium low-tech sectors (if the final set (population) is 110 enterprises (SMEs), of which 55 currently operate in low-tech and medium low-tech sectors), is very small  $P(46; 110, 55, 61) = 1,47088E-09$ .

Based on the above, we can reject the null hypothesis that the share of SMEs funded by venture capital in low-tech or medium low-tech industries of all SMEs funded by venture capital is equal to 50%.

We perform the exact test under assumption that the final set of SMEs funded by venture capital is

50% of enterprises operating in low-tech or medium low-tech sectors. But null hypothesis says that the share of SMEs funded by venture capital in low-tech or medium low-tech sectors is  $\leq 50\%$ .

If we perform the exact test under assumption that we will reduce the number of enterprises in the final set of SMEs ( $N = 110$ ), which have monitored characteristic ( $m$ ), which means that SMEs operating in low-tech and medium low-tech sectors, so  $m < N/2$ , in our case  $m = 50$ , probability calculated according to equation (1) for  $m = 50$  would have been even lower  $P(46; 110, 50, 61) = 2,38149E-13$ . For this reason, the null hypothesis can be rejected for less than originally projected 50% of SMEs funded by venture capital operating in low-tech and medium low-tech sectors.

On the basis of exact test, we have confirmed scientific hypothesis No. 2 and we can conclude that in the Slovak Republic, venture capital is related more to the enterprises operating in low-tech or medium low-tech sector than to the enterprises operating in high-tech or medium high-tech sector. Therefore, our finding confirms the research results of Kortum and Lerner (2000) who did not confirm the presumption that the venture capital should be more widely used by innovative firms.

## CONCLUSION

This article contains exploratory study of micro, small and medium sized enterprises (SMEs) funded by venture capital in conditions of the Slovak Republic. In this article, we understand “venture capital” as venture capital investments, which as an external financial source becomes a part of equity capital of enterprise with innovative or extraordinary idea and these investments are put into the enterprise in seed, start-up or early development stages. The term “private equity” includes venture capital (all seed, start-

up and early stage development investments), as well as all forms of later stage development investments, which become a part of company's equity capital.

We have verified two scientific hypotheses; each of them has been transformed into a statistical hypothesis. Verification of hypotheses was performed by the exact tests on the research sample consisted of 61 SMEs funded by venture capital in the Slovak Republic in the time period 2001–2006.

According to affiliation of enterprises to the category of micro, small and medium sized enterprises, in our research sample our assumption that micro and small sized enterprises are more venture capital funded than medium sized enterprises was confirmed. The results of our analysis showed that the majority of SMEs, financed by venture capital, are micro enterprises representing with a share of 60.66% (37 enterprises) and small sized enterprises with a share of 27.87% (17 enterprises). The share of micro and small sized enterprises of all SMEs financed by venture capital in our research sample was 88.52%. On the basis of our analysis and on the basis of the exact test, we have confirmed hypothesis No. 1 and have concluded that especially micro and small sized enterprises are funded by venture capital in the Slovak Republic.

According to affiliation of enterprise to industry branch in compliance with its technological or knowledge demandingness, in our research sample, the assumption that venture capital is related especially to the enterprises in high-tech sector was not confirmed. The share of enterprises in high-tech sector was the lowest among all the sectors (low-tech, medium low-tech, medium high-tech and high-tech). It was a share of only 3.28%, which are only 2 enterprises of all 61 enterprises in our research sample. On the basis of the exact test, we have confirmed hypothesis No. 2 and have concluded that venture capital in the conditions of the Slovak Republic is related more to the enterprises operating in low-tech or medium low-tech sector than to the enterprises operating in high-tech or medium high-tech sector.

On the basis of the results of our exploratory study, we can say that in our research sample of Slovak SMEs, venture capital, as a specific source of financing, is mainly used by micro and small sized enterprises and is related more to the enterprises operating in low-tech or medium low-tech sector.

The importance of the findings of our exploratory study is that no comprehensive study has yet been carried out in Slovakia to address SMEs funded by venture capital. In the next research, we are interested in the impact of venture capital investments as a specific source of financing on the performance and innovation activity of SMEs. The findings of foreign empirical research may, on the one hand, inspire similar research in Slovakia and, on the other hand, they can justify the importance of developing venture capital activities in the Slovak economy.

## REFERENCES

1. Amit, R., Brander, J., & Zott, C. (1998). Why Do Venture Capital Firm Exist? Theory and Canadian Evidence. *Journal of Business Venturing*, 13(6), 441-466. [https://doi.org/10.1016/S0883-9026\(97\)00061-X](https://doi.org/10.1016/S0883-9026(97)00061-X)
2. Bernoth, K., & Colavecchio, R. (2014). The macroeconomic determinants of private equity investment: a European comparison. *Applied Economics*, 46(11), 1170-1183. <https://doi.org/10.1080/00036846.2013.866306>
3. Bertoni, F., Colombo, M. G., & Quas, A. (2015). The patterns of venture capital investment in Europe. *Small business economics*, 45(3), 543-560. <https://doi.org/10.1007/s11187-015-9662-0>
4. Bürgel, O., Fier, A., Licht, G., & Murray, G. (2000). *Internationalization of High-Tech Start-Ups and Fast Growth – Evidence for UK and Germany* (ZEW Discussion Papers No. 00-35). Retrieved from <http://ftp.zew.de/pub/zew-docs/dp/dp0035.pdf>
5. Engel, D. (2002). *The impact of venture capital on firm growth: an empirical investigation* (ZEW Discussion papers No. 02-02). Retrieved from <http://ftp.zew.de/pub/zew-docs/dp/dp0202.pdf>
6. Engel, D., & Keilbach, M. (2002). Firm Level Implications of Early

- Stage Venture Capital Investment: an empirical investigation. *Journal of Empirical Finance*, 14(2), 150-167, 2007. <https://doi.org/10.1016/j.jempfin.2006.03.004>
7. European Commission (2006). *The new SME definition. User guide and model declaration*. Enterprise and industry publications. Retrieved from <https://www.eusmecentre.org.cn/sites/default/files/files/news/SME%20Definition.pdf>
  8. Evca (2007). *EVCA Yearbook 2007*. Brussels: EVCA.
  9. Freňáková, M. (2011). *Venture kapitál a rozvojový kapitál pre váš biznis*. Bratislava: Vydavateľstvo TREND.
  10. Gompers, P. A., & Lerner, J. (1999). *What drives venture capital fundraising?* (NBER Working Paper No. 6906). Retrieved from <http://www.nber.org/papers/w6906>
  11. Gompers, P. A., & Lerner, J. (2001). *The money of invention: How Venture Capital Creates New Wealth*. Boston: Harvard Business School Press.
  12. Hellmann, T., & Puri, M. (2000). The Interaction between Product Market and Financing Strategy: The Role of Venture Capital. *The Review of Financial Studies*, 13(4), 959-984. <https://doi.org/10.1093/rfs/13.4.959>
  13. Hsu, D. H. (2004). What do Entrepreneurs Pay for Venture Capital Affiliation? *The Journal of Finance*, 59(4), 1805-1844. <https://doi.org/10.1111/j.1540-6261.2004.00680.x>
  14. Invest Europe (2016). *Invest Europe's 2015 European Private Equity Activity*. Brussels: Invest Europe. Retrieved from <https://www.investeurope.eu/media/651727/invest-europe-2016-european-private-equity-activity-final.pdf>
  15. Jeng, L. A., & Wells, P. C. (2000). The Determinants of Venture Capital Funding: Evidence across Countries. *Journal of Corporate Finance*, 6(3), 241-289. [https://doi.org/10.1016/S0929-1199\(00\)00003-1](https://doi.org/10.1016/S0929-1199(00)00003-1)
  16. Kortum, S., & Lerner, J. (1998). *Does Venture Capital Spur Innovation?* (NBER Working Paper No. 6846). Retrieved from <http://www.nber.org/papers/w6846.pdf> (application/pdf)
  17. Kortum, S., & Lerner, J. (2000). Assessing the Contribution of Venture Capital to Innovation. *RAND Journal of Economics*, 31(4), 674-692. Retrieved from [https://www.jstor.org/stable/2696354?seq=1#page\\_scan\\_tab\\_contents](https://www.jstor.org/stable/2696354?seq=1#page_scan_tab_contents)
  18. Lerner, J. (2002). When Bureaucrats Meet Entrepreneurs: The Design of Effective 'Public Venture Capital' Programmes. *The Economic Journal*, 112(477), F73-F84. <https://doi.org/10.1111/1468-0297.00684>
  19. Lyasnikov, N. V., Frolova, E. E., Mamedov, A. A., Zinkovskii, S. B., & Voikova, N. A. (2017). Venture Capital Financing as a Mechanism for Impelling Innovation Activity. *European Research Studies Journal*, 20(2), 111-122. Retrieved from [https://www.ersj.eu/repec/ers/papers/17\\_2\\_B\\_p7.pdf](https://www.ersj.eu/repec/ers/papers/17_2_B_p7.pdf)
  20. Manigart, S., & Hyfte, M. (1999). Post-Investment Evolution of Belgian Venture-Capital Backed Companies: An Empirical Study. Paper presented at the Babson Entrepreneurship Conference. In D. Engel & M. Keilbach, *Firm Level Implications of Early Stage Venture Capital Investment: an empirical investigation* (ZEW Discussion paper No. 02-82). Retrieved from <ftp://ftp.zew.de/pub/zew-docs/dp/dp0282.pdf>
  21. Romain, A., & van Pottelsberghe, B. (2004). *The Economic Impact of Venture Capital* (Discussion Paper Series 1: Economic studies 2004, 18). Deutsche Bundesbank. Retrieved from <https://www.econstor.eu/bitstream/10419/19485/1/200418dkp.pdf>
  22. Sapienza, H. J. (1992). When Do Venture Capitalists Add Value? *Journal of Business Venturing*, 7(1), 9-27. [https://doi.org/10.1016/0883-9026\(92\)90032-M](https://doi.org/10.1016/0883-9026(92)90032-M)
  23. Sba. (2017). *Report on the State of Small and Medium Enterprises in the Slovak Republic in 2016*. Bratislava: Slovak Business Agency. Retrieved from [http://www.sbagency.sk/sites/default/files/sprava\\_o\\_stave\\_msp\\_v\\_sr\\_v\\_roku\\_2016\\_-\\_preklad\\_en.pdf](http://www.sbagency.sk/sites/default/files/sprava_o_stave_msp_v_sr_v_roku_2016_-_preklad_en.pdf)
  24. Sokolowska, E. (2016). Is the growing wealth the driving force for venture capital fundraising in Europe? An empirical analysis. *Applied economics letters*, 23(16), 1125-1129. <https://doi.org/10.1080/13504851.2015.1137542>
  25. Soloma, A., & Jedlicka, P. (2013). Venture capital and private equity markets: a comparison between Poland and the Czech Republic. *In Proceedings from International Scientific Conference on Hradec Economic Days 2013 – Economic Development and Management Region* (pp. 368-373). Hradec Kralove, Czech Republic, February 19-20, 2013.
  26. Timmons, J. A., & Bygrave, W. D. (1986). Venture capital's role in financing innovation for economic growth. *Journal of Business Venturing*, 10(1), 161-176. [https://doi.org/10.1016/0883-9026\(86\)90012-1](https://doi.org/10.1016/0883-9026(86)90012-1)
  27. Ughetto, E. (2010). Assessing the contribution to innovation of private equity investors: A study on European buyouts. *Research policy*, 39(1), 126-140. <https://doi.org/10.1016/j.respol.2009.11.009>