

## Development of the Venture Capital Market against the Selected World Competitors

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**Abstract.** The article deals with the issues of venture capital market development. The determinants of functioning and growth of the venture capital market were discussed. On the basis of the data concerning venture capital investments as % of GDP and availability of financing from the venture capital funds the development of the market in the European Union and selected world countries in the years 2012 and 2016 is presented. The results of author's research are presented with the use of Warda methods concerning the grouping of the member countries and selected world countries due to the similarities of venture capital market. As a result of the conducted cluster analysis four group of countries were selected. In the first group (A) are the countries with the highest financial availability of venture capital and the biggest share of venture capital in GDP. The second group (B) includes the countries with a slightly lower financial availability of venture capital and the share of venture capital in GDP lower than in group A countries. The third group (C) contains the countries with the lowest financial availability of venture capital and the lowest share of venture capital in GDP. The fourth group (D) includes the countries where venture capital markets are better developed than in group C countries and at the same time worse than in group A and B countries.

**Key words.** Venture Capital, Investment Financing, Innovation.

### 1 Introduction

The issues of financing new, original and not verified on the market yet ideas of all the innovators with the development of technology always is accompanied by difficulties due to high risk of enterprises failure and the loss of paid capital funds. A person who had an idea but did not have the capital was forced to search for external financing among private people or banks that were interested in their innovative projects. On the other hand, a kind of bond has always functioned on the line innovator – capital donor. First of all, the innovator in order to implement their project tried to convince private people or a bank to participate in the enterprise and as a consequence to gain financial benefits. Secondly, among the capital donors always functioned a group of investors who were not satisfied with the profit coming from traditional investment of free funds. In return for the possibility of receiving in the future over average rate of return they were willing to take risk. An enhancement

of cooperation between innovators and investors was a guarantee of a dynamic development of science and technology. The funding structure of innovative projects presented above resembles to an extent a contemporary financial instrument which is a venture capital [15].

In the literature on the subject exist a lot of interpretations of the term venture capital. In the P.A. Samuelson's synthetic definition, the venture capital is an investment funds made available for implementation of high risk projects [13]. On the other hand, in the wider approach of P. Drobny the venture capital is a form of share-related financing. It exists outside the capital market and therefore it is intended for small and average enterprises which are not listed on the stock market. The investment involves purchasing shares of the given enterprise by the external investor who is going to sell them in the future. The venture capital investor is not usually interested in the contemporary management of the enterprise and the period of their investment lasts from two to five years. In most cases it is a minority shareholder although there are also cases of majority shareholders [3].

The issue of impact of venture capital funds activity on innovations generating has been dealt by various researchers so far. International publications on the subject include among others Gompers and Lerner [7] or Dessi and Yin [2] who considered both positive and negative aspects of venture capital funds functioning. On the other hand, Ferrary and Granovetter [5] analysed an interesting case study concerning the role of venture capital funds in creation of comprehensive network of innovations in Silicon Valley in the USA. Among the Polish researchers the interesting articles were presented by among others Fałat-Kilijańska [4], Szydłowski [16] and Włodarska-Zoła [20]. The research on the subject can also be found in the studies by Czerniak [1] and Weresa [19] who apart from empirical research present the recommendations concerning innovative policy in supporting venture capital funds development [6].

## **2 The Aim, Methodology and the Area of Research**

The aim of the article is a classification of the European Union countries and their main economic competitors due to the level of development of the venture capital market.

The theoretical part of the article deals with the issue of factors determining the functioning and development of the venture capital market in the theory of economics. In the further part of the article addresses an issue of development of venture capital market in the European Union and the selected countries of the world economy in the years 2012 and 2016. The issue of venture capital investments as % of GDP and availability of financing from the venture capital funds is also clarified.

In the further part of the study the empirical research was conducted with the use of Ward's method, which is a recursive method. At the first step the distances between all the observation pairs (in this case between each pair of countries) are calculated. The Euclidean distance, in our case, the distance between  $i$  and  $j$  country, named  $d_{ij}$  is defined by the following equation:

$$d_{ij} = \sqrt{(x_i - x_j)^2 + (y_i - y_j)^2} \quad (1)$$

In the above equation  $x_i$  is (standardised) financial availability from the venture capital funds in the years 2016-2017 in the  $i$  country, and  $y_i$  is (standardised) venture capital investments as % of GDP in 2016 in the country. The situation is similar in  $j$  country.

At the second step a pair of countries is selected for which the distance described above is the smallest. They are combined in a group (cluster). The distance of this group from the  $k$  group is calculated with the use of the equation:

$$d_{(ij)k} = \frac{n_i + n_k}{n_i + n_j + n_k} d_{ik} + \frac{n_j + n_k}{n_i + n_j + n_k} d_{jk} - \frac{n_k}{n_i + n_j + n_k} d_{ij} \quad (2)$$

where  $n_i, n_j$  i  $n_k$  are number of clusters.

The second step is repeated until all the observations (in this case countries) will be in the same cluster.

In order to answer a question for how many groups to finally divide the countries, so called scree plot is used or the elbow method. It is based on the fact that the distance (calculated vertically) between branches is strictly connected with the clusters similarity for which these branches divide our group the more the cluster differs. It may be concluded that it is worth dividing as long as the branches are relatively distant from each other (on a vertical coordinate).

### 3 Conditions for the Venture Capital Market Development

The search of the literature on the subject indicates a very frequent use of terms venture capital and private equity interchangeably. However, it should be emphasized that these terms are not identical, as the private equity is a more capacious term and concerns the capital investments made at all phases of the enterprise development, often with the willingness to participate in the direct management of this enterprise. On the other hand, the venture capital funds investments are intended for the early phase of the enterprise development [20]. The following stages of private equity/venture capital funds investments can be identified:

- The phase of sowing (the incubation capital, *seed capital*). This type of investments is undertaken in order to finance a very early stage of the given enterprise implementation. This phase refers to all the activities connected with starting the company's activity, such as e.g.: preparation of a product concept, market investigation, building the senior management team and creation of a business plan. This phase is characterised by a very high level of risk undertaken by the seed capital funds.

- The start-up phase (the initial capital, *start-up financing*). This stage refers to finalisation of the formal procedures referring to starting a company and the works connected with developing a product and marketing preparation. At this stage the company may have some experience with selling a product although not at a commercial scale. The degree of taken risk is certainly lower than in the sowing phase.
- The phase of early development (*early-stage financing*). This stage is characterised by the completion of the product development, although it should be emphasized that the company does not generate profit. The financial resources are allocated for starting up production and selling at the market scale. This stage is characterised by a lower level of risk than at the previous stages and the need of incurring increased capital expenditures.
- The expansion phase (*expansion financing*). The investments are directed to enterprises with the established market position, which are able to finance their current activity by themselves. The resources disbursed from the funds are allocated for the financing of the increase of production and marketing activities as well as for increasing working capital.

The investment process of venture capital funds is characterised by cyclicity and may be divided into four main stages [14]:

- Stage I: Raising capital;
- Stage II: The preliminary analysis and selection of potential investment projects and undertaking the investment;
- Stage III: The period of investment implementation;
- Stage IV: Leaving of the investment and realisation of portfolio profits.

The functioning of venture capital funds is limited to serving as a financial intermediary between investors and private enterprises that search for a capital for development. These enterprises are unlisted innovative companies which often operate in the advanced technologies industries. The venture capital funds aim at giving an assistance to developing enterprises during their growth until they reach the stage when they are ready to enter the stock exchange. After obtaining shares in such an enterprise venture capital funds give resources for their development and assume a part of the risk connected with completing the enterprise. It should be noted, that venture capital funds are not directly involved in the company management but undertake monitoring and supervision of its activity by an active participation in the supervisory boards. The investment period has medium or long character and after fixed period of investment there is a disinvestment (*exit*), that is a sale of shares through introducing an enterprise on the stock exchange or their divestiture on the over the counter market [24]. It should be emphasized that each capital investment in innovative enterprise creates a necessity of deep analysis both an investor and a capital receiver. The investor should assess a chance of success of the undertaken innovative enterprise and possibilities of profit generation. As the primary assessment criterion may be a return rate from the invested financial resources or unearned increment rate of the enterprise from the implemented innovative project [15].

#### 4 Development of the Venture Capital Market in the European Union and Selected Countries of the World Economy

The value of the capital invested by the venture capital funds is different across countries. The American venture capital market is recognized as the biggest and it was a pioneer of such type of financing and is much more developed than its European equivalent [19]. According to the data for 2016 the value of the American venture capital market amounted to 66 626 mln USD and the European nearly 4 745 mln USD. In terms of amount of invested funding the European leaders are Germany, France and Great Britain with their investments amounted respectively to 1 051, 894 and 761 mln USD. At a global level, highly developed venture capital markets are Canada (2 377 mln USD), Japan (1 367 mln USD), South Korea (1 212 mln USD) and Israel (1 165 mln USD). Compared to both European and world economies the Polish result is very modest (23 mln USD) [6, 12].

**Table 1.** Venture capital investments as % of GDP in selected countries in the years 2012 and 2016 [8, 12, 13].

Country	2012	2016	Country	2012	2016
Austria	0.011	0.01446	Poland	0.002	0.00505
Belgium	0.024	0.02801	Portugal	0.01	0.00817
Bulgaria	l.d.	0.012	Romania	l.d.	0.001
Croatia	l.d.	l.d.	Slovakia	l.d.	0.01232
Cyprus	l.d.	l.d.	Slovenia	0.005	0.00746
the Czech Republic	0.003	0.00241	Sweden	0.054	0.0404
Denmark	0.032	0.03066	Great Britain	0.038	0.02906
Estonia	0.008336	0.03111	Hungary	0.066	0.0278
Finland	0.041	0.05053	Italy	0.005	0.00523
France	0.027	0.03633	Australia	0.021	0.00916
Greece	0.005	0	Israel	0.36	0.26557
Spain	0.011	0.03624	Japan	0.026	0.01938
the Netherlands	0.029	0.02648	Canada	0.08	0.08733
Ireland	0.054	0.07718	South Korea	0.054	l.d.
Lithuania	l.d.	l.d.	Norway	0.029	0.01463
Luxembourg	0.025	0.00133	Russia	0.014	l.d.
Latvia	l.d.	0.03153	the Republic of South Africa	0.0273	l.d.
Malta	l.d.	l.d.	The United States	0.171	0.13999
Germany	0.021	0.03034	Switzerland	0.033	0.029

l.d. – lack of data

An investment activity of venture capital funds in a given economy can be identified by approximation of their value in relations to the amount of GDP. Within the countries included in the analysis large disparities are noticeable in the achieved results. The best results in 2016 had Israel (0.266%), the United States (0.14%) and

Canada (0.087%). Nevertheless, it should be noticed that in case of leader and vice-leader a significant decrease was noticed compared to 2012. Among the UE member states the best results had Ireland (0.077%) and two Scandinavian countries – Finland (0.051%) and Sweden (0.04%). In this case both leader and vice-leader significantly improved the value of the index compared to 2012. A moderately high value of venture capital investments as % of GDP (about 0.030-0.036%) bore in 2016 Spain, France, Latvia, Estonia, Denmark and Germany. Unfortunately, Poland is not among these countries and with the result amounted to 0.005% is among the weakest the EU member states (table 1).

**Table 2.** Availability of financing from venture capital funds in the selected countries in the years 2012 and 2016 [17, 18].

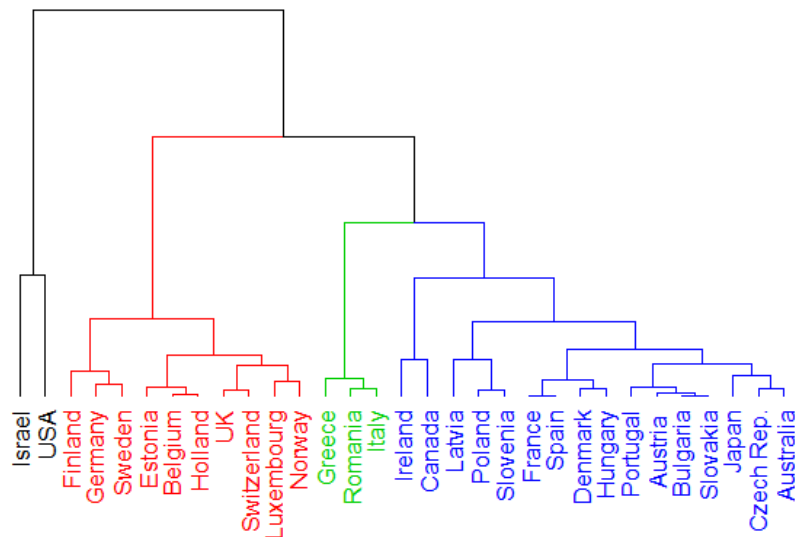
Country	2012	2016	Country	2012	2016
Austria	2,8	3,2	Poland	2,3	2,8
Belgium	3,3	3,9	Portugal	2,2	3,1
Bulgaria	2,7	3,2	Romania	2,4	2,1
Croatia	2,2	2,3	Slovakia	2,7	3,2
Cyprus	2,8	2,4	Slovenia	2	2,9
The Czech Republic	2,6	3,4	Sweden	4,3	4,5
Denmark	2,4	3,2	Great Britain	3,5	4,3
Estonia	3,3	3,8	Hungary	2,1	3,3
Finland	4	4,8	Italy	1,8	2
France	2,9	3,4	Australia	3,6	3,4
Greece	1,7	1,8	Israel	4,2	5,1
Spain	2,3	3,4	Japan	3,1	3,6
the Netherland	3,5	3,9	Canada	3,4	3,7
Ireland	2,7	3,1	South Korea	2,1	2,9
Lithuania	2,5	3	Norway	4,3	4,1
Luxembourg	4	4,2	Russia	2,6	2,6
Latvia	2,8	2,5	the Republic of	3,3	2,9
Malta	3,2	3,2	South Africa		
Germany	3,2	4,6	the United States	4,3	5,2
			Switzerland	3,4	4,2

An interesting source of information about the high-risk capital market development in the most of the world countries is the study conducted for *The Global Competitiveness Report 2017-2018*. The entrepreneurs surveyed in the study express their opinions on the possibilities to acquire support from venture capital funds by giving ratings on a scale from 1 to 7. The bigger venture capital financing availability, according to the entrepreneurs, the rating is higher. In 2016 venture capital funds were the most easily available in the United States and Israel where the entrepreneurs assessed their availability respectively for 5,2 and 5,1, and they were the only countries in the ranking that obtained the rating higher than 5. The countries that obtained rating higher than 4 also should be mentioned: Finland (4,8), Germany (4,6), Sweden (4,5), Great Britain (4,3), Luxembourg (4,2), Switzerland (4,2) and Norway (4,1). It is worth emphasizing that in all mentioned countries, apart from Norway,

there is an improvement compared to 2012. Poland received 2,8 and in only 7 countries from the 38 studied the venture capital funds availability was assessed worse. Comparing the results from all the countries in the years 2012 and 2016 according to the entrepreneurs a larger availability of venture capital may be noticed. There is an improvement in 30 countries, deterioration in 6 countries (Cyprus, Latvia, Romania, Australia, Norway, the South Africa Republic), and in 2 countries nothing changed (Russia, Malta) (table 2), [6, 17, 18].

In order to conduct the analysis of clusters of the European Union member states and the selected world countries on the grounds of the similarity of the venture capital market development the Ward's method was applied with the use of two variables: availability of financing from the venture capital funds in the years 2016-2017 and the venture capital investments as % of GDP in 2016 (figure 1).

Before the analysis a standardization (by subtracting the average and dividing by standard deviation) both analysed variables in such a way that each of them has the same weight in the process of cluster search. The dendrogram resulting from this analysis is presented below.



**Fig. 1.** The results of grouping of the European Union member countries and the selected world countries concerning the similarities of the venture capital market.

The following clusters were selected on the basis of the analysis of the scree:

- cluster one (Israel and the USA) – group A cluster;
- cluster two (Finland, Germany, Sweden, Estonia, Belgium, the Netherlands, Great Britain, Switzerland, Luxembourg, Norway) – group B;
- green cluster (Greece, Romania, Italy) – group C;

- blue cluster (Ireland, Canada, Latvia, Poland, Slovenia, France, Spain, Denmark, Hungary, Portugal, Austria, Bulgaria, Slovakia, Japan, the Czech Republic, Australia) – group C.

To describe them we see the values used for variables analysed divided into four groups. The results of the post-hoc tests present the following general image (table 3):

- group A includes the countries with the highest VC financial availability and the biggest share of VC in GDP;
- group B includes the countries with a bit lower VC financial availability and a lower share of VC in GDP compared to group A countries;
- group C includes the countries with the lowest VC financial availability and the lowest share of VC in GDP;
- group D includes the countries with a lower VC financial availability than in groups A and B and a higher than in C, and the share of VC in GDP lower than in group A but higher than in C.

**Table 3.** The results of basic statistics for the variable of financial availability from the venture capital funds in the years 2016-2017 and the variable of venture capital investment as % of GDP in 2016.

Variable		Group A	Group B	Group C	Group D	p*
Availability of financing from venture capital funds in 2016-2017	av±SD	5,15±0,07	4,23±0,33	1,97±0,15	3,21±0,3	<0,001
	Median	5,15	4,2	2	3,2	P
	Quartiles	5,12-5,18	3,95-4,45	1,9-2,05	3,1-3,4	A>B>D>C
Venture capital investments as % of GDP in 2016	av±SD	0,2±0,09	0,03±0,01	0±0	0,03±0,02	0,008
	Median	0,2	0,03	0	0,02	NP
	Quartiles	0,17-0,23	0,03-0,03	0-0	0,01-0,03	A>D,C B,D>C

\* P = Normal distribution in the groups, test t-student; NP = lack of normality of distribution in the groups, Mann-Whitney's test

\* P = Normal distribution in the groups, ANOVA + post-hoc analysis results (Fisher's LSD test); NP = Lack of normal distribution in the groups, Kruskal-Wallis's test + post-hoc analysis results (Dunn's test)..

## 5 Conclusions

In case of new or young investment firms the condition to achieve success of effective development and introducing a product into the market is possibility to gain the external source of project financing. Taking into account the high risk of the enterprise failure and lack of credit capacity the traditional financing institutions like banks are not interested to finance such projects. A panacea for a lack of capital is a functioning of venture capital market that includes the private investors ready to take high risk in exchange for possibility to obtain over average return rate.

On the basis of the conducted cluster analysis the following synthetic final conclusions may be formulated:



- At the global scale the most developed venture capital markets are the American and Israeli markets, which are in different group of countries. These markets are characterised by the highest financial availability of venture capital and the biggest share of venture capital in GDP. In the United States and Israel, the great importance is given to entrepreneurship development, promotion of innovative enterprises implemented by the new, or functioning for a few years on the market, companies.
- The venture capital markets of high level of development but lower than in case of the United States and Israel are functioning in: Belgium, Estonia, Finland, the Netherlands, Luxembourg, Germany, Norway, Switzerland, Sweden and Great Britain. It is significant that these countries also achieve very good results in various rankings of economy innovation which results, to some degree, from a very well-developed venture capital market.
- The least developed venture capital markets include Greek, Romanian and Italian markets where the potential investors find it difficult to apply for financing their projects with the use of venture capital. The situation corresponds with the generally low level of innovation of these countries economy.

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