

# The impact of lending availability and conditions for SMEs on the global development of venture financing systems

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## Abstract.

**Research background:** The current situation, which caused global economy recession, has shown that all participants of the venture capital market are not ready for such occasions. Small and medium-sized businesses found themselves in a in a pickle that completely limited the ability to conduct business in most sectors of the economy and venture investors had to urgently reassess their capabilities and their requirements for investment objects. Different events have been constantly influencing the venture financing system to change and develop during decades of its existence. The most important changes are happening today in new world order dictated by COVID-19.

**Purpose of the article:** The aim of this article is to analyse the current state of venture financing, find out how VC is related to the ICT development in European countries, compare VC to other lending mechanisms for SMEs and assume how the global venture industry may be changed by global isolation.

**Methods:** The ARDL model for panel data is used to assess the impact of ICT developments on VC. Comparative and statistical analysis of available datasets on financing mechanisms is conducted.

**Findings & Value Added:** The results show that the increase in value-added in the ICT sector is driving the growth of venture capital in leading countries in terms of innovation activity. Venture capital will be forced to transform towards globalization and centralization, but with the delegation of authority to local representatives, through new communication forms. Countries with high ICT development may be more attractive for venture financing.

**Keywords:** *venture capital; innovative entrepreneurship; ICT; financing SMEs*

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## 1 Introduction

The venture capital (VC) system is diverse and specific, characterized by the development and flexibility of its functional structure. This system has a fairly wide range of capabilities, mechanisms and instruments for financing and managing innovation. Basically, venture capital is aimed at the development and promotion of high-tech and high-risk projects. [1] The state plays a huge role in the development and functioning of the venture capital ecosystem, while at the same time it is the reason why SME's rarely qualify for "traditional" bank loans. This creates the so-called "funding gap" problem where the credit market fails to clear the demand for financing. Even though this phenomenon was originally discussed in the context of the loan market, it also affects the supply of equity.[2]

There are three main sources of financing SMEs. The first is venture capital, which came in addition to the second source - lending, and also digital finance, which has begun to gain popularity in recent years. [3] All three have their own limitation, first of all they all depend on the current economic, political, legislative state and rules and, most importantly, on the mentality of business in a particular region. We are talking about the opportunities and preferences of investors, the conditions and complexity of issuing and receiving loans from banks and the legal framework regarding the possibility of using digital money. In any case, it turns out that all sources of financing are highly targeted instruments and the possibility of attracting them primarily depends on the preferences and expectations of investors. [4] So, for example, BA's have a small portfolio and expect a high return on each project, while VC funds target certain industries and finance many enterprises with the expectation of getting a high level of participation in target industries. [5]

Venture capital investment reached €11bn in 2019 in Europe, according to Invest Europe data, 19% growth from 2018. Venture capital funds backed about 60% of the total number of companies invested into. Start-up investments reached €6bn, a 13% increase from 2018, taking 56% of total venture capital investment. By sector, ICT is key (half of Venture capital investment). Despite this, according to CrunchBase, the volume of venture capital in the first half of 2020 is 10% lower than the same period in 2019. There is also a noticeable decrease in the activity of venture capital funds (a drop in the number of transactions performed while maintaining the average check size) and an increase in the activity of business angels (the number of transactions increased, nevertheless, the average check size decreased almost threefold). At the same time, with a sharp decrease in the activity of participants in the venture capital market in February-May 2020, there is a sharp diversification of industry preferences of investors. The most invested enterprises were in the field of medicine and pharmacology, as well as the ICT industry, aimed at solutions in the areas of remote services (entertainment and education) and contactless exchange of goods and services. Venture investors have the ability to be mobile and react to crisis almost instantly, even in the face of COVID-19.

However, the development of many important projects has been hindered by various legal and political constraints. So, for example, projects related to unmanned drones (delivery, monitoring) depend on the policy regarding certification and flight authorization. It should also be noted that the activities of venture investors are limited not only by the environment and market conditions, but also by the enterprises themselves. Thus, based on the results of the analysis of a survey of European entrepreneurs, the most popular financing instruments in Europe are credit line, bank overdraft or credit cards overdraft and bank loans in almost all analysed European countries. Equity capital, that includes all forms of venture capital, is suitable for 10% -30% of enterprises, except for Sweden, Turkey and Albania where equity capital is relevant to 50-65% of enterprises. Also, the main problems of SMEs are availability of skilled staff or experienced managers and finding customers. Interesting, that access to financial instruments is the least problem for SMEs. This is

primarily due to a wide range of available financing instruments. Nevertheless, venture capital, as a component of equity capital, despite the rather strong development, is quite unpopular in Europe among another financing instruments.

The global trend of the global venture capital market is a high proportion of investments in the ICT industry. Today, most of the "unicorns" for which the largest and most influential investors are chasing represent precisely various solutions in the field of Internet communication (for example, Ant Group, Palantir, AirBNB). In Europe, as well as in most countries and regions, projects in the ICT industry prevail in terms of the number of transactions and attracted investment. The reasons for this attractiveness are that such projects have a greater chance of final implementation, lower requirements for material resources in most cases and a shorter project life cycle than in other areas such as the biochemical industry or mechanical engineering. [6] Thus, venture capitalists who have invested in an ICT project can realize their investments faster. But along with the opportunities, there is also a risk that along with the short life cycle of projects, the "window" for the implementation of super-profitable projects also decreases.[7] Therefore, it can be assumed that the development of ICT in the country can be the main incentive for innovative activity in the country, which in turn attracts venture funding.

To prove our assumption we made an analysis, in which the EU 27 countries were initially selected, since this sample mainly consists of countries with a high level of ICT development according to the ICT Development Index (IDI), developed by the International Telecommunication Union. This index included 11 indicators related to mobile services and infrastructures (the number of mobile phones per 100 inhabitants, coverage of modern mobile networks, the cost of services, etc.), as well as to household indicators (the number of computers and fixed telephones, the number of households connected to the Internet, as well as Internet users, connection speed, etc.). The IDI can have values from 0 to 10, where 0 is complete underdevelopment, and 10 is the maximum development of all aspects of ICT. For most European countries, the index value ranges from 8 to 10, showing that Europe has a well-developed infrastructure and widespread access to both advanced 3G and LTE mobile systems, and a developed area of coverage of high-speed broadband Internet. [8] The top ten IDI leaders from the European region include Switzerland, Denmark, the United Kingdom, the Netherlands, Norway and Luxembourg. Since Switzerland, Norway and the UK are not part of the EU 27, we decided to expand the sample with these countries.

A review of the dynamics of the IDI draws attention to the growth of Switzerland's rank from 12th place in 2010 to 3rd place in 2017. The main reasons for this were a developing of full coverage of the country's territory with 3G and LTE mobile networks, as well as the greater availability of the Internet (almost 94% of the population have access to the network, which is 20% higher than the European average). Another characteristic worth mention is its development in the field of innovation activity by promoting and maintaining scientific freedom of institutions in research, strong protection of intellectual property and an attractive tax climate for starting a business. Switzerland's innovativeness is also reflected in another index, the Global Innovation Index, in which it has been ranked first since 2011. The UK, like Switzerland, rose to 5th place in the ICT Development Index by 2010. It also has a highly developed ICT market that can be characterized by early liberalization and fierce competition. Infrastructure scores are above the European average and show almost 100% coverage with 3G and LTE networks, and attention is also paid to the deployment of high-speed broadband communications. In terms of innovation, the UK's high position in the GII should be noted. Its main innovation institution can be considered the Council for Technological Strategies, renamed Innovative UK in 2014, which stimulates the allocation of investments for the creation of new technologies, as well as supports their development and commercialization. With his support, innovation centres are

being formed in the United Kingdom, focusing either on the development of priority technologies or on a specific sector of the economy to combine the complementary disciplines of science and technology. As well as the above mentioned countries, Norway is distinguished by a high level of coverage of mobile networks and broadband penetration. The Government of Norway paid attention to the special role of ICT in the development of the country and therefore contributed to the increase of both information literacy of the population and the penetration of ICT into various institutions, both industrial and social, but researches show that implemented cyber-physical systems are not as effective as they can be. [9] This problem also can be seen even in most developed European countries. [10] The selected countries demonstrate strong development in ICT, but it is only a tool for the development of innovative activity, in this regard, we decided to consider how strong the correlation between the IDI and GII ratings is. Estimating the ratings for our sample for 2010, 2015 and 2017 using Spearman's rank correlation, we got the indicators equal to 0.926, 0.916 and 0.869, respectively. Considering that in the GII one of the many indicators is the development of ICT, such a strong relationship between these ratings can be interpreted as the fact that ICT is the prevailing factor for innovation activity nowadays. Based on the above, we assume that the development of ICT sector in a country stimulates VC investments. Reasons for that are:

- ICT sector is one of the most dynamic sectors in European countries. This sector stands out for its high R&D intensity and for a productivity level that is higher than that of the whole economy [11]
- ICT sector is among risky but profitable sectors
- ICT was the largest sector for venture investment in 2018, receiving 47% of the total, followed by biotech and healthcare (28%) and consumer goods and services (9%) (according to 2018 European Private Equity Activity report). 40% of European companies received VC investments in 2018 were operating in ICT sector. [12]

As nowadays COVID-19 is changing globalization processes and rules of business, we assume that the venture capital systems and ICT sectors are also strongly affected by pandemic.

We also assume, that the number of SMEs in a country is associated with venture capital as 90% of VC went to SMEs in 2018. However, we are mostly interested in number of SMEs in ICT sector in the context of relationship between ICT sector and VC.

## 2 Method

We consider that the increase in ICT value added above the common trend in the previous period stimulate an increase in VC investment keeping other constant. We also include number of small and medium ICT companies as potential applicants for venture capital investment. Thus, we propose as the basic the following ARDL(1, 1) model (equation 1):

$$VC_{it} = \beta_1 VC_{it-1} + \beta_2 ICT_{it-1} + \beta_3 SME\_ICT_{it-1} + \alpha_i + \varepsilon_{it} \quad (1)$$

First, we assume that  $\alpha_i = 0, \delta_\tau = 0$  that is there is no country specific or time specific fixed effects.

If  $\varepsilon_{it}$  are independent and identically distributed error terms, then we can apply OLS to compute estimates of the slope coefficients.

If the disturbance term is subject to autocorrelation, then OLS may be inconsistent because of the correlation between  $VC_{t-1}$  и  $\varepsilon_{it}$ . In this case we use Panel Generalized Method of Moments to estimate parameters, using  $VC_{t-2}$ , as an instrument for  $VC_{t-1}$ .

The third case we considered is the model with the cross-section fixed effect  $\alpha_i \neq 0$ , and the errors for a cross-section to be heteroskedastic and serially correlated. In this case a White cross-section clustered estimator is used to calculate the coefficient covariances.

We consider two hypothesis: high interest rates for SMEs stimulate start-ups to apply for venture capital. Thus, venture capital is considered as substitute to a bank loan. The other hypothesis is that a bank loan can help young companies to start their projects and show first results. So they have more arguments to apply for venture capital. In this case VC is a complement to bank loans.

To decide between these two hypothesis and to assess the availability of bank lending for SMEs on venture capital, we include the additional variable *Rate\_SME* with one-period time lag (equation 2):

$$VC_{it} = \beta_1 VC_{it-1} + \beta_2 ICT_{it-1} + \beta_3 SME\_ICT_{it-1} + \beta_4 Rate\_SME_{it-1} \alpha_i + \varepsilon_{it} \quad (2)$$

### 3 Results

#### 3.1 Data description

Dataset covers 28 European countries (EU-27 (excluding Malta, Croatia and Cyprus due to data constrain), Great Britain, Switzerland, Norway, Russia) for the period 2007-2017.

We use the following notations.

*VC* – venture capital investment, US dollars, millions, current prices. In the OECD Entrepreneurship Financing Database, venture capital is made up of the sum of early-stage and later-stage venture capital. Note, that original data, provided by VC association and other data providers, have been re-aggregated to fit the OECD classification. OECD defines VC as a subset of private equity i.e. equity capital provided to enterprises not quoted on a stock market.

*XVC* - venture capital investment, % of GDP (OECD Entrepreneurship Financing database).

*XICT* – ICT value added is the difference between the Information and Communication Technology sector gross output and intermediate consumption. This indicator is measured in percentage of GDP and retrieved from OECD Annual National Accounts.

*SME ICT* – Quantity of small and medium enterprises, which are connected to the ICT services or manufacturing. This indicator is retrieved from OECD Structural Business Statistics.

*Rate\_SME* - interest rate for bank loans for SMEs (OECD Entrepreneurship Financing database).

For cross-country analysis we convert VC and ICT value added to constant international dollars

$VC\_PPP = XVC * GDP\_ESK/100$  - venture capital investment, international dollars, millions, constant PPPs

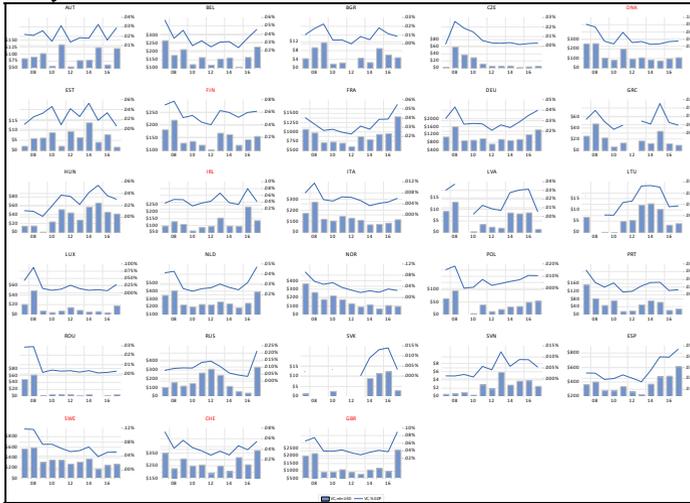
$ICT\_PPP = XICT * GDP\_ESK/100$

Here *GDP\_ESK* is GDP in constant 2018 PPPs, millions; the source is the conference board (Total Economy Database, 2019).

Figure 1 depicts the dynamics of venture capital investment in units (million USD) and as a percentage of GDP (right axis) for each country from our dataset. We use ISO code for identifying each country.

Great Britain, Germany and France are countries with the highest VC, but Scandinavian countries and Switzerland are within the leaders in terms of VC as percentage of GDP.

However, even in these countries venture capital constitutes a very small percentage of GDP, often less than 0.05% (for comparison, in USA the venture industries account for more the 0.35% of GDP in 2016 [13]). From 2007 to 2017 venture capital investment evolved differently across countries



**Fig.1.** Venture capital in selected European countries. OECD database

To consider evaluation of venture capital investment more closely, we calculate within group descriptive statistics of VC as a percentage of GDP for each year.

Table 1. Descriptive statistics of VC as a percentage of GDP across countries for each year

YEAR	Mean, %	Max, %	Min., %	Std. Dev.	Obs.
2007	0.036	0.118	0.001	0.030	28
2008	0.039	0.116	0.001	0.028	26
2009	0.025	0.073	0.000	0.020	26
2010	0.022	0.073	0.000	0.020	28
2011	0.023	0.062	0.003	0.017	27
2012	0.021	0.052	0.000	0.015	26
2013	0.022	0.067	0.000	0.017	28
2014	0.024	0.066	0.003	0.017	28
2015	0.025	0.054	0.001	0.015	28
2016	0.026	0.080	0.002	0.020	28
2017	0.028	0.090	0.003	0.023	28
All	0.026	0.117	0.000	0.021	301

We see from Table 1 that the mean of XVC dropped considerably after the global financial crisis. Especially, the decline is obvious for the countries with more developed venture industry at the times before crisis. However, since 2010 we see a modest increase in VC in average.

Analysis of VC investment shows (Fig.1) that the VC investment is higher in average in mature market economies then in countries from the former Soviet bloc. However, in such ‘old’ EU countries as Greece, Italy, Portugal, the VC investment and VC to GDP ratio are even lower than in “new” EU countries, which are focused on innovations and the development of ICT industry (such as Estonia, for example). So, we break down the median of VC and ICT (expressed in PPP dollars) by income and innovation performance. We use the Global innovation index GII and name a country as innovation leader if it is within first

50 countries in the world, ranked by GII. We use the World Bank definition to differentiate between high-income and non-high-income European countries.

It is worth noting, that in our dataset, there are no countries which are innovation leaders but not belong to high-income countries. In general, the more innovative the country is the higher its socio-economic performance is [14].

From Figure 1 we can assume that the relationship between VC and ICT is strong for innovation leaders [15]. For those countries that do not belong to this group, the median of VC investment is higher for high-income countries, but ICT value added is lower. So for further analysis we built a model and asses it using the panel data for 15 European counties (Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Ireland, Luxembourg, Netherlands, Norway, Sweden, Switzerland, United Kingdom) for the period 2007-2017.

### 3.2 Model results

The correlation analysis shows the strong relationship between VC and value added of ICT sector in the group of innovative countries (Table 2). Since there is a high correlation between the variables ICT\_PPP and SME\_ICT, we will not use these variables in one model to avoid multicollinearity.

**Table 2.** Correlation analysis for the group of innovation leaders

	VC_PPP	ICT_PPP	SME_ICT
VC_PPP	1		
ICT_PPP	0.93	1	
SME_ICT	0.85	0.90	1

We run unit root tests for panel data [16] and figured out that VC\_PPP has no unit roots (test statistic is -6.25, Prob.= 0,000, the null hypothesis is rejected), but ICT\_PPP is not stationary in levels.

Data analysis suggests that there is a common linear trend in ICT\_PPP. We identified the linear trend and removed it from the series. What is left (the residuals series) is denoted as ICT here and after.

**Table 3.** The basic model estimation using LS and GMM methods

Regressors	Panel Least squares	Panel Generalized Method of Moments	Panel Least Squares with cross-section fixed effects and White period st errors
$VC_{t-1}$	0.68*** (0.07)	0.74*** (0.09)	0.44*** (0.07)
$ICT_{t-1}$	0.016*** (0.005)	0.018*** (0.005)	0.017*** (0.006)
$SEM\_ICT_{t-1}$	0.33*** (0.06)	0.27*** (0.07)	0.60*** (0.15)
$R^2$	0.87	0.86	0.89
Obs.	145	131	145

The results of different approach estimating the basic model are presented in table 3.

From the presented results we can conclude that the VC investments positively related to VC investments in previous periods. The result is apparent for countries with a steadily developing innovation ecosystem.

The estimates support our hypothesis that the development of ICT sector boost VC investment. And the more SMEs operate in ICT industry, the larger the VC investment, controlling for other variables.

Next, we include interest rate for SMEs to account for financial support. The results show that increase in 1 p.p in the interest rate for SMEs hamper VC investment in the range from 24 to 31 millions of international dollars.

**Table 4.** The basic model estimation with interest rate for SMEs

Regressors	Panel Least squares	Panel Generalized Method of Moments
$VC_{t-1}$	0.45** (0.22)	0.63*** (0.15)
$ICT_{t-1}$	0.025*** (0.009)	0.023*** (0.009)
$SEM\_ICT_{t-1}$	0.42*** (0.15)	0.31*** (0.09)
$Rate\_SEM_{t-1}$	-24.3* (14.3)	-30.9** (14.0)
$R^2$	0.85	0.85
Obs.	123	113

## 4 Discussion

We assume that interest rate changes are inversely related to the volume of venture funding. That is, in a situation involving an increase in the interest rate, the volume of venture financing decreases. An increase in interest rates signals venture investors and entrepreneurs that the economy is beginning to stagnate and, in particular, that it is becoming more difficult to do business [17]. First, this is manifested in the rise in the cost of loans, which directly affects the possibilities of small and medium-sized businesses. Thus, the risks of investing in small and medium-sized enterprises, including innovative ones, are increasing and this should be especially noticeable in regions with emerging venture capital markets.

It should be noted that searching sales markets and finding potential customers are two of the main problems of SMEs in Europe. Therefore, based on the US experience and analysis of the main distinctive features of the American venture business model, it can be assumed that the transfer of features of this model has great potential for the EU venture capital market. [18] The primary goal of investors and innovators should be creating and capturing new markets. A shortage of consumers can speak of unrealized opportunities in the European Region and a way to solve this problem by engaging the Silicon Valley model of behaviour:

- the biggest mistake of an investor is to skip a new unicorn, the rest is the accumulation of experience;
- distinctive feature is the distribution of risks between investors and entrepreneurs;
- innovations are made to change the current reality (even small realities) and investors look in potential of possible changes.

Therefore, a lack of investment opportunities should be overcome by taking more risks and trying to change the current conditions that limit the activities of both investors and entrepreneurs. This will also help develop microenterprises and innovative fast-growing firms who still encounter significant problems when seeking finance.

In terms of COVID-19, new business models are forming. Both of VC and ICT become connected closer than ever. As well as VC is mostly provide development for ICT industries by investing them, ICT instruments, developed on this investments, can help

investors to spread their network by using technologies for connecting with clients from all over the world. Moreover, the COVID-19 pandemic, which has profoundly affected almost every country in the world, has unveiled the crucial role played by ICT and its R&D in a number of areas [19], such as:

- controlling the spread of the virus (e.g. the successful use of ICT for contact tracing and sharing information on social distancing measures in South Korea)
- the answer to the shortage of appropriate equipment (i.e. the use of 3D printers technology);
- the great stimulus given to online education;
- its role in reducing the cost of confinement, both in terms of human lives and lost production, thanks to the possibilities offered by teleworking.

The COVID-19 outbreak has meant, among many other things, a tremendous boost to the penetration of ICTs in all areas. However, for the next two years a strong positive impact on the production of the ICT sector is expected due to the increase in demand on ICT services because of confinement, in the contrary to the sudden stop of production in many countries in other industries as a consequence of the disruption of the global supply chains.

## 5 Conclusion

Covid-19 poses a threat to globalization. In attempt to contain the development of the pandemic, majority of countries closed their borders, the trade turnover and capital movement decreased significantly, the deformation of densely populated cities began in order to ensure the healthy existence of their citizens and more. Venture capital activity has slowed down dramatically. During the worldwide quarantine, many foundations have had to reassess their ability and adjust their “airbags” in the face of shutdowns in the most industries such as retail, real estate, travel and urban mobility.

However, within the Internet, thanks to the development of ICT, globalization is accelerating. Conducting various contests and accelerators online can attract more participants from both sides: start-ups and investors, although quarantine restrictions can seriously affect the possibility of a final deal between them. Venture capital is forced to transform. On the one hand, it will change towards centralization, but with the delegation of authority to local representatives, through new communication forms and countries with high ICT development may be in a favour more attractive for venture financing. On the other hand, the venture financing is forced to become a hybrid of digital and physical communication. That triggers new opportunities and challenges, increasing the level of current risks, lead to the new risks and to the need to develop answers to them.

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