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Working Paper

The development of the Central and Eastern European venture capital market in Europe

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The development of the Central and Eastern European venture capital market in Europe

JUDIT KARSAI

KRTK-KTI WP – 2023/23

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ABSTRACT

The working paper examines the role and development of the Central and Eastern European venture capital sector in the five years between 2016 and 2020. This period includes both the end of the recovery after the economic crisis in 2008 and the downturn due to the coronavirus crisis in 2019. A statistical analysis of venture capital funds and investments in the CEE region confirms that, while the overall position of the region in Europe did not change over the period under review, the differences between countries in the region increased sharply. The northern part of the region rivals the most developed countries in Europe, the central part is driven by an abundance of public resources, while the venture capital sector in the south is only in its infancy. The size of the venture capital funds in the region is far below the European average, so the start-ups only have a chance to become successful if they are involved in the international flow of venture capital. The role of the government in the funds in the region is extremely high, but the selection between companies is therefore not based solely on market considerations. Rent-seeking behaviour goes against the essence of venture capital. As a result of the deterioration of the global political and economic situation, the entire Central and Eastern European region is losing its ability to attract capital.

JEL codes: G23, G24, G28, L26, M13

Keywords: venture capital; private equity; acquisition; entrepreneurship; startup; innovation

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A kelet-közép-európai kockázatitőke-piac fejlődése Európában

KARSAI JUDIT

ÖSSZEFOGLALÓ

A tanulmány a kelet-közép-európai kockázatitőke-ágazat szerepét, fejlettségét vizsgálja a 2016-2020 közötti öt évben. Ebbe az időszakba a 2008-as gazdasági válság utáni fellendülés vége és a 2019-es koronavírus-válság miatti visszaesés egyaránt beletartozik. A régióbeli kockázatitőke-alapok és befektetések statisztikai elemzése azt támasztja alá, hogy miközben a vizsgált időszak során a régió pozíciója Európában összességében nem változott, a régióon belül az egyes országok közötti különbségek erőteljesen megnőttek. A régió északi része Európa legfejlettebb országaival vetekszik, középső részén az állami források bősége hajtja előre a piacot, míg déli területein a kockázati tőkeágazat csak csírájában van jelen. A régió kockázatitőke-alapjainak mérete messze elmarad az európai átlagtól, így az itteni startupoknak csak a kockázati tőke nemzetközi áramlásába bekapcsolódva van esélye igazán sikeressé válni. A régióbeli alapokban az állam szerepe kiugróan magas, a cégek közötti szelekció azonban emiatt nem kizárólag piaci szempontok alapján történik. A járadékvadász viselkedés ellentétes a kockázati tőke lényegével. A világpolitikai és világgazdasági helyzet romlása következtében az egész kelet-közép-európai régió veszít tőkevonzó képességéből.

JEL: G23, G24, G28, L26, M13

Kulcsszavak: kockázati tőke; magántőke; vállalatfelvásárlás; vállalkozás; startup; innováció

The development of the Central and Eastern European venture capital market in Europe¹

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Abstract

The working paper examines the role and development of the Central and Eastern European venture capital sector in the five years between 2016 and 2020. This period includes both the end of the recovery after the economic crisis in 2008 and the downturn due to the coronavirus crisis in 2019. A statistical analysis of venture capital funds and investments in the CEE region confirms that, while the overall position of the region in Europe did not change over the period under review, the differences between countries in the region increased sharply. The northern part of the region rivals the most developed countries in Europe, the central part is driven by an abundance of public resources, while the venture capital sector in the south is only in its infancy. The size of the venture capital funds in the region is far below the European average, so the start-ups only have a chance to become successful if they are involved in the international flow of venture capital. The role of the government in the funds in the region is extremely high, but the selection between companies is therefore not based solely on market considerations. Rent-seeking behaviour goes against the essence of venture capital. As a result of the deterioration of the global political and economic situation, the entire Central and Eastern European region is losing its ability to attract capital.

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Keywords: venture capital; private equity; acquisition; entrepreneurship; startup; innovation

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1. Introduction

Venture capital is an important source of financing for new, fast-growing, innovative businesses worldwide. Venture capitalists help companies in their portfolios to grow not only by providing capital, but also by mobilising their knowledge, business skills and networks. As a result, the proportion of venture capital-funded companies among the successful ones is exceptionally high (*Lerner and Nanda, 2020*). The success of venture capital companies is reflected in more innovation, new jobs and added value. In this way, the performance of companies financed by venture capital contributes to economic growth (*Davis et al., 2014; Samila and Sorenson, 2011*).

This working paper examines the extent to which venture capital has helped to promote the development of promising young, innovative businesses in Central and Eastern Europe³ (hereinafter referred to as the “region”) in the five years between 2016 and 2020. It shows how the chances of companies born in the region differ from those of their counterparts in more economically developed parts of Europe, and how the Russian invasion of Ukraine and the unfolding economic crisis are expected to affect this. The analysis starts with a literature review of the venture capital sector in Central and Eastern Europe. The paper then examines the volume of capital flowing into venture capital funds set up in the region in a European comparison, and whether the supply of venture capital is in sync with the financing needs of companies at different stages of development. In doing so, it seeks to answer the question of whether venture capital can meet the capital needs of both seed (early-stage) and expansionary growth stage companies requiring much larger investments, and how much and what role public/community resources play in this. The paper then examines the opportunities and chances for internationalisation of innovative companies from the region, with a particular focus on the need for relocation, which is a sensitive issue for the development of innovative economies in the region. The analysis of successful firms and the capital investments they have received in several rounds also reveals the heterogeneity of the region’s countries in terms of the development and functioning of the venture capital sector. The paper concludes with a recommendation on economic policy and regulatory measures to promote the effective functioning of the venture capital market in the region.

2. Literature review

Since the beginning of the 1990s, several studies have analysed the development of the venture capital sector in the transition countries of Central and Eastern Europe, in particular in the countries of the region that have become members of the EU. Initially, the role of venture capital was approached mainly from the perspective of the privatisation of state-owned enterprises (*Filatovchev et al., 1996; Karsai and Wright, 1994*). *Karsai et al. (1998)* presented the different investment practices of investors in the region compared to developed markets. *Wright et al. (1999)* pointed out that the active participation of investors in investments played a much more important role in this region than in developed capital markets. *Farag et al. (2004)* mainly analysed the factors that hinder the region’s markets from catching up with more developed markets. While investment practices were found to be similar by the authors, it was seen that the higher risk of the region was mainly reflected in financing contracts and monitoring practices. It was considered that the development of the region’s venture capital sector would require, first and foremost, a greater number of quality projects seeking capital and a broadening

³ In addition to EU member states in the Central and Eastern European region, such as Bulgaria, the Czech Republic, Estonia, Croatia, Poland, Latvia, Lithuania, Hungary, Romania, Slovakia and Slovenia, venture capital information providers also collect data on funds and companies in Bosnia and Herzegovina, Macedonia, Moldova, Montenegro, Serbia and Ukraine that specifically target the region or are established here.

of exit opportunities. *Klonowski (2005, 2006)* analysed the development of Polish, Hungarian, Czech and Slovak venture capital investments, mainly through long-term cycles, and found that the main obstacle to investments in the region was the unpreparedness of company managers. Other authors also concluded that the failure of investments was mostly caused by management errors (*Bliss, 1999; Chu and Hisrich, 2001, Karsai et al., 1998*). *Klonowski (2011)* also drew attention to the mistrust often experienced by investors because of their foreign status, which also made it difficult to build up the necessary relational capital in this region. *Iliev (2006)*, when analysing the structure of investments in the region, highlighted the extremely low share of financing for companies at an early stage of their development, explained by high transaction costs, limited supply of quality projects and a lack of infrastructure to support such transactions. The access of early-stage companies to venture capital was also hampered by the fact that the Central and Eastern European region had relatively fewer informal investors who undertook smaller capital investments (*Szerb et al., 2007*).

Johnson et al. (2002) emphasized the importance of protecting property rights in the region, while perceiving access to banking resources as a minor problem. *Groh and Liechtenstein (2011)* also pointed to the paramount importance of effective protection of property rights when analysing the requirements of institutional financiers deciding on the resources to invest. Other studies also found that limited credit availability made it difficult to achieve the desired returns for leveraged investments in the region (*Farag et al., 2004; Wright et al., 1999*). *Campbell and Kraeussl (2007)* considered that political-cultural characteristics also slowed down the growth of the sector in the region, i.e., they saw the bottleneck not in the supply of venture capital, but in the lack of entrepreneurship, in the demand for venture capital. According to *Klonowski (2012)*, access to capital in the Central and Eastern European region was also hampered by inadequate legal infrastructure, relatively poorer disclosure of financial results, that is, more difficult access to information.

As in developed countries, governments in the countries of the region tried to alleviate the difficulties of accessing capital through public intervention in order to promote economic growth and increase competitiveness. EU funds dedicated to the development of the venture capital sector in the 11 countries that joined the EU also provided a significant opportunity after 2010 in the context of the use of cohesion funds. This led to an increase in the number of academic publications (also) describing and evaluating government participation (*Avots et al., 2013; Breznitz and Ornston, 2017; Diaconu, 2017; Fazekas and Becsky-Nagy, 2018; Kállay and Jáki, 2020; Kitsing, 2013; Klonowski, 2010, 2012; Murray et al., 2012; 2019; Pastor, 2019; Ptacek, 2014; Prohorovs, 2014; Rudnicka-Dietl, 2013; Venckuviene and Snieska, 2014*). Experience showed that public venture capital programmes in the region had all the positive and negative features of similar programmes in developed countries, i.e., they did not avoid the mistakes of the past. In addition, the problems caused by the bureaucratic functioning of the EU and nation states in the region were compounded by the region's paternalistic, corrupt traditions and the fact that cultural and institutional endowments could not be changed by leaps and bounds. This led to a considerable amount of community resources being wasted. The impact of the programmes was reduced by the fact that the venture capital market was not able to absorb the increased supply of capital everywhere within the prescribed period. In particular, the issue of finding and encouraging private investors caused many difficulties, and the provision of extensive discounts involved a large number of wealthy private individuals who were known to have good relations with the state administration. Therefore, statistics did not reveal that government venture capital programmes crowded out real private investors in the region. The positive impact of the increased role of the state was reflected in an increase in the supply of capital, the birth of some outstanding innovations, some transparency in corporate

operations, a revival of business angels, the entry of several new funds and an increase in the visibility of venture capital (*Karsai, 2017, 2018*).

After a slow recovery of the region's venture capital market following the 2008 crisis, there was a global boom lasting more than a decade, with EU countries in the region benefiting from very significant EU support. Since the crisis, the growth rate of the countries in the region that joined the European Union continued to exceed that of the EU-15, which led to further convergence among them (*Grievenson et al., 2021*), but convergence was strongly curbed by the constraints of growth based on foreign technology and cheap labour, the so-called medium income trap (*Garrett, 2004*). In the more developed countries of the region, wages were no longer low enough to provide a competitive advantage for them, and their innovation performance was not yet strong enough to compete with developed countries (*Győrffy, 2021*).

3. Methodology and data

The analysis of data on the raising and investment of venture capital in Central and Eastern Europe, and thus the assessment of the role of venture capital in economic development, is complicated by the fact that, compared to other forms of corporate finance, there is a much more pronounced lack of relevant data and access to meaningful data is difficult. Often, not only the volume of capital invested, but also the fact that the transaction is concluded, is not necessarily disclosed. Moreover, the data can be manipulated relatively easily: on the one hand, because the time elapsed between the pledge of capital and its actual drawdown is not taken into account, on the other hand, it is possible to play with the schedule of payments, and finally, the application of leverage also makes accurate measurement difficult (*Economist, 2021*). Investors are not interested in publishing transactions because they do not want to draw the attention of their competitors or the tax authorities to the transactions they have carried out. The withholding of data for funds investing capital from public funds is particularly distasteful, since the capital invested is considered to be public money and the difficulty of monitoring transactions also hampers social control. The lack of data affects regions with a less developed venture capital industry, such as the Central and Eastern European region, even more than in other parts of Europe.

Even if transactions are not secret, they are not necessarily recorded accurately, as data collection is based on *voluntary disclosure* by investors. Data on investment transactions in Europe, including Central and Eastern Europe, are based on voluntary data collection under the auspices of Invest Europe, a trade association representing Europe's private equity, venture capital and infrastructure sectors, as well as their investors, and therefore data on investment fund managers not affiliated to national associations are missing. In order to encourage reporting, data on individual transactions are published from the database only in aggregate form. Data for the 17 Central and Eastern European countries in the region are also aggregated separately on an annual basis by the *Central and Eastern Europe Task Force*, a dedicated working group of investor representatives in the region, commissioned by Invest Europe (*Cf. Invest Europe, 2021a*).

Another potential source of data, following the disclosures of venture capital firms, is the *commercial* collection and publication of investment data by companies such as Crunchbase, CB Insight, PitchBook and Dealroom. Especially in the area of small investments in start-up companies, there is a high level of data gaps and late registration. Among the database management organisations, Dealroom publishes the most detailed data on venture capital funding for Central and Eastern European companies (at times dependent on the sponsorship

of its reports). However, the investments in named companies in Dealroom’s database are a more tangible representation of the venture capital industry.

Invest Europe and Dealroom aggregate venture capital investment and exit data using *different approaches* and categories. Invest Europe captures investments in both traditional and technology companies, while Dealroom only captures investments in technology companies, i.e., only those that are fast-growing, scalable, no more than ten years old and seeking to gain a competitive advantage through the development of a technology-based innovation. Invest Europe’s database classifies investments by company lifecycle (seed, early-stage, later stage, growth stage, buyout), whereas Dealroom indicates each investment round by the letters of the alphabet following the seed stage. A difference in perspective between the two types of disclosure is that Invest Europe includes buyouts as a type of investment that results in majority or sole ownership and as a type of exit, while Dealroom records buyouts as an exit route only. The data available on exits in the Invest Europe database are particularly scarce, as exit transactions are not recorded at their actual value, but based on the volume of capital at entry, i.e., returns cannot be tracked.

4. Results

4.1. Capital managed by Central and Eastern European venture capital funds

To measure the weight of the CEE venture capital and private equity market in Europe, Invest Europe’s new *Invest Europe, 2020* survey provided new data in 2020, which for the first time gave a full cross-sectional picture of the volume of capital under management in European funds, and the distribution between the amounts *already invested* in portfolio companies and the amounts committed but *not yet drawn* by fund investors, by taking a narrow sample of funds and extrapolating the data to the whole group. While the capital in portfolio companies provided a preview of future exits, the unspent capital, the so-called “dry powder”, indicated how much capital investment could be expected in the near future.

According to this study, the venture capital and private equity capital managed by fund managers based in Central and Eastern Europe amounted to EUR9bn in 2019, representing 1.3 per cent of the capital managed by European funds. Of the capital under management in the region, EUR5bn was already invested, while EUR4bn, or 1.6 per cent of Europe’s “dry powder”, was available for further investments in the region (*Invest Europe, 2021b*). Over the five years 2016-2020, the volume of capital raised annually by venture capital and private equity funds in the CEE region also averaged 1.6 per cent of the total capital raised in Europe. (See Table 1.) Capital raising fell from more than EUR2.5bn in 2018 to EUR1bn in 2020, due to the impact of the coronavirus pandemic.

Table 1: Annual value of capital raised for venture capital and private equity in Central and Eastern Europe and annual share of the Central and Eastern European region, 2016-2020 (EUR billion and percentage)

Year	Central and Eastern Europe (billion euro)	Europe (billion euro)	Central and Eastern Europe / Europe (percent)
2016	0.848	84.1	1.0
2017	1.652	96.6	1.7
2018	2.648	102.9	2.6
2019	1.568	114.5	1.4
2020	1.047	100.5	1.0
2016-2020 average	1.553	99.7	1.6

Source: Own calculation based on Invest Europe / EDC 2007-2021 data

Investors in venture capital and private equity funds in the region were much more focused on financing *early-stage* companies than in Europe as a whole. While in Europe, buyout funds took 70-80 per cent of the fresh capital raised each year, in the CEE region the share of capital raised in buyout funds declined every year since 2018, out of an already declining volume of capital raised. (The breakdown of capital collection by lifecycle to be financed by the funds is presented in *Table 2*.)

Table 2: Distribution of the value of capital raised annually for venture capital and private equity in Central and Eastern Europe (CEE) and Europe by fund-financed lifecycles, 2016-2020 (percentage)

Fund stage focus	2016		2017		2018		2019		2020	
	CEE	Europe	CEE	Europe	CEE	Europe	CEE	Europe	CEE	Europe
Venture	18.9	10.8	35.5	10.7	28.6	12.2	50.7	14.6	63.7	15.4
Growth	12.2	5.7	4.4	7.7	3.7	9.8	17.9	9.5	17.9	15.3
Buyout	68.9	83.5	60.1	81.6	67.7	78.0	31.4	75.9	18.4	69.3
Total funds raised	100	100	100	100	100	100	100	100	100	100

Source: Own calculation based on Invest Europe / EDC 2007-2021 data

The amount of capital available for investments could also be inferred from the size of funds established in the Central and Eastern European region. Funds raised by institutional investors in the same year to finance companies with the same lifecycle were set up with *much smaller* amounts in the CEE region than in Europe as a whole. (*See Table 3.*) The difference increased in line with the increase in the corporate lifecycle to be financed.

Table 3: Average size of funds raised annually for venture capital and private equity in Central and Eastern Europe (CEE) and Europe by fund-financed lifecycles, 2016-2020 (EUR million)

Fund stage focus	2016		2017		2018		2019		2020	
	CEE	Europe	CEE	Europe	CEE	Europe	CEE	Europe	CEE	Europe
Venture	28	81	31	98	28	83	43	92	33	118
Growth	31	135	0	100	38	135	94	250	32	255
Buyout	46	1146	500	734	110	1173	120	968	181	797
Total funds raised	36	684	218	338	52	432	60	409	59	370

Source: Own calculation based on Invest Europe / EDC 2007-2021 data

Funds did not have an equal chance of winning investors' capital. Investors preferred tried-and-tested fund managers to so-called “*emerging*” fund managers who were trying for the first time or had only a few previous funds. On average, only one-fifth of the new capital collected annually went to the funds of the less experienced fund managers (*Duong, 2000*). However, only a *minority* of fund managers in the region were considered experienced, as most had not yet launched at least three new funds. Moreover, it also mattered which institutional investors' capital made up that fifth. The most “entrepreneurial” institutions were those providing public capital, as well as other asset management institutions, whereas foundations, pension funds and sovereign public funds, which in principle had the most capital to invest in venture capital funds, were inaccessible to “emerging” fund managers. Another difficulty for new fund raising was the minimum fund size required by institutional investors. This was because the investment rules of large institutional investors imposed a lower limit on the minimum capital that could be invested in a fund and an upper limit on the maximum ownership stake that could be acquired in each fund, making it difficult to invest in smaller funds. These two capital constraints particularly affected the more underdeveloped venture capital markets of the Central and Eastern European region.

4.1.1. State involvement in the recapitalisation of venture capital funds in the region

An important indicator of the maturity of the Central and Eastern European venture capital and private equity market was the share of capital from public entities (including the allocation of EU funds) in the capital flowing into the funds to *make up* for the shortfall in private capital. Overall, the share of capital pledges of public institutions in the funds set up in the region between 2016 and 2020 increased steadily, from a quarter of the *capital raised each year* to more than *40 per cent*, while the share of public capital in Europe fluctuated only around 6 per cent. At the same time, the share of pension funds, which accounted for almost 30 per cent of European venture capital funds' capital raised, did not even reach 5 per cent in the CEE region. (The annual share of institutional investors in the capital raised by the funds is shown in *Table 4.*)

There was a *strong correlation* between the type of financing institutions and the lifecycle of the portfolio companies that the funds were seeking to finance. The state was the largest provider of capital to early-stage funds across Europe. However, most of the capital of funds investing in expansive businesses came from pension funds, family trustees and wealthy individuals. Pension funds were also the primary financiers of buyout funds. In the CEE region, a high proportion of government capital was projected to finance *early-stage* transactions in the

future, while a low proportion of pension funds led to a lack of larger investments needed to expand and buy out companies.

Table 4: Distribution of the annual capital raised by venture and private equity funds in Central and Eastern Europe (CEE) and Europe by type of institution financing the funds, 2016-2020 (percentage)

Investors	2016		2017		2018		2019		2020	
	CEE	Europe	CEE	Europe	CEE	Europe	CEE	Europe	CEE	Europe
Government agencies	24	6	34	5	38	6	40	6	42	7
Fund of Funds	22	11	24	12	14	11	6	13	12	13
Corporate investors	0	2	0	4	4	3	18	2	9	3
Pension funds	16	29	4	24	1	28	4	29	4	29
Other investors	38	52	38	55	43	52	32	50	33	48

Source: Own calculation based on Invest Europe / EDC 2007-2021 data

During the period under review, the capital raised by venture capital and private equity funds, including from government sources, was very *unevenly distributed* across countries in the region. Over the five years, the EUR2.1bn coming from government funds to the countries of the region represented 27 per cent of the total capital raised. Nearly two-thirds of the capital coming from public sources went to the venture and private equity funds of two countries, Poland and Hungary. As half of the public capital pledged to the region's capital funds over five years was allocated to the funds in 2019 and 2020, it could make a significant contribution to compensating for the reduction in private resources due to the coronavirus crisis.

There was *no reliable record* of the exact amount of capital going to the region's venture capital funds from EU and national budgets, and only the data reported by venture capital fund managers to Invest Europe in each year on the sources of capital raised provided a rough guide to the estimation of public capital from various government sources.

Community funds available to EU member states enabled the development of the venture capital industry in the region for the first time in the 2007-2013 programming period (*Community Guidelines, 2006*). It was secured partly by awarding funds which could be applied for individually and partly, and this was a much greater amount, by opening a new opportunity to use the capital provided by the Regional Development Funds (ERDF). The *Joint European Resources for Micro to Medium Enterprises (JEREMIE)* programme, which allowed European funds to be used in this new way, in the form of repayable financial instruments, became known as the JEREMIE initiative (*EIF, 2012*). This programme also gave new members of the European Union the opportunity to invest part of the Structural Funds as a repayable source, even in venture capital. Only a *very small share* of the resources used by the countries in the region were used for venture capital, and only seven out of the eleven EU member states in the

region participated in the JEREMIE programme for venture capital (*Karsai, 2018*). However, in the next programming period 2014-2020, the number of member states using EU funds in the form of venture capital already expanded, so that EU funds contributed to the development of the venture capital industry *in all the member states of the region*.

Alignment with EU standards was important for the region not only because of the volume of capital that can be raised. The use of Community funds as venture capital required compliance with a number of provisions which placed the functioning of the venture capital markets of these countries on a *market footing* and thus made it more able to be involved in international capital movements (*Community guidelines, 2006*). The rules required, for example, that funds receiving public capital must also have had profit-driven private owners, and that co-investments linked to public capital must have reached a certain private source ratio, depending on the stage of development of the specific company at which the fund backed by public capital was at. Private investors should have been able to benefit from the investment benefits and assume the corresponding obligations in the same proportion as the state. (Unless an area was so underdeveloped that it was expressly considered to be supported) Funds should have been managed in a business-like manner, and fund managers should have been remunerated only on the basis of performance and selected through transparent and impartial tendering. Funds should have made their investment decisions on a market basis, with a business and exit plan in place, ensuring adequate representation of private investors. The rules also limited the size of investments depending on the size, development and location of the companies concerned.

The demand-driven allocation of venture capital funding from the 2007-2013 programming period *favoured the most developed European* venture capital markets and did not contribute to the EU's stated objective of promoting a pan-European venture capital market (*European Court of Auditors, 2019*). Recognising these lessons along the way, the European Commission already paid more attention to the development of venture capital markets in the region in the 2014-2020 programming period. At the same time, less attention was paid to whether the market *was able to absorb* capital from public sources or, in the absence of suitable investment targets, too much public capital already created competition for private investors and also financed the development of companies that would not be competitive in the market.

4.2. Venture capital and private equity invested in Central and Eastern Europe

The lack of venture capital was particularly detrimental to the growth of start-ups. These young, innovative companies with high growth potential, which wanted to enter the market with a new product or service, were characterised by scalability and disruptivity at the same time, as they had a very high mortality rate and were therefore very risky to finance. There was no record of start-ups in the region that had stalled due to lack of venture capital. However, comparable data were available on *unicorns* that already achieved significant success, i.e., start-ups valued at one billion dollars. 31 per cent of the unicorns in the region were unable or unwilling to raise venture capital for their growth, and these companies grew organically from other sources or without external capital. The comparable share in Europe was only 7 per cent (*Startup Heatmap Europe, 2019*).

If start-ups that started in the region but since moved their headquarters to another region were included in the Central and Eastern European start-ups, by the end of 2021, *36 Central and Eastern European unicorns* could be linked to this region. At the same time, the market value of the 100 most valuable technology companies here exceeded 130 billion dollars (*Digital Poland, 2021*). The value of venture capital invested in technology companies in the region also increased extremely strongly, and after 2016 it *doubled almost every year* (*Dealroom, 2021*).

In 2019, EUR2.3bn of capital invested in technology enterprises in the region increased 2.3 times to EUR5.4bn in the first half of 2021. It is true, however, that EUR1.4bn of this was given to companies that started in the region but later moved their headquarters elsewhere. In five countries in the region, the value of venture capital invested between 2015 and the first half of 2021 already exceeded EUR1bn. Of these, Estonia and Romania accounted for more than EUR2bn. Over the same period, local and relocated technology firms in Poland and Ukraine received over EUR1bn in venture capital, while in Lithuania the value of venture capital invested was around EUR1bn (*MCI Capital, 2021*).

However, if we were looking at whether the capital of venture capital funds in the Central and Eastern European region played a role appropriate to the development of the region, then the picture was not nearly as favourable. An analysis of Europe's venture capital industry, *State of European Tech 2021*, published at the end of 2021, showed that while the Central and Eastern European region accounted for 10 per cent of Europe's GDP and 27 per cent of the European population between 2016 and 2020, funds here only raised 5 per cent of all European venture capital. (See Table 5.)

Table 5: Total capital value raised by venture capital funds, GDP generated, and population share in each region in Europe between 2016 and 2020 (percentage)

European regions	Share of VC funds raised by region 2016-2020 (%)	Relative weight of GDP (%)	Relative weight of population (%)
Northern Europe	38	24	17
France and Benelux	31	21	16
Southern Europe	8	19	21
DACH	18	26	18
Central and Eastern Europe	5	10	27

Source: *State of European Tech 2021 (2021)*, p. 75

Venture capital funds based here were by no means the only ones involved in funding technology start-ups from the Central and Eastern European region, as founders could also turn to funds registered in other European regions, as well as in the US and Asia. In fact, the role of these extra-regional funds increased significantly in recent years. While in 2015-2016, just over a quarter of venture capital invested in start-ups in the region came from within the region, as of 2018, only *one eighth* (*Dealroom, 2021*). The participation of venture capital funds from outside the region in start-up funding increased in proportion to the size of the amount invested. International funds only became actively involved in financing, joining local funds or replacing them in the ownership of companies after the so-called "A" investment round, which represented an investment range of HUF4-15m.

4.2.1. The function of venture capital and private equity invested in the Central and Eastern European region

According to the data of Invest Europe, the annual value of investments in the venture capital and private equity market of the region more than doubled from EUR 1.6 billion in the period

2016-2020, before falling back to the same level in 2020 as a result of the crisis. The number of companies receiving funding increased by one and a half times over the five years, i.e., the number of companies financed in 2016, which was less than 350, already exceeded 550 by 2020. This reflected a significant *shift* in the financing of businesses at different stages of their lifecycle, due to the *lack of high-value buyouts*. Although investments declined not only in the region but also throughout Europe, the rate of decline was smaller in Europe as a whole, so the share of the Central and Eastern European region in the value of investments decreased significantly. At the same time, according to the number of companies financed, the region's weight increased due to the higher proportion of the youngest companies. In 2020, almost *one in ten* seed or early-stage European venture capital companies were born in the region.

The high *concentration* of venture capital and private equity investments was demonstrated by the fact that 82 per cent of the total value of investment in the region between 2016 and 2020 (with 76 per cent of the number of companies receiving funding) was made in just *five* of the 13 countries covered by Invest Europe data: Estonia, the Czech Republic, Hungary, Poland and Romania. The highest individual value investments were made in the Czech and Serbian markets, while the lowest average value of investments was used to finance Bulgarian, Slovak and Hungarian companies in the region.

The amount and number of investments in a country varied primarily depending on the lifecycle of companies financed in that country. For example, in the case of classic venture capital investments, i.e., *seed and early-stage* companies, the *dominance of the Hungarian and Polish markets* in the region was clear. In this lifecycle, investments in these two countries accounted for 60-70 per cent of the total value of venture capital investments in the region. The financing of the youngest companies in Hungary was particularly prominent in Europe as a whole. (Hungary ranked 7th in the EU in Invest Europe's 2019 ranking of venture capital investment relative to GDP and 5th in the 2020 ranking.) The outstanding performance of the Hungarian and Polish market in financing early lifecycle enterprises was linked to *strong state participation* in the financing of venture capital investments, given that the state mainly supported this development phase.

Transactions financing expansive businesses were concentrated in even fewer countries in the region. In addition to the *dominance of the Polish market* throughout the five years, the performance of one or two other countries was outstanding. The concentration of investments in buyouts was even higher. Usually, a high-value buyout transaction dominated the buyouts in a given year. The outstanding performance of the Polish market was also evident in this area. In 2016, this market accounted for 49 per cent of the value of investments, and 72 per cent in 2017. In 2018, Czech and Polish buyouts accounted for two-thirds of the value of transactions, while Estonian and Serbian buyouts accounted for half of the value of all buyout transactions in 2019. In 2020, three markets, the Czech Republic, Estonia and Poland, accounted for 84 per cent of the value of the buyouts in that year.

4.2.2. The size of venture capital and private equity investments in Central and Eastern Europe

During the period under review, the development of the venture capital and private equity industry was accompanied by an *increase in the size of transactions* worldwide. Venture capitalists increasingly turned to financing growth-stage businesses that required significant capital, leaving the supply of capital for smaller deals to business angels and accelerator and incubator companies, or crowdfunding platforms. This was also reflected in an increase in the average investment value per company. This process also took place in the Central and Eastern

European region, but on a smaller scale than in regions with a more developed venture capital sector.

For early-stage funded enterprises, the investment value per company in the CEE region at both the beginning and end of the five years examined was a *third* as high as in the whole of Europe. However, the average amount of investments received by companies in the expansionary phase *did not differ significantly*, and in three of the five years examined, the share of growth deals in the region was higher than in Europe as a whole. However, there was a significant difference in the average size of buyout transactions between the region and Europe as a whole. While the value of capital per buyout in the region was EUR26m in 2016, it was one and a half times that in Europe as a whole. In 2017, the average value of Eastern buyouts even exceeded that of Europe due to one or two high-value transactions, and in 2019 it was almost the same. However, in 2020, the number of buyout transactions decreased considerably, and the investments in the region were *much lower* than the European average for transactions that did take place. There were only eight individual buyouts above EUR500m in the CEE region, two in 2017, four in 2018 and two in 2019.

According to the data collected by Dealroom, which included among the Central and Eastern European companies the companies that changed their headquarters but originated from the region and focused exclusively on technology companies and only counted buyouts among the exits, the *share of transactions worth EUR 250 million or more* in the total investments in the region *increased sharply* between 2016 and the first half of 2021 (Dealroom, 2021).

4.2.3. Sectors preferred by venture capital and private equity investors in Central and Eastern Europe

Venture capital and private equity investors mainly promoted the development of three sectors in the CEE region: ICT, consumer goods and biotechnology/healthcare. The prominent role of the ICT sector was already evident at the beginning of the period under review, with more than 20 percent of the capital invested in this sector in 2016. However, in 2020, the weight of this area in the value of investments increased even further, exceeding 40 per cent of regional capital investments in that year. At the same time, the weight of capital invested in the production of consumer goods and the development of the provision of services here fell from an initial level of almost 25 per cent to 10 per cent, following a temporary sharp rise, meaning that the attractiveness of this area for investors in the region declined over time. The weight of the third most important area, biotechnology and health, remained at around 15 per cent after some fluctuations.

Regarding the sectoral distribution of investments in the preferred sectors, the proportions in the region *did not differ significantly* from the preferences for venture capital in the European continent, but rather differed only in the relative weight of the sectors. For example, in 2020, the share of the ICT sector in the region was slightly smaller and the share of consumer goods was slightly higher. (See *Table 6* for the sectoral distribution of venture capital invested annually in the CEE region between 2016 and 2020.)

Table 6: Annual distribution of venture capital invested in the Central and Eastern European region by sector of the companies financed, 2016-2020 (per cent)

Sector	2016	2017	2018	2019	2020
Agriculture	0.7	0	0.9	1.2	1.5
Business products and services	6.1	9.0	11.4	8.6	11.6
Chemicals and materials	1.7	0	0.2	0.7	0.1
ICT (communications, computer and electronics)	21.3	11.2	15.5	43.6	44.3
Construction	3.0	0.2	0.7	0.1	0.4
Consumer goods and services	23.9	74.1	26.7	16.7	10.4
Energy and environment	11.8	2.3	1.4	0.9	5.0
Financial and insurance activities	9.4	1.4	6.3	21.0	5.5
Real estate	0.2	0	0	0.1	0.4
Biotech and healthcare	14.7	1.1	30.9	4.4	14.4
Transportation	7.3	0.7	4.8	2.8	6.1
Other	0	0	1.2	0	0.2
Total (percent)	100	100	100	100	100
Total (million euro)	1640	3532	2762	3272	1668

Source: Own calculation based on Invest Europe / EDC 2007-2021 data

Among the thirty most valuable companies in the CEE region, funded by venture capital, bought by professional investors or listed by founders and investors, the predominance of companies using and innovating in the *digital revolution* was overwhelming. Most of the companies (9) became internationally valuable in the fields of media and services, the second and third most common sectors (with 8-8 companies) were e-commerce and the provision of software as a service, while a further three companies became successful in the field of fintech and two in the field of digital information technology. The strength of the region was mainly in the field of business management software. The relatively lower investment amounts available to founders in the region, as well as the greater supply of skilled programmers, naturally steered the founders of new firms toward software development (*MCI Capital, 2021*).

4.2.4. Ranking of Central and Eastern European countries based on venture capital investments

When comparing the volume of venture and private equity transactions in the region in Europe, it is appropriate to consider the value of venture and private equity investments relative to GDP. In 2016, the aggregate indicator for the region reached only *a third* of the European similar figure, but in 2020, *the gap was five times larger* to the detriment of the region. The deteriorating European position of the region due to the coronavirus pandemic could be well illustrated by the above figures for venture capital and private equity investments in terms of GDP, based on Invest Europe statistics.

In terms of the value of venture and private equity investments relative to GDP, the *differences* between the countries of the Central and Eastern European region were *extremely large*. Estonia's performance was outstanding, ranking first in Europe in both 2019 (2.462 per cent) and 2020 (1.282 per cent), ahead of even the most developed European markets, such as the United Kingdom and the Netherlands (*Invest Europe, 2020*, 2021**).

Of course, a high-value buyout could cause a significant shift in the order of countries in each year. In 2020, for example, the four largest investment transactions accounted for 35 per cent of the annual investment value of the entire region, while in 2019, the four largest investments also accounted for 42 per cent of the annual volume. Therefore, looking at the ranking of countries over a five-year period might provide a more objective picture.

With an average over five years, the countries reached the following order: 1. Estonia, 2. Lithuania, 3. Poland, 4. Hungary, 5. Latvia. In terms of value and number of investments, these five countries accounted for a significant share of total venture and private equity investments in the region, which indicated that investments were very *unevenly distributed* across the region, meaning that the region could not be treated as a single market for venture capital investments.

According to the Dealroom company's data on technological investments, if we consider the proportion of the population, there was a very *large difference* between the countries in Europe and the *countries in the region*. With a per capita investment value of almost EUR2,000, Estonia produced the highest per capita figure not only in the region but in Europe as a whole. Estonia was ahead of Sweden, Switzerland, the United Kingdom, Finland, the Netherlands, France and Germany. Lithuania was second in the Central and Eastern European region, but the rest of the region lagged far behind Western European countries. (The value of per capita venture capital invested in the countries of the Central and Eastern European region between 2015 and the first half of 2021 is shown in *Table 7*.)

Table 7: Value of per capita venture capital invested in technology companies in some countries in the Central and Eastern European region between 2015 and the first half of 2021 (EUR)

Country	VC funding per capita by country in Central and Eastern Europe, 2015-2021 H1 (euro)
Estonia	1967
Lithuania	361
Latvia	170
Croatia	133
Romania	116
Czech Republic	80
Bulgaria	60
Poland	48
Hungary	45
Slovenia	41
Ukraine	35
Slovakia	29
Serbia	23

Source: *Dealroom (2021)*, p. 20.

4.3. The impact of venture capital on the internationalization of start-ups in Central and Eastern Europe

One of the most important issues for start-ups in the region was international expansion. The region had a rich supply of technology products and services, but demand in the region was not enough for companies to scale. Therefore, to be truly successful, businesses needed to become international. To do this, they needed investors who were familiar with the technique of entering the international market, that is, they could help the companies here to expand internationally. When a company in Central and Eastern Europe was acquired, it did not necessarily lose its connection with the mother country. For example, its research and development department could remain local, thus the so-called spillover effect could be achieved.

According to a survey by *Startup Heatmap Europe (2019)* based on 860 responses, 57 per cent of start-ups in Europe had foreign branches, foreign employees, or foreign investors. By 2020, the pandemic brought this figure down to 48 per cent in Europe. 37 per cent of the start-ups surveyed had foreign employees, 8 per cent had foreign headquarters, 19 per cent had a foreign department, and 27 per cent had foreign investors. The smaller the home country, the higher the proportion of start-ups with international roots, but more than half of start-ups from larger countries also had international connections. In 2020, *46 per cent of start-ups in the CEE region*

had some foreign affiliation, including a particularly high proportion of Baltic start-ups. In the UK and Ireland region, however, the figure was much higher at 70 percent, while in Mediterranean countries, for example, it was only 32 percent (*Startup Heatmap Europe, 2021*).

The most widespread form of internationalisation was the employment of foreign workers, which also indicated the limited local supply of hard-to-find staff with appropriate expertise. The most difficult task for start-ups in the process of internationalisation was the establishment of a foreign headquarters, and less than a tenth of the European start-ups had one at the time of the survey.

Seed investments were usually carried out by local or at least regional funds. International funds would only join them in “A” and subsequent investment rounds. Nevertheless, it was a common practice among local funds to look for an international fund as a co-investor for their “A” round investments, and some local investors were already trying to do so in the seed phase. The participation of international venture capital investors in the financing of technology start-ups in the Central and Eastern European region *increased, especially since 2018*. By 2020, quite a few regional companies reached A, B, C, etc. venture capital investment phase (*Dealroom, 2021*).

The proportion of foreign investors also affected whether companies that had received large amounts of financing and become successful *had to leave the region* and move their headquarters elsewhere. The necessity of relocation was also influenced by the company’s profile, but the size, economic and political stability of the mother country, the fairness of market operations there and the adaptation of local regulations to international standards played a role in this. Dealroom calculated that in 2021, before the outbreak of the Russian-Ukrainian war, most companies in the region receiving more than EUR1m in investment left *Ukraine* due to political instability, while Polish and Hungarian start-ups were the least likely to relocate (*Dealroom, 2021*). The most popular destinations for relocation were the United States and the United Kingdom. It was important for the development of the economies of the region that the companies originally born in Central and Eastern Europe retained 50-90 per cent of their employees (*Dealroom, 2021*). The pandemic also affected the international interconnection of companies by making travel more difficult. The widespread availability of remote working created a favourable situation for start-ups in Central and Eastern Europe, while finding, acquiring and retaining talented professionals became particularly difficult during the crisis.

According to *Mason and Harrison (2006)*, the acquisition of start-ups typically promoted the *return* of the founding entrepreneurs to the home country. This occurred when the entrepreneurial team left the company that was acquired by others and channelled part of its newfound wealth into promising new entrepreneurial activities. This might be the setting up of another business, becoming an investor in other people’s young companies (for example, as a business angel or venture capitalist), but former founders could also help in other ways, for example, by supporting community activities, institutions, and engaging in civil initiatives. The process of the return of the founders described above could also be observed in the CEE region. Generations of successful company founders from here learned how to make companies successful. An important component of the growth model, in addition to the substantial amount of venture capital, was an adequate supply of experienced developers and formerly emigrated founders. In fact, every country in the region now has more than one founder who became a “star” in his own right and around whom a whole network of companies was built. Success stories required that *the founders’ ownership stake did not fell so much* during the many rounds of funding for start-ups that it prevented them from becoming wealthy on exit. For a company

that became a unicorn, even a reduction in the average one-third founder's stake to 10 per cent at the start-up stage could make it possible to acquire substantial wealth.

4.4. Perspective of the Central and Eastern European venture capital market

The coronavirus crisis that started in 2019 sharply divided companies into two groups: those that were able to take advantage of the new opportunities created by the pandemic and those that suffered a sharp downturn due to the pandemic or were forced to exit the market. The government's response to the crisis focused on providing guarantees for the borrowing of companies, but this could provide less solutions for fast-growing start-ups that did not yet have continuous income or tangible assets to cover the borrowing. They were helped more by co-investment schemes, tax incentives for business angels and convertible debt instruments (Mason, 2020). The opportunities of the venture capital fund portfolio companies mainly varied depending on the stage of their development at the time of the crisis, the extent to which the sector they represented was exposed to the pandemic, and the amount of available capital that the companies themselves currently had as a result of their previously received investments. In most countries with a developed venture capital market, governments earmarked mainly public funds for venture capital funds to make up for the loss of private resources for start-ups with a marketable product or service and the potential to grow rapidly. However, when using public capital, they were careful to ensure that market aspects prevailed, and therefore they made the provision of state aid *conditional on the association of private resources* to a certain extent. Investment data for 2021 indicated that the region managed to overcome the coronavirus pandemic that caused temporary standstill, and the countries here were able to focus on developments enabling the fight against the pandemic as well as online health care, and the way the venture capital market operated in this region applied solutions that did not involve personal contact.

However, the *Russian invasion* launched on 24 February 2022 brought an immediate end to the form of globalisation that had been known in the last three decades, and it is expected that it will redraw the geopolitical balance of power in a number of ways, while exerting great pressure on the transformation of supply chains, thereby slowing down growth in the region and globally. The volatility of energy, equity and debt markets, supply chain disruptions and inflation were already a major challenge for venture capitalists planning transactions in 2022. The increasingly inflationary environment is inherently disadvantageous for the venture capital and private equity industry, as the crisis drives investors to other assets and deteriorating exchange rates make international expansion more difficult, and global markets become more closed and fragmented, making them harder to access. The real return potential of the venture capital and private equity sectors will be reduced, their ability to attract capital will decline, and the scope for rebalancing underperforming portfolio elements will be reduced. Shorter-term investor returns, i.e., liquidity and portfolio-level performance, will be decisive for investors.

Due to the geographical situation of the Central and Eastern European region, it is *particularly exposed* to the Russian-Ukrainian war. The sanctions imposed because of the war are leading to the closure of Russian interests in much of the international business world. Although most funds do not disclose the identity of their investors, venture capital and private equity funds seek to exclude sanctioned institutions or oligarchs from their investor base (Temkin, 2022). A further reaction is to promote the relocation of successful start-ups established in countries close to the war to other countries. Against this background, the ongoing war in Ukraine has a very significant impact on the entire Central and Eastern European region, severely *reducing its chances of deeper integration* into the international venture capital industry, *which were just beginning to improve*.

Signs of a *significant deterioration in the investment environment* worldwide are affecting the venture capital industry in the region. The economies in the region are suffering from a surge in inflation, a slowdown in growth in the euro area, an increasing risk to investment and, in particular, a forced shift in gas and oil supplies. In 2022, the number and value of venture capital investments in the United States decreased noticeably, the stock exchanges became depressed, supply chain disruptions occurred, and the level of inflation also increased. The share prices of companies newly appearing on the public market have started to fall, which discourages newer companies from entering the stock market, and therefore their former investors are expected to be less able to withdraw from their investments, thus further reducing the chances of financing newer transactions. This also affects the valuation of unquoted start-ups, making it more difficult for them to attract fresh capital, while recently recapitalised companies are even less likely to feel the change in investor sentiment (*Economist*, 2022).

5. Future research directions

A further important area for future research on the venture capital sector in the CEE region could be to improve data collection on the functioning of the sector and the development of start-ups, which could be used as a basis for an in-depth analysis of the impact of investments on the region's economies. In the Central and Eastern European market, accurate inventory of exit data by exit routes and valuation at the level of transactions and funds is particularly inadequate based on the yields achieved. Comparing the exit solutions chosen by investors in the region with those of developed capital market countries can contribute to a deeper understanding of the opportunities and constraints for start-ups that have started and succeeded in the region or have moved outside the region in the meantime.

6. Conclusions

Due to the nature of the industry, the venture capital sector can only operate in a *globalised way*. In the seed phase of innovative companies capable of rapid growth, local investors are involved in the selection and financing of perspective companies, and then together with their foreign counterparts, they develop increasingly international companies. However, the main players in financing international expansion are now reputable international venture capital funds that have the capital and expertise to successfully grow companies, take them public or enter into agreements with professional buyers.

A *significant change* took place in the venture capital market of the region in the half-decade examined between 2016 and 2020. Many of the start-ups here were preparing for an international expansion from the beginning, so they were looking for partners who could help. Several start-ups skipped domestic investors in the first place and turned to international players for investment. The region is characterised by a *very large supply of capital* for a wide range of start-ups, with *public fund managers investing public funds* to develop the underdeveloped venture capital industry and improve the supply of capital, but not selecting companies solely on market criteria. Since government intervention is predominant in many countries in the region, market conditions and market behaviour have not yet been able to take root in many places. The key to success for companies living on public rent-seeking and government orders is not efficiency or value added, but rather maintaining proper connections with public decision-makers. Thus, the persistence of significant state dominance, which catalysed the development of the start-up sector and helped to counteract the effects of the coronavirus outbreak after its arrival, may not only help but also hinder the development of the start-up sector in the region, as the natural selection mechanism of the market cannot be clearly enforced. Thus, a *dual*

economy can be seen on the market of start-ups in the CEE region: some of them are trying to make a living from the market and stay away from public support, whereas others are trying to prosper through public assistance. In a time of crisis, bailouts from public funds without market discretion can perpetuate this situation.

The data on venture capital investments and internationally successful start-ups also clearly show that the institutional environment for venture capital has *developed very unevenly* in the CEE region. The countries in the region can be broadly divided into four groups according to the way the venture capital industry operates. The first group includes the Baltic countries of Estonia and Lithuania, which, by opting for liberal market regulation and the spread of digitalisation, have a vibrant venture capital market with internationally strong results. The second group includes two countries operating under illiberal conditions, Hungary and Poland, where the market is split between a world of start-ups artificially inflated by the EU and national budgets, and a world of internationally successful innovative businesses, with the help of locally grown, experienced private fund managers. The third group includes the other countries in the region that have joined the European Union, where EU funds are helping to strengthen the market economy and where the institutional transformation is well underway. In the fourth group of countries (outside the EU), the venture capital market is still in its infancy and, apart from a few exceptionally successful companies, the market here is more likely to be the site of a few large buyouts.

The venture capital industry can only be effective in its role as a driver of innovation if *freedom of enterprise and fair competition* are fully respected in the markets of the CEE region. Infrastructure is being built to support the sector's operations, education is providing a workforce with up-to-date skills and language skills to keep pace with technological developments, and the recruitment and retention of skilled workers is made possible by the use of share options on attractive terms, facilitating the start-up and operation of businesses and the exit of loss-making firms from the market, with the opportunities offered by digitalisation for remote working and the possibility of operating companies in other countries through the use of special visas.

Recognising these conditions, founders and managers of successful companies with roots in the region, with the wealth and experience they have acquired, are more likely to choose their home countries to continue their activities, mentor start-ups there, invest in new "successful" businesses as business angels or through venture capital funds, and thus contribute directly and indirectly to the development of their home country's ecosystem through the example they set. However, if not the best companies are selected in the market for promising, fast-growing innovative businesses, because state subsidies and public investments distort the sources of the revenues that can be generated, leading to rent-seeking behaviour, the venture capital market cannot play its role as an economic development tool, the functioning of the system is distorted and the integration of venture capital into the international market in the countries concerned is slow and incomplete.

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