

DOCTORAL SCHOOL IN REGIONAL AND ECONOMIC SCIENCES

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The current situation of Hungarian startup companies
in the comparison of the Visegrad countries

Thesis book

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Table of content

1	The aim of the thesis	31
2	The structure of the thesis	32
3	Research questions and hypotheses	35
4	Research methodology	39
5	Evaluation of the hypotheses	41
6	Conclusions	43
7	New, results, novelties, discussion and an outlook for continuing the research	46
	The Author's publications	50
	The Author's conference presentations on this topic.....	52
	References.....	54

1 The aim of the thesis

In my thesis, I examine the creation and the operation of Hungarian startups among? the V4 countries, presenting successful best practices that can serve as a model for future SMEs, contributing to the innovative and sustainable performance of this sector. It aims to present the development trajectory of the startup ecosystem in the V4 countries and the position of Hungary within it. Due to the complexity of the topic, I have analyzed the issue using a combination of disciplines (economics, regional science) and methodologies.

The uniqueness of the research experiment lies among other things, in the fact that startups do not exist as a registered form of enterprise, neither by the National Tax and Customs Administration nor by any other institution. , Neither in Hungary nor in the Visegrad countries there is no official registered database of these enterprises. Thus, I used a unique data collection approach in my research, which was greatly assisted by excellent experts¹ from the countries of the study, with whom I had made contact during my doctoral studies and who willingly supported my research.

The relevance of the topic is justified by several factors. First, the UNCTAD (2019) report has highlighted that the digital revolution has transformed our lives with unprecedented speed and scale. Alongside its enormous opportunities, it is a daunting challenge for societies. New technologies can make significant contribution to the achievement of the SDGs, and there is a need to make a conscious effort to harness their social and economic potential. Digital transformation has accelerated and amplified the changes that had already begun in the global business environment: industrial boundaries have become more porous (Szalavetz, 2013) and digital technology firms, i.e. competitors from outside the industry, are emerging in traditional industries. "Thus, technology players are creating serious competition and sometimes even displacing the former leaders of traditional industries, because they are turning the parameters and characteristics of competition upside down" (Szalavetz, 2020,10).

¹ Special thanks to Professor Agnieszka Skala, Faculty of Management, Warsaw University of Technology; Associate Professor Miroslav Pavlak, Faculty of Management, University of West Bohemia, Plzeň; Acting Director Marian Zajko, Institute of Management, Slovakian University of Technology; Győr-Moson-Sopron County Chamber of Commerce and Industry; Csongor Biás, Managing Director of Startup Hungary; Gabriella Falu, Head of Communications of the INPUT Program; Attila Khader, Investment Director of Startup Campus; Tamás Turcsán, Director of Pozi. io; Krisztián Szabó, StartITup Győr Association. I thank them for their support and guidance during my research.

In 2021, the performance of startups will break previous records, with 959 unicorns² born by the end of 2021, according to CB Insight (cbinsights.com).

All this suggests that venture capital investors in the US - not in the Central European region - compete for promising startups (Szalavetz 2022). Therefore, the study of startups, who are the most prominent actors in digital transformation, is important and timely.

As Nagy (2020) stated, startups are the most efficient source of innovation, and their activities not only generate benefits for the economy but also for the society. Thus, the development of startups is of particular importance, and it is important to explore and understand their specificities and the support environment in which they operate.

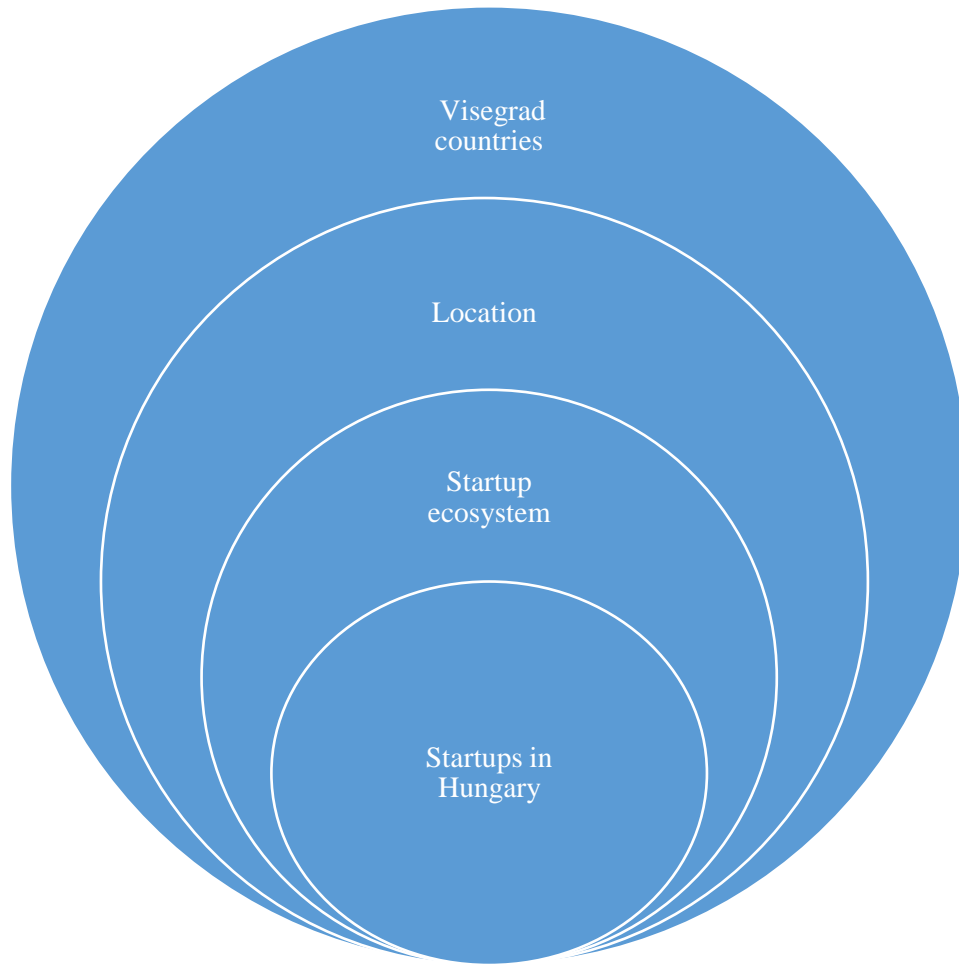
"The development of startups and the innovative ecosystems are not just one of many opportunities for a society, but an obligation" (Nagy 2020, 11). Looking at the strengths of the Visegrad countries, Gál and Lux (2022) highlighted product innovation and the potential of startups, in addition to internationalisation. All this suggested that the research topic is timely and important. due to its relevance in the context of regional policy, economic policy, foreign policy and foreign economic policy, as Agnieszka Skala (2019) has put it: startups, their ecosystem and their corporate culture are a new and promising research area.

2 The structure of the thesis

After the introduction, I will describe the spatial and temporal dimensions of the investigated area. The research focuses on the economically important, moderately developed post-socialist Visegrad countries (Czech Republic, Poland, Hungary and Slovakia) with a similar historical past and socio-economic structure in the Central and Eastern European Greater Region (Kotosz-Lengyel 2018). The thesis contains 346 sources (262 scientific, 81 Internet sources and three additional legislations). It covers three topics: location theories as part of regional economics, followed by an interpretation of the concepts: startup and startup ecosystem. In the second logical unit of the thesis, I present my fundamental/basic research: database analyses, case studies and in-depth interviews, followed by my primary research: a survey of startup entrepreneurs in the V4 countries. The fourth logical unit of the thesis is the evaluation of the results of the research, complemented by some reflections on further research options, which I conclude with a summary chapter (Figure 1).

² Startups with an exit value of over one billion dollars (Goreczky 2021b).

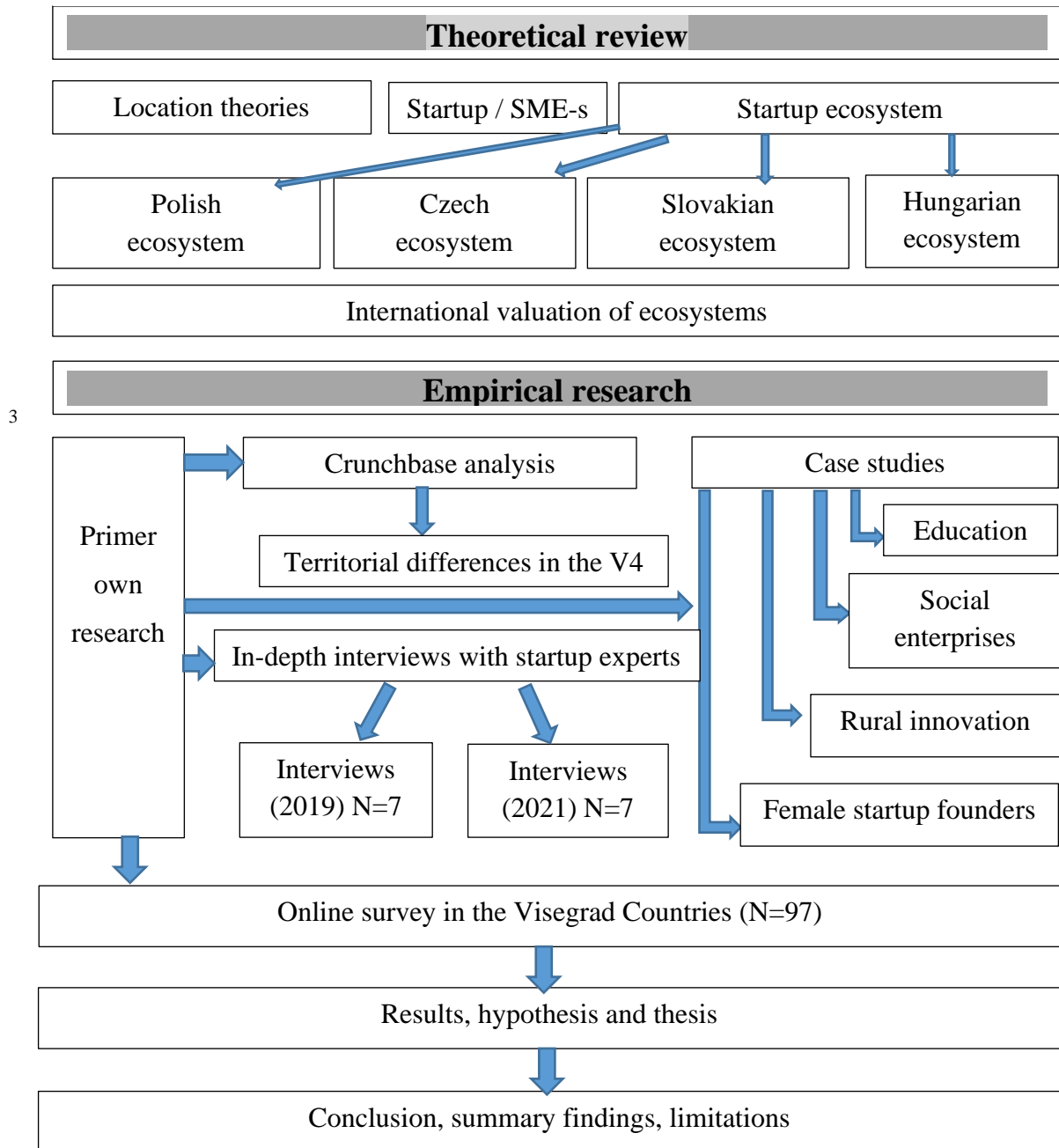
Figure 1. The research model



Source: own compilation

I have published some of research results in national and international journals. The structure of the thesis is summarized in Figure 2.

Figure 1. The structure of the thesis



Sources: Own compilation

³ As reported by the Kauffman Foundation, the database is increasingly used by the venture capital industry as "the primary database of the tech/startup world" (Dalle et al. 2017, 5). CB is one of the largest and best-known sources of startup information, covering startup companies from 199 countries around the world in addition to Hungary, making it the most comprehensive source of information for high-tech companies and investors (Pisoni - Onetti 2018).

3 Research questions and hypotheses

Based on the theoretical review and the results of international empirical research, I identified seven questions and formulated five hypotheses. My research questions:

RQ1: What does distinguish startups from traditional enterprises?

RQ2: How does the development of market economies influence the creation and expansion of startups?

RQ3: Are there or can be institutional environments and activities (subsidies) that stimulate the creation and operation of startups? What characterizes this ecosystem?

RQ4: What are the differences and similarities in the development of startups and their supporting ecosystems in the V4 countries?

RQ5: What makes state support for startups in Hungary effective?

RQ6: What is the impact of the metropolitan milieu on the emergence and functioning of startups?

RQ7: How has the global economic crisis (such as the recent epidemic) affected startups and their ecosystem in recent years?

The research questions and hypotheses can be divided into two main groups, theoretical and empirical questions and hypotheses, depending on the methodology used to answer them:

Based on the research questions, I formulated the following hypotheses:

H1: Startup entrepreneurship is a specific form of entrepreneurship; its creation, spread and operation are influenced by the level of development of market economies, which can be detected in the ecosystem that has been established. Hypothesis H1 is a theoretical hypothesis that examines the difference between startups and traditional SMEs, but also the environment in which they are created, grow and operate. This environment - the market, the policy, financing and support environment, culture and human resources - are interlinked into a single organic system to support and encourage the creation and successful operation of innovative startups. Tripathi et al (2019) analysed a total of 18 310 online resources (including 63 papers specifically on the startup ecosystem) to define the concept of the ecosystem. A startup ecosystem is a distinct and defined region where entrepreneurs, who embody innovation (Németh - Németh - Heidrich - Vajdovich 2022; Heidrich -Németh - Németh - Vajdovich 2022) and support organisations collaborate to create new startups and to facilitate the development of existing startups. The term 'ecosystem' is most often used to describe the network of 'people', 'organisations' and 'resources' that are used to create startups."

In general they mean entrepreneurs and investors; by 'organisations', investment institutions, large corporations (including multinationals) and universities; by 'resources', the supporting infrastructure provided by people and organisations to help startups to emerge (Tripathi et al. 2019). This hypothesis is a theoretical hypothesis.

H2: The development of the market economies in the Visegrad countries influences the formation and operation of startups at different levels, and there are many differences between the countries. This thesis aims to present Hungary's position in the V4 countries, therefore hypothesis H2 is based on question RQ4, and aims to identify similarities and differences between the startups in the studied large region, which results from a similar historical past and similar socio-economic structure. To prove the hypothesis, I used the results of the specialized literature analysis and the answers to the relevant questions from the V4 startup survey (2021).

H3: Central measures for the development of startups in Hungary (2011-2021) are significant, supporting the emergence and development of the startup ecosystem with the involvement of local actors. In hypothesis H3 I examine the role of central measures. Based on the literature analysis, I presume that central measures are significant for the development of startup enterprises. The aim is to support the creation and development of an economic climate and a conducive ecosystem to innovative startups by involving local communities, local actors and ecosystem actors. Among the specificities that emerged as a result of hypotheses H1-H2, I will explore more in depth the role of central policies. "In many countries, the state plays a major role in providing capital to the venture capital market" (Karsai 2014, 8). However, in Hungary, the role of the state as an investor in the venture capital market has undergone a significant transformation in recent decades (Karsai 2014). In the current epidemic situation in Hungary, the National Research, Development and Innovation Office has launched a special programme called COVIDEA Idea and Startup Competition (nkfih.gov) for projects and startup ideas to combat, treat and test the COVID-19 coronavirus. To prove the hypothesis, I used the results of the survey to the relevant questions on the topic.

H4A: Local factors strongly influence startups within the ecosystem. Based on RQ6, I first formulated hypotheses H4A and then H4B, which investigate the location choice of startup businesses in relation to regional science. I assumed that local factors strongly influence the location, emergence and continued operation of startups. I expect evidence for the H4A hypothesis from the analysis of in-depth interviews and the V4 startup questionnaire (2021).

H4B: The metropolitan environment and the capital elements of the area have an inspirational effect on the emergence and successful operation of startup businesses.

Hypothesis H4B investigates the role of the metropolitan environment and territorial capital elements in the choice of location of the startup companies. Based on the literature analysis (Singh 2017; Adler - Florida - King - Mellander 2019; Szolnoki - Papp-Váry 2020), I assume that metropolitan environment and territorial capital are more inspirational for the formation and successful operation of startup businesses, i.e. that geographical determinism is limited to metropolitan areas. For the hypothesis testing, I focus on regional centres in the emerging region of Europe, the V4 countries, which are the engines of economic growth and innovation spread along the hierarchy of cities. In addition to capitals, regional centres and medium-sized cities also play a role in spatial growth and innovation potential in the V4 countries. For this reason, it is important to identify which regional centres and medium-sized cities can be characterised as both smart cities and startup hubs (Kézai-Lados-Fischer, 2020). I expect the analysis of the Crunchbase database (2020) and the responses to the V4 startup questionnaire (2021) to prove this hypothesis.

H5: There is a difference in the crisis and shock resilience of startups in the V4 countries and in Hungary. In April 2020, when I wrote my research concept, a COVID-19 pandemic was sweeping around the world and on 11 March 2020, the WHO (2020a,b) declared it a global pandemic. The public became increasingly aware of the dangers of economic and social crises as a result of the pandemic (Sady 2020), and I considered it a timely issue. The H5 hypothesis aims to explore the crisis or shock resilience of startups as the impact of the pandemic caused by COVID-19, which was raging at the time of the research, on startup businesses. The European Commission (EIC 2020) has called on startups to support any idea or business that offers a solution to the pandemic caused by the COVID-19 virus. Thus, on 11 March 2020, the European Commission published an immediate call for proposals for €164 million in funding from the European Innovation Council fund (EIC 2020). This immediate funding was available to startups and innovative SMEs working on technologies and innovations that could help combat, treat and test the COVID-19 outbreak (EIC 2020). According to the call for proposals, the European Commission was looking for startups, among others, to provide solutions to the health crisis. To prove the hypothesis, I will use the answers of the in-depth interviews (2021) and the V4 startup questionnaire (2021).

Table 1. Research methodology

<i>Research question</i>	<i>Hypothesis</i>	<i>Research methods</i>	<i>Chapter</i>
RQ1-3.	H1: Startups are a specific form of entrepreneurship; their creation, spread and operation are influenced by the level of development of market economies, which can be seen in the ecosystem they have created.	Relevant literature review	3.2–3.7
RQ4.	H2: The level of development of the market economies in the V4 countries influences the emergence and functioning of startups to different degrees, and there are many differences among countries.	Relevant literature review, V4 startup survey (2021)	3.7 4.4
RQ5.	H3: In Hungary, central measures for the development of startups (2011-2021) are significant, supporting the emergence and development of the startup ecosystem with the involvement of local actors.	V4 startup survey (2021)	4.4.5
RQ6.	H4A: Within the ecosystem, local factors strongly influence startups.	Literature review, in-depth interviews and V4 startup survey (2021)	3.7 4.3 4.4.6
RQ6.	H4B: The metropolitan environment and the capital elements of the area are inspirational for the emergence and success of startups.	Literature review, data analysis and V4 startup survey (2021)	3.7 4.1 4.3 4.4
RQ7.	H5: There are differences in the crisis and shock resilience of startups in the V4 countries and Hungary.	In-depth interviews and V4 startup survey (2021)	4.3 4.4.

Source: own compilation

4 Research methodology

The empirical part of the thesis consists of a qualitative and a quantitative research. Thus, I chose a mixed-methods research methodology, more specifically an explanatory sequential design methodology following Király- Dén-Nagy- Gering-Nagy (2014): in addition to literature analysis, I conducted quantitative database analysis and questionnaire analysis, qualitative in-depth interviews, and case studies.

In the first part of the thesis, I conducted a literature review as a secondary research methodology, and then I used the international startup database Crunchbase to determine the regional differences in the V4 countries. Subsequently, I conducted my research in the form of case studies, which underpinned the dissertation. These helped me to understand the situation and functioning of startups, to map their various relationship systems, to understand their operating models and, in particular, to identify and systematise elements of the local/urban milieu. As in the case of the competitions for startups, the candidate startups are evaluated on different themes, I continued this train of thought by examining Hungarian startups on four themes: education, social entrepreneurship, rural innovation and women. The case studies presented will help to explore and understand how the Hungarian ecosystem works and will serve as a basis for the V4 startup survey.

Then I conducted in-depth interviews with the actors of the startup ecosystem in two phases: in 2019 and 2021, to understand the situation in Hungary. The individual semi-structured in-depth interviews were based on Babbie (2021). Data was collected through expert interviews based on a predefined interview schedule. The existence of an interview outline did not prevent the real interaction between the researcher and the respondent during the face-to-face interviews. In-depth interviews (n=7) were conducted in 2019 with experts and members of the Hungarian startup ecosystem in the West-Transdanubian region. The in-depth interviews aimed to explore the knowledge, perspectives and opinions of Hungarian startups. Then, in the context of the global economic crisis, I conducted further semi-structured in-depth interviews (n=7) in May-June 2021. The interviewees were selected from the Hungarian startup ecosystem and recruited through a snowball method at startup events.

To study the V4 ecosystem as comprehensively as possible, I conducted a questionnaire survey among V4 startups after the case studies and in-depth interviews.

My aim in compiling the questionnaire was to provide an up-to-date picture of the V4 startup ecosystem with the 2021 survey, with a particular focus on Hungarian startups and the ecosystem around them.

The questionnaire was based on the 84-question validated questionnaire of the V4 Startup Report 2016/2017 survey (Beauchamp & Skala, 2016/2017), but I adapted only the questions from the original questionnaire that are relevant to my research, i.e. the ones on location theory and regional differences, 53 in total. The questionnaire is structured around seven themes. The themes contain questions with different numbers of items. The first theme (Section A) covers demographic data, followed by the second (Section B) which examines the respondent's past experiences. The third theme (Section C) is designed to explore the demographics of the startup and the fourth (Section D) is designed to explore the conditions under which the startup operates. The fifth theme (section E) explores the use of space and the sixth (section F) explores the location theory, for which I adapted the questions used in the survey of the HBH Strategy and Development Ltd. and Collective-Intelligence Ltd. consortium (2018). Finally, for the last seventh topic in the questionnaire (section G), I used the questions from the Design Terminal (2020) study to investigate the crisis and stress tolerance of startups.

The original sample for the study was 3902 startups, however, the final sample included a total of 2202 startups due to incorrect email addresses. After 8 months of research, the number of completions reached 152, but after cleaning, a total of 97 evaluable items remained (20 Czech, 47 Hungarian, 24 Polish and 6 Slovakian startups).

The questionnaire data were processed using Microsoft Excel (Microsoft, (2016), Redmond, Washington: Microsoft) and IBM SPSS (IBM Corp., 2016, IBM SPSS Statistics for Windows, Armonk, NY: IBM Corp.). Descriptive statistics were used to summarize the characteristics of the respondents, and Khi-square, Fisher's exact test, one-sample and independent samples t-test, and Mann-Whitney tests were used to compare startups in the capital and other locations. To improve data handling, I performed a principal component analysis with Oblimin rotation on a subset of the questionnaire. In line with the generally accepted practice, I kept the probability of a first-order error at 5%, so I considered the $p < 0.05$ level to be significant for statistical tests. For graphs, I have indicated the 95% confidence intervals.

5 Evaluation of the hypotheses

The literature review, based on sections 3.2-3.7, first showed that while small and medium-sized enterprises are defined primarily by their size, startups are defined by their ambition and approach, and are founded from the outset with something new, something that is completely disruptive to the market and has high growth potential. **A startup is therefore a specific form of business development, different from traditional corporate structures. The actors that shape the operating environment of startups and their environment are brought together in an organic system, creating an ecosystem that is supportive of development in the region, influenced and justified by the level of development of market economies.** *Hypothesis H1 is confirmed.*

The international assessment of ecosystems in literature chapters 3.6 to 3.7 has shown **that the level of development of market economies in the V4 countries influences the emergence and functioning of startups at different levels and that there are many differences between countries.** The results of the literature analysis were also supported by the survey (chapter 4.4.6), as differences between Hungarian and other V4 startups in the areas of site selection criteria, site assessment and financing were found, thus hypothesis *H2 is fulfilled.*

Based on the V4 startup survey in chapter 4.4.5 **the sources of capital listed are not significant for startups founded before 2015 and after 2016, i.e. the public sector was of very little importance in supporting startups in both periods.** *Therefore hypothesis H3 is not fulfilled.* This is in line with the findings of Karsai (2022a,b,c) that a dual economy operates in the startup market, where some startups try to survive on the market and keep away from state support, while others try to survive with help of the state. This dual economy prevents startups from operating efficiently and succeeding internationally, while at the same time stifling the involvement of global venture capital in the development of the countries concerned. Overall, the entire region is losing its ability to attract capital.

The research has shown that the ecosystem develops and functions in several dimensions. In the national dimension, institutional and support frameworks are developed, while in the territorial/local dimension, the cooperation of local actors creates economic development. Startups also have a place in this environment, but their links with local actors are different. University cooperations stimulate innovation activity, chamber of commerce links build the network of contacts for businesses, and local authorities can be involved in the local supply.

It is clear, and this applies to all V4 countries, those big cities can provide startups with meaningful impact, influence, market conditions and new resources. The capital elements in cities provide a continuous impetus to local businesses, which innovation-oriented startups take up and incorporate more vigorously into their activities and their development. It is clear - and this has been clearly demonstrated by the in-depth interviews (chapter 4.3), the case studies (chapters 4.2.1-4.2.4) and the questionnaires for V4 - that local and urbanisation influences are an important part of the development ecosystem and exert a meaningful - albeit only indirectly detectable - influence on the creation and development of startup businesses. Therefore *I accept hypothesis H4A: local factors within the ecosystem strongly influence startup businesses.*

Based on the results of the literature analysis in chapter 3.6, the database analysis in chapter 4.1, the in-depth interviews in chapter 4.3 and the survey in chapter 4.4, *I accept hypothesis H4B, i.e. that the metropolitan environment and the capital elements of the area are inspirational for the formation and successful operation of startups.* Startup hubs/centres are formed where there is innovation (e.g. university), where there is territorial capital, where there is a supportive economic environment (e.g. chamber of commerce and industry, coworking office/community office, incubator house, business angel investor, etc.), i.e. where the city reaches a level of development where it becomes attractive for such innovative startup ideas/enterprises for reasons of economies of scale.

H5: There is a difference in the crisis and shock resilience of startups in the V4 countries and Hungary was not fulfilled, as neither the in-depth interviews with startup entrepreneurs in chapter 4.3 nor the results of the survey of startup entrepreneurs in the V4 countries (chapter 4.4.7) demonstrated that there was a difference in the crisis and shock resilience of startups in Hungary and the Czech Republic, Poland and Slovakia. The study showed that the different effects were caused by sectoral differences.

6 Conclusions

Based on the literature and empirical research, it is clear that the research on the organic system of startups and the actors shaping their operating environment and their environment, i.e. the startup ecosystem, is a topical and relevant issue. On the one hand, new innovative ideas offer solutions to overcome the economic, health and social crisis caused by the global challenges such as the coronavirus epidemic and the war against Ukraine, and on the other hand, the digital transformation of the 21st century has accelerated and amplified the changes in the global business environment and the emergence of non-industry competitors in traditional industries, which have fundamentally disrupted the market economy. Startups are the most effective source of innovation and their activities not only generate economic benefits but also have the potential to generate benefits for society

The uniqueness of the present research experiment lies in the fact that there is no official registered database of these enterprises either in Hungary or in the Visegrad countries.

This dissertation analyses the somewhat under-researched topic of Hungarian entrepreneurship research, the creation and operation of Hungarian startups in the Central and Eastern European metropolitan area of economically important, moderately developed post-socialist countries (Czech Republic, Poland, Hungary and Slovakia) with a similar historical past and socio-economic structure.

In the first part of the thesis, the dissertation links to regional economics, first exploring the development of theories of establishment and then the differences between traditional small and medium-sized enterprises (SMEs) and startups: the dissertation identifies the fundamental difference as being that a startup is established from the outset with something new, something that is completely disruptive to the market and has high growth potential, then summarises the different interpretations of the concepts of startup and ecosystem, based on a literature analysis. A startup is a company that is less than ten years old, uses highly innovative technologies and/or business models and is aiming for significant growth (in sales and/or employment). The dissertation will interpret the concept according to this definition, i.e. a startup is a specific form of business development that differs from traditional corporate structures and their evolution. It also presents the development trajectory of the startup ecosystem in the V4 countries, providing insights on where the V4 startup ecosystem is positioned in the global competition based on the Startupblink (2021) report. The Polish ecosystem leads the way, followed by the Czech, Hungarian and finally the Slovakian.

Cities that stand out in the ranking are those that have a sufficiently large and diverse economic milieu for their economies. It was also found that the level of development of the market economies in the V4 countries influences the emergence and functioning of startups to different degrees, thus revealing a number of differences between them.

As a first step, the empirical research underlying the dissertation will identify the startup hubs in the V4 region based on the international Crunchbase database: in the Czech Republic Brno, in Poland Gliwice, Bielsko-Biala, Katowice, Gdynia, Gdansk, Wroclaw and Poznan. Szeged and Debrecen in Hungary and Bratislava in Slovakia. There is therefore clear evidence that the metropolitan environment and its territorial capital elements have a positive impact on the emergence and success of startups.

Just as in startup competitions, the candidate startups are assessed on different themes, case studies on four themes (education, social entrepreneurship, rural innovation and women) continue this train of thinking and help to explore how the Hungarian ecosystem works.

The case studies helped to inform the research work on the V4 Startup Survey and have identified Hungarian good practices that are internationally exemplary initiatives.

As a next step, in-depth interviews were conducted with actors of the Hungarian startup ecosystem in two phases, first in 2019 and then in 2021 (N=7+7). In 2019, it was found that the startup ecosystem in Hungary is centralised, only Budapest is a startup ecosystem, with Debrecen and Győr being the strongest nodes among the rural cities. In the rest of the country, startup communities are still in their infancy. Startup hubs are formed where there is innovation (e.g. university) and a supportive economic environment (e.g. chamber of commerce and industry, coworking/community office, incubator house, business angel investor), i.e. where the city reaches a level of development where it becomes attractive for such innovative startup ideas/enterprises for reasons of economies of scale. The importance of local factors and the capital elements of the area have a positive impact on startups.

The focus of the interviews in 2021 was on the crisis and stress resilience of startups. It was verified that domestic and international startups were not uniformly affected by the crisis. The crisis and stress resilience of startups vary across sectors. The winners of the economic crisis are in IT, healthcare (Medtech and health tech), e-commerce, logistics and digital education, while the big losers are startups in tourism and hospitality. In the last part of the chapter, current startups offer advice for future entrepreneurs.

Then, to get a more comprehensive picture of the V4 ecosystem, a survey of startup entrepreneurs in the V4 countries was conducted, based on the Beauchamp and Skala (2017) Visegrad Startup Report. The questionnaire covered seven main topics: demographics, previous experience of the respondent, demographics of the startup, conditions of startup operation, space use and location theories related to regional science, and then stress and crisis resilience of startup businesses in the shadow of the effects of the COVID-19 pandemic. The survey was evaluated by examining the differences and similarities between traditional SME/startup, metropolitan/rural and Hungarian/other V4 (Czech, Polish and Slovakian) startups with locations in the region.

To sum up, the analysis of the location choices of startups and traditional SMEs have shown that startups need adequate human resources (knowledge and know-how), that is linked to research, development, innovation centres and research universities, whose presence are essential. These institutions support and stimulate startups (e.g. university incubation) and help them to become embedded in the local economy through elements of territorial capital, thus creating the local attachment that is a particular characteristic of rural startups. However, less important for startups in their choice of location is the availability of utilities in the industrial area, public safety, transport infrastructure - proximity to motorways, rapid access, urban environment, location - positive impression of the municipality, the availability of a suitable size for purchase/lease, regional transport services - labour commuting conditions, quality of local municipal public services, targeted municipal facilities (e.g. In particular, the capital startups consider that good market accessibility, good accessibility and high quality of business services, quality of maintenance of local public and green spaces, the existence of cluster of activities, quality of local public health and social services and the existence of an industrial park are negligible.

Startups located in the capital city and in the countryside are equally likely to perceive their activities as innovative, to think similarly about the novelty of their services and the extent to which they feel their business is distinctive compared to competitors nationally, in Europe and globally.

Looking at the impact of the COVID-19 pandemic on startups, the majority of startups have faced significant challenges in the past 12 months: sales and customer acquisition, financing, product or service development, growth, internal processes within the company, attracting competent employees, cash flow, maintaining stable income. Team development was rated as a medium challenge, while internationalisation, attracting and retaining skilled staff, and financial barriers were perceived as minor challenges.

A survey of startups in Hungary and other V4 countries showed that Hungarian startups typically have management skills. Czech, Polish and Slovakian startups were more influenced in their choice of location by the characteristics of the local workforce than their Hungarian counterparts. There is a very strong local patriotism among the other V4 startups, which is also reflected in their plans to raise capital, as they are primarily looking to raise local venture capital in the next 12 months. Overall, in terms of crisis resilience, they are satisfied with the pace of growth of their businesses and are uniformly moderately affected by the crisis on average. The time factor, market growth and new opportunities were all rated as having a uniformly positive impact. Thus, there is no difference in the crisis and shock resilience of startups in the V4 countries and Hungary.

7 New, results, novelties, discussion and an outlook for continuing the research

The novel research findings of my thesis, based on my review of the literature and the results of the studies conducted, are as follows:

1. I have highlighted aspects of startups that distinguish them from traditional SMEs.
2. Based on the synthesis of the literature, it became clear that location theories, which, as part of regional economics, examine the spatiality of economic activities, i.e. microeconomic decisions embedded in the macroeconomic environment determine location selection processes (Lengyel - Rechnitzer 2004), have changed for the 21st century (Egedy 2021) and that soft factors, such as knowledge, innovation and creativity are gaining importance instead of hard location factors. Thus, the case of startups, which are a specific form of entrepreneurship development, is different from traditional corporate structures and of their evolution. The actors that shape its operating environment and their environment are brought together in an organic system and an ecosystem is created that supports development in the region.
3. Startups in the V4 countries have a similar development trajectory and the ecosystems that have emerged have similar elements. However, the economic nature of the countries and the specificities of their settlement networks also point to a number of unique solutions. The nature of the resulting entrepreneurial ecosystem, its institutional framework and its forms of support influence the economic development and competitiveness of cities, regions, countries and societies.

The literature review and the results of the research can provide a basis for future entrepreneurs thinking about innovative solutions to solve a problem; for practitioners looking to develop their network of contacts; and for local leaders to consider what innovative startups, seen as drivers of the local economy, can be given space to join programmes that support innovation. After all, as highlighted in the OECD (2014) study, innovation is as vital for rural areas as it is for urban economies. Their goals and challenges are the same: to increase productivity and the quality of public services (OECD, 2014).

It also provides guidance to policymakers on how to identify and support these businesses, thereby increasing the competitiveness of the area.

As a policy recommendation, I call for collaboration between municipalities, public and private partners, startups and investors to jointly develop a city startup ecosystem and associated smart regional hubs adapted to changing circumstances and local conditions. The present thesis can serve as a guide to the implications of future perspectives, which may be useful for policymakers seeking to make the leap into the 21st century. Just as Israel's "Silicon Wadi" (wadi=valley) is a good example of how a state of nine million inhabitants could become an internationally leading startup ecosystem through rational economic development (not encouraging the development of industrial or manufacturing activities, but the production of high value-added, research-intensive, exportable products and services).

However, it has also taken advantage of the opportunities offered by the world wide web: selling low-resource, high-return export products to global markets that do not require containers, packaging, complex customs procedures and insurance to reach their destination. It is thanks to this early recognition and effort that Israel, a country of nine million people, has become an internationally recognised 'Startup Nation', a pioneer in technological innovation (Szolnoki - Papp-Váry 2020). This is why I propose the creation of an official startup database for the Hungarian region, the V4 region and later for the entire Central and Eastern European Greater Region (similar to the Rocket Shepherd initiative), which would both support these innovative ideas and provide a space and a meeting point for members of the startup ecosystem to collaborate.

Discussion

One of the limitations of this dissertation is that the research is based solely on the most comprehensive dataset of high-tech companies and investors in the US, Crunchbase, an internationally recognised database, according to Pisoni and Onetti (2018). I chose it because there is no other comprehensive, officially available startup data collection in the region under study, i.e. neither in East-Central Europe nor in the V4 countries. An initiative to create a database covering the V4 countries was already started at the time of the research (Rocket Shephard), but it is still under development and moreover, it is not an official database. One of the limitations of the in-depth interviews I conducted in my research to inform the analysis was that I only conducted the research with startups located in the West-Hungary region in 2019 and then nationally in 2021.

The limitations of the quantitative V4 startup survey after the groundwork research include the fact that I directly contacted the enterprises filtered by the startup definition (9 502 startups, of which 3 353 startups were reached by email) via email. However, the response rate of the successfully contacted startups was very low, only 1 percent of the total sample and 2.8 percent of the email sample. Many companies asked me to delete them from the database and not to send them a follow-up email because they did not wish to complete it. The low willingness to respond was mainly attributed by the in-depth interview subjects to the pandemic caused by coronavirus: lockdown, digital education and home office. Companies were faced with completely new challenges in this new environment and therefore less prioritised participation in the survey. Thus, overall, the sample processed as a result of the primary research was not representative and even showed spatial variations, but the tests used in the statistical analyses helped to identify trends and tendencies.

Outlook for continuing the research

- 1) To explore the characteristics of the different phases of startups, with a special focus on unicorns - startups worth billions of dollars on the market - their development, characteristics and regional differences, in order to understand how to develop the Hungarian ecosystem to produce a globally successful unicorn in the long run. After all, a startup community can be built in any city, and the long-term maintenance of competitiveness and the economic development of cities, regions, countries and societies depends on building and maintaining these communities (Goreczky 2021a,b).
- 2) Exploring ideas for sustainability - The European Union has set a target to reduce CO2 emissions by 55% by 2030 and to achieve total carbon neutrality by 2050 (European Commission 2020c), and innovative ideas for sustainability, implemented by innovative startups, are key to achieving these goals.
- 3) Linking startup ecosystems to innovative clusters. What are the differences and similarities between the startup ecosystem and innovative cluster flows?
- 4) Spillover effects of startups: how do startups influence the development of the local economy, and what are the mechanisms of impact they can generate, such as labour, employment, knowledge flows, and innovative collaborations?

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2. **Examination of Hungarian large cities in terms of the creative economy in the period 2008-2018** 15th International Conference on Economics and Business Sapientia Hungarian University of Transylvania. 3-5th of March 2021. SECTION G 2: Regional disparities and territorial problems English subsection; Chairman of Regional disparities and territorial problems section 2: György Otilia
3. **Territorial Capital and Innovative Milieux as Startup Attractiveness in Big Cities in Visegrad Countries** ERSA Web Conference, Spatial Challenges for the New World. Session: PS15- Spatial regrouping of small firms. 2020. augusztus 25–27.
4. **Overview of the Local Creative Industry Based on the Group Discussion in the City of Győr, Hungary** RSA Regional Studies Association Central and Eastern Europe Conference, Lublin in Poland Szekció: Best Practices of Creative Cities in the CEE Countries 2019. szeptember 11-13.
5. **Education startup in the market economy** IRI Economics Conference Stúrovo, Slovakia. 2019. jan 14–15. 6th
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7. **Győr as a creative city - Overview of the local creative industry** Gróf Bethlen István Kutatóintézet: Culture-based Development in Modern Cities: Experiences From Russia and Hungary” International Conference, Győr, 2019. október. 7.
8. **The creative activities and industry analysis in Győr, focussed on the group discussions** Gróf Bethlen István International Conference: „Creative Cities and Regions in Europe” Győr, 2018. november 28.

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