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THE IMPACT OF ECONOMIC DEVELOPMENT AND INNOVATION POTENTIAL ON ENTREPRENEURIAL ECOSYSTEMS IN THE WESTERN BALKAN AND SCANDINAVIAN COUNTRIES

Abstract

Purpose: Entrepreneurship is a key driver of economic growth and development. This paper examines the interdependence between economic development, innovation, and the growth of entrepreneurial ecosystems in Scandinavian and Western Balkan countries for the year 2024.

Methodology: The study employs standard statistical methods, including correlation analysis, simple and multiple linear regression, followed by a panel data analysis (Fixed and Random Effects models) with a Hausman specification test to validate the robustness of the findings.

Results: Results show that both economic development and innovation positively influence entrepreneurial ecosystems in the cross-sectional analysis. However, panel data analysis indicates that innovation (GII) remains a statistically significant predictor over time, while the effect of GDP per capita becomes less pronounced when innovation is accounted for, suggesting that the relative influence of economic development may be captured through innovation channels in this specific sample. The Random Effects model was validated as the appropriate specification by the Hausman test.

Conclusion: The findings suggest that while economic growth and innovation are jointly linked to ecosystem development, innovation potential shows a more robust statistical association in the observed period. When countries are observed over time, these results should be treated as exploratory, given the specific regional focus and sample size. Policies that strengthen innovation capacity and economic development can effectively foster entrepreneurship, particularly in emerging economies.

Keywords: Entrepreneurial ecosystems, economic development, innovation, Scandinavia, Western Balkans

1. Introduction

The economic growth of countries, especially countries in transition, is related to the development of entrepreneurship. The basic characteristics of entrepreneurs are passion and desire for change, working in conditions of increased uncertainty and risk, willingness to act, creativity, and innovation (Pink, 2011; Ries, 2011). To encourage the development of entrepreneurship, it is necessary to change people's mindsets first. The following limiting factors for startups are commonly discussed: inadequate knowledge, limited access to capital, individual inertia, lack of creativity, and insufficient institutional support, including financial or advisory incentives provided by the state or other organizations (Barringer & Ireland, 2016; Auriol, 2013).

The 21st century is the century of entrepreneurship, bearing in mind that entrepreneurship is the engine of economic growth in countries (Varga, 2021). That is why it is extremely important to encourage the development of entrepreneurship as well as entrepreneurial ecosystems in all countries, especially in countries in transition. Entrepreneurial ecosystems are increasingly attracting attention from theoreticians and practitioners in the field of entrepreneurship and management, as they represent a combination of various actors and environmental factors that influence the development of entrepreneurship within a country or a specific location (Spilling, 1996).

Considering the importance of entrepreneurial ecosystems, it is essential to differentiate the stages of their development across countries. Entrepreneurial ecosystems typically evolve through four phases: the initial phase, the growth phase, the maturity phase, and the diversification/globalization phase (Stam, 2015). Based on this categorization, the Scandinavian countries in the sample fall within the maturity and diversification/globalization stages, or are positioned between these stages, indicating a highly developed entrepreneurial ecosystem. In contrast, the entrepreneurial ecosystems of the Western Balkan countries range from the initial to the growth phase—Albania and Bosnia and Herzegovina are positioned between the initial and growth stages, while Serbia and North Macedonia are in the growth phase (Deutsche Gesellschaft für Internationale Zusammenarbeit, 2021). Consequently, the countries included in this sample represent substantially different levels of entrepreneurial ecosystem development. This sampling strategy also ensures the inclusion of Western Balkan countries, which belong to the upper-middle-income group, as well as Scandinavian countries, which are classified as high-income economies.

The aim of this paper is to examine the interdependence between economic development, innovation, and the growth of entrepreneurial ecosystems using the example of Scandinavian and Western Balkan countries. To achieve this, the paper first provides a theoretical overview of key concepts related to entrepreneurial ecosystems. Empirically, different analytical procedures are applied depending on the hypothesis. For the first two hypotheses, statistical analysis is conducted using 2024 cross-sectional data, including correlation analysis and simple linear regression. For the third hypothesis, which investigates the joint effect of economic development and innovation on ecosystem performance, both multiple linear regression for 2024 and panel analysis for the period 2020–2024 were conducted, enabling a more comprehensive assessment of their combined and dynamic influence.

The paper is structured as follows. The next section provides an overview of the relevant theoretical background and previous empirical findings related to entrepreneurial ecosystems. The third section presents the research methodology, including the sample, variables, and applied statistical techniques. The fourth section reports the empirical results, followed by a discussion of the findings in relation to the existing literature. Finally, the last section outlines the main conclusions, practical implications, limitations of the study, and directions for future research.

2. Literature review

An entrepreneurial ecosystem is a complex entity that consists of many different actors that cooperate with each other to realize both their own and common interests of the ecosystem (Stam & Van de Ven, 2021). For example, if one considers a startup that begins business in a certain place, an entrepreneur who is the owner of that business should develop cooperative relations with various actors to successfully run their firm. The entrepreneur establishes cooperative relations with suppliers, distributors, as well as customers, to take a position in the market and gain market share. All the above actors play important roles in the entrepreneurial ecosystem (Raut et al., 2022). Therefore, the entrepreneurial ecosystem consists of many different actors, who play different roles in the ecosystem, as well as environmental factors that interact and thus determine the entrepreneurial success of a region or locality (Spilling, 1996).

There are many definitions of entrepreneurial ecosystems. An entrepreneurial ecosystem is a complex set of economic, social, and institutional factors that interactively influence the creation, finding, and exploitation of entrepreneurial opportunities (Qian, 2012). One of the well-known definitions of entrepreneurial ecosystems is the one that starts from the entrepreneur and sees the entrepreneurial ecosystem as a set of interconnected entrepreneurs, entrepreneurial organizations, institutions, and entrepreneurial processes that formally and informally connect, mediate and manage performance in the local entrepreneurial environment (Mason & Brown, 2014). Since 2018, the definition of entrepreneurial ecosystems has been upgraded with the Ecosystem Quality Composite Index [ESI], which is an indicator of the success of the business of each ecosystem (Global Entrepreneurship Monitor, 2018).

If the entrepreneurial ecosystem is observed in relation to ecosystems in nature, it can be said that the entrepreneurial ecosystem is a sum of biotic components (the individual) and abiotic components (the institutional environment) (Stam & Spigel, 2017; Torres & Godinho, 2022). The biotic component refer to system conditions that are made up of leadership, finances, a network of entrepreneurs, talent, skills, knowledge, support, and others, while the abiotic component, i.e., framework conditions, are made up of the social context or factors that affect the business of the ecosystem (Ivanović-Đukić & Radosavljević, 2020). It is emphasized that entrepreneurial ecosystems can be innovative, fast-growing, and internal ecosystems of company employees (corporate entrepreneurship) (Levi Jakšić et al., 2018) The results of the existence of such an entrepreneurial ecosystem are reflected in the growth of productivity, income, employment, and well-being in an economy. The entrepreneurial ecosystem consists of many different elements, which Isenberg, for clarity, grouped into six domains: culture, politics, finance, human capital, market, and institutional and infrastructural support (Isenberg, 2021). In the past, numerous upgrades were made to Isenberg's initial model of the entrepreneurial ecosystem, but one should accept the fact that it is not enough to just know the elements of an entrepreneurial ecosystem in order to understand how it works; it is also necessary to understand how the various elements are interconnected and how they function together.

3. Methodology

Bearing in mind the above theoretical considerations, the authors will try to prove the following three hypotheses:

H1: The economic development of a country has a statistically significant impact on the development of its entrepreneurial ecosystem.

H2: The innovative potential of a country has a statistically significant impact on the development of its entrepreneurial ecosystem.

H3: The economic development of a country and its innovative potential together influence the development of its entrepreneurial ecosystem.

In accordance with the defined aim of the research and the hypotheses, appropriate theoretical and empirical research methods were used. For the first two hypotheses, correlation analysis and simple linear regression using 2024 cross-sectional data were applied. For the third hypothesis, which examines the joint influence of economic development and innovation, both multiple linear regression for 2024 and panel analysis covering the period 2020–2024 were employed to capture the combined and dynamic effects on the entrepreneurial ecosystem. The potential for endogeneity in the relationship between innovation and entrepreneurial ecosystems is acknowledged. While the current specification treats innovation potential (GII) and economic development (GDP) as independent variables, it is recognized that a highly developed entrepreneurial ecosystem may reciprocally drive innovation and growth. Given the exploratory nature of this study, the analysis focuses on these structural drivers, while noting this bi-directional causality as a limitation for future research.

3.1 Sample and context of research

As the research sample, the authors selected for the development of entrepreneurial ecosystems of the Western Balkan and Scandinavian countries. The group encompassing Western Balkan countries consists of the following countries: Serbia, North

Macedonia, Montenegro, Bosnia and Herzegovina, and Albania, while the group of Scandinavian countries consists of: Norway, Finland, Denmark, and Sweden. The main reasons for analyzing the entrepreneurial ecosystems of Scandinavian countries and those of the Western Balkans lie in the differences in income levels, cultural mindset, and other contextual factors, such as institutional quality, innovation capacity, governance systems, digital readiness, and societal trust. These differences provide a useful basis for examining how economic development and local environmental factors influence entrepreneurial ecosystems. As highly developed economies, Scandinavian countries have leveraged their global market positions to foster entrepreneurship and create wellestablished entrepreneurial ecosystems, where support structures play a key role in realizing innovative ideas. Moreover, developed countries like the Scandinavian states serve as an inspiration for entrepreneurs in the Western Balkans (Peráček et al., 2020).

Cultural factors play a crucial role in shaping the entrepreneurial atmosphere and mindset, which is important for creating a stimulating environment for business development. These factors are best defined and measured through Hofstede's index, which identifies six dimensions of culture: range of power, collectivism vs. individualism, masculine vs. feminine traits (motivation to achieve and succeed), avoidance of uncertainty and risk, long-term vs. short-term orientation, and indulgence (forgiveness, tolerance) (Hofstede & Minkov, 2010).

Table 1 shows two contrasting situations. Scandinavian countries are characterized by a smaller range of power. Instead of authoritative managerial behavior, cooperation between different hierarchical levels is valued, accompanied by informal relations and direct communication. In contrast, the Western Balkan countries exhibit opposite values in terms of these cultural dimensions.

The third column in the table—Motivation for Achievement and Success, formerly referred to as Masculinity and Femininity—reflects the drive of men and women to succeed in business. A typical example is Albania, which scores 80 on this dimension, making it a clearly "masculine" country, whereas Scandinavian countries are generally considered "feminine" according to this indicator. Other Western Balkan countries fall in the middle, gradually moving toward the cultural values characteristic of the Scandinavian countries.

Table 1 Hofstede's index: Country comparison

Country	Power distance	Individualism	Motivation toward Achievements and Success	Uncertainty Avoidance	Long Term Orientation	Indulgence
Sweden	31	71	5	29	53	78
Norway	18	74	16	23	35	70
Denmark	31	69	8	50	35	55
Finland	31	71	5	29	53	78
Serbia	86	25	43	92	52	28
North Macedonia	90	22	45	87	62	35
Albania	90	20	80	70	61	15
Montenegro	88	24	48	90	75	20
Bosnia & Herzegovina	90	22	48	87	70	44

Source: The Culture Factor Group

The data given in the table provide a good basis for the assumption that differences in cultural factors can lead to differences in the understanding of entrepreneurship and the environmental atmosphere and conditions for the development of entrepreneurship between Scandinavian and Western Balkan countries.

Given the focus on two specific regions—the Western Balkans and Scandinavia—the sample size is constrained to N = 8 countries. While this provides a targeted comparative perspective, it limits the inferential power of the statistical tests. Consequently, the findings are presented as exploratory insights into these specific regional dynamics rather than universal confirmations.

3.2 Data and variables

In this research, the Global Innovation Index (GII) and the Global Startup Ecosystem Index (GSEI) are utilized as primary metrics for innovation and ecosystem quality. Although the GII and the GSEI share certain structural components, such as human capital and infrastructure, they serve distinct analytical purposes. The GII is primarily focused on innovation inputs and outputs, whereas the GSEI targets the operational quality and density of the startup environment. This conceptual distinction justifies their inclusion as separate indicators in the empirical analysis, acknowledging that the observed effects reflect substantive ecosystem dynamics rather than a mere index overlap.

Table 2 Conceptual mapping of GII and GSEI components

Dimension / Component	Global Innovation Index (GII)	Global Startup Ecosystem Index (GSEI)
Primary Focus	National innovation capacity, inputs, and outputs across all sectors.	Operational quality, density, and performance of the startup community.
Human Capital	Education system, R&D researchers, tertiary enrollment, and PISA scales.	Founder quality, availability of tech talent, number of startup events/meetups.
Infrastructure	ICT access, general infrastructure (electricity, logistics), ecological sustainability.	Internet speed, availability of coworking spaces, incubators, and tech hubs.
Market & Finance	Credit availability, investment levels, market diversification, and scale.	Presence of VC funds, number of unicorns, specific startup investment rounds (Seed, Series A).
Institutions	Political stability, regulatory quality, ease of starting a general business.	Specific startup incentives, digital nomad visa regimes, government support for tech.
Knowledge Outputs	Patents, scientific publications, high-tech exports, software spending.	Successful exits (M&A, IPOs), number of active startups, global influence of local startups.

Source: Stam, 2015; StartupBlink, 2024; World Intellectual Property Organization [WIPO], 2024

To address concerns about mechanical correlation between the GII and the GSEI, a conceptual mapping of their components was conducted (Table 2). While both indices share foundational pillars like infrastructure and human capital, the GII captures broad innovation inputs, whereas the GSEI emphasizes the operational outcomes of the startup sector. Statistical diagnostics using Variance Inflation Factors (VIF = 3.437) further confirm that the correlation between these indices remains within acceptable limits for multivariate analysis, supporting the conclusion that the GII effect reflects a substantive causal link rather than a mere index construction overlap.

The empirical framework acknowledges potential endogeneity issues, particularly reverse causality, where mature entrepreneurial ecosystems may themselves drive further innovation and GDP growth. While instrumental variables or lagged regressors are common treatments for endogeneity, the limited sample size and time horizon (T = 5) of this study necessitate a contemporaneous specification to preserve statistical power. Consequently, the results are presented as exploratory correlations that highlight the structural alignment of these variables rather than unidirectional causal certainties.

3.3 Entrepreneurial ecosystems of the Scandinavian countries

When it comes to the development of entrepreneurial ecosystems in individual Scandinavian countries, the analysis yielded the following results.

Sweden has one of the most developed entrepreneurial ecosystems in the world. In 2024, Sweden was ranked 6th on the StartupBlink list, which represents a drop of one position compared to 2023, when it was ranked 5th. If we look at the European

Union, Sweden ranked 2nd in 2024, the same as in 2023 (StartupBlink, 2024). GDP per capita in Sweden in 2024 amounted to 57,723.2 US dollars (World Bank, 2025a), which classified Sweden as a highincome country. Sweden's GDP for the year 2024 was USD 610,117.79 million (World Bank, 2025b). The World Intellectual Property Organization (WIPO) ranked Sweden second in the world in 2024, indicating that it is a country with high innovation potential (WIPO, 2024). In 2024, Sweden had as many as 12 cities ranked in the top 1,000 cities classified as centers of entrepreneurial ecosystems in the world (StartupBlink, 2024).

According to the same sources, Norway is an innovative country with a developed entrepreneurial ecosystem. In 2024, Norway was ranked 25th on the StartupBlink list, which represents a decline of two positions compared to 2023. Norway was the lowest-ranked Scandinavian country in 2024, ranking 14th in Europe (StartupBlink, 2024). GDP per capita was USD 86,809.7 (World Bank, 2025a), which places both Norway and Sweden in the group of countries with high incomes according to the criteria of the World Bank for the year 2024. Norway's total GDP for the year 2024 was USD 483,727.40 million (World Bank, 2025b). WIPO ranked Norway 21st in the world in 2024, which means that it is a country with great innovation potential (WIPO, 2024). As for the cities ranked in the top 1,000 in 2024, Norway had 8 cities classified as centers of entrepreneurial ecosystems (StartupBlink, 2024).

According to StartupBlink, Denmark was ranked 18th in the world in 2024, marking an increase of one position compared to 2023 (StartupBlink, 2024). GDP per capita was USD 71,851.8, which, just like the previous Scandinavian countries, placed Denmark in the group of countries with high incomes (World Bank, 2025a). Denmark's total GDP was USD 429,457.37 million in 2024 (World Bank, 2025b). According to the Global Innovation Index, Denmark ranked 10th in the world in 2024, placing it, like the previous two countries, among innovative nations (WIPO, 2024). Unlike the previous two Scandinavian countries, in 2024, Denmark had only 6 cities ranked in the top 1,000 in the world in terms of the development of entrepreneurial ecosystems (StartupBlink, 2024).

Finland was ranked 14th in StartupBlink's 2024 ranking, which is a decrease of one position compared to 2023. In the same year, Finland was ranked 8th among the entrepreneurial ecosystems in Europe (StartupBlink, 2024). Finland's GDP per capita in 2024 was USD 53,188.6, which means that the World Bank criteria were also met in this case, so Finland was classified as a high-income country (World Bank, 2025a). Finland's total GDP in 2024 was USD 299,835.63 million (World Bank, 2025b). It is a country that is extremely prone to innovation, which is confirmed by the ranking on the WIPO list; in 2024, Finland ranked 7th (WIPO, 2024). Finland, like other Scandinavian countries, had multiple cities ranked among the top 1,000. It had as many as 8 cities with entrepreneurial ecosystems ranked among the top 1,000 in the world (StartupBlink, 2024).

3.4 Entrepreneurial ecosystems of the Western Balkan countries

When it comes to the development of entrepreneurial ecosystems in the countries of the Western Balkans, the analysis yielded the following results.

According to StartupBlink data, Serbia ranked 53rd in 2024, with a total score of 3.195, representing a decline of two positions compared to 2023. This decline refers to the decline of all three individual scores: the quantitative, the qualitative, and the business environment score. Serbia, like other Western Balkan countries, is not a member of the European Union, but it is the first among the Western Balkan countries in terms of the development of entrepreneurial ecosystems. As for Europe, Serbia ranked 33rd in 2024, representing a decline of one position compared to 2023 (StartupBlink, 2024). According to the World Bank criteria regarding the level of income, Serbia, like other Western Balkan countries, is among upper-middle-income countries. Accordingly, Serbia's GDP per capita in 2024 was USD 13,523.7 (World Bank, 2025a). Serbia's total GDP in 2024 was USD 89,083.51 million (World Bank, 2025b). Although Serbia is not at the very top of the ranking published by WIPO, its position and score place it among countries with high innovative potential. In 2024, Serbia was in 52nd place in this ranking, with a score of 32.3 out of a maximum of 100 (WIPO, 2024). The centers of entrepreneurial ecosystems in Serbia in 2024 were Belgrade, Novi Sad, and Niš, as in 2023 and 2022. However, in 2021, following the COVID-19 pandemic, Niš was not among the cities with entrepreneurial ecosystems ranked in the top 1,000 in the world. The IT sector in Serbia is a significant driver of economic development in this country and this region, as many entrepreneurs in Serbia develop IT solutions for foreign companies. The increasingly popular blockchain technology, IT, electronic commerce, and the like are leading sectors in Serbia's entrepreneurship (StartupBlink, 2024).

North Macedonia is the second country in the Western Balkans in terms of the development of entrepreneurial ecosystems. In 2024, North Macedonia ranked 77th on the StartupBlink list, representing a decline of seven positions compared to 2023. As for the ranking in Europe, North Macedonia ranked 40th in 2024 (StartupBlink, 2024). As for economic development in 2024, North Macedonia's GDP per capita was USD 9,310.0, which means that, according to the World Bank criteria, North Macedonia belonged to the group of upper-middle-income countries (World Bank, 2025a). For the year 2024, North Macedonia's GDP amounted to USD 16,685.24 million (World Bank, 2025b). According to the World Intellectual Property Organization, North Macedonia, like Serbia, belongs to the group of countries with potential for entrepreneurial development, based on the Global Innovation Index. According to the ranking of this organization, North Macedonia ranked 58th in 2024, with a total score of 29.9 (WIPO, 2024). As for the centers of entrepreneurial ecosystems in 2024, Skopje was only center in North Macedonia ranked in the top 1,000 in the world according to the total score. Most startups in North Macedonia are in the early development phase, while most entrepreneurs work for global companies in the ICT industry (StartupBlink, 2024).

Albania is a Western Balkan country ranked 72nd on the StartupBlink list in 2024, marking an increase of two positions compared to 2023. As for Europe, Albania ranked 39th in 2024 (StartupBlink, 2024). Albania's GDP per capita in 2024 amounted to USD 10,011.6, placing it among the upper-middle-income countries according to the World Bank criteria (World Bank, 2025a). Albania's total GDP in 2024 was USD 27,177.74 million (World Bank, 2025b). WIPO ranked Albania 84th in 2024, with the Global Innovation Index of 24.5 (WIPO, 2024). Tirana is the only center of entrepreneurial ecosystems in Albania ranked in the top 1,000 in the world in 2024. The Albanian entrepreneurial ecosystem is characterized by a large number of young people with advanced ICT skills who have already participated in projects such as Gjirafa (StartupBlink, 2024).

Montenegro is a small country in the Western Balkans that has great innovation potential, but it is not ranked on the StartupBlink lists. Montenegro's GDP per capita in 2024 was USD 12,935.5, which ranks it among upper-middle-income countries (World Bank, 2025a). Montenegro's total GDP amounted to USD 8,069.54 million in 2024 (World Bank, 2025b). This means that, relative to population size, Montenegro is the most developed among the observed countries of the Western Balkans. On the other hand, the World Intellectual Property Organization ranked Montenegro 65th in the world in 2024 according to Montenegro's Global Innovation Index score of 28.9 (WIPO, 2024). These indicators show that Montenegro has strong innovative potential and the possibility of developing its economy in a short period of time and transitioning to the group of high-income countries, according to the World Bank criteria.

Bosnia and Herzegovina is the last country in the observed Western Balkan group. In 2024, Bosnia and Herzegovina ranked 96th on the StartupBlink list, marking an improvement of four positions compared to 2023. As for Europe, Bosnia and Herzegovina ranked 44th in 2024, marking an improvement of one position compared to 2023 (StartupBlink, 2024). In 2024, the World Bank ranked Bosnia and Herzegovina among upper-middle-income countries. Bosnia and Herzegovina's GDP per capita in 2024 was USD 8,957.4 (World Bank, 2025a). Bosnia and Herzegovina's total GDP in 2024 was USD 28,343.39 million (World Bank, 2025b). In terms of innovation, the World Intellectual Property Organization ranked Bosnia and Herzegovina 80th, with an overall score of 25.5 (WIPO, 2024). The only city in Bosnia and Herzegovina with an entrepreneurial ecosystem ranked in the top 1,000 in the world is Sarajevo. The main factor contributing to this negative trend is the unstable and unsupportive environment caused by the country's uncertain geopolitical situation (StartupBlink, 2024).

4. Results

The analysis focuses on four countries in the Western Balkans for which all necessary indicators are available: the Republic of Serbia, Albania, North Macedonia, and Bosnia and Herzegovina, as well as four Scandinavian countries: Norway, Denmark, Sweden, and Finland. Due to a lack of data, Montenegro was not included in the further analysis. For the purposes of statistical analysis, secondary data were used (Table 3), which were processed using the SPSS software package. The dependent variable is the total score of the StartupBlink index (Global Startup Ecosystem Index [GSEI, 2024]), which shows the development of the entrepreneurial ecosystem in each of the analyzed countries. The independent variables are GDP per capita [GDP per capita] as an indicator of the economic development of a country and the total score of the Global Innovation Index [GII], which shows the innovative potential of each of the analyzed countries.

Table 3 Global Startup Ecosystem Index, GDP per capita in US$ and Global Innovation Index for observed countries (2024)

Country	Global Startup Ecosystem Index (2024)				GDP per capita in US$ (2024)	Global Innovation Index (2024)
	World Rank	European Rank	Score	Number of cities		
Sweden	6		27.024	12	57,723.2	64.5
Norway	25		11.694	8	86,809.7	49.1
Denmark	18		15.823	6	71,851.8	57.1
Finland	14		18.147	8	53,188.6	59.4
Serbia	53		3.195	3	13,523.7	32.3
North Macedonia	77		0.850	1	9,310.0	29.9
Albania	72		0.970	1	12,935.5	24.5
Montenegro	-	-	-	-	10,011.6	28.9
Bosnia and Herzegovina	96		0.454	1	8,957.4	25.5

Source: StartupBlink, 2024; World Bank, 2025a; WIPO, 2024

To assess the impact of a country's economic development on the development of its entrepreneurial ecosystem, correlation analysis and simple linear regression will be used. The same statistical methods will be used to assess the impact of a country's innovative potential on the development of its entrepreneurial ecosystem. The joint impact of economic development and innovative potential on the entrepreneurial ecosystem will be assessed using multiple regression analysis. Prior to this, it will be tested whether the given sample satisfies the assumption of normality (Table 4).

Table 4 Normality tests

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	df	Sig.
GSEI	.245	8	.171	.872	8	**.159**
GDPperCAPITA	.286	8	.053	.835	8	**.067**
GII	.238	8	.200*	.868	8	**.146**

a Lilliefors Significance Correction
* This is a lower bound of the true significance level.
Source: Authors' calculations using SPSS software

Considering the sample size, the Shapiro-Wilk test was used instead of the KolmogorovSmirnov test. Since the significance values for these variables are greater than Sig. > 0.05, it is concluded that the sample is normally distributed.

The next step is correlation analysis. A pronounced correlation between these variables with adequate statistical significance provides the basis for testing the hypotheses using regression analysis methods.

Table 5 Nonparametric correlations

			GSEI	GDPperCAPITA	GII
Spearman's rho	GSEI	Correlation Coefficient	1.000	.786*	.929**
		Sig. (2-tailed)		.021	.001
		N	8	8	8
	GDPperCAPITA	Correlation Coefficient	.786*	1.000	.767*
		Sig. (2-tailed)	.021		.016
		N	8	9	9
	GII	Correlation Coefficient	.929**	.767*	1.000
		Sig. (2-tailed)	.001	.016	
		N	8	9	9

* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed)
Source: Authors' calculations using SPSS software

Table 5 shows a strong positive correlation between all observed variables, with statistical significance for each variable. Further analysis involves determining linear regression coefficients for each hypothesis individually.

Spearman's correlation coefficient *rho* shows that there is a strong positive correlation r = 0.786 between a country's economic development, expressed by GDP per capita, and the development of entrepreneurial ecosystems, measured by the Global Startup Ecosystem Index, with statistical significance Sig. = 0.021. The coefficient of determination ($R^2 = 0.6177$) indicates that a country's development economic explains as much as 61.77% of the variance in the development of its entrepreneurial ecosystem. This statistical model is significant at the Sig. < 0.05 level (F = 8.223, Sig. = 0.029; Table 6).

Table 6 Linear regression model (Model 1)

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	401.962	1	401.962	8.223	.029[a]
	Residual	293.278	6	48.880		
	Total	695.240	7			
a. Predictors: (Constant), GDPperCAPITA b. Dependent Variable: GSEI						

Coefficients[a]

Model 1	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(1) Constant	.567	4.051		.140	.893
GDPperCAPITA	*.000236*	.000	.760	2.868	.029
a: Dependent Variable: GSEI					

Source: Authors' calculations using SPSS software

To examine the relevance of the regression model for these variables, further analysis is based on the formula:

$$y_i = b_0 + b_1 x_1 + \varepsilon_i,$$

where y is the dependent variable (in this case, it is the Global Startup Ecosystem Index), and x is the independent variable (in this case, it is GDP per capita). In this case, the regression model formula is as follows:

$$GSEI = 0.567 + 0.000236 * GDPperCAPITA.$$

The slope coefficient $b_1 = 0.000236$ shows that an increase in GDP per capita by 1 US dollar causes an average increase in the GSEI by 0.000236. The representativeness of this model can be measured using the coefficient of determination $R^2 = 0.6177$, which indicates that 61.77% of the variance in the GSEI score can be explained by variations in GDP per capita.

As for the second hypothesis, Spearman's *rho* coefficient shows an extremely strong correlation between the innovativeness of an economy and the development of entrepreneurial ecosystems (r = 0.929; Sig. = 0.001). The coefficient of determination in this case is $R^2 = 0.8630$, which means that a country's propensity for innovation explains as much as 86.30% of the variance in the development of the entrepreneurial ecosystem. This model is statistically significant at the Sig. < 0.05 level (F = 105.683, Sig. = 0.00; Table 7).

Table 7 Linear regression model (Model 2)

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
2	Regression	657.889	1	657.889	105.683	.000[a]
	Residual	37.351	6	6.225		
	Total	695.240	7			

a. Predictors: (Constant), GII
b. Dependent Variable: GSEI

Coefficients[a]

Model 2	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(2) Constant	-15.398	2.602		-5.917	.001
GII	.588	.057	.973	10.280	.000

a: Dependent Variable: GSEI

Source: Authors' calculations using SPSS software

To examine the relevance of the regression model for these variables and in the second model, the following formula is used:

$$y_i = b_0 + b_1 x_1 + \varepsilon_i,$$

where y is the dependent variable (in this case, it is the Global Startup Ecosystem Index), and x is the independent variable (in this case, it is the Global Innovation Index). In this case, the regression model formula is as follows:

$$GSEI = -15.398 + 0.588 * GII.$$

The slope coefficient $b_1 = 0.588$ shows that an increase in the Global Innovation Index by one US dollar causes an average increase in the Global Startup Ecosystem Index by 0.588. The representativeness of this model can be measured using the coefficient of determination $R^2 = 0.8630$, which indicates that 86.30% of the variance of the GSEI score can be explained by variations in the GII.

In the multiple regression model including a country's economic development and innovative potential, the adjusted coefficient of determination is Adj. $R^2 = 0.941$. This indicates that the model explains 94.1% of the variance in the development of the entrepreneurial ecosystem. The regression model is statistically significant at the level of Sig. ≤ 0.05 (F = 57.218; Sig = 0.000; Table 8).

Table 8 Multiple regression model (Model 3)

ANOVA[b]

Model 3	Sum of Squares	Df	Mean Square	F	Sig.
(3) **Regression**	666.135	2	333.068	57.218	.000[a]
Residual	29.105	5	5.821		
Total	695.240	7			
a. Predictors: (Constant), GDPperCAPITA, GII **b. Dependent Variable: GSEI**					

Coefficients[a]

Model 3		Unstandardized Coefficients		Standardized Coefficients	t	Sig	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-17.353	3.005		-5.775	.002		
	GII	.691	.103	1.143	6.737	*.001*	.291	3.437
	GDPperCAPITA	*.00006*	.000	-.202	-1.190	*.287*	.291	3.437
a. Dependent Variable: GSEI								

Collinearity Diagnostics[a]

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions		
				(Constant)	GII	GDPperCAPITA
1	1	2.770	1.000	.01	.00	.01
	2	.209	3.645	.18	.00	.28
	3	.022	11.336	.81	1.00	.71
a. Dependent Variable: GSEI						

Source: Authors' calculations using SPSS software

As shown in the Coefficients section of Table 7, within the multiple regression model only the Global Innovation Index (GII) is statistically significant (Sig = 0.01 < 0.05). Given that this is a multiple regression model, multicollinearity was examined using the Tolerance and VIF values. Since Tolerance > 0.1 and VIF < 10, it can be concluded that the model satisfies the collinearity criteria. Multicollinearity was formally assessed using Variance Inflation Factor (VIF) diagnostics. As presented in Table 8, the VIF values for both innovation potential (GII) and economic development (GDP per capita) are **3.437**. Since these values are well below the conservative threshold of 5 (and the standard limit of 10), it is concluded that multicollinearity does not significantly distort the regression coefficients. This further suggests that the observed loss of statistical significance of GDP per capita in the multivariate setting is not a statistical artifact of multicollinearity, but rather indicates that its influence is mediated through innovation channels.

To further validate these results, a panel analysis (2020–2024) was conducted using fixed effects (Table 9) and random effects (Table 10) models. Consistent with the SPSS findings, only the GII demonstrated statistical significance in the random effects model (Table 10), while GDP per capita remained insignificant. The Hausman test (χ^2 = 4.27; p = 0.118) confirmed that the RE model is the appropriate specification, reinforcing the conclusion that innovative potential is the key factor influencing the entrepreneurial ecosystem (Table 11).

Table 9 Fixed effects (within) regression model

Fixed effects (within) regression **Group variable: Country_id**			**Number of obs = 40** **Number of groups = 8**			
R-squared: • Within = 0.0798 • Between = 0.7472 • Overall = 0.6334			Obs per group: • min = **5** • avg = **5.0** • max = **5**			
corr(u_i, Xb) = -0.6358			F (2,30) = **1.30** Prob > F = **0.2870**			
GSEI	**Coefficient**	**Std. err.**	**t**	**P > |t|**	**[95% conf. interval]**	
GDP_PC GII _cons	**.0001678** **.3278179** **-12.58676**	**.0001145** **.4248047** **19.23873**	**1.46** **0.77** **-0.65**	**0.153** **0.446** **0.518**	**-.0000661** **-.5397491** **-51.87749**	**.0004016** **1.195385** **26.70397**
sigma_u sigma_e rho	**5.1319919** **3.6600242** **.66285613** (fraction of variance due to u_i)					
F test that all u_i=0: F (7, 30) = 1.92			Prob > F = **0.1012**			

Source: Authors' calculations using STATA software

Table 10 Random effects GLS regression model

Random effects GLS regression **Group variable: Country_id**			**Number of obs = 40** **Number of groups = 8**			
R-squared: • Within = 0.0035 • Between = 09372 • Overall = 0.7746			Obs per group: • min = **5** • avg = **5.0** • max = **5**			
corr(u_i, X) = 0 (assumed)			Wald $chi^2(2)$ = **79.34** Prob > chi^2 = **0.0000**			
GSEI	**Coefficients**	**Std. err.**	**z**	**P > |z|**	**[95% conf. interval]**	
GDP_PC GII _cons	**-.0000337** **.5483133** **-14.64832**	**.000043** **.0936845** **3.035885**	**-0.78** **5.85** **-4.83**	**0.434** **0.000** **0.000**	**-.000118** **.364695** **-20.59854**	**.0000506** **.7319316** **-8.698089**
sigma_u sigma_e rho	**1.4411041** **3.6600242** **.13422351**	(fraction of variance due to u_i)				

Source: Authors' calculations using STATA software

Table 11 Hausman FE/RE model

	Coefficients		**(b-B)**	**Sqrt(diag(V_b-V_B))**
	(b)	**(B)**		
	FE	**RE**	**Difference**	**Std. err.**
GDP_PC GII	**.0001678** **.3278179**	**-.0000337** **.5483133**	**.0002014** **-.2204953**	**.0001061** **.4143456**
b = Consistent under H0 and Ha; obtained from xtreg. B = Inconsistent under Ha, efficient under H0; obtained from xtreg.				
Test of H0: Difference in coefficients not systematic				
	$chi^2(2)$ = (b-B)'[(V_b-V_B)^(-1)](b-B) = **4.27** Prob > chi^2 = **0.1180**			

Source: Authors' calculations using STATA software

The Hausman test suggested the appropriateness of the random effects model; however, the limited power of this test in small samples (N = 8) is acknowledged. Furthermore, time fixed effects were omitted from the final specification to preserve degrees of freedom, though it is recognized that global shocks during the observed period (2020–2024), such as the postpandemic recovery and inflation, may influence the observed dynamics.

Additionally, a Bayesian linear regression was conducted to validate the stability of the coefficients (Table 12). The analysis yielded a posterior mean of **0.582** for the GII, with a 95% credible interval of **[0.421, 0.745]**, confirming that the innovative potential remains a significant and robust predictor. The Bayesian results align with the frequentist OLS estimates, reinforcing the reliability of the findings in an exploratory context.

Table 12 Bayesian linear regression estimates (robustness check)

Likelihood:
GSEI ~ regress(xb_GSEI,{sigma2})

Priors:
{GSEI:GII GDP_PC _cons} ~ normal(0,10000) (1)
{sigma2} ~ igamma(.01,.01)

(1) Parameters are elements of the linear form xb_GSEI.
Bayesian linear regression
Random-walk Metropolis–Hastings sampling

Log marginal likelihood = -142.82917

MCMC iterations = 12,500
Burn-in = 2,500
MCMC sample size = 10,000
Number of obs = 40
Acceptance rate = .3861
Efficiency: min = .05375
avg = .07574
max = .1227

	Mean	**Std. dev.**	**MCSe**	**Median**	**Equal-tailed [95% cred. interval]**	
GSEI						
GII	**.5822768**	**.0824278**	**.003556**	**.5804204**	**.4206201**	**.7446897**
GDP_PC	**-.0000517**	**.0000379**	**1.6e-06**	**-.0000505**	**-.0001282**	**.0000205**
_cons	**-15.44989**	**2.597558**	**.096671**	**-15.44672**	**-20.66569**	**-10.39068**
sigma2	**16.58608**	**4.116725**	**.117539**	**15.96389**	**10.35194**	**26.46879**

Source: Authors' calculations using STATA software

Based on the comprehensive analysis, it can be concluded that there is a strong, statistically significant positive correlation between economic development and entrepreneurial ecosystems. Therefore, *the first hypothesis is confirmed,* which states that *a country's economic development significantly affects the development of its entrepreneurial ecosystem.*

There is also a statistically significant positive correlation between the innovative activity of a country measured by the Global Innovation Index and the score of entrepreneurial ecosystems. Therefore, the *second hypothesis is confirmed,* and it can be concluded that *the innovative activity of the observed countries has a statistically significant impact on the development of their entrepreneurial ecosystems.*

Finally, regarding the third hypothesis, the results indicate that when a country's economic development and innovative potential are examined jointly, only the innovative potential (GII) has a statistically significant impact on the Global Startup Ecosystem Index (GSEI). The effect of economic development (GDP per capita) is not statistically significant in either the multiple regression model or the panel analysis. Therefore, Hypothesis 3 is **partially confirmed**: although both variables contribute to the overall model, only innovative potential exhibits a significant individual effect on the development of the entrepreneurial ecosystem.

5. *Discussion*

The results of the analysis provide important insights into the factors influencing the development of entrepreneurial ecosystems in the selected countries. The study shows that both economic development, measured by GDP per capita, and innovative potential, measured by the Global Innovation Index (GII), are strongly correlated with the development of entrepreneurial ecosystems, as reflected by the Global Startup Ecosystem Index (GSEI).

The first model indicates a significant positive relationship between GDP per capita and the GSEI ($r = 0.786$; Sig. = 0.021), with an R^2 of 0.6177. This suggests that a country's economic development explains approximately 61.77% of the variance in its entrepreneurial ecosystem development. This confirms the first hypothesis, emphasizing that higher economic development provides resources and infrastructure that facilitate entrepreneurship. However, the slope coefficient ($b_1 = 0.000236$) indicates that the impact of a one-dollar increase in GDP per capita on the GSEI is relatively small, implying that economic growth alone may not be sufficient to substantially enhance entrepreneurial ecosystems.

The second model shows an even stronger positive correlation between the Global Innovation Index and the GSEI ($r = 0.929$; Sig. = 0.001), with an R^2 of 0.8630. This means that innovative potential explains 86.30% of the variance in entrepreneurial ecosystem development. The slope coefficient ($b_1 = 0.588$) demonstrates that increases in innovation capacity have a much larger effect on entrepreneurial ecosystems compared to equivalent changes in GDP per capita. Consequently, the second hypothesis is confirmed, highlighting that innovation is a critical driver of entrepreneurial ecosystem development in both Western Balkan and Scandinavian countries.

The multiple regression model (Model 3), which combines GDP per capita and the GII, shows an adjusted R^2 of 0.941, indicating that these variables together explain 94.1% of the variance in entrepreneurial ecosystem development. However, only the Global Innovation Index retains statistical significance in the joint model (Sig. = 0.001), while GDP per capita remains nonsignificant (Sig. = 0.287). This finding suggests that, although economic development is correlated with entrepreneurial ecosystem performance in isolation, its effect is largely overshadowed by a country's innovative potential when both factors are considered simultaneously. Therefore, the third hypothesis, which assumed a joint significant impact of both economic development and innovative potential, cannot be fully confirmed. To further verify the robustness of these findings, a panel analysis using both fixed effects (FE) and random effects (RE) models was conducted for the period 2020–2024. The GSEI was retained as the dependent variable, while GDP per capita and the GII were included as independent variables. The Hausman test indicated that the RE model is consistent ($\chi^2 = 4.27$; $p = 0.118$), and thus RE estimates were used for interpretation. The panel results confirm the findings from the 2024 cross-sectional multiple regression: the GII is a statistically significant predictor of entrepreneurial ecosystem development, while GDP per capita does not show a significant effect. To further verify the stability of these coefficients, a Bayesian linear regression (MCMC with 10,000 iterations) was conducted as a robustness check. The results (Table 12) strongly confirm the frequentist findings, as the innovation potential (GII) yielded a strictly positive posterior mean of 0.582 with a 95% credible interval [0.421, 0.745] that does not contain zero. In contrast, the credible interval for GDP per capita contained zero, reinforcing the conclusion that innovation is the primary driver in this specific context. This longitudinal analysis reinforces the conclusion that innovative potential is the key driver of entrepreneurial ecosystem performance across countries over time, while economic development alone has a limited impact when both factors are considered jointly.

Overall, the analysis emphasizes the dominant role of innovation in shaping entrepreneurial ecosystems. The observed reduction in the statistical significance of GDP per capita in joint models should not be interpreted as irrelevant to ecosystem development. Instead, following the VIF diagnostics (VIF = 3.437), it appears that economic development acts as a foundational requirement, but its influence is largely mediated through innovation channels. In other words, higher GDP per capita provides the resources necessary for innovation, which then directly fuels the entrepreneurial ecosystem. Countries with strong innovative capacities, such as the Scandinavian countries in the sample, tend to have higher GSEI scores, even when GDP per capita is comparable or slightly lower than that of other countries. In contrast, despite varying levels of economic development, Western Balkan countries generally exhibit lower entrepreneurial ecosystem scores due to lower innovation levels. These results underline the importance of policy measures that support innovation, knowledge transfer, and technology adoption to strengthen entrepreneurial ecosystems, particularly in developing economies.

6. Conclusion

The findings of this study suggest that while both economic growth and innovation are jointly linked to ecosystem development, innovation potential shows a more robust statistical association when countries are observed over time. However, the observed reduction in the statistical significance of GDP per capita in the panel setting should not be interpreted as true irrelevance; rather, it suggests that the influence of economic development may be captured through innovation channels in this specific sample. These results provide exploratory insights into the factors shaping entrepreneurial processes in the Western Balkans and Scandinavia.

In addition to the substantive findings, methodological considerations were also considered. Due to the relatively small sample size, the Shapiro–Wilk normality test was applied, as it is more suitable for small samples. To further strengthen the robustness of the results and minimize the risk of violating statistical assumptions, the nonparametric Spearman correlation coefficient was used, ensuring additional reliability of the empirical findings. Furthermore, the inclusion of Bayesian inference (Table 12) provided a modern robustness check that confirmed the stability of the regression coefficients despite the small sample size.

The main contribution of this research lies in its empirical assessment of the relationships between economic development, innovation potential, and the examined indicators, using a combined approach of parametric and nonparametric methods. This provides deeper insight into the factors influencing modern economic processes and lays the groundwork for further research in this field.

Furthermore, the application of panel analysis for the period 2020–2024 reinforces the findings of the cross-sectional multiple regression. By considering the dynamics of economic development and innovative potential across countries over time, the panel results confirm that the Global Innovation Index (GII) remains the dominant factor influencing the development of entrepreneurial ecosystems (GSEI), while GDP per capita does not exhibit a statistically significant effect. This longitudinal perspective strengthens the empirical evidence for the third hypothesis, demonstrating that innovative potential consistently drives entrepreneurial ecosystem development, whereas the direct impact of economic growth appears to be largely mediated by a country's innovation capacity when both factors are considered jointly.

Furthermore, this research contributes to the comparative entrepreneurship literature by applying Stam's (2015) entrepreneurial ecosystem framework to two structurally diverse regions. By positioning the findings relative to innovation-led growth theory, the study clarifies how different ecosystem regimes respond to economic and innovative inputs.

The most important limitations include:

- The small sample size (N=8), which affects statistical power and limits the generalizability of the results, requiring that these findings be treated as exploratory rather than confirmatory. Due to these constraints, advanced resampling methods like Bootstrapping were found to be numerically unstable, leading to the prioritization of Bayesian MCMC and VIF diagnostics to ensure reliability.
- The selection of variables, which does not capture all relevant dimensions of the economic environment.
- Dependence on available datasets, which inherently carry methodological constraints.
- The potential for endogeneity and reverse causality, as highly developed ecosystems may also drive further economic growth and innovation.

Considering these limitations, future studies should:

- Include a larger number of countries and a longer time horizon to obtain more robust and representative findings.
- Integrate a broader set of economic, institutional, and technological indicators, such as human capital metrics, regulatory quality, or innovation infrastructure.
- Apply more advanced econometric techniques, including panel regression models, structural models, or machine learning methods.
- Incorporate qualitative approaches to better understand national specificities and contextual factors.
- Further investigate the conceptual and structural overlap between innovation and ecosystem indices to better isolate their individual causal effects.

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