The role of the startup ecosystem in shaping the innovative competitiveness of a national economy (case studies of Sweden and Estonia)

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ORIGINAL ARTICLE

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Abstract. This article examines the role of startup ecosystems in shaping the innovative competitiveness of a national economy, using Sweden and Estonia as case studies. The analysis focuses on the key elements of successful ecosystems, including the institutional environment, access to finance, human capital development, and the level of digitalization. Particular attention is paid to a comparative analysis of two distinct models: the Swedish model, characterized by a complex, multi-layered architecture integrating the state, universities, and large corporations, and the Estonian model, which is oriented towards the digitalization of administrative infrastructure and the creation of an open global ecosystem. The positive effects of developing startup ecosystems are considered, such as inbound investment flows, an increase in the number of high-tech companies, and improved national standings in global competitiveness rankings. The relevance of the topic is driven by the growing importance of innovation as a key factor for economic growth and resilience in the context of global competition. The aim of this research is to identify the relationship between the development of startup ecosystems and the level of national competitiveness, as well as to determine key trends, barriers, and prospects for countries with emerging innovation ecosystems. The research logic is as follows: first, the conceptual framework and theoretical foundations of innovative competitiveness and startup ecosystems are outlined; subsequently, a detailed comparative analysis of the Swedish and Estonian models is conducted, employing statistical data and correlation analysis to identify key success factors. The study is based on comparative, statistical, and analytical methods, as well as on the analysis of contemporary scientific publications and reports from international organizations. Based on the analysis, it is concluded that the competitiveness of a national innovation economy is determined by the efficacy of administrative institutions and the degree of digitalization. The findings of this research can be utilized for developing small and medium-sized enterprise (SME) growth strategies in other countries.

Keywords: startup ecosystem; national competitiveness; innovative competitiveness; national innovation system; comparative analysis

JEL codes: O31, O32, G23, L26, O38, O52

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Introduction

The concept of national competitiveness in the contemporary context has become a cornerstone of policies aimed at strengthening a state's economic resilience and innovative capacity on the international

stage. Widely applied in economics, marketing, business, international relations, politics, and education, the concept of competitiveness serves as a tool for a comprehensive assessment of an economic entity's development, as well as for identifying its strengths and weaknesses [14].

The new wave of innovative company creation – startups – emerged at the turn of the millennium [6] and has since become an integral part of the modern economic landscape. Startups, as components of an ecosystem and a business model element, are established under conditions of extreme uncertainty within environments where innovation is the focal point of operational activity [3]. A country's ability to foster favorable conditions for entrepreneurship and startup ecosystems determines its level of long-term prosperity.

The European Union's enlargement process has intensified economic heterogeneity within the region, revealing disparities in innovative potential between older and newer member states, which is reflected in the dynamics of their entrepreneurial activity and competitive capabilities [12, 15]. The European startup market is growing and becoming increasingly attractive to foreign acquirers, particularly from the United States [13]. Regional studies have indicated that macroeconomic stability and skills, namely human capital, are the most critical factors influencing the creation and scaling of startups and technology companies in Europe, while the size of the national market remains the least significant aspect [9]. It has been established that more developed European Union countries provide startups with an institutional competitive advantage, whereas the gap in success factors between highly developed and catching-up economies can be attributed to human capital and institutional frameworks [19].

The foundation for enhancing a state's competitiveness lies in the innovative activity of enterprises, which shapes the development trajectory of the national economy. Globalization, in turn, has increased pressure on the small and medium-sized enterprise (SME) sector, incentivizing organizations to optimize their production processes. Startups play a particularly crucial role by creating new technological solutions, driving digital transformation, and ensuring a continuous influx of innovation across various industries. Their operational prospects are determined by the quality of institutional and infrastructural conditions – such as access to financing, state support for innovation, and regulatory transparency – which become fundamental success factors. The business environment constitutes a multi-level system encompassing economic, political, and technological factors, as well as parameters of the market's competitive structure [5].

This research analyzes the correlation between the development of startup ecosystems in Sweden and Estonia and their respective levels of national competitiveness. It aims to identify key trends, barriers, and prospects for the development of innovative entrepreneurship as a driving force behind the competitive advantages of European nations.

Main Part

According to contemporary scholarly understanding, the concept of innovative competitiveness is a property of a national economy that entails the creation, adoption, and scaling of new solutions, enabling it to maintain a sustainable advantage in the long term [1]. A state achieves stable long-term development when it possesses a large number of innovative small and medium-sized enterprises (SMEs). It is these companies that render an economy flexible and allow it to adapt swiftly to changes. Moreover, the increasing number of developing startup ecosystems correlates with the growing innovative activity of nations worldwide over recent decades [4].

Modern academic literature features several conceptions of the "startup ecosystem." Evolving from the definition of a "business ecosystem" – an environment that accumulates opportunities for launching ventures aimed at creating technological products [11] – a startup ecosystem is "a dynamic and self-evolving organism, constituting a set of interconnected actors, institutions, processes, and resources that collectively shape favourable conditions for the emergence, development, and scaling of innovative companies" [21].

The development of innovation ecosystems addresses a range of key issues in a comprehensive manner, acting as a catalyst for positive change. Within the context of the environmental agenda, such ecosystems serve as testing grounds for the creation and implementation of 'green' technologies, whether it involves developing more efficient solutions in renewable energy, adopting circular economy principles for waste

recycling, or creating smart systems utilizing AI and IoT to optimize energy consumption and reduce carbon footprints [17]. Concurrently, they transform the landscape of trade relations by generating entirely new markets for high-tech goods and services, thereby enhancing the competitiveness of national companies on the global stage and fostering the growth of digital trade through the adoption of blockchain and fintech [18]. Furthermore, their impact extends beyond these areas, positively affecting the social and urban environment – through improved quality of life resulting from breakthroughs in medicine and education, as well as by attracting top international talent to a region, which creates a self-reinforcing environment for knowledge generation and sustainable competitive advantage in the long run.

As an integral component of the entrepreneurial ecosystem [2], the startup ecosystem constitutes a complex of digital and spatial resources that enable entrepreneurs to establish and scale high-technology businesses [12].

The complex network of interactions among participants is a noted characteristic, where constant horizontal and vertical linkages are formed. These connections stimulate knowledge circulation and accelerate the diffusion of innovations both within new ventures and established companies [16]. Thus, human capital, cultivated in a society where a significant proportion of the population holds higher education degrees and has opportunities for continuous learning and knowledge exchange, constitutes one of the fundamental elements for the development of a startup ecosystem.

It is crucial to highlight the necessity for diverse funding sources within the ecosystem. These sources enable startups to secure necessary capital at every stage – from ideation to mass market entry – thereby strengthening their path to profitability. This also depends on the level of development of the state's institutional and regulatory environment, including intellectual property protection mechanisms, and influences the growth rate of the startup ecosystem as an effective vector for developing the national business environment. This, in turn, ensures growth in the country's Gross Domestic Product and employment [5].

Digital startup ecosystems contribute to the diversification of a country's economic structure. It is important to note the growing prominence of the financial sector within the global startup ecosystem map. New generations of companies entering this market foster job creation and instigate a profound transformation of national and transnational markets through the development of fundamentally new financial products and services. Despite the initial negative impact of the COVID-19 pandemic on digital startups, it is noteworthy that the number of these companies grew 2.3 times faster than other small and medium-sized enterprises since 2019. A dominant component is the share of financial startups among unicorn companies (39.2%) – startups with a total valuation exceeding $1 billion[1].

The ecosystem's influence on the dynamics of venture and foreign investments presents a distinct area of scientific and practical interest. As research indicates [20], stable state support is a key factor in transforming a startup ecosystem into a hub for international capital. In the competitive struggle for global investments, those states gain an advantage that integrate the startup creation process with government support programs and strategic cooperation with large corporations. Beyond increasing the resource base of the national economy, the inflow of investments facilitates the diffusion of best practices, innovative management approaches, and modern technological standards.

The experience of European countries confirms that they serve as drivers of innovative development, providing economies with the flexibility to counteract the challenges of globalization[2]. As of 2024, 8 European states are ranked among the top 15 leaders in the global ranking: Sweden, Germany, France, the Netherlands, Switzerland, Estonia, Finland, and Spain (Figure 1).

In contrast to the business strategies of large European states, which focus on scaling within their domestic markets, the innovative potential of Sweden – a sparsely populated country with approximately 10 million inhabitants – serves as a driver for the global startup ecosystem. According to the 2024 Global Startup Ecosystem Index report (Startup Blink)[3], Sweden has maintained its position as the leading startup

[1] *A global startup research platform StartupBlink. Source: https://www.startupblink.com/?leaderboards (accessed on 17.07.2025)*
[2] *According to the Global Startup Ecosystem Index, compiled by the research center SturtupBlink. Global Startup Ecosystem Index 2024. Source: https://lp.startupblink.com/guanajuato-report/ (accessed on 17.07.2025)*
[3] *Global Startup Ecosystem Report 2024. Source: https://lp.startupblink.com/guanajuato-report (accessed on 17.07.2025)*

ecosystem within the European Union (Figure 1). A 33% increase in the number of financial companies between 2019 and 2024 indicates the growing competitiveness of the Swedish digital finance sector and rising investor interest in financial technologies.

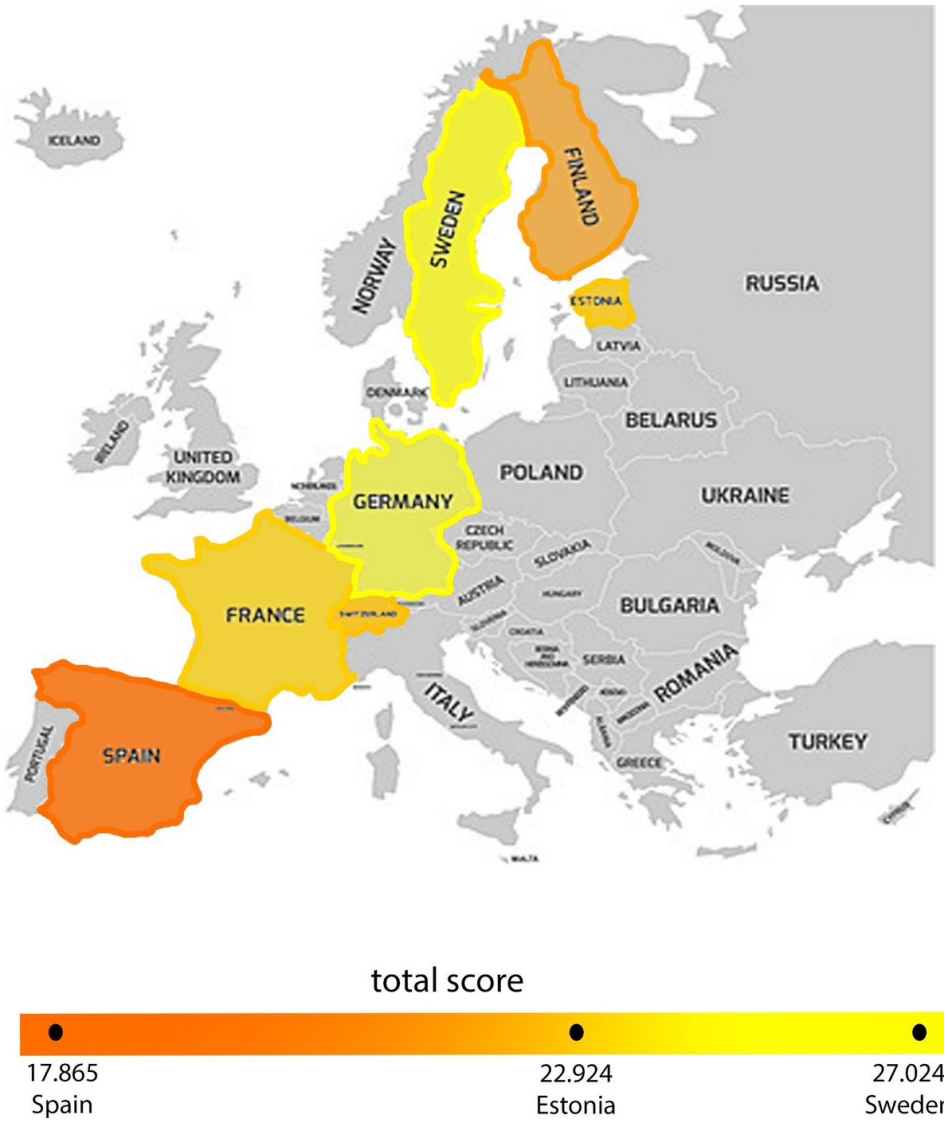

Figure 1. Distribution of European Countries Ranked in the Top 15 of the Global Startup Ecosystem Index in 2024

Source: Global Startup Ecosystem Index, 2024

Despite a high cost of living that can constrain startups lacking initial funding, Sweden ranks third in Europe by volume of venture capital attracted in 2024. Venture investments in the fintech sector have shown a consistently positive trend, peaking in 2021-2022 (exceeding €2 billion annually) and remaining at a high level throughout the period under review. Leading fintech companies – such as Klarna, iZettle, Trustly, and Tink – demonstrate a high degree of integration with the banking sector and global financial markets, reinforcing Sweden's position as a hub of European technological leadership. Lending to small businesses grew from €20 billion to €42 billion, confirming the existence of effective mechanisms for channelling capital into the innovation sector and a high level of trust in startups from financial institutions.

Between 2018 and 2024, the number of small enterprises (with up to 10 employees) increased by 78.7%, reflecting a high level of entrepreneurial activity and the efficacy of national business support institutions. This growth is attributable to the combined effect of macroeconomic factors and targeted state policy – specifically, programs offering credit, educational, and accelerator support for innovative entrepreneurship.

Notable initiatives include the independent Sweden Startup Nation effort[4], aimed at strengthening policies for startup support and business scaling. Furthermore, a residency program for self-employed immigrants allows entrepreneurs access to free higher education, thereby enhancing the country's human capital. This is corroborated by a positive correlation between the economically active population and the share of GDP expenditure on R&D (Figure 2).

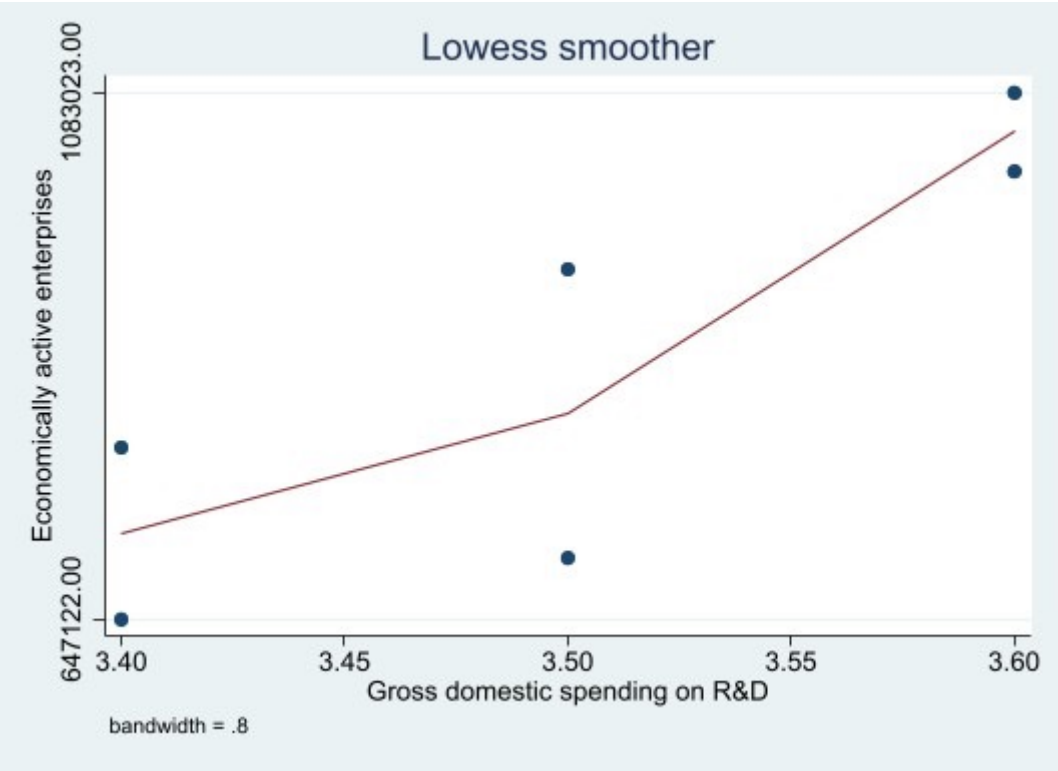

Figure 2. Locally Weighted Scatterplot Smoothing (LOWESS) for Economically Active Population vs. Gross Domestic Expenditure on R&D (GERD) as a Percentage of GDP in Sweden (2019–2024)
Source: Eurostat

Table 1 – Correlation Matrix of Key Indicators Underpinning the Development Dynamics and Investment Attractiveness of Startup Ecosystems in Sweden (2018-2024)

Key Indicators	Gross domestic spending on R&D, % of GDP	Population above 15 with higher education, %	Venture and growth capital. mil EUR	Economically active enterprises. Number (less than 10 employers)	New business lending, mln EUR	Volume of FinTech Investment, € million	Number of FinTech Companies
Gross domestic spending on R&D, % of GDP	1						
Population above 15 with higher education, %	0.7270	1					
Venture and growth capital, mln EUR	0.2026	0.8027	1				

[4] *Sweden Startup Nation (SSN). Source: https://www.swedenstartupnation.se/en (accessed on 17.07.2025)*

Key Indicators	Gross domestic spending on R&D, % of GDP	Population above 15 with higher education, %	Venture and growth capital. mil EUR	Economically active enterprises. Number (less than 10 employers)	New business lending, mln EUR	Volume of FinTech Investment, € million	Number of FinTech Companies
Economically active enterprises, number (less than 10 employers)	0.8377	0.7954	0.4107	1			
New business lending, mln EUR	0.4643	0.1720	0.72	0.3937	1		
Volume of FinTech Investment, € million	0.48	0.413	0.51	0.477	0.76	1	
Number of FinTech Companies	0.53	0.6	0.75	0.552	0.68	0.87	1

Source: Eurostat

A positive correlation (r = 0.72) was identified between the volumes of venture capital investment and bank lending, reflecting a multi-channel financing model that includes foreign direct investment and public support instruments. The correlation between the number of FinTech companies and the volume of bank lending (r = 0.68) confirms the significance of credit resource availability for the expansion of entrepreneurial activity. The strongest relationship is observed between venture investments and the number of FinTech companies (r = 0.75), indicating the sector's high sensitivity to the volume of capital raised.

The Swedish model of an innovation ecosystem is based on a complex institutional infrastructure that includes government agencies, universities, large corporations, acceleration platforms, and banks. This structure ensures the consolidation of resources and the formation of a sustainable innovation support mechanism, establishing Stockholm as the central Swedish startup hub for the FinTech sector. Its success is further bolstered by the Invest Stockholm program[5], which stimulates the growth of small and medium-sized businesses by fostering credit systems.

Despite a small domestic market, a population of less than 2 million, and a limited resource base, Estonia has accelerated its pace of new business development. Since 2020, the country has been the startup leader in Eastern Europe, and its lead over Lithuania, which holds second place in the region, has quadrupled. It is noteworthy that, according to the provisions of the Estonia White Paper 2021-2027[6], one of the country's strategic goals is to increase the innovation sector's contribution to 15% of GDP.

Data from 2019–2024 show that the number of FinTech companies in Estonia grew by approximately 35%, significantly exceeding the European average. Although this growth is lower in absolute terms than Sweden's, such high rates indicate a significant density of innovative activity per capita. This characteristic is typical of dynamically developing ecosystems and serves as a powerful factor in attracting international investment, as well as foreign experts and entrepreneurs.

The success of Estonian FinTech is largely the result of a unique institutional environment and a targeted state policy of digitalization. Key initiatives such as e-Estonia and the e-Residency program have played a pivotal role. They allow non-residents to establish businesses in Estonia quickly and remotely, which directly contributes to the globalization of the local ecosystem. Estonia is a global leader in implementing

[5] *Invest Stockholm Programme Outlook. Source: https://www.stockholmbusinessregion.com/ (accessed on 17.07.2025)*

[6] *This work has been completed as a result of the work of the Estonian State. Commission on Examination of the Policies of Repression. Source: https://www.riigikogu.ee/wpcms/wp-content/uploads/2015/02/TheWhiteBook.pdf (accessed on 17.07.2025)*

e-government services, the success of which is explained by the extensive use of blockchain technologies [16], which are actively developed within FinTech startups.

The digitalization of key administrative procedures – from business registration to tax reporting – has minimized transaction costs for startups and created attractive conditions for foreign entrepreneurs. This explains the positive correlation between the economically active population and the share of R&D expenditure in the country's GDP (Figure 3).

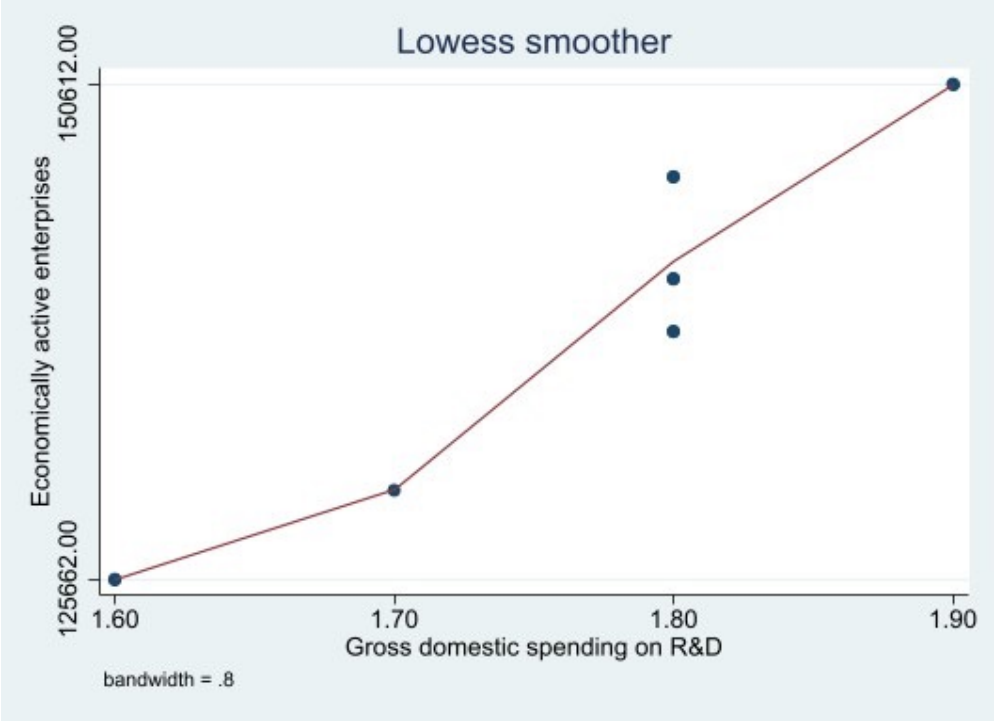

Figure 3. Locally Weighted Scatterplot Smoothing (LOWESS) of the Relationship Between Economically Active Population and Gross Domestic Expenditure on R&D (GERD) as a Percentage of GDP in Estonia (2019-2024)

Source: Eurostat

Over the period from 2019 to 2024, the volume of venture capital investment in FinTech increased from €45 million to €150 million, indicating growing investor confidence in the maturity of the innovation ecosystem. In parallel, small business lending volume rose from €1.2 billion to €2.1 billion, reflecting improved access to financial resources and heightened confidence from banks and institutional investors in the innovation sector. The synchronous growth of both indicators underscores a comprehensive strengthening of financial support for startups. This is corroborated by a strong positive correlation (r = 0.95) between the volume of investment and lending to new businesses.

Table 2 – Correlation Matrix of Key Indicators Underpinning the Development Dynamics and Investment Attractiveness of the Startup Ecosystem in Estonia (2018-2024)

Key Indicators	Gross domestic spending on R&D, % of GDP	Population above 15 with higher education, %	Venture and growth capital. mil EUR	Economically active enterprises. Number (less than 10 employers)	New business lending, mln EUR	Volume of FinTech Investment, € million	Number of FinTech Companies
Gross domestic spending on R&D, % of GDP	1						

Key Indicators	Gross domestic spending on R&D, % of GDP	Population above 15 with higher education, %	Venture and growth capital. mil EUR	Economically active enterprises. Number (less than 10 employers)	New business lending, mln EUR	Volume of FinTech Investment, € million	Number of FinTech Companies
Population above 15 with higher education, %	0.93	1					
Venture and growth capital, mln EUR	0.3	0.25	1				
Economically active enterprises, number (less than 10 employers)	0.95	0.87	0.15	1			
New business lending, mln EUR	0.29	0.26	0.95	0.22	1		
Volume of FinTech Investment, € million	0.69	0.369	0.733	0.284	0.56	1	
Number of FinTech Companies	0.748	0.5	0.64	0.821	0.532	0.42	1

Source: Eurostat

A positive correlation was identified between the volume of investments and bank lending (r = 0.56), confirming the systemic nature of the ecosystem's development, where private and public capital form a stable financial foundation for innovation. A significant proportion of new small enterprises are oriented towards international digital markets and high-tech services [7]. This strategy is driven by two key factors: Estonia's active participation in international startup support programs and the targeted development of human capital. For instance, in 2024, the share of the population with higher education reached 37.8%, and the quality of specialist training meets leading European standards.

A positive correlation was also found between the number of FinTech companies and the volume of venture investments (r = 0.64), indicating a direct influence of investment activity on the sector's growth and the creation of new enterprises. Furthermore, Estonia is home to the headquarters of the global startup accelerator Startup Wise Guys, which has invested in over 400 startups worldwide.

The key distinctions between the two countries lie in the realm of absolute metrics: the scale of their national economies, the number of FinTech startups, and the volumes of attracted investment. For example, the total volume of venture investments in FinTech over six years in Sweden amounted to €9.5 billion, whereas in Estonia it was approximately €600 million. At first glance, this confirms Sweden's leadership in terms of aggregate innovative potential.

However, the picture changes when shifting to relative indicators. Considering the significant difference in population size (10.5 million in Sweden versus 1.3 million in Estonia), Estonia demonstrates comparable, and in some parameters, even superior dynamics. Metrics such as the density of innovative activity and the growth rate of FinTech companies per capita position it as a full-fledged and confident regulator of a startup ecosystem. Specifically, over the five-year period, the growth in the number of FinTech unicorns in Estonia

reached 35%, slightly outpacing the Swedish figure of 33% (Figure 4).

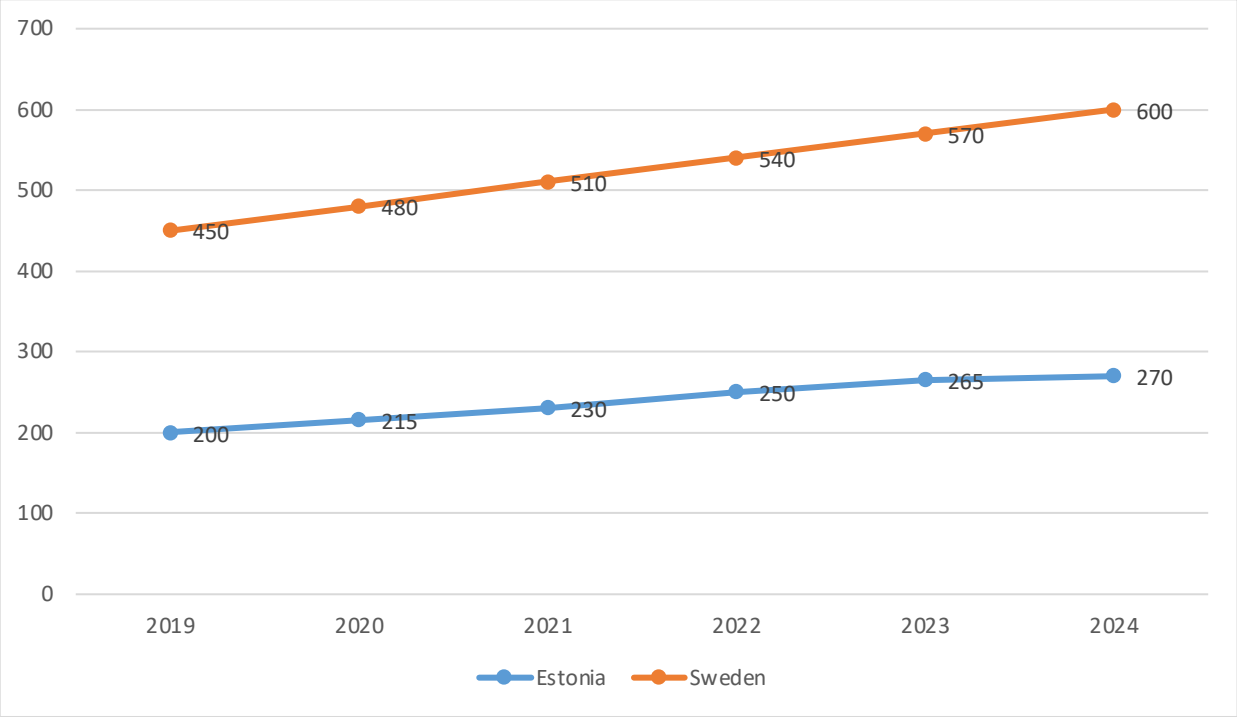

Figure 4. Number of FinTech Unicorn Companies Founded in Sweden and Estonia, 2018-2024
Source: Eurostat

The startup ecosystem exerts a substantial influence on a country's position in the Global Competitiveness Index (GCI)[7], calculated by the World Economic Forum. This index assesses nations' capacity to ensure sustainable economic growth, taking into account factors such as infrastructure, macroeconomic stability, health and education, labour market efficiency, innovation potential, and business dynamism.

In developed Northern European economies, particularly in Sweden, startups function to reinforce a pre-existing, robust innovation system. Their impact is reflected in the improvement of national scores within those GCI components related to innovation, capital market development, and human capital quality. According to the ranking[8], Sweden holds 8th place globally in 2024. This is explained by the active development of venture capital and university spin-offs (for instance, from KTH and Chalmers University of Technology), which increases private investment in R&D, thereby directly enhancing Sweden's standing in the "Innovation ecosystem" pillar [10].

In Estonia, which holds the 27th position in this ranking, startups, conversely, serve a compensatory function – acting as a tool for accelerated growth and institutional modernisation. They enhance flexibility, digital readiness, and the efficiency of public administration. The positive impact of social welfare expenditure is emphasised as a fundamental stimulus for economic growth and a facilitator of the state's innovative activity [8]. Companies such as Bolt, Veriff, Pipedrive, and Wise demonstrate how startups can influence macroeconomic parameters reflected in the competitiveness index: they boost the export of IT services, increase labour productivity, and stimulate inflows of foreign direct investment.

A 49% annual growth in the startup sector's turnover (according to Startup Estonia[9]) directly affects the metrics for "Market Size," "Business Dynamism," and "Innovation Capability," thereby strengthening the country's overall score. Consequently, fostering innovative activity promotes employment and income growth, enhances product quality and production efficiency, which collectively improve the population's standard of living. For developing economies, innovation strategies serve as a tool for accelerated economic convergence

[7] *GCI is a framework that assesses a country's economic competitiveness based on factors like institutions, policies, and productivity.*
[8] *Global Competitiveness Report 2024. Source: https://databank.worldbank.org/metadataglossary/africa-development-indicators/series/GCI.INDEX.XQ (accessed on 17.07.2025)*
[9] *Startup Estonia Report 2024. Source: https://startupestonia.ee/ (accessed on 17.07.2025).*

and sustainable development [10].

Conclusion

Thus, the Swedish and Estonian experiences in developing innovative potential within their startup ecosystems demonstrate that the competitiveness of a national innovation economy is determined by the efficacy of administrative institutions and the degree of digitalization within the entrepreneurial environment. Building sustainable leadership in the realm of innovative products requires comprehensive transformations, including the modernization of legal and tax frameworks, the development of the educational system, support for the startup ecosystem, and deeper global economic integration.

Significant differences are observed in the institutional approaches of the two countries. The Swedish model is characterized by a complex, multi-layered architecture that integrates government agencies, universities, corporations, powerful accelerators, and financial institutions. This coalition of key stakeholders enables the consolidation of substantial resources and the implementation of comprehensive national-scale programs to support innovative entrepreneurship.

An important consequence of this integration is the close linkage between FinTech companies (such as Klarna, iZettle, Trustly, Tink) and traditional banks, as well as their deep involvement in the global economic system. In contrast, the Estonian model is focused on the digitalization of administrative infrastructure, which attracts not only local but also international entrepreneurs, rendering the Estonian ecosystem open and flexible. This allows Estonian FinTech companies (like Wise, Monese, Pipedrive, Bolt) to pursue rapid scaling strategies, initially targeting international markets from their inception.

The findings of this research can be utilized by countries with emerging business ecosystems to formulate their own strategies for the development of small and medium-sized enterprises and to adapt successful foreign models to their specific national contexts.

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CONFLICT OF INTEREST

One of the authors of the article is the editor-in-chief of the journal.

AUTHORS' CONTRIBUTION

Svetlana N. Rastvortseva – conceptualization, project administration, writing – original draft.
Sofiia A. Panasiuk – investigation, writing – review & editing.
Dmitrii A. Chudaikin – formal analysis, writing – original draft.

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