

# INNOVATION PERFORMANCE OF SERBIA: EVIDENCE FROM THE GLOBAL INNOVATION INDEX

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**Abstract:** This paper examines Serbia's innovation performance during the period 2021–2025 using the Global Innovation Index (GII) framework, with particular emphasis on the dynamics between innovation inputs and outputs and their interaction. The study applies a quantitative approach based on secondary data analysis. Empirical data are drawn from annual GII reports published by the World Intellectual Property Organization (WIPO). The analysis focuses on sub-index values rather than ranking positions in order to capture changes over time and evaluate the efficiency of input-output transformation. The findings reveal a consistent positive trajectory between 2021 and 2024 across both sub-indices. However, a structural break is observed in 2025, marked by a significant decline in innovation inputs, particularly in pillars Business sophistication, Market sophistication, and Institutions. A simultaneous decrease in innovation outputs - most notably in Knowledge and technology outputs - indicates a reduced capacity to effectively convert innovation inputs into measurable outcomes. The results suggest the presence of structural imbalances within Serbia's innovation system, primarily associated with institutional instability, market constraints, and financing limitations rather than deficiencies in human capital or research intensity. The decline in 2025 highlights the sensitivity of emerging innovation systems to fluctuations in key enabling conditions. The paper emphasizes the importance of improving institutional quality, strengthening market mechanisms, and diversifying innovation financing structures in order to enhance long-term systemic resilience and sustainable innovation growth. By providing a five-year input-output assessment in an upper-middle-income economy, this study offers empirical insight into recent innovation trends and systemic dynamics.

**Keywords:** *innovation, innovation performance, Global Innovation Index, Serbia, innovation indicators.*

**Field:** Social Sciences

## 1. INTRODUCTION

In today's turbulent business environment, innovation is a *conditio sine qua non* for market survival and long-term competitiveness. At the microeconomic level, innovation is a key driver of competitive advantage and financial performance. On the other hand, it is widely acknowledged that innovation is essential not only for enterprises, but also for economies (Vukojevic & Tanovic, 2025). In this regard, innovation is widely regarded as a fundamental driver of economic growth across different economic systems (Challoumis, 2024). Porter (1990) emphasizes the central role of innovation in determining national competitiveness. In this context, competitiveness is viewed as a function of a country's sustained commitment to innovation and continuous improvement. From this standpoint, national innovation performance reflects the effectiveness of an innovation system in converting available inputs into tangible and measurable outputs (Iglesias-Sánchez, 2019). As the importance of innovation becomes increasingly recognized, countries strive to improve their rankings and strengthen their position in the global innovation landscape (Sokolov & Vukojevic, 2019).

According to some authors, national competitiveness can be assessed on the basis of a country's innovation capacity and its degree of digital development (Marti et al., 2023). Several global indicators have been developed to compare and monitor innovation performance. The Global Innovation Index represents one of the most widely used instruments for comparing innovation performance between countries. In contrast, the European Innovation Scoreboard (EIS) and the Digital Economy and Society Index (DESI) focus on European countries.

The GII provides a systematic framework for analyzing national innovation systems; therefore, it is adopted as the most appropriate instrument for analysis in this paper. It also enables global comparability over time. Although innovation performance is often compared through several ranking systems, there is limited analysis of the mutual effects of innovation inputs and outputs and the efficiency of their transformation, especially in developing countries. This gap raises the question of systemic efficiency within national innovation systems.

According to the latest GII report, Serbia is classified as an upper-middle-income economy and ranked 54th among the 139 economies featured in the GII 2025. Moreover, the index provides a clear separation of input and output dimensions, allowing for accurate tracking of performance changes over

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time.

The main goal of this paper is to analyze innovation performance of Serbia based on the Global Innovation Index over the period 2021–2025, with particular emphasis on changes in innovation inputs and outputs.

## 2. MATERIALS AND METHODS

This study is based on secondary data analysis. The paper applies a quantitative approach using descriptive methods to examine innovation performance in Serbia. The empirical findings are grounded in the annual reports on national innovation performance issued by the World Intellectual Property Organization (WIPO). The GII represents one of the most widely used international frameworks for assessing and comparing the innovation capacity and performance of national economies.

The study covers the period from 2021 to 2025 and focuses on the values of GII sub-indices rather than country ranking positions, in order to provide a more precise evaluation of changes in innovation performance over time. As emphasized in the annual WIPO report for 2025, the GII's conceptual framework is founded upon two equally important sub-indices: Innovation Input Sub-Index and the Innovation Output Sub-Index (WIPO, 2025). Within the GII framework, innovation inputs are reflected through five pillars addressing institutional quality, research capacity, infrastructure development, market conditions, and business sophistication. Innovation outputs are measured through two performance-oriented pillars: Knowledge and technology outputs and Creative outputs.

Descriptive analysis is applied to identify the main trends and dynamics of innovation inputs and outputs over the observed period, as well as to determine key areas of improvement and decline. Particular emphasis is placed on the comparative examination of changes in the values of innovation inputs and outputs over time, as well as their interaction. Given that this research uses the officially published sub-index scores provided by WIPO, without recalculating the composite index, potential variations in the internal weighting structure do not materially influence the descriptive analysis conducted in this paper.

## 3. RESULTS

This section presents the results of the descriptive analysis of innovation performance of Serbia during the period 2021–2025. This analysis is focused on trends in the GII (Global Innovation Index), and its sub-indices, Innovation Input and Innovation Output. The main purpose is to identify key trends and changes during this period.

According to the WIPO annual report (2025), the five pillars of the Innovation Input Sub-Index capture the key economic conditions that support and stimulate innovation activity. Specifically, these pillars are:

1. Institutions,
2. Human capital and research,
3. Infrastructure,
4. Market sophistication and
5. Business sophistication.

Institutions represent the political stability and the regulatory and legal framework. Human capital and research illustrates education, investments in R&D and science. The infrastructure pillar reflects digital infrastructure, information and communication technologies and logistics. Market sophistication indicates financing and investment activities. Business sophistication illustrates innovation linkages.

On the other hand, the output dimension of the GII focuses on tangible innovation outcomes and is structured around two pillars: Knowledge and technology outputs and Creative outputs. Knowledge and technological outputs include patents, scientific publications and technological products. Creative outputs include results of creative industries, such as like designs and brand values.

Trends in innovation sub-indices in Serbia for the period 2021 to 2025 are shown in Table 1. Most of the pillars of the Innovative Input Sub-Index show successive growth during the period of 2021–2024. However, in 2025 a significant decline can be observed in all pillars within Innovation Input Sub-Index, except Human capital and research.

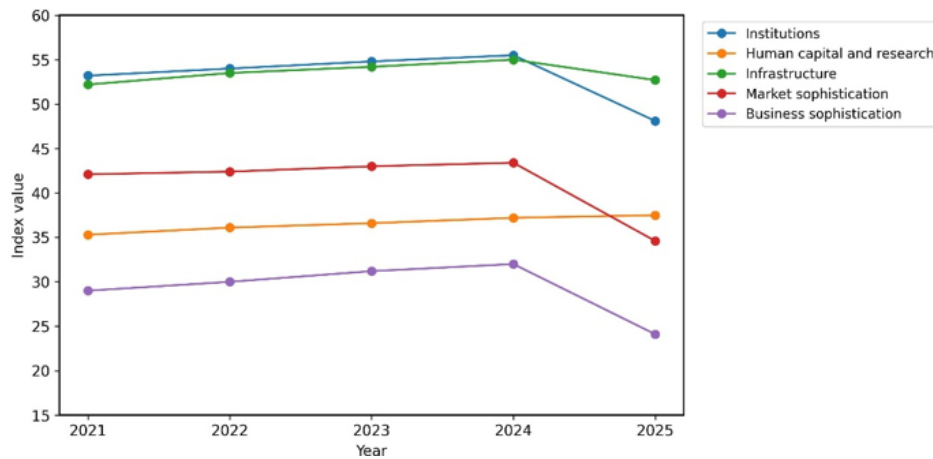
Table 1: Global Innovation Index - Serbia (2021–2025)

Year	Global Innovation Index					Innovation outputs	
	Innovation inputs					Knowledge and technology outputs	Creative outputs
	Institutions	Human capital and research	Infrastructure	Market sophistication	Business sophistication		
2021	53.2	35.4	52.3	42.2	29.1	34.4	17.0
2022	54.0	36.1	53.5	42.5	30.0	35.0	18.2
2023	54.8	36.6	54.2	43.1	31.2	35.8	19.1
2024	55.3	37.2	54.9	43.5	32.0	36.5	20.0
2025	48.1	37.5	52.8	34.6	24.2	30.8	17.3

Source: Author's elaboration based on WIPO (2021–2025)

Figure 1 shows dynamics of pillars within Innovation Input Sub-Index. The most substantial decline was recorded in Business sophistication (-24.38% compared to 2024), followed by Market sophistication (-20.46% compared to 2024) and Institutions (-13.02% compared to 2024). Human capital and research was the only pillar which demonstrated stable growth even in 2025.

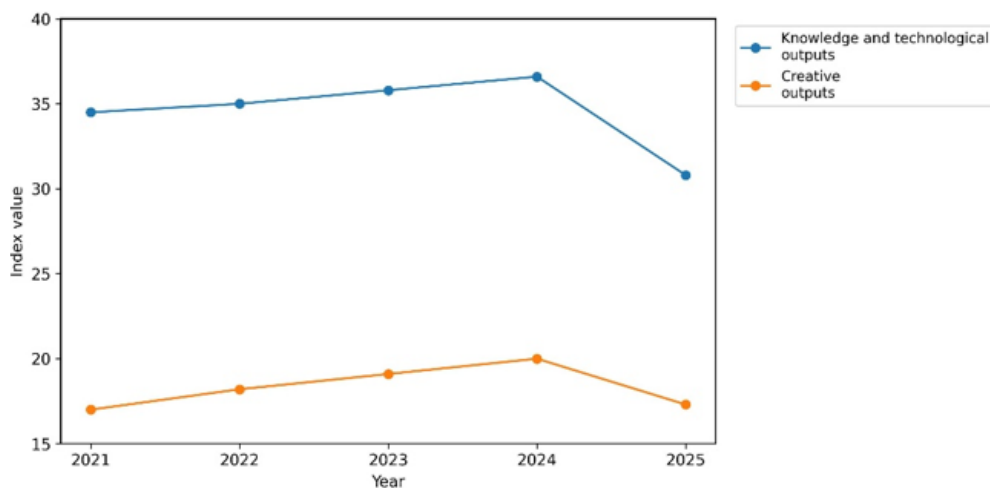
Figure 1: Changes in Innovation Input Sub-Index pillars in Serbia (2021–2025)



Source: Author's elaboration based on WIPO (2021–2025)

If we look at innovation outputs, a similar pattern can be observed. From 2021 to 2024, both pillars demonstrated stable growth, however, in 2025, significant decline was recorded. As shown in Figure 2, pillar Knowledge and technological outputs (-15.61% compared to 2024) demonstrated a steeper decline than Creative outputs (-13.6% compared to 2024).

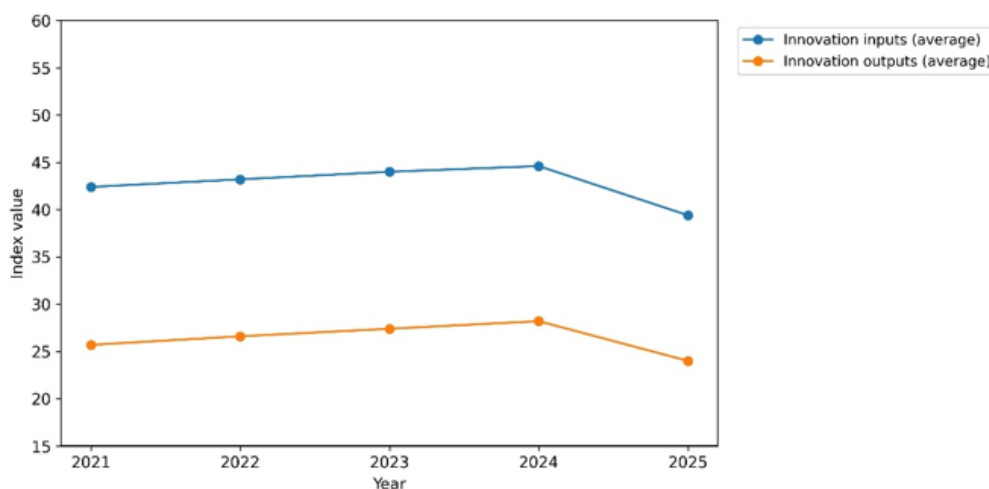
Figure 2: Changes in Innovation Output Sub-Index pillars in Serbia (2021–2025)



Source: Author's elaboration based on WIPO (2021–2025)

Figure 3 represents the average values of innovation inputs and innovation outputs during the period 2021–2025. This graph confirms the upward trend until 2024, followed by a noticeable decline in 2025, particularly within innovation inputs.

Figure 3: Trends in innovation inputs and outputs in Serbia (2021–2025)



Source: Author's elaboration based on WIPO (2021–2025)

Overall, these descriptive results provide a foundation for the following discussion on Serbia's innovation performance during the period 2021–2025.

#### 4. DISCUSSION

The results emphasize the relevance of examining the relationship between innovation inputs and outputs in order to assess the determinants of innovation efficiency in Serbia.

The findings indicate that Serbia's innovation performance followed a positive trend between 2021 and 2024, reflecting a strengthening of innovation capacity during this period. This development may be associated with the implementation of measures defined in the Strategy for Scientific and Technological Development of the Republic of Serbia 2021–2025 "Power of Knowledge" (Government of the Republic of Serbia, 2021). However, the decline observed in 2025 appears to be primarily linked to the weakening of market and business conditions.

The simultaneous decline in both sub-indices suggests reduced systemic efficiency. Although the Human capital and research pillar demonstrated resilience, the deterioration of market and business components indicates constraints in financial and commercialization mechanisms, which may limit the effective utilization of knowledge and research resources.

The decline in the Institutions pillar further supports this interpretation. Since this pillar captures the regulatory environment, rule of law, and policy stability, its weakening may reduce investor confidence and complicate long-term business planning. These findings suggest structural weaknesses in the institutional framework, extending beyond financial and market aspects. While strategic documents emphasize the importance of institutional support for innovation, the results indicate that regulatory instability may represent a significant constraint.

The more pronounced decline in the Knowledge and technology outputs pillar reinforces this conclusion. Science-and-technology-based outcomes appear particularly sensitive to changes in institutional and financial conditions. The findings therefore indicate structural constraints in the conversion of innovation inputs into market-relevant outputs.

A closer examination of the input-output relationship shows that the decline in 2025 was not entirely proportional. Although innovation inputs decreased significantly, innovation outputs declined even more sharply. This pattern suggests weakened efficiency in transforming innovation investments into measurable outcomes, which is consistent with WIPO's (2025) assessment of a structural gap between innovation inputs and outputs in Serbia. Overall, the results indicate a reduced capacity of the innovation system to generate measurable outputs within a deteriorating institutional and market environment.

## 5. RECOMMENDATIONS

Based on these findings, several important implications for innovation policy can be highlighted. As some authors emphasize, establishing an institutional framework that supports innovation significantly influences a country's position in the international environment (Sepashvili, 2020).

Institutional stability represents a fundamental condition for the effective functioning of the innovation system. Strong intellectual property protection, regulatory consistency, and predictable enforcement mechanisms contribute to a stable and supportive business environment. Improving the transformation of innovation inputs into commercially viable outputs requires strengthening entrepreneurial infrastructure and enhancing cooperation between research institutions and the business sector. The findings also suggest the importance of developing more diversified financing mechanisms, including domestic venture capital and public-private partnerships.

Although the decline observed in 2025 does not necessarily imply long-term structural deterioration, the results point to the importance of balanced development across institutional, market, and financial dimensions in order to enhance systemic efficiency and long-term innovation performance.

## 6. CONCLUSIONS

The main purpose of this paper was to analyze Serbia's innovation performance during 2021–2025 based on the Global Innovation Index (GII), with particular emphasis on the dynamics of innovation inputs and outputs. The findings show gradual growth between 2021 and 2024, followed by a noticeable decline in 2025, particularly within the Innovation Input Sub-Index.

The observed pattern suggests that recent constraints are more closely associated with institutional instability, market limitations, and financing conditions than with deficiencies in human capital or research capacity. The concurrent decline in both sub-indices indicates reduced efficiency in transforming innovation inputs into measurable outputs.

Although the short-term decline in 2025 does not imply structural collapse, it reveals vulnerabilities that may affect the long-term stability and effectiveness of Serbia's innovation system.

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