


INNOVATION AND TRANSITION PERFORMANCE  
AS DRIVERS OF ECONOMIC GROWTH AND PROSPERITY:  
THE CASE OF THE EU

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# INNOVATION AND TRANSITION PERFORMANCE AS DRIVERS OF ECONOMIC GROWTH AND PROSPERITY: THE CASE OF THE EU

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*Abstract:* The present paper highlights the crucial elements of innovation, transition performance toward economic growth, and prosperity by exploring the connections between critical variables across European Union Member States. The analysed countries' performances in terms of innovation and transition are closely related to their degrees of economic growth and prosperity. The goal of this paper is to provide insight into the significance of innovation and transition performance in increasing economic growth and prosperity within EU economies. Diverse analytical assessment tools have been used to investigate the relationships between the significant indicators of innovation, transition, economic growth, and prosperity. Auxiliary sources were used to gather the empirical data required to carry out this investigation. The findings point to the critical factors that influence innovation and transition performance for growth and prosperity in certain countries. Synthesized metrics of innovation and transition performance are connected to the key variables assessed for boosting prosperity and growth. The basis for the eventual endorsement of significant innovation and transition outcomes for the advancement of crucial sectors within national economies is an acknowledgment of the diversity between fundamental factors and a consciousness of responsiveness.

*Keywords:* innovation and transition performance; drivers; economic growth; prosperity; EU

*JEL codes:* A1; C80; O30; O49; O57

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## Introduction

Rapidly globalizing countries' economic performance, innovation, and transition achievements toward economic growth and prosperity have been featured as fundamental topics in the current literature of economics. Global research has continued to focus on

economic growth and prosperity in the context of innovation and transition. Still, a thorough analysis of these topics has not been offered in the most recently published scientific papers due to the diversity of their characteristics and judgments about them. The long-standing perception of a nation's economic well-being relates to a consistent GDP growth rate. However, the breadth of issues that nations around the world are currently confronting, ranging from polarization in society and environmental degradation to increased innovation and transition performance, could argue for a more extensive framework for assessment. Transition performance monitors sustainable development beyond the scope of GDP and makes the case that a change in perspective is needed, taking into account the societal, ecological, and governing roles of varied economies. The present study helps emphasize the distinctive features of growth and prosperity through innovation and transition performance. An investigation was conducted to determine the relationships between innovation and transition performance indicators, gross domestic product per capita, and measurements of prosperity as well as economic, socioeconomic, and governance performance in the countries of the European Union. It is widely understood that one of the most important factors influencing a country's economy and its potential for future growth and prosperity are innovation and various performances. However, recent studies have neglected to highlight the significance of innovation and transition performance toward economic growth and prosperity. A substantial portion of this paper addresses the following research question: Do innovation and transitional performance contribute significantly to the promotion of economic growth and prosperity in EU economies?

Through the utilization of various methodological assessment instruments, the present investigation intends to examine the role of innovation and transition performance in increasing economic growth and prosperity in the European Union. Spearman's hypothesis testing has been used to explore the associations between significant parameters. The research also employed the rho-p test for hypotheses to assess the importance of Spearman's associations, which is typically done on ordinal parameters. The relationships between the Innovation Performance Index, Transition Performance Index, GDP per capita, Prosperity Index, Economic Performance Index, Socioeconomic Performance Index, and Governance Performance Index were examined using Spearman's rank-order associations.

The outcomes of the study could be useful to key stakeholders and governments. The distinctions in how important factors are ranked and prioritized have laid the groundwork for future assessments of economic growth and the development of strategies for accelerating the effectiveness of the green and digital transitions in the examined EU economies. The article is divided into five different parts. The introduction is covered in the paper's first section. The theoretical foundations of the

present scientific research on innovation and transitions as they affect economic growth and prosperity are clarified in the second section. The third explains the study's methodology, collected data, and methodology assessment tools related to the parameters and significant indicators under examination. The article's fourth section provides clarification on the investigation's findings. Conclusions are presented in the fifth section.

### **Theoretical overview of recent literature**

An important collection of empirical studies on the relationship between innovation and economic growth has repeatedly demonstrated the crucial role that technological innovation plays as an accelerator of economic progress. The idea of research and development as a gauge of inventive activity was employed by Freimane and Băliņa (2016) in one of the most significant studies addressing this topic. Innovation plays a crucial part in economic growth because, according to economist Joseph Schumpeter (1934), business formation represents one of the useful functions that might lead to innovation. According to Schumpeter, innovation is the process of combining already-existing resources in creative ways (1947), and multinational corporations play a crucial role in both promoting economic growth and creating innovation to strengthen their competitive position (1934). The theoretical distinction Schumpeter makes between invention and innovation was his most significant contribution. As a result, innovation is viewed by much of the traditional literature as a shift in the methods used to carry out social action, encompassing a variety of societal, economic, and institutional transformations. The supervisory and technological views interact alongside this one. Before the last decade of the previous century, a typology had to be developed due to the diversity of approaches. Since that time, there has been significant advancement in the scientific conceptualization of innovation (Rosenberg, 2004; Malerba & Brusoni, 2007; Edquist, 2014; Acemoglu & Cao, 2015; Terzić, 2017; Fagerberg, 2018; Terzić, 2022a). The innovation-based growth model postulates that innovation and economic growth are positively correlated, at least in economic theory.

This theory holds that research and development (R&D) is critical to innovation, increased efficiency, and faster economic expansion. On the other hand, Mulgury and Albury (2003) define innovation as the development and application of novel procedures, goods, services, and delivery systems that significantly enhance performance, efficacy, efficiency, or quality.

The present article methodically arranges research on the association between innovation, transition performance, and economic growth based on a review of the available literature. The relationship between technological innovation and economic

growth can be explained through several hypotheses. Innovation's influence is considered a significant factor in long-term integration and economic growth in the neoclassical framework because it is a component of the Solow residual. The Solow residual is a figure that represents the empirical rise in productivity within an economy over time, both in terms of years and decades. A rise in the production of products and services within a given period relative to a prior period is referred to as economic growth. It can be expressed in real values (with adjustments to account for inflation) or in terms of nominal values. Albeit different metrics are occasionally employed, gross national product (GNP) or GDP (gross domestic product) is the conventional indicator of overall economic growth.

Romer's contribution led to the emergence of modern growth theories. These theories concentrate on the internal consequences of technological advancement, R&D, human resources, and their effects on production function. Technological innovation created endogenously leads to long-term, sustainable economic growth, provided that creative research continues to yield returns on the human resources invested in it (R&D). An adequate framework for analysing significant problems pertaining to strategy, advancement and research efficiency, innovation strategies, and the significance of technological advancement in the framework of economic growth is provided by inner growth theories.

Through ensuring that novel technologies are developed and used effectively, different organizations and companies have started observing an impact on innovation and technological advancement (Acemoglu et al., 2018; Akcigit et al., 2017; Akcigit & Kerr, 2018; Aghion et al., 2018; Acemoglu et al., 2015). Long-term economic growth and welfare are mostly determined by innovation and technological advancement. In this regard, the study by Akcigit et al. (2017) demonstrates that some areas of the United States of America with increasing innovations during the 20th century developed quite quickly in comparison to those that had none. Additionally, further study has been done to comprehend the societal effects of innovation. Do increases in gross domestic product per capita or economic growth raise national prosperity and overall welfare? The same observational study on income ranges and prosperity examined the relationships between several subjective prosperity indicators and income increases. Therefore, a rise in the ability of the economy to generate goods or services over a given time is referred to as economic growth. It alludes to the long-term growth of the economic system's productive capacity to satisfy societal demands on an individual basis. Increases in job opportunities and national income are two benefits of the nation's sustained economic growth, both of which raise quality of life. According to the Legatum Prosperity Institute (2021), an inclusive society with a robust social compact that safeguards each person's

fundamental rights and security is defined as prosperous. It is propelled by an open economy that uses skills and ideas to forge long-term routes out of poverty. Additionally, it is constructed by capable individuals who actively participate in fostering a culture that prioritizes well-being. Several studies have shed light on the connection between innovation and prosperity, suggesting that the possibility of prosperity increases with the economy's level of innovation (Stern & Valero, 2021; Terzić, 2022a).

The association between destructive creativity and well-being has been investigated by Aghion et al. (2016). Conversely, Stevenson and Wolfers (2013) have found a positive relationship between gross domestic product and well-being. Contemporary political discourse pays growing attention to increases in income, and several suggestions to reverse the current pattern concentrate on implementing additional taxation on the highest-earning households. The relationship between top-income inequalities and innovation needs to be considered in these kinds of conversations as well, according to research by Aghion et al. (2018). The foundations of economic progress are innovative concepts.

The effectiveness of translating innovative ideas into goods for consumers or other forms of economic output additionally plays a role in the improvement of income levels. The relationship between innovation and advancement in society is a complex and crucial one. Several researchers have positively demonstrated that countries and regions with the most inventions also enjoy higher levels of social advancement. Therefore, the invention of novel products and applications is one of the fundamental methods for developing additional benefits (Fagerberg & Normann, 2022; Fagerberg, 2018; Aghion et al., 2018). According to numerous authors (Terzić, 2023; Foray et al., 2021; Edquist, 2014), innovation is essential to maintaining the economic growth, prosperity, or stagnation of countries over time. Authorities have pledged to provide the necessary funding for fostering innovation and national prosperity, especially those associated with GDP generation (Agenor & Neanidis, 2015; Atkinson & Ezell, 2012; Griffith et al., 2006; Grossman & Helpman, 1991; Porter, 2008; Aghion & Howitt, 2009; Gackstatter et al., 2014; Terzić, 2017; Godin et al., 2021; Terzić, 2022a), which in turn constitutes the highest-priority concern in the majority of countries.

In the past decade, our globalized society has witnessed an increase in academic studies on innovation, transition, economic growth, and prosperity (Rosenberg, 2004; Gackstatter et al., 2014; Stern & Valero, 2021; Terzić, 2022b). A modern economic theory that identifies elements impacting innovation, wealth, and growth should also acknowledge the processes for creating new ideas and comprehend their dissemination at national or global levels. These operations are also connected to the global transfer of various economic performances. Governments have pledged adequate resources to

encourage innovation and transition performance, recognized as potential growth drivers and representing two of the main issues affecting most economies worldwide (Griffith et al., 2006). Adam Smith (1776) made contributions to economic theory and the equitable distribution of income among countries in relation to knowledge as well as labour. The past several years have seen heightened interest in the empirical analysis of economic performance, partly due to the use of new indices and analytical techniques. Numerous studies (Helpman, 2004; Aghion et al., 2015; George, McGahan & Prabhu, 2012; Atkinson & Ezell, 2014; Castellacci & Natera, 2015; Roggea & Reichardt, 2016; Terzić, 2017; Fagerberg, 2018; Terzić, 2023) have found that innovation and transition performance are the most essential components associated with a nation's prosperity and growth.

The most prominent multilateral organizations utilize a variety of measures that are critical for examining the contribution that innovation makes to growth and national prosperity. The new Global Innovation Index (GII), created by the World Intellectual Property Organization (WIPO), is significant for each country, according to Dutta et al. (2021). The GI offers novel information on the current state of innovation worldwide. Outstanding corporate performance reduces poverty and significantly improves economic growth, yet expanding innovation and increasing economic complexity are starting to raise questions. By impacting economic and social unpredictability, numerous researchers contend that widening income gaps could reduce economic performance, growth, and prosperity alike (Acemoglu et al., 2018; Atkinson & Ezell, 2014; Cingano, 2014; Dore & Teixeira, 2023).

Nevertheless, income inequality can hasten poor societal decisions while shattering community solidarity and trust, which has a detrimental impact on prospective GDP growth (Bourguignon, 2003). Understanding the elements of innovation and transition performance continues to be a priority for policymakers, analysts, and government officials, even though intervening in GDP inequalities continues to be a challenging task for advanced and developing nations (Stiglitz, 2012). Do innovation and transition performance significantly contribute to promoting economic growth and prosperity in EU Member States? This is an essential issue that is addressed in this study's investigation. Numerous studies have focused on the connection between innovation and growth (Sarangi et al., 2022; Terzić, 2022), showing that the more inventive an economy is, the greater the probability it has of achieving higher levels of economic growth.

The second iteration of a brand-new composite indicator, the Transitions Performance Index (TPI, 2021), gauges how effectively nations are performing in relation to four aspects of transition: economic, social, environmental, and governance performance. To demonstrate to both policymakers and the public the overall effect of the policy

framework established in each nation, the majority of TPI measures are outcome oriented. The TPI encompasses nations with 76% of the world's population by utilizing consistent global data. Subsequently, it allows for an assessment of national performance in moving to equitable, inclusive, and long-term prosperity by employing a "beyond-GDP" perspective. The TPI represents a scoreboard that evaluates and ranks national economies based on its four transitions towards prosperous sustainability. The four dimensions (European Commission, 2022) are:

- economic (education, wealth, labour productivity and research and development intensity, industrial base)
- social (healthy life, work, and inclusion, free or non-remunerated time, equality)
- environmental (greenhouse gas emissions reduction, biodiversity, material use, energy productivity)
- governance (fundamental rights, security, transparency, sound public finances).

## Methodology and data

The approach builds upon a comprehensive theory of endogenous growth and prosperity supported by superior innovation performance (Romer, 1990; Peretto, 1996; Peretto, 2003). To emphasize the importance of nations being ranked based on innovation, transition performance, GDP, and prosperity, those were the concepts used in the analysis. Sustainable companies are supposed to generate usable final goods that can be utilized to produce additional products of superior performance or new goods. As a result, the production process could be illustrated using the equation below, where  $g$  stands for the value of final goods,  $L$  symbolizes labour, and  $I$  represents production input.

$$P = \int_0^g A_j^\alpha * [P_j^\alpha P^{1-\alpha} * (\frac{L^\beta I^{1-\beta}}{g^{1-\delta}})^{1-\delta}] * p_j \quad 0 < \alpha, \beta; \delta < 1.$$

Input performance efficacy refers to the ability to increase levels of national growth per capita and other significant factors, such as a capacity's input along with its efficiency aspect ( $p_j$ ) and the total value of  $P$ .

$$P = \int_0^n (P_j/g) * p_j$$

The advantages of the latest innovations serve society through the advantages of novelty at the degree  $\delta$  and utility at the suggested degree 1. Through outlining how



innovation affects national prosperity and economic growth, economists (Solow et al., 1966; Stiglitz, 1974a; Dasgupta & Heal, 1979; Romer, 1990; Perreto, 2015; Collard & Licandro, 2021) have laid the groundwork for the concrete methodology that is often employed to analyse each nation's economic growth. Data could additionally be deployed to demonstrate how innovation improves a country's growth and prosperity over the long term. For EU economies, they could be calculated using the formula below:

$$P = IP * C_P^\alpha * L_P^\beta * I_P^{1-\alpha-\beta} \quad 0 < \alpha < 1; 0 < \beta < 1.$$

$$IPI = IP^\beta * C_{IP}^\beta * L_P^\beta * I_{IP}^{1-\beta-\delta} \quad 0 < \beta < 1; \delta < 1.$$

where:

the variable P represents the number of parameters used in innovation performance,

C presents the capital used for innovation development,

L is labour,

I represents input components, and

the Innovation Performance Index (IPI) represents the number of metrics associated with the EU's innovation performance created in the EU research sector.

The observed IPI sub-variables have been transformed into scores of performance achievements by grading nations between 0 and 100 to check the variables' aggregates against numerous other aspects (with the maximum innovation scores and minimum tolerable innovation achievement scores). Therefore, every variable is typically scaled again by applying this equation:

$$S_{IP,j} = \left( \frac{S_{p,j} - \text{Minimum } S_{IP,j}}{\text{Maximum } S_{IP,j} - \text{Minimum } S_{IP,j}} \right) * 100$$

where:

$S_{IP,j}$  represents an updated score of the observed economies for indicator (j);

$\text{Minimum } S_{IP,j}$  is the minimum tolerable innovation performance score of the EU countries for the parameter (j); and

$\text{Maximum } S_{IP,j}$  is the European Union countries' greatest innovation output which is capable of increasing innovation performance.

Observing the computed values for the EU countries, any variance may represent an

EU policy objective, the maximum score to be achieved, or a particular figure taken from the pattern of distribution assessment. A value receives a score of zero if it is below the lowest acceptable EU measurement; variables that are beyond the greatest value receive ratings that exceed 100. When it comes to parameters based on the IPI, the smallest possible result is usually one (1), and the results are often seven in total (7). The outcomes match the two definitive responses to every query in the Global Innovation Index Report.

$$IPI_{e,i} = weight_{i,I} * X_i + weight_{i,II} * Y_i + (1 - weight_{i,I} - weight_{i,II}) * subindices_i$$

Coefficients (e.g., interdependence × degree of inventiveness) are presented by Xi and Yi to quantify the correlations between proximity and innovation factors. Consequently, given the existence of geographically restricted factors (such as the processes of innovation in the European Union by region), Xi and Yi might be understood as the parameters modulating the impacts of weight (i) I and weight (i) II. This technique has been widely applied to find markers that reduce the beneficial effects of relatedness on promoting revolutionary economic progress and prosperity.

The significance of funding, transparency in trade, or specific economic achievements might fluctuate as economies rate more significantly on the spectrum of prosperity, according to the PI's outstanding ranking algorithm. The vector of measurements needed to create an index PI (it) that illustrates the *i*-th level of prosperity during an assessed period is shown by Vn:

$$PI_{ip} = \left[ \frac{\left( \sum_{n=1}^i \alpha \bar{V}_n \right)}{i} \right]_{ip}$$

$$\bar{V} = \frac{X_t}{X_0}$$

whereas: X represents the score of a crucial gauge, *i* denotes the index's total values (n = 1, 2, ..., i), and α is the weight assigned to specific parameters comprising the prosperity index. The parameters that compose the number of points in the Prosperity Index (PI) are referred to as z-values (Legatum Institute, 2021). Through a re-scaled formula, the main parameters are converted into values using an average of 0 and a standard deviation of 1.

$$PI_{ip} = \frac{Z_{value_p} - \overline{Z_{value}}}{\sigma(x)}$$

where:

$PI_{ip}$  denotes the i-th element of the variable p,

$Z_{value_p}$  represents the actual value of the essential gauge,

$\overline{Z_{value}}$  represents the average of the essential gauges, and

$\sigma(x)$  is the standard deviation, a measure of the variability of the indicator (x).

As a result, the Legatum Institute has created a preliminary assessment of the importance of each indicator in relation to the others. The overall prosperity indicator particularly aims to identify key areas in which policymakers and authorities could significantly impact the attainment of economic growth and prosperity. The paper's scope does not include the arrangement of permanent prosperity indicators. Globally available additional information regarding the PI underpinning come from long-term competitiveness metrics. The rho-p test for hypotheses has been further employed to determine the statistical significance of Spearman's relationships. The associations between the parameters of innovation, transition, economic growth, and prosperity have been investigated using Spearman's rank-order coefficients. If the collected data is examined by order of significance, it is crucial to investigate the position of variables. The Spearman coefficient (p or rho) is typically employed to calculate the connection between prevalent quantitative parameters. Sources for the data that was utilized to generate the indices include the Global Innovation Index Report, the European Commission, the Legatum Prosperity Index Report, the Central Intelligence Agency, and the Eurostat countries database.

## Research results

The research study was carried out in the subsequent European Union countries: Sweden, Finland, Denmark, France, Slovenia, Austria, Ireland, Latvia, Portugal, Germany, Estonia, Lithuania, the Netherlands, Croatia, Luxembourg, Italy, Slovakia, Czechia, Belgium, Spain, Poland, Romania, Greece, Malta, Hungary, Bulgaria, and Cyprus. The aggregated data for every country covers the period 2022-2023.

Table 1 displays scores and ranks in the European Union countries based on the Innovation Performance Index (IPI), Prosperity Index (PI), GDP per capita, and the Transition Performance Index (TPI), Economic Performance Index (EPI), Social Performance Index (SPI), and Governance Performance Index (GPI).

Table 1. Scores and ranks of EU countries by measures of innovation and transition performance, economic growth, and prosperity in 2022-2023

Indicator	Innovation Performance Index (IPI)		Prosperity Index (PI)		GDP per capita		Transition Performance Index (TPI)	
	Score	Rank	Score	Rank	Value	Rank	Score	Rank
Economy	Score	Rank	Score	Rank	Value	Rank	Score	Rank
Sweden	61.6	1	83.67	2	\$53,600	6	72.34	5
Finland	56.9	4	83.47	3	\$48,800	9	67.40	14
Denmark	55.9	5	84.55	1	\$58,000	3	78.36	1
France	55.0	6	76.73	11	\$45,000	10	69.65	9
Slovenia	40.6	18	74.54	15	\$40,000	15	70.39	7
Austria	50.2	7	79.38	8	\$54,100	5	70.35	8
Ireland	48.5	11	80.31	7	\$102,500	2	75.93	2
Latvia	36.5	23	72.99	18	\$32,100	22	64.44	19
Portugal	42.1	17	74.64	14	\$33,700	20	66.96	16
Germany	57.2	3	80.81	6	\$53,200	7	70.70	4
Estonia	50.2	8	77.31	10	\$38,700	17	66.07	17
Lithuania	37.4	22	72.54	19	\$39,300	16	63.48	23
Netherlands	58.0	2	82.32	4	\$56,600	4	73.58	3
Croatia	35.6	24	68.24	24	\$31,600	24	64.32	20
Luxembourg	49.8	9	81.83	5	\$115,700	1	68.73	12
Italy	46.1	14	73.03	17	\$41,900	12	67.64	13
Slovakia	34.3	26	71.15	21	\$31,900	23	64.97	18
Czechia	42.8	16	75.08	13	\$40,700	14	68.84	11
Belgium	46.9	12	77.84	9	\$51,700	8	68.90	10
Spain	44.6	15	76.03	12	\$37,900	18	67.11	15
Poland	37.6	21	70.15	22	\$34,900	19	64.17	21
Romania	34.1	27	66.40	26	\$30,800	25	61.16	25
Greece	34.5	25	68.48	23	\$29,500	26	62.08	24
Malta	49.2	10	74.36	16	\$44,700	11	70.74	6
Hungary	39.8	19	66.88	25	\$33,600	21	63.96	22
Bulgaria	39.5	20	65.55	27	\$24,400	27	59.34	27
Cyprus	46.2	13	71.82	20	\$41,700	13	59.94	26

Sources: Global Innovation Index Reports (2022-2023), European Commission (2022), Legatum Prosperity Index Report (2022), Central Intelligence Agency (2023), Eurostat countries database (2023), and the author's calculations.

Sweden, the Netherlands, Germany, Finland, and Denmark are the top 5 most significant EU nations, according to their rankings and scores for innovation performance. The Innovation Performance Index ratings revealed notable variations among EU economies. As shown in Table 1, Denmark is the European Union's leading country with the highest scores and ranks on the prosperity index and for transition performance. Luxembourg,

Ireland, Denmark, the Netherlands, and Austria are the top five leading EU countries based on GDP per capita values and ranks. Romania has obtained the lowest rank related to innovation performance, and Bulgaria is the lowest-positioned EU Member State in terms of GDP per capita, prosperity index, and transition performance. Table 2 presents the scores and ranks for the EU economies according to the Economic Performance Index (EPI), Social Performance Index (SPI), and Governance Performance Index (GPI).

Table 2. Scores and ranks in the EU according to the Economic Performance Index (EPI), Social Performance Index (SPI), and Governance Performance Index (GPI)

Indices	Economic Performance Index (EPI)		Social Performance Index (SPI)		Governance Performance Index (GPI)	
	Score	Rank	Score	Rank	Score	Rank
<b>Economy</b>						
Sweden	73.0	3	84.3	4	83.7	3
Finland	68.2	7	84.1	5	80.7	5
Denmark	73.4	2	85.5	2	84.0	2
France	58.9	12	81.0	9	73.2	14
Slovenia	62.5	10	85.9	1	77.7	10
Austria	70.2	5	80.6	11	78.0	9
Ireland	76.1	1	78.3	15	79.0	8
Latvia	47.9	22	72.2	21	66.0	24
Portugal	50.3	20	76.9	16	73.1	15
Germany	70.7	4	82.0	7	79.1	7
Estonia	56.4	14	79.2	14	80.3	6
Lithuania	52.3	19	71.7	23	68.4	20
Netherlands	66.7	9	84.8	3	82.5	4
Croatia	45.6	24	72.0	22	68.7	19
Luxembourg	69.3	6	75.5	17	85.0	1
Italy	56.7	13	70.2	25	65.7	25
Slovakia	50.1	21	80.9	10	70.9	17
Czechia	60.4	11	83.9	6	77.3	11
Belgium	67.9	8	81.6	8	73.3	13
Spain	54.2	16	74.7	19	73.7	12
Poland	52.5	18	74.1	20	71.8	16
Romania	42.2	26	66.0	26	66.6	22
Greece	45.2	25	70.9	24	63.8	26
Malta	55.7	15	80.1	12	70.1	18
Hungary	53.0	17	75.3	18	60.5	27
Bulgaria	40.8	27	65.3	27	66.7	21
Cyprus	47.6	23	79.2	13	66.1	23

Source: European Commission (2022) and the author's calculations.

According to the EPI, the top five ranked countries are Ireland, Denmark, Sweden, Germany, and Austria. Bulgaria is the lowest-ranked country according to the EPI and SPI. The top five economies in terms of social performance are Slovenia, Denmark, the Netherlands, Sweden, and Finland. Luxembourg is the highest-ranked country on the governance performance index, while Hungary is the lowest-ranked country. Table 3 presents relationships between the Innovation Performance Index, Transition Performance Index, GDP per capita, Prosperity Index, Economic Performance Index, Socioeconomic Performance Index, and Governance Performance Index in the EU Member States in 2022-2023. The estimation was performed by employing SPSS 25.

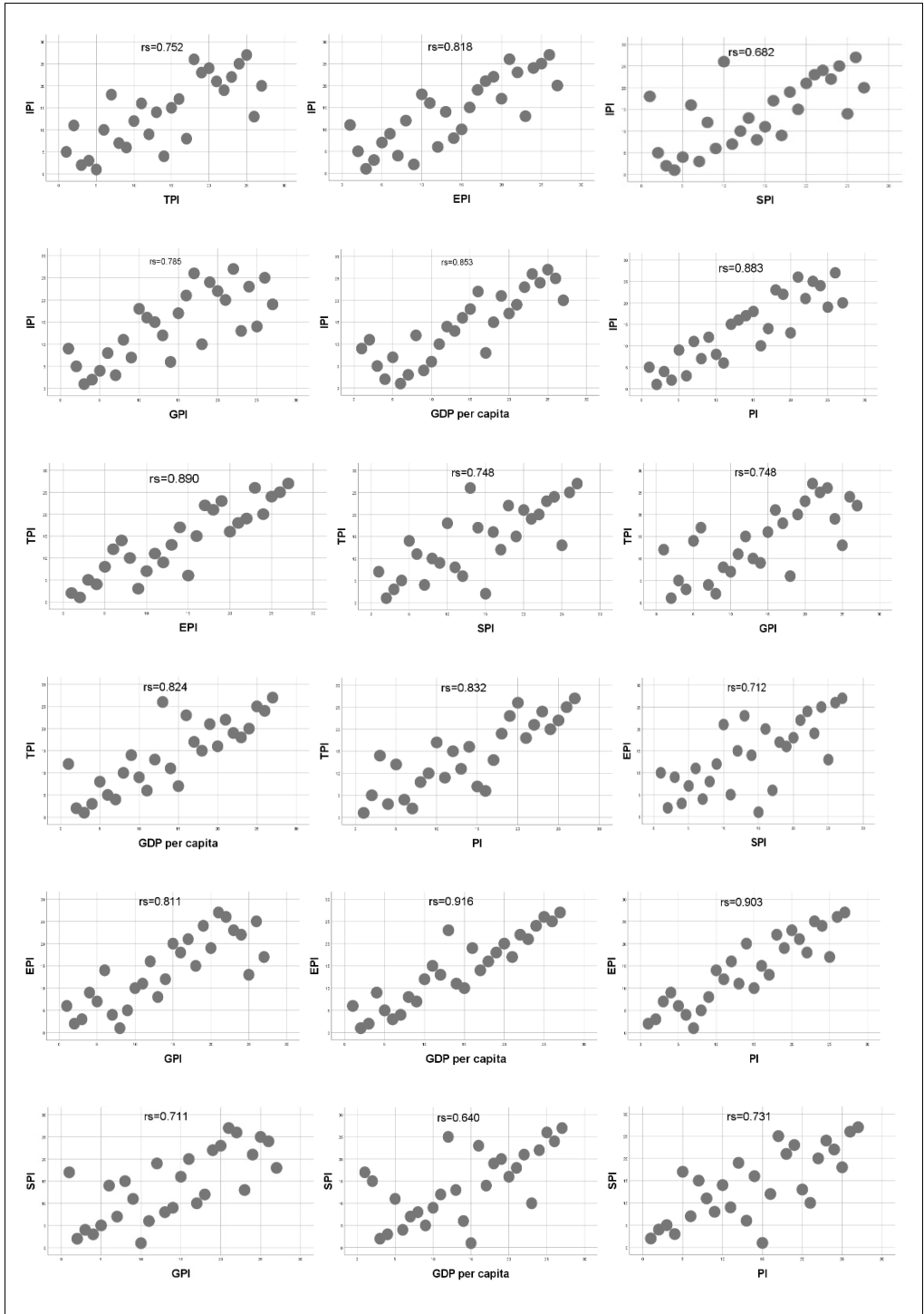
Table 3. Relationships between the Innovation Performance Index, Transition Performance Index, GDP per capita, Prosperity Index, Economic Performance Index, Socioeconomic Performance Index, and Governance Performance Index in the EU in 2022-2023

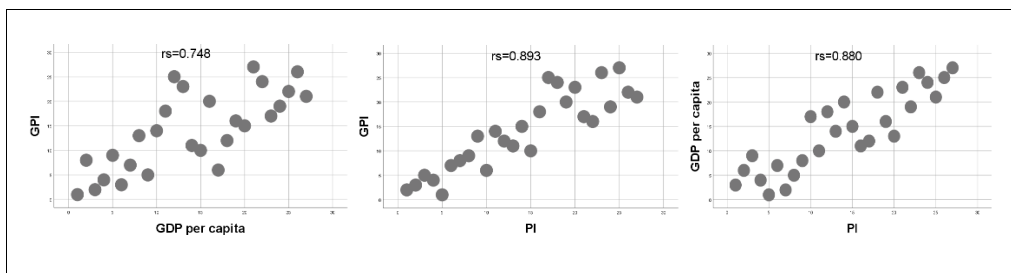
	<b>IPI</b>	<b>TPI</b>	<b>EPI</b>	<b>SPI</b>	<b>GPI</b>	<b>GDP pc</b>	<b>PI</b>
<b>IPI</b>	1.000	.752**	.818**	.682**	.758**	.853**	.883**
<b>TPI</b>	.752**	1.000	.890**	.748**	.737**	.824**	.832**
<b>EPI</b>	.818**	.890**	1.000	.712**	.811**	.916**	.903**
<b>SPI</b>	.682**	.748**	.712**	1.000	.711**	.640**	.731**
<b>GPI</b>	.758**	.737**	.811**	.711**	1.000	.748**	.893**
<b>GDP pc</b>	.853**	.824**	.916**	.640**	.748**	1.000	.880**
<b>PI</b>	.883**	.832**	.903**	.731**	.893**	.880**	1.000

Note: \*\*correlation is significant (p<0.001).

Source: Estimation by the author.

The following scatter plots (Figure 1) display the associations between variable results according to Spearman's coefficient.





Note: correlation is significant ( $p < 0.001$ ).

Source: By the author via SPSS 25.

Figure 1. Relationships between the indicators of Innovation, Transition Performance, GDP per capita, and Prosperity in the EU economies in 2022 – 2023

Various suggestions can be derived from the investigation performed in EU economies. There is a positive and significant correlation between the Transition Performance Index and the Innovation Performance Index (0.752, where  $p < 0.001$ ). A very strong positive and significant interrelationship has been determined between the Economic Performance Index and the Innovation Performance Index (0.818, where  $p < 0.001$ ). A positive and significant correlation has been revealed between the Socioeconomic Performance Index (SPI) and the Innovation Performance Index (IPI) with a correlation coefficient of 0.682,  $p < 0.001$ . A positive relationship has been determined between the Governance Performance Index (GPI) and the IPI with a correlation coefficient of 0.758,  $p < 0.001$ . There is a positive and significant correlation between GDP and the IPI with a correlation coefficient of 0.853,  $p < 0.001$ . The Prosperity Index (PI) and IPI are also significantly positively correlated, with a correlation coefficient of  $rs = 0.883$ ,  $p < 0.001$ .

A very strong linkage has been revealed between the Economic Performance Index (EPI) and the Transition Performance Index (TPI) with a correlation coefficient of  $rs = 0.890$ , where  $p < 0.001$ . The SPI and TPI are correlated with a coefficient of  $rs = 0.748$ ,  $p < 0.001$ . A strong positive and significant correlation exists between the GPI and the TPI with a correlation coefficient of  $rs = 0.737$ ,  $p < 0.001$ . A very strong positive and significant linkage has been revealed between GDP and the TPI with a correlation coefficient of  $rs = 0.824$ ,  $p < 0.001$ . The correlation coefficient between PI and TPI,  $rs = 0.832$  ( $p < 0.001$ ), indicates a very strong positive and significant connection. Positive and significant interdependence has also been determined between the SPI and EPI with a correlation coefficient of  $rs = 0.712$  where  $p < 0.001$ , and the GPI and EPI are significantly positively correlated with a correlation coefficient of  $rs = 0.811$ ,  $p < 0.001$ .

GDP and the EPI have a very strong positive and significant association ( $rs = 0.916$ ,  $p < 0.001$ ), as confirmed by the data. The correlation coefficient  $rs = 0.903$  ( $p < 0.001$ )



indicates a very strong positive and significant association between the PI and EPI. The GPI and SPI are positively and significantly correlated with a correlation coefficient of  $r_s=0.711$ ,  $p<0.001$ . GDP and the SPI are positively and significantly correlated, as indicated by a correlation coefficient of  $r_s=0.640$  ( $p<0.001$ ). With a correlation coefficient of  $r_s=0.731$ ,  $p<0.001$ , a very strong positive and significant association between the PI and SPI has been shown. GDP and the GPI are significantly positively correlated with a correlation coefficient of  $r_s=0.748$ ,  $p<0.001$ . The correlation coefficient  $r_s=0.893$ ,  $p<0.001$ , indicates a very strong positive and significant association between the PI and GPI, while the correlation coefficient  $r_s=0.880$ ,  $p<0.001$ , indicates a highly significant and positive relationship between GDP and the PI.

## **Conclusion**

Investigating the significance of innovation, transition, economic growth, and prosperity in EU countries has been the main objective of this research paper. Various methodologies have been employed to evaluate the links between the parameters of innovation, transition performance, national prosperity, and growth with respect to the declared purpose of analysing associations throughout each indicator. The results of the investigation have indicated very strong positive associations between the variables IPI, TPI, EPI, SPI, GPI, GDP, and PI that prove to be highly significant. The following inferences can be generated regarding the importance of innovation and transition performance in increasing the future growth and prosperity of EU Member States: the most crucial drivers are efficient innovation and transition performance, with special emphasis on economic, socioeconomic, and governance performance. The scores in the areas of innovation, transition, economic growth, and prosperity offered through the proper metrics could be extremely essential in comparable assessments between countries and offer useful recommendations to countries that create economic policies with the aim of fostering future economic welfare. The scores in the areas of innovation and transition performance, given by the relevant variables, could be important in comparable assessments across countries and offer clarifying recommendations to policymakers that create economic policies to promote prosperity and economic growth in the coming decades. European countries can use the IPI, TPI, EPI, SPI, GPI, GDP, and PI to continuously monitor overall economic growth and future prosperity. Europe has an opportunity to redirect its economic expansion towards sustainability and equity through the green transition.

The concept of economic growth and national prosperity has been linked to consistent growth in gross domestic product. The theoretical framework needs to be altered to incorporate environmental, social, and governance components alongside the competitive sustainable development that characterizes EU economies, without neglecting the future

challenges that involve social polarization, increased digitization, rising disparities, and the significance of the institution of regulations. Adequate indicators are necessary to enable policymakers to form decisions about public investments in order to guide innovation that improves all Europeans' lives, establishes economic independence, and advances common principles with other nations in order to make recommendations based on evidence that will be beneficial. The ranking information highlights the importance of innovation performance in addition to measures for the transition to a green economy. Innovative research and development boost the effectiveness and flexibility of social and economic structures, which advance countries' transitions as tracked by their transition performance. The transition performance rankings also emphasize the vital role effective government plays as a foundational element for attaining inclusive, resilient, and sustainable economic growth.

### **Conflict of interests**

The author has no conflict of interests to declare.

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