ISSN: 2247-6172
Review of Applied Socio- Economic Research
(Volume 29, Issue 1/ 2025), pp. 19- 36
URL: http://www.reaser.eu
e-mail: editors@reaser.eu

Does Innovation really enhance National Competitiveness in Developing countries? Evidence from Asia

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Abstract. *Enhancing national competitiveness is an important issue for supporting economies in the context of globalization. Although some empirical studies done in developed countries, the link between innovation and national competitiveness in developing countries has not received enough academic attention yet. To fill this empirical research gap, this study aims to investigate the impact of innovation on national competitiveness in Asia. We use the Generalized Double Diamond (GDD) approach to establish the theoretical framework of the study. The panel data estimations including Pooled OLS, Fixed effects, Random effects, and Driscoll-Kraay standard error are employed to calculate the effects of innovation on national competitiveness with a dataset covering 21 Asian developing economies from 2011 to 2022. The results confirm that innovation positively affects the competitiveness of developing countries. Besides, other domestic elements including tax, infrastructure, and institutions have positive effects on national competitiveness. On the other hand, in international factors, export helps increase national competitiveness but foreign direct investment can harm the competition of countries. This study may be the first one which analyzes the impact of innovation on the competitiveness of developing countries in Asia. The results provide valuable information for policymakers to handle innovation like a long-term developing strategy for enhancing national competitiveness in the future. Besides, governments should evaluate their competitive position and identify critical technology areas for improvement in national competitiveness.*

Keywords: Innovation, research and development, national competitiveness, development strategy, technology development.

JEL Codes: F15, F41, F63

1. Introduction

The competitiveness of economies in the context of increasingly rapid globalization has become a global research topic (Rusu & Roman, 2018; Aiginger, 2021; Simionescu et al., 2021). Besides, increasing competitiveness based on innovation is receiving huge attention not only from academics but also from policymakers in many countries (Powell & Snellman, 2004; Bae & Yoo, 2015). In the era of the Fourth Industrial Revolution, countries must constantly develop high technologies and increase investment in critical areas to improve their competitiveness (Dima et al., 2018). Under the explosion of the revolution in information technology and the internet, countries have become increasingly closely linked, and the globalization process has helped accelerate the technology transfer process. As a result of the Fourth Industrial Revolution, innovation has facilitated access to domestic and international markets, significantly impacting national competitiveness (Szeles & Simionescu, 2020).

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ISSN: 2247-6172
Review of Applied Socio- Economic Research
(Volume 29, Issue 1/ 2025), pp. 19- 36
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Therefore, to improve the country's current position, it is necessary to consider development and innovation to build a strong and sustainable economy (Carayannis & Grigoroudis, 2014).

Today's main concern of policymakers in developed and developing countries is national competitiveness and how to enhance it (Rusu & Roman, 2018). In the context of an increasingly interconnected and market-sharing world, countries compete to improve innovation capacity to achieve growth and economic efficiency of the economy (Diebolt & Hippe, 2019). Competition and innovation are essential for countries to build innovation capacity because they provide viable pathways to accelerate technological catch-up and sustain productivity and capability growth competition (Khyareh & Rostami, 2022). The innovation index chart can help developing economies keep pace with global innovation trends, as it is the basis for providing the overall innovation performance of countries (Wonglimpiyarat, 2010). The innovation index can also help assess what countries should do to promote innovation, leading to economic growth and employment.

Furthermore, the innovation index highlights policy challenges – national policies for building new national innovation strategies. Innovation is essential to sustainable competitiveness and strengthening the knowledge economy, a pillar of knowledge progress and social, environmental, and economic efficiency. In the literature, there is no unified approach to national competitiveness; many studies have dealt with this topic and come up with different opinions; for example, Krugman (1995) equates competitiveness with productivity. This article mainly applies an innovation-based perspective to understand improving national competitiveness and, thereby, countries gaining competitive advantage. External technological knowledge can be spread across firms, regions, and countries through various transmission mechanisms (Pietrubelli, 1996). Additionally, knowledge is embodied in technology, such as patents, paperwork, and information from the market and the organization's management (Spender, 1996). However, to date, there has been little research on whether the interaction between internal and external knowledge facilitates this process.

To better understand the trends in catch-up development across countries, it would be interesting to examine whether there is a promotion or antagonism between internal technological innovation capacity and the absorption of outside knowledge. Furthermore, we assume that developing and emerging countries are actors in global competition. Based on previous discussions, there is some concern that the current competition model in developing and emerging economies needs to be better for the path to prosperity in emerging economies, such as helping Join the development team. The general problem is that a fast-growing country will fall into the middle-income trap and get stuck at that income level (Awdeh & Hamadi, 2018; Lee, 2020); the middle-income trap is the biggest challenge when it comes to the situation where a country has a middle income (Tung & Hoang, 2024). Therefore, improving the competitiveness of these countries is a complex problem, which currently has few studies to help clarify, especially in the global innovation trend.

This study makes several contributions to disciplinary theories. Firstly, through empirical research in 21 developing and emerging Asian countries in 2011-2022, the role of innovation as an essential factor for improving capacity in national competition will be clarified. This finding is a significant contribution to the current literature. Although innovation is a critical topic that has been discussed recently when some studies

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considered this factor's impact on the firm's competitiveness (at the microeconomics level), there is a demand for clarifying this effect at the macroeconomics aspect, for example, innovation and national competitiveness. In the case of Asian developing countries, the link between innovation and national competitiveness is a real empirical research gap and our study would fill this research gap. Second, the econometric model not only considers the effect of innovation, but also separates the variables into two groups: internal and external factors. The result shows that the interaction between internal factors positively influences national competitiveness. Regarding external factors, we have provided an essential discovery that the international environment also plays a significant role in promoting competition, but foreign direct investment is an issue that creates obstacles. Finally, some implications should help to improve the quality of related policies in the future.

The paper is structured in 5 parts. Section 2 presents an overview of the related studies. The econometric model, methodology, and data source are presented in Section 3. Next, Section 4 presents the estimative results and discussion. Finally, Section 5 is the conclusion as well as provides policy implications.

2. Literature Review

Innovation is now a progressive trend in a lot of countries in integrating the world economy (Galindo & Méndez, 2014). The impact of innovation on economic growth positively enhances the competitiveness of countries (Bae & Yoo, 2015; Kaynak et al., 2017). National competitiveness is achieved by producing the highest significant quantity of goods and services that can successfully compete worldwide (Krugman, 1994). The competitiveness of an economy helps us to understand how the products of a country can have a high demand in the international market (Farinha et al., 2018).

National strategies for promoting innovation should appropriate policies to enhance the business environment and economic freedom and create a knowledge economy based on advanced technologies. In recent decades, many small enterprises have appeared in the service industry and have focused on innovative elements that have the potential to promote vigorous competitiveness and enhance the business's position (Amorós & Bosma, 2014). The macroeconomic environment is the driving force to promote national competitiveness, however, the competitiveness of a country will depend on the level of economic development of that country because there is a vast difference in competitiveness between countries (Liu, 2017). A stable economic environment is not necessarily the only factor that makes a country develop, but an unstable macroeconomic environment will be a great danger to a country (Khyareh, 2021).

Macroeconomic factors can influence competitiveness, and include internal factors and international factors that can increase or weaken the competitiveness of a country (Galindo & Mendez, 2014). In the current trend, economies, especially in developing countries, must also improve the domestic economic environment by enhancing the knowledge base in economic fields such as technical innovation, research, and development (Dima, 2018). Powell and Snellman (2004) also clarified this relationship through the knowledge economy that would give the country more robust economic development than economies dependent on natural resources.

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Nowadays, economic development based on knowledge and innovation is no longer the exclusive playground of high-income developed countries. Developing countries are also constantly improving institutions and innovative policies to improve competitiveness in the international market (Khyareh, 2021). Innovation has become decisive in creating a stable and growing knowledge economy. From here, it is possible to build solid foundations such as improving professional knowledge, increasing labor productivity and creating jobs, reducing unemployment, and avoiding waste of resources. At the corporate level, investment in research and development (R&D) and innovation helps companies build new business models, new products, new services, new production processes, and new management styles. Thereby, they change the domestic microeconomic environment in a positive direction (Fernandes & Ferreira, 2013). When countries innovate, they create smart economies with competitive advantages and enhance national influences (Koc & Ceylan, 2007). Businesses are the pillars of the national economy, and these production capabilities demonstrate the ability to expand markets and increase product competitive advantage and profits (Hu & Hsu, 2008; Kaminski et al., 2008). As countries increase integration, international competition becomes increasingly fierce to improve national position, therefore, innovation is vital. Therefore, innovation will be a critical factor in improving national competitiveness and sustainable economic development based on knowledge (Kaynak et al., 2017).

Marčeta and Bojnec (2020) analyzed the key elements of the Global Competitiveness Index (GCI) in 28 EU countries. The study investigated the relationship between research in universities-industries and cluster development on competitiveness. The result indicates that innovation and workforce training as essential drivers of competitiveness in the EU region. On the other hand, countries with economic policies and strategies based on technological innovation not only have a considerable advantage and sustainable competitive advantage in terms of global competitiveness but also growth and development of the economy leads to prosperity and national welfare (Şener & Sarıdoğan, 2011). A country's competitiveness can increase when there are policies to build a flexible modern macroeconomic environment based on a foundation of innovation and technological development (Carayannis & Grigoroudis, 2014; Voinescu & Moisoiu, 2015; Ciocanel & Pavalescu, 2015; Dima et al., 2018).

When considering external factors that can impact the competitiveness of an economy, first of all, global openness through trade, investment, and labor mobility is essential for improving competitiveness (World Economic Forum, 2015). Fontagné and Pajot (1997) clarified the relationship between foreign direct investment (FDI), international trade, and national competitiveness. However, FDI has both positive and negative sides, and this external factor can be a factor that will overwhelm domestic enterprises. With substantial financial resources and rich experiences, multinational corporations will be a direct competitor to domestic enterprises and host countries' industries, weakening national competitiveness (Law et al., 2018).

Besides, FDI plays a positive role when the country has a certain level of development, good institutions, and modern infrastructure systems (Meyer & Sinani, 2009; Kim & Li, 2014). Sekuloska (2015) investigated the different FDI flows between two European regions by analyzing the influence of innovation (R&D) in the business sector. The findings reflect that stimulating innovation through technology transfer depends on the quality of FDI and R&D activities. The differences in regions in R&D levels are due to differences in the quantity and quality of FDI in those regions.

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Other macro factors have an external impact on the domestic economy, such as international trade. As international trade expands, a country has access to global resources and expands its consumption markets, improving efficiency and increasing economic benefits (Bloom et al., 2016). When a country receives more international investments, it can learn innovative educational experiences, which leads to a better economy (Fetahi-Vehapi et al., 2015). The more regulations an economy has on the labor market, the lower the unemployment rate, and the labor market meet the needs of international investors, there are reasonable business regulations, the costs will be decreased, and competitiveness will increase (Krammer, 2009; Diebolt & Hippe, 2019; Rodríguez-Pose & Wilkie, 2019).

In summary, previous studies highlighted the role of innovation in improving competitiveness, but most of them were at the microeconomics level, which focused on competitiveness in firms. Therefore, this topic is rarely studied at the macroeconomics level. Besides, previous studies have been done based on old databases that did not keep up with the trends of the world economy. Following these studies, the policies may need to be more accurate. Furthermore, there needs to be more evidence of the relationship between innovation and national competitiveness in Asia, which has booming economies. In this region, the effects of internal factors, and international factors on national competitiveness are undiscovered.

3. Research Objectives and Methodology

This study used a panel database covering the period of 2011–2022. The data has been screened for reflecting the general trends and removed potential impacts of any outliers. This study evaluates the competitiveness of Asian developing countries in the context that this region is considered a new pole in the world's development trend. The variables used are based on the factors included in the GDD approach (Moon et al., 1995) as the primary theoretical basis for the competitiveness model (Porter, 1990). Our study presents two econometric models that followed the GDD model (Castro-Gonzáles et al., 2016; Moon et al., 1998; Moon & Lee, 2004). The first one is a local diamond, and the second one is a combination with an international diamond.

The impact of innovation on national competitiveness in 21 developing Asian economies will be quantitatively identified by some panel data estimation methods. First, the Pearson correlation analysis method is applied to explore the correlation relationships between variables in the econometric models. Second, the Pooled-OLS, Fixed effects model (FEM), and the Random effects model (REM) are conducted. In the next step, some diagnostic tests are done to select appropriate results. If estimated results meet econometric problems such as the serial-correlation or heteroskedasticity, the Driscoll-Kraay standard errors method will be employed for estimating the most reliable results.

4. Theoretical Framework

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For researching competitiveness, Porter's diamond model (1990) is popularly known, but this model has some disadvantaged aspects and should be improved for more suitable small countries or developing economies (Rugman, 1991). Moon et al. (1995) proposed the Generalized Double Diamond (GDD) model which combined the activities of multinational companies and the roles of governments. Moon et al. (1998) asserted that the GDD model helped analyze the competitiveness of small countries with a high export intensity (Lagrosen, 2007). The GDD model has been employed in some previous studies (Castro-Gonzáles et al., 2013; Moon et al., 1998; Moon & Lee, 2004).

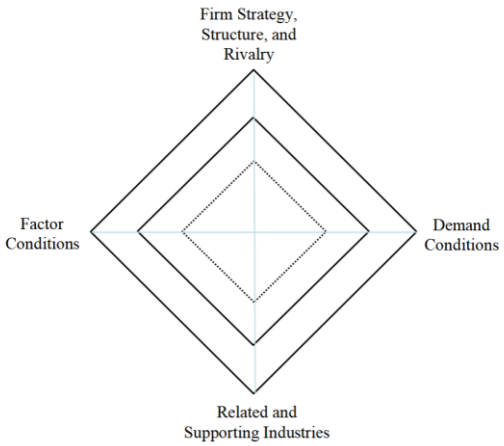


Figure 1: Generalized Double Diamond model (Sourced from Moon et al., 1998)

5. Empirical Analysis

a. Empirical Model and Data Set

Specifically, in model 1, the dependent variable is national competitiveness and it is denoted by the Global Sustainable Competitiveness Index (GSCI). Innovation is an independent variable and it is presented by the Global Innovation Index (GII). The GII is a popular index for measuring a country's innovation. The impact of domestic diamonds is represented by internal factors that influence national competitiveness. A domestic diamond has four elements: "Local factor conditions," "Local demand conditions," "Local related and supporting industries," and "Strategy, structure, and competition of local companies". Denote the four elements of the domestic diamond, independent variables include the four component elements of this diamond: Innovation (Global Innovation Index), Tax (Total taxes on profits), Infrastructure, and Institutions (National institutional quality).

$$Competitiveness_{i,t} = \varphi_0 + \varphi_1 Innovation_{i,t} + \varphi_2 Institution_{i,t} + \varphi_3 Tax_{i,t} + \varphi_4 Infrastructure_{i,t} + \varepsilon_{i,t} \quad (1)$$

In model 2, besides internal elements, the international diamond has four external elements: "International factor conditions", "International demand conditions", "International related and supporting industries", and "Strategy, structure, and competition of international companies". Four component elements of the external diamond have been added: FDI (foreign direct investment),

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Unemployment (unemployment rate), Export (Export rate of goods and services to developed countries), and Openness (Trade openness).

$$Competitiveness_{i,t} = \beta_0 + \beta_1 Innovation_{i,t} + \beta_2 Institution_{i,t} + \beta_3 Tax_{i,t} + \beta_4 Infrastructure_{i,t} + \\ + \beta_5 FDI_{i,t} + \beta_6 Export_{i,t} + \beta_7 Openness_{i,t} + \beta_8 Unemployment_{i,t} + \mu_{i,t} \quad (2)$$

Where ε and μ are the error terms, i is the i country in the data sample, and t is the t year in the study period.

A data set of 21 developing and emerging economies in Asia is used for this research. The study period is 2011-2022. The list of 21 countries includes Azerbaijan, Bangladesh, China, Indonesia, India, Iran, Jordan, Kazakhstan, Kyrgyz Republic, Cambodia, Lebanon, Sri Lanka, Mongolia, Malaysia, Nepal, Pakistan, Philippines, Thailand, Tajikistan, Uzbekistan, Vietnam. Descriptive statistics of the research variables are presented in Table 2. The measurements of the variables in the econometric models are summarized in Table1.

Table 1: Definition and measure of variables

Variable symbol	Definition and measure	Source
Competitiveness	Global Sustainable Competitiveness Index (GSCI) (1 to 100)	Solability (Solability.com, 2023)
Innovation	Global Innovation Index (GII) (1=low to 100=high)	World Intellectual Property Organization (2023)
Institution	Evaluate the effectiveness of the economy (1=low to 100=high)	Heritage Foundation (2023)
Tax	Other taxes payable by businesses (% of commercial profits)	World Development Indicators (World Bank, 2023)
Infrastructure	Individuals using the Internet (% of the population)	
FDI	Foreign direct investment (% GDP)	
Export	Merchandise exports to high-income economies (% of total merchandise exports)	
Openness	Merchandise trade (% of GDP)	
Unemployment	Unemployment, total (% of total labor force) (modeled ILO estimate)	

Source: Authors' calculation using the study data

b. Testing of the Model and Estimates

All variables in our econometric functions are presented by a database sourced from the Solability (2023), World Intellectual Property Organization (2023), Heritage Foundation (2023) and World Development Indicators (World Bank, 2023). The descriptive statistics of all variables are presented in Table 2.

Table 2: Descriptive statistics of variables in the econometric models

Variable	Max	Min	Mean	Std. Dev.	Obs
Competitiveness	51.4	31.8	41.9	3.85	231
Innovation	55.3	17.6	31.3	7.16	245

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Institution	70.3	0 .1	7.59	14.2	245
Tax	96.7	3.1	44.4	24.6	223
Infrastructure	55.4	12.3	31.9	9.50	252
FDI	43.9	-37.1	3.50	5.64	246
Export	89.2	3.78	52.5	22.3	210
Openness	182.3	21.4	65.3	37.9	252
Unemployment	19.2	0 .14	5.71	3.82	330

Source: Authors' calculation using the research data

In the first step of the study process, the Pearson Correlation matrix is employed to unveil the correlation coefficients among variables. Table 3 shows the direction of the correlation between variables and helps detect multicollinearity in the models. This econometric problem can strongly influence the results of the econometric regression.

Table 3: Correlation coefficient matrix of the econometric models

Variables	*Competitiveness*	*Innovation*	*Tax*	*Infrastructure*	*Institution*	*FDI*	*Export*	*Openness*	*Unemployment*
Competitiveness	1.000								
Innovation	0.3577	1.000							
Tax	0.1639	-0.1793	1.0000						
Infrastructure	0.3474	0.3327	-0.2854	1.0000					
Institution	0.2738	0.5529	-0.1494	0.4441	1.0000				
FDI	-0.0891	0.0380	-0.1201	0.0034	-0.1905	1.0000			
Export	-0.1466	0.1478	-0.1794	0.0715	0.1711	-0.0173	1.0000		
Openness	0.1104	0.2590	-0.2370	0.2428	0.0935	0.3929	0.1312	1.0000	
Unemployment	-0.2149	-0.1646	0.0096	0.1267	0.1643	-0.1717	-0.4113	-0.3814	1.0000

Source: Authors' calculation using the research data

The internal elements will be considered first; the correlation coefficient between Competitiveness and Innovation is positive (0.3577), demonstrating a positive relationship between the two variables; it means that a country has a good innovation capacity, so its competitiveness will be higher. The correlation coefficient between Tax and Competitiveness has a positive sign (0.1639) and confirms a positive relationship among these variables; a total tax increase can lead to an increase in the national competitiveness index. The correlation coefficient between Infrastructure and Competitiveness is 0.3474 and shows that the more development in infrastructure level, the higher the national competitiveness. The correlation coefficient between Institution and Competitiveness is 0.2783, which implies that good institutional quality will compete strongly in the international market and vice versa.

From the views for international factors, the correlation coefficients between FDI, Export, Unemployment, and national competitiveness are negative (-0.0891, -0.1466, and -0.2149, respectively). These values demonstrate negative relationships between international factors and national competitiveness; this implies that the participation of multinational corporations has created fierce competition that harmed the

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Review of Applied Socio- Economic Research
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competitiveness of the host country. However, the correlation coefficient between Openness and Competitiveness is positive (0.1104) and suggests an increase in competitiveness when a country strengthens its integration. The country's competitiveness will rise when the domestic market is highly open to the outside.

Finally, the multicollinearity test shows that the independent variables have VIF values that are quite small (lower than 2), and the mean value of VIF is 1.66. Therefore, it can be concluded that there is no multicollinearity phenomenon among the independent variables in the functions.

Table 4 presents the regressive results of all methods and the diagnosis tests for checking the results. Besides, some tests are employed to select the most reliable result for the study. Model 1 represents a domestic diamond with internal factors and helps to identify the effect of innovation on national competitiveness.

In the regressive step, the Pooled_OLS, FEM, and REM methods are used to estimate the panel data. The Pooled-OLS regression focuses on the average impact of independent variables on competitiveness. However, this method has received some concern as it may produce biased and inconsistent coefficients. The Wooldridge test is applied to check the auto-correlation problem, and the testing result confirms no such phenomenon in the model. The Breusch-Pagan test also concludes that the estimated result met the heteroskedasticity problem. We conducted the regression with FEM and REM models to choose the appropriate result; then, the Hausman test showed that FEM was the better one. To choose between the Pooled_OLS and FEM, the F_test was used and showed that FEM is more reliable; therefore, FEM is chosen as the best result of these methodologies.

Table 4: The estimated results of model 1

Dependent variable: Competitiveness			
Variables	Pooled_OLS	FEM	REM
Innovation	0.222*** [4.21]	0.152** [2.04]	0.125** [1.97]
Tax	0.069*** [3.07]	0.075*** [3.31]	0.078*** [3.64]
Infrastructure	0.022 [1.65]	0.085*** [6.09]	0.077*** [5.80]
Institution	-0.024 [-0.66]	0,073** [2.26]	0.063*** [2.04]
_Cons	33.58*** [24.78]	30.15***[12.31]	31.78***[15.1]
Prob > F	0.0000	0.0000	0.0000
R-squared	0.2121	0.3683	0.1534
Number of countries	21	21	21
Observations	154	154	154
F-test	u_i=0: F(20, 125) = 23.84 Prob > F = 0.0000		
Hausman-test		$\chi2(4)=18.28$ Prob>$\chi2$= 0.0011	
Breusch–Pagan test	$\chi2(1)=5,34$ Prob> $\chi2$ = 0.0208	$\chi2(1)$ = 1027.15 Prob> $\chi2$ = 0.0000	$\chi2(1)$ = 212.8 Prob> $\chi2$ = 0.000
Wooldridge test	F(1, 20) = 48.2 Prob > F = 0.0000	$\chi2(1)$ = 48.2 Prob> $\chi2$ = 0.0000	$\chi2(1)$ = 4.52 Prob>$\chi2$ = 0.0334

Note: *,**,*** significant at 10%, 5%, 1%. The t statistical values are in parentheses below the coefficients.

Source: Authors' calculation using the research data

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Review of Applied Socio- Economic Research
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The estimated result, based on the FEM model, indicates that innovation is the spotlight factor that has the positively most robust effect on national competitiveness. This evidence supports the development strategy that the more a country has in innovation activities, the more its competitiveness level increases. Other internal variables, including tax, infrastructure, and institution, statistically positively affect national competitiveness. Their coefficients imply that when businesses are operating favorably, the business-economic activities promote trade, which causes total taxes to increase. Besides, the result concludes that the improvement of the infrastructure system would promote national competitiveness. The estimated evidence confirms that an economy with good institutions, transparent public policies, and a high degree of business freedom also has a strong competitiveness.

On the other hand, a country can increase its competitiveness through open-door policies that enhance other countries' transactions. To consider the role of innovation in competitiveness, the econometric model should not only include internal factors but also cover the effect of external factors. Therefore, Model 2, which includes all the factors of the Generalized Double Diamond (GDD), will be estimated. The regressive results are presented in Table 5.

Table 5: The estimated results of model 2

Dependent variable: Competitiveness			
Variables	Pooled_OLS	FEM	REM
Innovation	0.152*** [2.77]	0.195** [2.39]	0.133** [1.95]
Tax	0.054** [2.47]	0.075*** [3.30]	0.076*** [3.60]
Infrastructure	0.039*** [2.97]	0.085*** [5.90]	0.081*** [6.10]
Institution	0.031 [0.80]	0.05 [1.53]	0.041 [1.32]
FDI	-0.085* [-1.72]	-0.083*** [-2.85]	-0.093*** [-3,24]
Export	-0.060*** [-4.09]	0.029 [0.75]	0.008 [-0.33]
Openness	-0.006 [-0.68]	0.005 [0.25]	-0.001 [-0,1]
Unemployment	-0.386*** [-4.11]	0.132 [0.62]	-0,042 [-0.29]
_Cons	39.52*** [22.43]	27.27*** [7.06]	33.07.*** [11.22]
Prob > F	0.0000	0.0000	0.0000
R-squared	0.3306	0.4247	0.1823
Number of countries	21	21	21
Observations	154	154	154
F-test	u_i=0: F(20, 125) = 21.13 Prob > F = 0.0000		
Hausman test		$\chi2(8)$ =16.94 Prob > $\chi2$ = 0.0308	
Breusch–Pagan test	$\chi2(1)$ = 2.89 Prob>$\chi2$ = 0.0889	$\chi2(1)$ = 666.07 Prob>$\chi2$ = 0.0000	$\chi2(1)$ = 209.39 Prob>$\chi2$ = 0.0000
Wooldridge test	F(1, 20) = 35.524 Prob>F =0.0000	$\chi2(1)$ = 35.524 Prob>$\chi2$ = 0.0000	$\chi2(1)$ = 3.64 Prob>$\chi2$ = 0.0563

Note: *,**,*** significant at 10%, 5%, 1%. The t statistical values are in parentheses below the coefficients.

Source: Authors' calculation using the research data

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Review of Applied Socio- Economic Research
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According to the testing results (F test and Hausman test), the FEM model is the most reliable one, and it should be chosen as the estimated result for model 2. Both internal and external factors are included in the econometric model for investigating national competitiveness. Innovation has a statistically positive effect on national competitiveness; the effect of innovation on competitiveness remains unchanged. It is still the critical variable having a robust impact on national competitiveness, and this evidence is supported by previous studies (Bae & Yoo, 2015; Kaynak et al., 2017). Because the coefficient has a negative sign, FDI hurts national competitiveness, and this result is supported by the finding of Law et al. (2018).

Table 6: Estimated results of the Driscoll-Kraay method

Dependent variable: Competitiveness		
Variables	Driscoll-Kraay estimation	
	Model 1	Model 2
Innovation	0.152** [3.39]	0.195*** [3.85]
Tax	0.075*** [8.69]	0.074*** [7.98]
Infrastructure	0.085*** [3.97]	0.084*** [4.46]
Institution	0.073* [2.88]	0.05** [2.60]
FDI		-0.083*** [-3.32]
Export		0.029* [1.95]
Openness		0.005 [0.43]
Unemployment		0.132 [1.62]
_Cons	30.15*** [29.29]	27.27*** [12.80]
Prob > F	0.0000	0.0000
R-squared	0.3683	0.4247
Number of countries	21	21
Observations	154	154

Note: *,**,*** significant at 10%, 5%, 1%. The t statistical values are in parentheses below the coefficients.

Source: Authors' calculation using the research data

Because the estimated result met the heteroskedasticity and autocorrelation problems, this situation leads to uncertainty in study outcomes. To overcome the problem, the Driscoll-Kraay standard errors technique is employed to investigate the models.

In line with our previous estimated results, the Driscoll-Kraay standard errors method continuously concludes that innovation has a statistically positive effect on national competitiveness. This evidence highlights the role of innovation in improving national competitiveness. The internal and generalized models have the same direction regarding the effect of innovation on national competitiveness. It unveils that the higher the level of innovation operation, the more robust the level of competitiveness in a country. After that, the more competitiveness that economies have, the more benefits for the business environment and people's livelihoods. This result expands the evidence of previous studies (Marčeta & Bojnec, 2020; Szeles & Simionescu, 2020; Dima et al., 2018; Ciocanel & Pavalescu, 2015). Some existing research agrees with us on

ISSN: 2247-6172
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the role of innovation, which is the foundation of solid national economic development and necessary for survival in today's dynamic world (Şener & Sarıdoğan, 2011; Ciocanel & Pavelescu, 2015; Ferreira et al., 2017; Hadj, 2020). Creativity is a significant driving force that significantly contributes to economic growth and development sociolect-economic. Creativity and innovation create new values, increase human labor's value and productivity, and promote national economic growth and development. Creation exists in all aspects of the economy; this confirms a significant contribution. In the knowledge economy, innovation and creativity are of particular importance to economic growth and the ability to competitiveness of the economy. This assessment is supported by previous related studies such as Voinescu & Moisoiu (2015), Ciocanel & Pavalescu (2015), and Dima et al. (2018). From another perspective, innovation capacity, primarily scientific and technological innovation capacity, are decisive factors in national competitive advantage. In recent decades, countries have attached great importance to promoting economic innovation. At the same time, they propose strategies, policies, and measures to encourage innovation. Our research confirms a robust and complete answer that the impact of innovation on economic growth will positively enhance the competitiveness of countries in the knowledge economy and is Completely consistent with the study of Kaynak et al. (2017).

Second, the remaining components of the domestic diamond present statistically positive impacts on promoting national competitiveness. Specifically, the tax variable substantially impacts competitiveness, with its regression coefficient of 0.075 at a significance level of 1%. It means that when total taxes rise, the public financial resources come from dynamic business activities. Increasing taxes is always understood that countries produce more types of goods and services; thereby, this process enhances national competitiveness. As a result, the competition of that economy in the global market also automatically increased.

The following variable in the model is infrastructure, whose coefficients are positive and significant at the 1% level. According to Moon and Lee (2004) emphasize that transportation infrastructure is critical to the development of industries. Our research results show that a country with a high-quality infrastructure system can enjoy a robust competitive position compared to other countries (Aiginger, 2021; Astikė, 2022). Besides, the impact of the institutional variable is found in a positive direction between this variable and national competitiveness. The results promote a development model based on high institutional quality; the better the institutional quality, the more efficient the economy, leading to greater national competitiveness. Flachenecker (2018) and Camagni and Capello (2010) argue that national competitiveness must be encouraged by factors such as good institutions and appropriate economic policies because this will be the foundation to promote the development of Countries.

Third, the factors of international diamonds that can influence national competitiveness are considered. The regression coefficient of innovation to competitiveness shows a significant contribution when increasing from 0.152 to 0.195. In the GDD model, innovation is essential in promoting national competitiveness when placed among international factors. The model involves international trade by exporting goods and services to high-income countries; the coefficient of the export variable has a positive value and is statistically significant, positively impacting national competitiveness. This finding indicates that this is a mutually supportive direction, in which the more value of goods and services a country sells to developed countries,

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Review of Applied Socio- Economic Research
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the more competitive its economy becomes. Low export incentives can weaken national competitiveness (Ilzkovitz et al., 2008). As trade improves a country's access to global resources and expands market access, its business performance depends on its strong competitiveness (Taner et al., 2006).

Next, in previous studies on the same topic, FDI has supported local manufacturers to increase R&D and absorb more knowledge, leading to more substantial innovation and increased competition (Fu & Yang, 2009) that according to Rusu and Roman (2018), the authors demonstrated that increasing FDI encourages competitiveness. The positive impact of foreign direct investment on national competitiveness and entrepreneurship depends on the country's level of development (Meyer & Sinani, 2009; Kim & Li, 2014). However, our study discovered the impact of FDI on competitiveness represented by a negative coefficient (-0.083). That means increasing FDI in this Asian region could reduce the competitiveness of countries. On the other hand, foreign direct investment can lead to the absorption of skilled and technical talent abroad, crowd out small businesses, and reduce domestic innovation (Law et al., 2018). If the technological foundation of domestic enterprises is not good, foreign multinational corporations with enormous resources can become competitors of domestic enterprises when investing in the host country. at (García et al., 2013). This situation will lead to adverse reactions to national competitiveness; therefore, FDI harms the host country's competitiveness in this study, and our results contradict previous studies (Peña-Vinces, 2009). The remaining variables in the international factor group, Openness, and Unemployment, have positive impacts on the dependent variable, but the coefficients are not statistically significant, so there is not enough evidence to conclude the relationships.

6. Conclusion

The purpose of this research is to identify the impact of innovation on national competitiveness in the Asia region with a panel database collected from 2011to 2022. Besides, the study models also examine the effect of other macroeconomic factors on the dependent variable. The study finds that innovation increases national competitiveness in the countries. From the estimated results, some policy implications are suggested for the policymakers in developing countries.

Firstly, innovation is the factor that has the most substantial impact on national competitiveness, so to keep up with the current innovation trend, developing countries need to focus on improving their internal technological capacity, including knowledge creation capacity and knowledge absorption capacity (Şener & Sarıdoğan, 2011; Ciocanel & Pavelescu, 2015; Ferreira et al., 2017; Hadj, 2020). The government and companies must have strategies and priorities to promote R&D research activities because knowledge creation capacity provides a knowledge base and a solid foundation for a developed country. In the Global Innovation Index (GII) and represented by INO in the research model with the criterion of whole-of-society innovation, the richness lies in not only traditional innovations such as improving the quality of education, promoting scientific articles, building research centers, granting patents and increasing R&D costs. Innovation is broader, more general, and includes social and business model innovation. Therefore, governments need to promote more in both the public and private sectors, innovating in knowledge and people to keep up with the trends of the times.

Secondly, given the domestic environment, countries need to promote the production of goods and services. When a country produces many products, prosperity, and competitiveness in the social trend, come

ISSN: 2247-6172
Review of Applied Socio- Economic Research
(Volume 29, Issue 1/ 2025), pp. 19- 36
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with it, and imports are also increasingly strong. Investment in complete infrastructure is a factor that promotes development (Aiginger, 2021; Astikė, 2022). When people and businesses can do business and produce in a country with policies prioritizing infrastructure development, people and businesses will receive great benefits toward wealth and prosperity. Institutional quality is also essential to promote competitiveness in developing Asian countries. Governments must promote transparency in public policies, ensure integrity and social justice, and promote economic freedom because these factors will strengthen a country's position when integrating.

Thirdly, international factors are also issues that governments must pay attention to and develop policies in the context of increasingly fierce competition between corporations and countries. When attracting foreign investment (FDI) in developed Asian countries, it is necessary to pay attention to technology transfer and knowledge diffusion policies through which businesses and people of the host country will gain a lot of experience and technology from more advanced countries (Meyer & Sinani, 2009; Kim & Li, 2014). However, for FDI projects that are labor-intensive, have outdated technology, and have the potential to cause environmental pollution, countries need to make a careful assessment and only accept investment when it benefits the country and its people in a long-term and sustainable way. Governments must prioritize exporting goods and services to more developed countries in international trade because this also promotes national competitiveness.

In such an economic context, developing countries must seize investment opportunities, innovate, and produce goods that will help increase assets quickly and become powerful countries globally and internationally. Therefore, national governments or economies need innovation policies to guide creative development while limiting factors that affect national competitiveness.

Authors' contribution

All authors equally contributed to the study's concepts, designed the study framework, and calculated and discussed the results. All authors read and approved the final manuscript.

Disclosure statement

No potential conflicts of interest were reported by the authors.

7. References

[1]. Aiginger, K. (2021). European competitiveness and sustainable development–A policy-oriented response to "Rethinking the role of the EU in enhancing European competitiveness". *Competitiveness Review: An International Business Journal*, *31*(5), 883-900. https://doi.org/10.1108/CR-03-2021-0039.

[2]. Awdeh, A., & Hamadi, H. (2018). Factors hindering economic development: evidence from the MENA countries. *International Journal of Emerging Markets*, *14*(2), 281-299. https://doi.org/10.1108/IJoEM-12-2017-0555.

[3]. Amorós, J. E., & Bosma, N. (2014). *Global entrepreneurship monitor 2013 global report,* Universidad del Desarrollo.

[4]. Astikė, K. (2022). Does cultural economics affect country's competitiveness?. *Business, Management and Economics Engineering*, *20*(2), 224-236. https:// doi.org/10.3846/bmee.2022.17308

ISSN: 2247-6172
Review of Applied Socio- Economic Research
(Volume 29, Issue 1/ 2025), pp. 19- 36
URL: http://www.reaser.eu
e-mail: editors@reaser.eu

[5]. Bae, S. H., & Yoo, K. (2015). Economic modeling of innovation in the creative industries and its implications. *Technological forecasting and Social change, 96,* 101–110. https://doi.org/10.1016/j.techfore.2015.02.010.

[6]. Bloom, N., Draca, M., & Van Reenen, J. (2016). Trade induced technical change? The impact of Chinese imports on innovation, IT and productivity. *The Review of Economic Studies, 83*(1), 87–117. https://doi.org/10.1093/restud/rdv039.

[7]. Camagni, R., & Capello, R. (2010). Macroeconomic and territorial policies for regional competitiveness: an EU perspective. *Regional Science Policy & Practice*, *2*(1), 1-19.

[8]. Castro-Gonzáles, S., Peña-Vinces, J. C., & Guillen, J. (2016). The competitiveness of Latin-American economies: Consolidation of the double diamond theory. *Economic Systems*, *40*(3), 373-386. https://doi.org/10.1016/j.ecosys.2015.10.003.

[9]. Carayannis, E., & Grigoroudis, E. (2014). Linking innovation, productivity, and competitiveness: implications for policy and practice. *The Journal of Technology Transfer*, *39*, 199-218. https://doi.org/10.1007/s10961-012-9295-2.

[10]. Ciocanel, A. B., & Pavelescu, F. M. (2015). Innovation and competitiveness in European context. *Procedia Economics and Finance*, *32*, 728-737. https://doi.org/10.1016/S2212-5671(15)01455-0.

[11]. Dierx, A., & Ilzkovitz, F. (2021). EU competition policy: an application of the failing forward framework. *Journal of European Public Policy*, *28*(10), 1630-1649. https://doi.org/10.1080/13501763.2021.1954063.

[12].Diebolt, C., & Hippe, R. (2019). The long-run impact of human capital on innovation and economic development in the regions of Europe. *Applied Economics, 51*(5), 542–563. https://doi.org/10.1080/00036846.2018.1495820.

[13]. Dima, A. M., Begu, L., Vasilescu, M. D., & Maassen, M. A. (2018). The relationship between the knowledge economy and global competitiveness in the European Union. *Sustainability*, *10*(6), 1706. https://doi.org/10.3390/su151914117.

[14]. Eren, M., & Kaynak, S. (2017). An evaluation of EU member states according to human development and global competitiveness dimensions using the multi-period grey relational analysis (MP-GRA) technique. *Grey Systems: Theory and Application*, *7*(1), 60-70. https://doi.org/10.1108/GS-08-2016-0023.

[15]. Fernandes, C. I., Ferreira, J. J., & Raposo, M. L. (2013). Drivers to frm innovation and their efects on performance: an international comparison. *International Entrepreneurship and Management Journal, 9*(4), 557–580. https://doi.org/10.1007/s11365-013-0263-6.

[16]. Ferreira, J. J., Fernandes, C. I., & Ratten, V. (2017). Entrepreneurship, innovation and competitiveness: what is the connection?. *International Journal of Business and Globalisation*, *18*(1), 73-95. https://doi.org/10.1504/IJBG.2017.081030

[17]. Fetahi-Vehapi, M., Sadiku, L., & Petkovski, M. (2015). Empirical analysis of the efects of trade openness on economic growth: An evidence for South East European countries. *Procedia Economics and Finance, 19*, 17–26. https://doi.org/10.1016/S2212-5671(15)00004-0.

ISSN: 2247-6172
Review of Applied Socio- Economic Research
(Volume 29, Issue 1/ 2025), pp. 19- 36
URL: http://www.reaser.eu
e-mail: editors@reaser.eu

[18]. Flachenecker, F. (2018). The causal impact of material productivity on macroeconomic competitiveness in the European Union. *Environmental Economics and Policy Studies*, *20*(1), 17-46. https://doi.org/10.1007/s10018-016-0180-3

[19]. Fontagnë, L. and M. Pajot (1997): How foreign direct investment affects international trade and competitiveness: an empirical assessment, Centre d'Études Prospectives et d'Informations Internationales, *Document de Travail*, No. 97-17.

[20]. Galindo, M. Á., & Méndez, M. T. (2014). Entrepreneurship, economic growth, and innovation: Are feedback efects at work? *Journal of Business Research, 67*(5), 825–829. https://doi.org/10.1016/j.jbusres.2013.11.052.

[21]. Garcia, S. M., Tor, A., & Schiff, T. M. (2013). The psychology of competition: A social comparison perspective. *Perspectives on psychological science*, *8*(6), 634-650. https://doi.org/10.1177/1745691613504114.

[22]. Hadj, T. B. (2020). Effects of corporate social responsibility towards stakeholders and environmental management on responsible innovation and competitiveness. *Journal of Cleaner Production*, *250*, 119490. https://doi.org/10.1016/j.jclepro.2019.119490

[23]. Hu, J. L., & Hsu, Y. H. (2008). The more interactive, the more innovative? A case study of South Korean cellular phone manufacturers. *Technovation, 28*(1–2), 75–87. https://doi.org/10.1016/j.technovation.2007.07.010.

[24]. Kaminski, P. C., de Oliveira, A. C., & Lopes, T. M. (2008). Knowledge transfer in product development processes: A case study in small and medium enterprises (SMEs) of the metalmechanic sector from Sao Paulo, Brazil. *Technovation, 28*(1–2), 29–36.

[25]. Kaynak, S., Altuntas, S., & Dereli, T. (2017). Comparing the innovation performance of EU candidate countries: an entropy-based TOPSIS approach. *Economic research-Ekonomskaistraživanja, 30*(1), 31–54. https ://doi.org/10.1080/1331677X. 2016. 1265895.

[26]. Kim, P. H., & Li, M. (2014). Injecting demand through spillovers: Foreign direct investment, domestic socio-political conditions, and host-country entrepreneurial activity. *Journal of Business Venturing, 29*(2), 210–231. https://doi.org/10.1016/j.jbusvent.2012.10.004.

[27]. Khyareh, M. M., & Rostami, N. (2022). Macroeconomic conditions, innovation and competitiveness. *Journal of the Knowledge Economy*, *13*(2), 1321-1340. https://doi.org/10.1007/s13132-021-00752-7.

[28]. Koc, T., & Ceylan, C. (2007). Factors impacting the innovative capacity in large-scale companies. *Technovation, 27*(3), 105–114. https://doi.org/10.1016/j.technovation.2005.10.002.

[29]. Krammer, S. M. (2009). Drivers of national innovation in transition: Evidence from a panel of Eastern European countries. *Research Policy*, *38*(5), 845–860. https://doi.org/10.1016/j.respol.2009.01.022

[30]. Krugman, P.R. (1994). Competitiveness: a dangerous obsession. *Foreign Affairs*, *73*(2), 28–44. https://doi.org/10.2307/20045917

[31]. Law, S. H., Lee, W. C., & Singh, N. (2018). Revisiting the fnance-innovation nexus: Evidence from a non-linear approach. *Journal of Innovation & Knowledge*, *3*(3), 143–153. https://doi.org/10.1016/j.jik.2017.02.001

ISSN: 2247-6172
Review of Applied Socio- Economic Research
(Volume 29, Issue 1/ 2025), pp. 19- 36
URL: http://www.reaser.eu
e-mail: editors@reaser.eu

[32]. Lee, J. W. (2020). Convergence success and the middle-income trap. *The Developing Economies*, *58*(1), 30-62. https://doi.org/10.1111/deve.12214

[33]. Liu, C. (2017). International competitiveness and the fourth industrial revolution. *Entrepreneurial Business and Economics Review*, *5*(4), 111–133. https:// doi.org/10.1007/s11769-017-0890-x.

[34]. Marčeta, M., & Bojnec, Š. (2020). Drivers of global competitiveness in the European Union countries in 2014 and 2017. *Organizacija*, *53*(1), 37-52. https:// doi.org/10.2478/orga-2020-0003.

[35]. Meyer, K. E., & Sinani, E. (2009). When and where does foreign direct investment generate positive spillovers? A meta-analysis. *Journal of International Business Studies*, *40*(7), 1075–1094. https://doi.org/10.1057/jibs.2008.111.

[36]. Moon, C. H., Rugman AM, Verbeke A. (1995). A generalized double diamond approach to international competitiveness. En AM Rugman (Ed.). *Research in Global Strategic Management: Annual Study*, *5*, 97–114. https://doi.org/10.1016/S1064-4857(95)05005-1

[37]. Moon, C. H., Rugman, A.M., & Verbeke, A. (1998). A Generalized Double Diamond Approach to the Global Competitiveness of Korea and Singapore. *International Business Review*, *7*(2), 135–150. https://doi.org/10.1016/S0969-5931(98)00002-X

[38]. Moon, H. C., & Lee, D. (2004). The competitiveness of multinational firms: A case study of Samsung Electronics and Sony. *Journal of International and Area Studies*, *11*(1), 1-21. https://www.jstor.org/stable/43107084.

[39]. Porter, M. E. (1990). The competitive advonioge of notions. *Harvard business review*, *73*, 91.

[40]. Powell, W. W., & Snellman, K. (2004). The knowledge economy. *Annual Review of Sociology*, *30*(1), 199-220. https://doi.org/10.1146/annurev.soc.29.010202.100037.

[41]. Rodríguez-Pose, A., & Wilkie, C. (2019). Innovating in less developed regions: What drives patenting in the lagging regions of Europe and North America. *Growth and Change*, *50*(1), 4–37. https://doi.org/10.1111/grow.12280.

[42]. Rusu, V. D., & Roman, A. (2018). An empirical analysis of factors affecting competitiveness of CEE countries. *Economic Research-Ekonomska Istraživanja*, *31*(1), 2044-2059. https://doi.org/10.1080/1331677X.2018.1480969.

[43]. Şener, S., & Sarıdoğan, E. (2011). The effects of science-technology-innovation on competitiveness and economic growth. *Procedia-Social and Behavioral Sciences*, *24*, 815-828. https://doi.org/10.1016/j.sbspro.2011.09.12.

[44]. Sekuloska, J. D. (2015). Innovation oriented FDI as a way of improving the national competitiveness. *Procedia-Social and Behavioral Sciences*, *213*, 37-42. https:// doi.org/10.1016/j.sbspro.2015.11.400.

[45]. Sinimole, K. R., & Saini, K. M. (2021). Performance evaluation of R&D organisations: an Asian perspective. *International Journal of the Economics of Business*, *28*(2), 179-196. https:// doi.org/10.1080/13571516.2020.1858703.

[46]. Simionescu, M., Pelinescu, E., Khouri, S., & Bilan, S. (2021). The Main Drivers of Competitiveness in the EU-28 Countries. *Journal of Competitiveness*, *13*(1), 129–145. https: //doi.org/10.7441/joc.2021.01.08.

ISSN: 2247-6172
Review of Applied Socio- Economic Research
(Volume 29, Issue 1/ 2025), pp. 19- 36
URL: http://www.reaser.eu
e-mail: editors@reaser.eu

[47]. Spender, J. C. (1996). Making knowledge the basis of a dynamic theory of the firm. *Strategic Management Journal*, *17*(S2), 45–62. https://doi.org/10.1002/smj.4250171106

[48]. Szeles, M. R., & Simionescu, M. (2020). Regional patterns and drivers of the EU digital economy. *Social Indicators Research*, *150*(1), 95-119. https://doi.org/10.1007/s11205-020-02287-x.

[49]. Tung, L. T., & Hoang, L. N. (2024). Impact of R&D expenditure on economic growth: evidence from emerging economies. *Journal of Science and Technology Policy Management*. *15*(3), 636-654. https://doi.org/10.1108/JSTPM-08-2022-0129.

[50]. Voinescu, R., & Moisoiu, C. (2015). Competitiveness, theoretical and policy approaches. Towards a more competitive EU. *Procedia Economics and Finance*, *22*, 512-521. https://doi.org/10.1016/S2212-5671(15)00248-8.

[51]. Wonglimpiyarat, J. (2010). Innovation index and the innovative capacity of nations. *Futures*, *42*(3), 247-253. https://doi.org/10.1016/j.futures.2009.11.010.

[52]. World Economic Forum. (2015). The global competitiveness report 2015–2016. *Geneva: World Economic Forum*.

Manuscript received: 07 March .2024
Manuscript received in revised form: 25 August 2024
Manuscript accepted: 09 June 2025