

ISSN 2560-421X

UDK 33+502/504

ECONOMICS

of Sustainable Development

1



Vol. VIII

Niš, 2024

ECONOMICS OF SUSTAINABLE DEVELOPMENT
ЕКОНОМИКА ОДРЖИВОГ РАЗВОЈА



ДРУШТВО ЕКОНОМИСТА “ЕКОНОМИКА” НИШ
SOCIETY OF ECONOMISTS “ЕКОНОМИКА”, NIS

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Prepress & Cover:

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e-mail: zoki@medianis.net; ekonomika@sbb.rs

WEB: <http://www.ekonomika.org.rs>

Bank Account: 160-19452-17

Printed by:

“MEDIVEST”

18000 Niš

Copies: 200

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ORIGINAL SCIENTIFIC PAPER

10.5937/ESD2401001J

Received: September 25, 2023

Accepted: January 19, 2024

THE INFLUENCE OF R&D ON PATENT ACTIVITY OF HIGH-TECHNOLOGY COMPANIES

Abstract

In order to maintain a competitive advantage, occupy a leadership position on the market and take on the role of a creator of the “rules of the game”, high-tech companies rely on their innovation activity, and invest significantly in research and development (R&D) activity, the output of which are inventions that are the potential subject of patent protection. The company’s patent activity is an indicator of its innovation activity and an instrument that the company can use to achieve various business goals. The goal of this research is to determine the impact that research and development activities have on patent activity of high-tech companies that are on WIPO’s Top 50 PCT applicants list from 2013 to 2020. Using a panel regression analysis, it was established that investments in research and development have a positive impact on the company’s patent activity expressed by the number of granted patents and the number of published PCT applications. Also, it was determined that the return on investment in research and development has a positive impact on the number of granted patents, but a negative impact on the number of published PCT applications. Finally, no statistically significant impact of research and development intensity on patent activity indicators was found.

Keywords: *research and development, patents, innovation activity, high-technology companies*

JEL classification: *O32, O34*

УТИЦАЈ ИСТРАЖИВАЊА И РАЗВОЈА НА ПАТЕНТНУ АКТИВНОСТ ВИСОКОТЕХНОЛОШКИХ КОМПАНИЈА

Апстракт

У циљу одржавања конкурентске предности, заузимања лидерске позиције на тржишту и преузимања улоге креатора „правила игре“, високотехнолошка

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предузећа се ослањају на своју иновациону активност, значајно улажу у активност истраживања и развоја, чији су аутпут проналасци који су потенцијални предмет патентне заштите. Патентна активност предузећа индикатор је његове иновационе активности и инструмент који предузеће може користити за постизање различитих пословних циљева. Циљ истраживања је да утврди утицај који активности истраживања и развоја имају на патентну активност високотехнолошких предузећа која се налазе на листи „50 највећих подносилаца међународних патентних пријава“ Светске организације за интелектуалну својину у периоду од 2013. до 2020. године. Применом панел регресионе анализе установљено је да улагања у истраживање и развој имају позитиван утицај на патентну активност предузећа изражену бројем признатих патената и бројем објављених међународних патентних пријава. Такође, утврђено је да принос на улагања у истраживање и развој има позитиван утицај на број признатих патената, али негативан утицај на број објављених међународних патентних пријава. На крају, није установљен статистички значајан утицај интензивности истраживања и развоја на индикаторе патентне активности.

Кључне речи: *истраживање и развој, патенти, иновациона активност, високотехнолошка предузећа*

Introduction

The modern business environment of high-tech companies is characterized by the intense dynamics of changes that direct the pace of market competition. Businesses are forced to adapt to the speed of change in order to survive in the market and improve intellectual performance (Krstić, 2009). Innovative activity is the main instrument for achieving business success. High investments in research and development activities are a precondition for the creation of innovative solutions that provide high-tech companies with achieving and maintaining a competitive advantage on the market and sustainable development (Jovanović, Krstić & Berezjev, 2022).

The outputs of research and development (R&D) can often be inventions that satisfy the criteria of patentability (Vasić, Kecman, & Mladenović, 2016). In this case, companies can decide to submit a patent application for their invention to a national office of intellectual property of the country in which they want to obtain patent protection. Patents can have a strategic importance for companies, that is reflected in the possibility of excluding competition from the market, generating revenue from licensing, attracting external capital, etc. (Krstić, Janjić, Jovanović & Milanović, 2021). High-tech companies, which have high expenditures in research and development, often come up with inventions that can be imitated by the competition, which causes the original inventor to lose part of the market share, as well as part of the profit (Rađenović, Krstić, Janjić & Vujatović, 2023). By owning a patent over a certain invention, the company prevents the competition from exploiting its invention and retains all the benefits of placing the innovative product on the market (Jovanović, Krstić & Radjenović, 2023).

Bearing in mind the importance that patent activity has for companies, especially for high-tech companies whose basis of business success is its innovation activity, it is necessary

to create a patent portfolio as an output of research and development activities, which will maximize the value of the company's innovation efforts. The purpose of the research is to explore the impact that research and development activities have on the patent activity of high-tech companies that are on WIPO's Top 50 PCT applicants list from 2013 to 2020.

1. Literature review

There are many studies in which the link between R&D and patenting activity is indicated. The results of some studies show the positive influence of R&D on patenting. Pakes and Griliches (1984), Bound et al. (1984) and Hall et al. (1986) found a strong and positive link between R&D expense and the number of patents. Their samples included a wide range of organizations and industries. Cardinal and Hatfield (2000) examined the organizations in the pharmaceutical industry. They found that companies that placed a stronger focus on R&D investment were more productive in terms of creating inventions which were measured by the number of patents. Ahuja and Katila (2001) have also come to the deduction about a strong correlation between R&D investment and patents in their study that was focused on the chemical industry. The same conclusion was indicated by the results of the study of the companies in the computer industry by Hagedoorn and Duysters (2002).

Kim & Marschke (2004) broke down the increase in patents at the industry level into parts that correspond to a) more money being allocated for R&D, b) an increase in the overall patent yield of each R&D dollar, and c) changes in the patent yield in certain industries. Computer hardware and pharmaceuticals, two high-tech industries, were responsible for 22% of the growth in patents. Although these two sectors witnessed the largest R&D growth among those they studied, the pharmaceutical sector's patent expansion was constrained by a fall in its yield. They demonstrate that higher R&D expenditures are responsible for 70% of the rise in patents.

In their study, Bilbao-Osorio & Rodríguez-Pose (2004) examined the influence of R&D spending of the public, corporate, and HE sectors on innovation (measured as the number of patent applications per million people). Also, they analysed the impact of innovation and the growth of innovation on economic growth. The findings show that R&D spending overall, and higher education R&D spending in the EU's peripheral regions in particular, is positively correlated with innovation. However, the existence and strength of this link depend on socioeconomic factors unique to each region, which have an impact on each region's ability to convert R&D investment into innovation and, ultimately, innovation into economic growth.

Peeters and van Pottelsberghe de la Potterie (2006) showed that companies that invest more in basic and applied research encounter higher levels of patenting. Their study was based on the examination of 150 manufacturing and service companies. Paula & Silva Rocha (2021) have found that internal R&D has a positive influence on patent applications on a sample of 751 enterprises from six Latin American countries.

Although there are many studies which show a positive effect of R&D activity on patent activity, there are some studies which show the opposite.

According to the research by Graves and Langowitz (1993), growing R&D investment has a negative impact on the ability of organizations in the pharmaceutical industry to produce inventions. In their research, Lanjouw and Schankerman (2004) show a negative relationship

between research productivity at the firm level and the patent quality index. Danguy et al. (2010) demonstrate in their study a direct correlation between R&D expenditures and patent counts at the industry level. It is asserted that the notion of “propensity-to-patent” ought to be divided into two categories: “appropriability propensity” and “strategic propensity”. The research is based on a special panel dataset of 19 countries, 18 industries, and 18 years. Research productivity, appropriability propensity, and strategic propensity have an impact on the link between R&D and patents.

2. Methodology of research

The aim of the study is to explore the impact of R&D activity on the patent activity of high-tech companies based on the various performances which are presented in Figure 1 within the conceptual framework of this study.

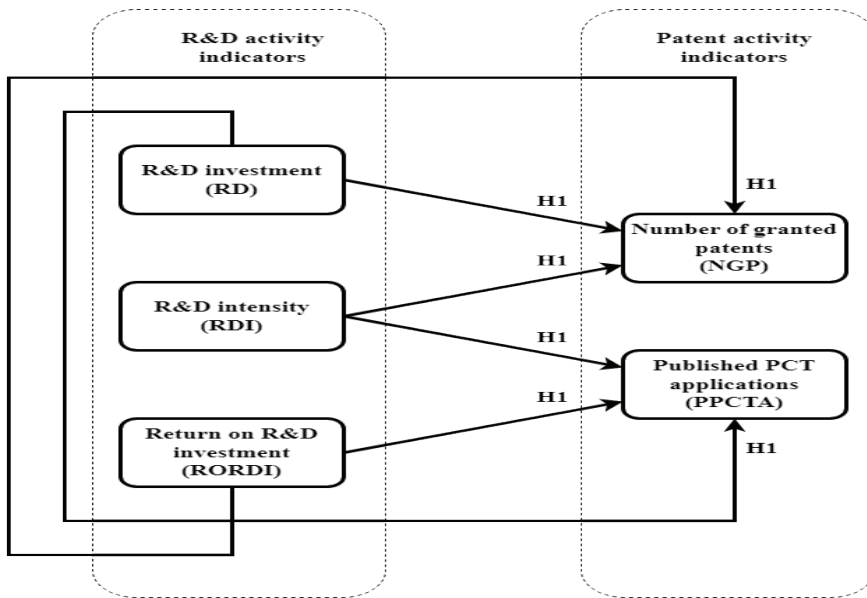


Figure 1: The conceptual framework
Source: Authors' presentation

The explanation of the variables used in the research and the method of their calculation is given in the following text.

The R&D investment (RD) is equivalent to expenditures in R&D.

The R&D intensity (RDI) indicator is defined as expenditures in R&D in the current year (t) divided by the company's sales in the current year (t) (Savrul & Incekara, 2015):

$$R\&D\ intensity_t = R\&D\ expenditures_t : Sales\ revenue_t \quad (1)$$

Return on R&D investment (RORDI) shows how much of the gross profit in the current year (t) realized from the R&D investment in the previous year ($t-1$) (Christensen and Van Bever, 2014):

$$\text{Return on R\&D investment}_t = \text{Gross profit}_t : \text{R\&D expenditures}_{t-1} \quad (2)$$

The number of granted patents (NGP) represents the number of patents granted by the United States Patent and Trademark Office (USPTO), as one of the 5 biggest national intellectual property offices in the world. Published PCT applications (PPCTA) show the number of published patent applications on the international level according to Patent Cooperation Treaty (PCT).

Considering the presented research results of various authors, the following hypothesis H1 was defined:

The R&D investment (RD), R&D intensity (RDI) and Return on R&D investment (RORDI) have a positive impact on the Number of granted patents (NGP) and Published PCT applications (PPCTA) in the next year.

The sample contains of 33 companies that operate in the high-tech sector and that are on WIPO's Top 50 PCT applicants list in the period from 2013 to 2020. These are the following companies: Samsung, Siemens, Huawei, LG Electronics, Ericsson, Sony Corporation, Microsoft, 3M, Apple, Intel, Bosch, Applied Materials, Qualcomm, Fujifilm, Murata Manufacturing, BASF SE, Hewlett-Packard Development Company, Panasonic Corporation, Mitsubishi Electric, NEC Corporation, Sharp Corporation, Hitachi, ZTE, Philips, Kyocera, Nokia, Google, LG Chemicals, Densco, Tencent, Halliburton Energy, BOE Technology, and Shenzhen China Star Optoelectronics Technology. Data for calculating the research variables for the mentioned companies were collected from their annual reports, WIPO's PCT annual review, USPTO's website and other publicly available databases. The analysis covers 264 observations.

In the first two models, R&D investment (RD) is the independent variable. In the next two models, the R&D intensity (RDI) is the independent variable. In the last two models, Return on R&D investment (RORDI) is the independent variable. In all six models, Number of granted patents (NGP) and Published PCT applications (PPCTA) are dependent variables.

The hypothesis of the research was tested using the program Stata (version 12.0) by applying the panel regression analysis. After the identification of a balanced dataset and that the assumptions are met, the fixed-effect model (FEM) and random effect model (REM) were tested. In order to select FEM or REM, the Hausman test was performed for each test. The significance cut-off point of Hausman test was 0.05. According to that, the selection of FEM was indicated by all values statistically significantly less than 0.05. On the contrary, REM was the wright choice.

3. Results of empirical research

The following part of the work presents the research models, which are investigated by employing panel regression analysis of the data. Firstly, the results of R&D investment (RD) influence on patent activity indicators are presented in Table 1.

Table 1: Results of panel regression – R&D investment as a predictor

Independent variable	Research models	
	Model 1	Model 2
	ln NGP	ln PPCTA
	FEM	REM
Constant	2.410 (0.000)	6.074 (0.000)
ln L1RD	.493 (0.000)	.099 (0.000)
F / χ^2	61.04 (0.000)	12.68 (0.000)
R^2	0.859	0.006

Note: p-value in the parentheses, ln – natural logarithm, L1 – one year lagged value.
Source: Authors' calculations

Based on the methodological assumptions of the panel regression analysis that were previously established, models 1 and 2 are statistically significant.

Model 1 measures the influence that RD has on NGP in the next year. It is hypothesized the positive influence. Model fit is significant at the level of $p < 0.01$ ($F = 61.04$, $p = 0.000$). R^2 indicates that the independent variable explains 85.9% of the variance of the dependent variable. If R&D investments increase by 1%, the Number of granted patents will increase by 0.49% in the next year and its effect is statistically significant.

Model 2 measures the influence that RD has on PPCTA in the next year. It is hypothesized the positive influence. Model fit is significant at the level of $p < 0.01$ ($\chi^2 = 12.68$, $p = 0.000$). If R&D investments increase by 1%, PPCTA will increase by 0.099% in the next year and its effect is statistically significant.

Table 2 presents the results of R&D intensity (RDI) influence on patent activity indicators.

Table 2: Results of panel regression – R&D intensity (RDI) as a predictor

Independent variable	Research models	
	Model 3	Model 4
	ln NGP	ln PPCTA
	REM	REM
Constant	6.763 (0.000)	7.025 (0.000)
ln L1RDI	-.064 (0.237)	.024 (0.603)
F / χ^2	1.40 (0.237)	.27 (0.603)
R^2	0.002	0.012

Note: p-value in the parentheses, ln – natural logarithm, L1 – one year lagged value.
Source: Authors' calculations

The panel analysis of the RDI effect on patent activity indicators revealed a negative sign of influence in model 3 and a positive sign of influence in model 4, but in both cases, it is not statistically significant.

Table 3 presents the results of Return on R&D investment (RORDI) influence on patent activity indicators.

Table 3: Results of panel regression – Return on R&D investment (RORDI) as a predictor

Independent variable	Research models	
	Model 5	Model 6
	ln NGP	ln PPCTA
	REM	FEM
Constant	6.732 (0.000)	7.257 (0.000)
ln L1RORDI	.130 (0.022)	-.269 (0.001)
F / χ^2	5.25 (0.022)	11.90 (0.000)
R^2	0.016	0.832

Note: p-value in the parentheses, ln – natural logarithm, L1 – one year lagged value

Source: Authors' calculations

Based on the assumptions of the panel regression analysis, models 5 and 6 are statistically significant.

Model 5 measures the influence that RORDI has on NGP in the next year. It is hypothesized the positive influence. Model fit is significant at the level of $p < 0.05$ ($\chi^2 = 5.25$, $p = 0.022$). If RORDI increases by 1%, the NGP will increase by 0.13% in the next year and its effect is statistically significant.

Model 6 measures the influence that RORDI has on PPCTA in the next year. It is hypothesized the positive influence. Model fit is significant at the level of $p < 0.01$ ($F = 11.90$, $p = 0.000$). R^2 indicates that the independent variable explains 83.2% of the variance of the dependent variable. If RORDI increases by 1%, the PPCTA will decrease by 0.269% in the next year and its effect is statistically significant.

Therefore, the research hypothesis H1 is partly confirmed according to the presented results.

Conclusion

This paper examines the impact of R&D activities on patenting activity of high-tech companies. The indicators of R&D activities, which were used in the empirical part of the work, are R&D investments (RD), R&D intensity (RDI) and Return on R&D investment (RORDI). Indicators of patent activity, on which the influence of the R&D indicators was examined are Number of granted patents (NGP) and Published PCT applications (PPCTA).

The research hypothesis that the R&D investment (RD), R&D intensity (RDI) and Return on R&D investment (RORDI) have a positive impact on the Number of granted patents (NGP) and Published PCT applications (PPCTA) in the next year is partially confirmed. It is confirmed that an increase in R&D investment has a positive impact on the Number of granted patents (NGP) and Published PCT applications (PPCTA) in the next year. This result is consistent with the research such as Ahuja and Katila (2001), Hagedoorn and Duysters (2002), Kim and Marschke (2004). When it comes to Return on R&D investment (RORDI) the results show that an increase in Return on R&D investment (RORDI) leads into an increase in Number of granted patents (NGP) in the next year, but a decrease in Published PCT applications (PPCTA) in the next year. The panel analysis of the R&D intensity effect on patent indicators revealed results that were statistically insignificant.

The novelty of this research reflects in studying the impact of Return on R&D investment (RORDI) on patent activity indicators - Number of granted patents (NGP) and Published PCT applications (PPCTA).

Certain limitations were present when conducting the research. Namely, the research period from 2009 to 2020 conditioned the sample size. The sample on which the research was conducted consists of companies which were continuously on WIPO's Top 50 patent applicants list in the observed period - 33 companies. Also, the patent activity indicator Number of granted patents (NGP) refers to the number of patents granted only by the United States Patent and Trademark Office (USPTO), as one of the 5 largest intellectual property offices in the world. Other national or regional intellectual property offices do not provide insight into the number of granted patents at the company level.

The results of the research have significant implications for the R&D management and the management of intellectual property of high-tech companies. Bearing in mind that greater investments in R&D contribute to a greater number of patent applications and a greater number of granted patents, it is necessary that they be at a high level in order for the company to create an optimal patent portfolio. The intellectual property management of the company should maximize the value of the outcomes of R&D activities, by submitting patent applications for inventions that meet the conditions of patentability in order to create a patent portfolio of the company that can serve as a means of creating a competitive advantage and which is a signal of intense innovative activity of the company.

The conducted research observes the impact of R&D activities from the previous year on the patent activity of the current year. Given that the process of patenting is long, it is recommended in future research to study this impact over a longer period of 3 to 5 years.

Acknowledgements: Ministry of Science, Technological Development and Innovation of the Republic of Serbia (Contracts No. 451-03-47/2023-01/200371 and 451-03-47/2023-01/200148)

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P. 11-24

SCIENTIFIC REVIEW PAPER

10.5937/ESD2401011B

Received: December 20, 2023

Accepted: March 1, 2024

ACHIEVED LEVEL OF SUSTAINABLE TOURISM DEVELOPMENT IN THE REPUBLIC OF SERBIA – THE CASE OF SPA DESTINATIONS

Abstract

Sustainable tourism is a dominant theoretical paradigm and the most acceptable solution to the challenges of modern tourism development. The main goal of the paper is to examine the achieved level of development of sustainable tourism in the Republic of Serbia on the example of spa destinations. Spa destinations are one of the three most developed forms of tourism in the Republic of Serbia with a long tradition of development. The paper analysed the most developed and recognizable destinations: Vrnjačka Banja, Sokobanja, Vrdnik Banja, Palić Banja, Bukovička Banja and Koviljača Banja. To assess the achieved level of sustainability, indicators developed by the European Union were used: economic, ecological, social, cultural and indicators of tourist satisfaction with the destination. The research results show that the achieved level of development is not aligned with sustainable development. The paper provides recommendations on how to improve the development of tourism and harmonize it with the principles of sustainable tourism.

Keywords: sustainable tourism, spa destinations, development, Republic of Serbia

JEL classification: Z32, O11

ДОСТИГНУТИ НИВО РАЗВОЈА ОДРЖИВОГ ТУРИЗМА У РЕПУБЛИЦИ СРБИЈИ – СЛУЧАЈ БАЊСКИХ ДЕСТИНАЦИЈА

Апстракт

Одрживи туризам је доминантна теоријска парадигма и најприхватљивије решење изазова развоја савременог туризма. Основни циљ рада је да се истражи достигнути ниво развоја одрживог туризма у Републици Србији на примеру бањских дестинација. Бањске дестинације су један од три најразвијенија обли-

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ка туризма у Републици Србији са доста дугом традицијом развоја. У раду су анализирани најразвијеније и најпрепознатљивије дестинације: Врњачка Бања, Сокобања, Бања Врдник, Бања Палић, Буковичка Бања и Бања Ковиљача. За оцелу достигнутог нивоа степена одрживости, коришћени су индикатори које је развија Европска Унија: економски, еколошки, социјални, културни и индикатори задовољства туриста дестинацијом. Резултати истраживања показују да достигнути ниво развоја није усклађен са одрживим развојем. У раду су дате препоруке на који начин унапредити развој туризма и ускладити га са принципа одрживог туризма.

Кључне речи: одрживи туризам, бањске дестинације, развој, Република Србија

Introduction

In the last 70 years, tourism represents one of the fastest growing industries, with particularly pronounced economic effects in the period 2000-2019, where it has profiled itself as one of the leading economic branches of many national economies (Koseoglu, Rahimi, Okumus & Liu, 2016). The key reasons that led to such tendencies are numerous (Page & Connell, 2009):

1. Greater internationalization and globalization of tourism;
2. Changes in technology and the legislative environment;
3. Increasing political recognition of tourism's economic impact;
4. Emergence of new consumers and changes in products;
5. Development of marketing, research and information.

In addition to economic effects, tourism also has a significant socio-cultural impact on the destinations where it is developed, which increases its value as a developing economic branch (Bošković, Vujičić & Ristić, 2020). Also, the development of tourism leads to changes in the environment, particularly the form of consumption of resources or their pollution, so the environmental impact of tourism is also evident (Milićević, Bošković & Lakićević, 2021). In accordance with the above, it is necessary continuously monitor the effects of tourism development and support the development of those forms that ensure the simultaneous satisfaction of the economic, ecological, social and cultural components (Landorf, 2009; Peattie, 2010; Grujić, 2019; Krstić, Petrović, & Stanišić, 2015).

The paper analyses the achieved level of sustainable tourism in spa destinations of the Republic of Serbia. Spa destinations were chosen because spa tourism is one of the three developed forms of tourism in the Republic of Serbia, as well as because water resources, which are key attractions for the development of spa tourism, are one of the most challenging resources for sustainable development. The paper analysed 6 spa destinations: Vrnjačka Banja, Sokobanja, Vrdnik Banja, Palić Banja, Bukovička Banja and Koviljača Banja, which account for over 77% tourist arrivals of all spa destinations in the Republic of Serbia. During the analysis of sustainability, 11 indicators were used, which were systematized into 5 groups: economic, tourist satisfaction, cultural, social and indicators of the state of the environment.

The paper is divided into three logically related units. The first part gives an overview of the relevant literature in the field of sustainable tourism. It shows

the extent to which theory in this field has evolved and how sustainability issues are becoming crucial for the development of tourism in different types of destinations. Special emphasis is placed on spas as tourist destinations. The second part explains the methodology applied in the paper and introduces the spa destinations to be analysed from the aspect of sustainable tourism. The third part presents the results of the achieved level of sustainable tourism in spa tourist destinations in the Republic of Serbia, as well as certain recommendations how to make the development of tourism more sustainable.

1. Literature review

The embryos of the concept of sustainable tourism originate from the 70s of the last century in the research of Miller (1978), who studied the possibilities of tourism development in national parks. According to the results of his research, it is possible to develop tourism while simultaneously preserving the natural characteristics of protected areas.

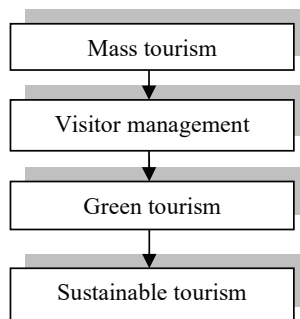
In economic theory, issues of sustainable tourism have been analysed by numerous authors and from different aspects. Earlier research on sustainable tourism (Bramwell & Lane, 1993; Hunter & Green, 1995) aims to present it as a new paradigm that solves the complex relationships between participants in the tourism market and the way to solve the perceived problems. This attitude is also accepted by Lu & Nepal (2009), who define the relations between the increasingly numerous stakeholders of tourism development in one destination in order to overcome conflict situations. The results of the research show that the development of tourism in one destination is possible in the long term if the needs of all participants in the tourism market are met: creators of the tourism product (tourism industry), consumers (tourists) and the local population. This can be achieved through the sustainable use of tourist resources, as key drivers of tourism development in the destination. Special emphasis is placed on the preservation of natural resources. The parallel between the preservation of natural resources and the development of tourism is obvious, because the largest number of tourist movements takes place in destinations that are rich in natural resources (Qu, Zhou, Guo & Yang, 2023). The development of a tourist destination must ensure the fulfilment of four key goals (Kunst, 2012, 106): effective protection of the destination's resource-attractive base; permanent preservation of the socio-cultural potential of the destination; improving the destination infrastructure, and ensuring the constant growth of living standards.

In the period of mass tourism, it can be pointed out that there are no elements of sustainability, because mass tourism is exclusively a short-term economically oriented form of tourism (Crouch & Geoffrey, 2011). As a partial response to the perceived negative effects of mass tourism, the concept of visitor management was introduced (Nicholas & Thapa, 2010), which was supposed to limit the activities of tourists in terms of reducing the negative effects on the destination's resources. The results of such solutions were partially sustainable, i.e. they reduced to a certain extent the negative effect on the destination's resources, but did not lead to tourist satisfaction, because they were designated as the main limiting factors of tourism development. For this reason, turn was made towards green tourism (Popović, Cvetkovic & Avramović, 2023), which emphasizes the conservation of the destination's resources in the foreground, which, in

the situation of relegating economic effects to the background, significantly limited the possibilities of tourism development. From an ecological point of view, this concept is acceptable in the short term, but it cannot exist in the long term, because the problem of financing the sustainability of resources arises, if economic activities are excluded.

In response to previously observed shortcomings, there was a need to introduce sustainable behaviour of all participants in the tourist market (Seočanac, 2022). When we talking about sustainable tourism, it should not mean some new form of tourism, but any form of tourism that tends to exist in a certain area in the long term must be sustainable (He, He & Xu, 2018).

Figure 1: **The development of the concept of sustainable tourism**



Source: Authors

The most important category of resources for the development of tourism is water resources. Water availability in adequate quantities and qualities is a fundamental requirement of tourist destination (Rico-Amoros, Sauri & Olcina-Cantos, 2013). In a recent and comprehensive review on the relationships between tourism and water use (Gössling, Peeters & Hall, 2012), it was argued that changes in global precipitation trends could increase water stress in certain important tourist destinations, and that purposeful management was needed to overcome the effects of dwindling water supplies in these destinations. It is now a well-recognized fact that water is a finite and vulnerable resource, and it must be used efficiently and in an ecologically sound manner for present and future generations (Li, Deng, Peng & He, 2023).

Since water resources belong to the category of renewable natural resources, in the coming period the importance of indirect use of water resources is stimulated, as well as the minimization of those economic activities that pollute water resources, i.e. the concept of sustainable use of water resources is promoted. This clearly indicates the fact that the development of tourism is best integrated into the concept of sustainable use of water resources, which in the case when the largest number of water resources is polluted or severely damaged, represents a significant comparative advantage of tourism over other economic branches.

Travelling to areas rich in thermal mineral waters is one of the oldest forms of tourism (Jenner & Smith, 2000). A similar situation exists in the Republic of Serbia. Historically speaking, in the period of medieval Serbia, spa places are mentioned, as well as in the period of the Turkish rule. Remains of spa places from those periods are visible in today's spa destinations in the Republic of Serbia (Pavlović, Radivojević, Lazić, 2009).

2. Material and methods

Observing the reached level of tourism development in the Republic of Serbia in 2022, it can be concluded that spa destinations are one of the three developed forms of destinations. According to the number of arrivals, spa destinations achieved 703,972 arrivals, or 18.20% of total arrivals. On the other hand, according to the number of overnight stays, spa destinations are in second place, with 3,054,744 overnight stays, which represents 25% of the total number of overnight stays by tourists in 2022.

Table 1: Basic tourism parameters per destination type in Serbia, 2022

Type of destinations	Tourist arrivals		Overnight stays	
	Number of tourists	% of tourists	Number of nights	% of nights
Urban destinations	1398862	36.15	3742039	30.56
Spa destinations	703972	18.20	3054744	24.96
Mountains destinations	804235	20.79	2800358	22.86
Other tourism places	786725	20.33	2061544	16.83
Other places	175441	4.53	586928	4.79
All destinations	3869235	100.00	12245613	100.00

Source: Authors' calculations, based on data published by the Statistical Office of the Republic of Serbia (2023), Statistical Yearbook. Retrieved from <https://publikacije.stat.gov.rs/G2023/pdf/G20232056.pdf>. Accessed on 10 January 2024

There are 43 spas in the Republic of Serbia, 19 of which are categorized as tourist destinations. The paper analysed the 6 most important spa destinations, considering attendance, as well as national and international recognition. These are: Vrnjačka Banja, Sokobanja, Banja Vrdnik, Banja Palić, Banja Bukovička and Banja Koviljača. Together, they participate with 77.63% in the total number of tourist arrivals, i.e. with 68.4% in the total number of overnight stays in all spa destinations in the Republic of Serbia.

Table 2: Basic tourism parameters in selected spa destinations in Serbia, 2022

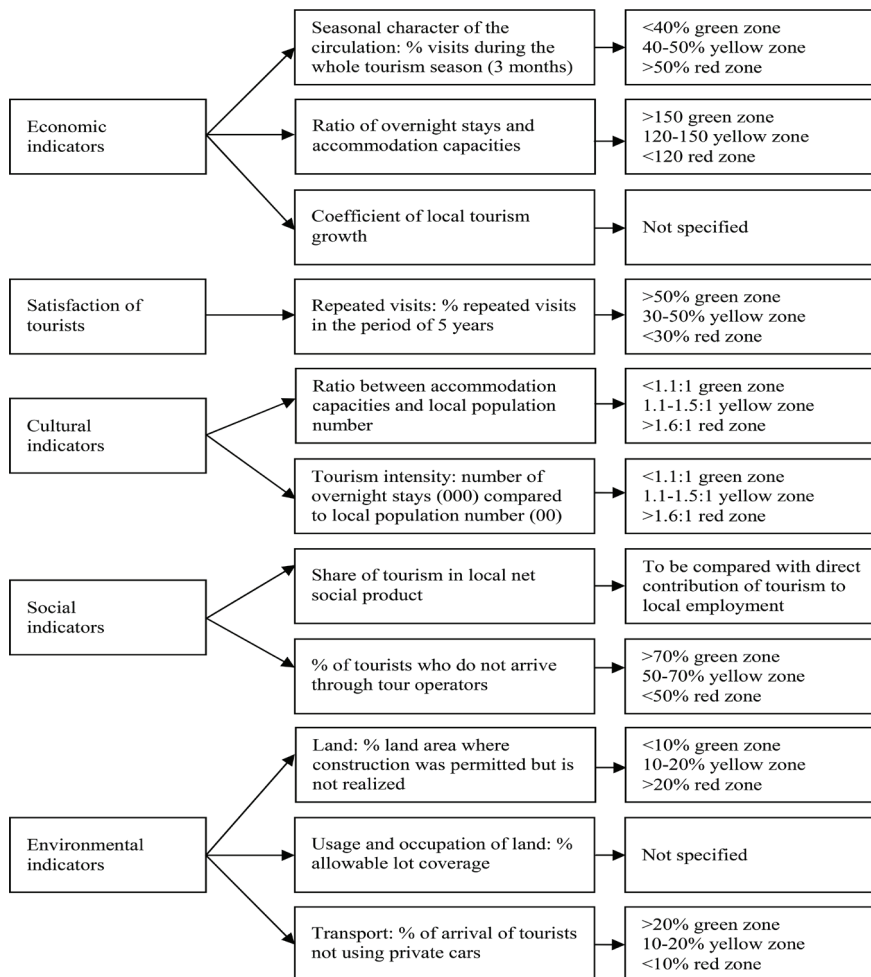
Spa destinations	Tourist arrivals		Overnight stays	
	Number of tourists	% of tourists	Number of nights	% of nights
Vrnjačka Banja	207559	29.48	756142	24.75
Sokobanja	160509	22.80	767725	25.13
Banja Vrdnik	79372	11.27	201872	6.61
Banja Palić	47628	6.77	122156	4.00
Bukovička Banja	26509	3.77	62034	2.03
Banja Koviljača	24872	3.54	179662	5.88
Other spa destinations	157523	22.37	965153	31.60
All spa destinations	703972	100.00	3054744	100.00

Source: Authors' calculations, based on data published by the Statistical Office of the Republic of Serbia (2023), Statistical Yearbook. Retrieved from <https://publikacije.stat.gov.rs/G2023/pdf/G20232056.pdf>. Accessed on 10 January, 2024

In accordance with the defined research subject, as well as theoretical analysis, in order to assess the achieved level of sustainable tourism in spa destinations, a methodology based on the analysis of sustainability indicators developed by the European Union was used in the paper (Figure 2). The indicators are classified into five groups: economic indicators, tourist satisfaction, social indicators, cultural indicators and environmental indicators.

Certain sustainability zones are given for most of the indicators, whereby: the red zone shows that the reached level of tourism development is unsustainable; the yellow zone shows that the achieved tourism development is a sustainable solution in the short term, and the green zone shows that the achieved level of tourism development is in line with sustainable development.

Figure 2: Indicators of sustainable tourism destination



Source: Milićević, S., Bošković, N. & Lakićević, M. (2021) Sustainable tourism development in mountain areas in Šumadija and Western Serbia. *Journal of Mountain Science*, 18(3), 735-748

3. Research results and discussion

In order to determine the achieved level of sustainable tourism in the selected spa destinations, it is necessary to look at the basic indicators of the achieved development of tourism in them (Table 3 and Table 4).

Table 3: Numbers of tourist arrivals per month in selected destinations in Serbia, 2022

	Numbers of tourist arrivals per month											
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Vrnjačka Banja	9561	11095	11789	19376	17667	19425	19616	26587	24591	23548	15350	8954
Sokobanja	3774	4892	6622	10047	10856	12365	19397	32524	26135	19643	9327	4927
Banja Palić	1795	1795	2494	4409	5236	4920	6258	6205	4636	4512	2375	2351
Bukovička Banja	1546	1655	1468	1950	1888	2431	3171	3511	2570	2403	1923	3489
Banja Vrdnik	4669	6074	5470	6806	6318	7136	8164	9306	6720	7219	6573	4917
Banja Koviljača	1262	1332	1266	1672	2305	2055	2242	3437	3201	3189	1803	1108

Source: Authors' calculations, based on data published by the Statistical Office of the Republic of Serbia (2023), Statistical Yearbook. Retrieved from <https://publikacije.stat.gov.rs/G2023/pdf/G20232056.pdf>. Accessed on 10 January 2024

Table 4: Numbers of nights per month in selected destinations in Serbia, 2022

	Numbers of nights per month											
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Vrnjačka Banja	29113	29236	31811	52540	59342	70472	86028	122240	102885	91857	56245	24364
Sokobanja	11778	25190	24878	37063	48637	60638	95963	172075	141259	101714	45933	12597
Banja Palić	5700	7137	7640	10525	12987	11260	14681	15898	11876	12001	6774	5677
Bukovička Banja	3994	3902	2938	4136	4071	5132	8363	10381	6309	5395	3924	3489
Banja Vrdnik	10874	12874	11380	15085	15107	17820	23570	30011	20224	19414	15853	9660
Banja Koviljača	9192	9035	8409	9847	15768	15888	17841	23503	23285	22831	13957	10106

Source: Authors' calculations, based on data published by the Statistical Office of the Republic of Serbia (2023), Statistical Yearbook. Retrieved from <https://publikacije.stat.gov.rs/G2023/pdf/G20232056.pdf>. Accessed on 10 January 2024

In addition to the above, in order to calculate the values of indicators of sustainable tourism, it is necessary to specify the number of local population, as well as the number of accommodation capacities (Table 5).

Table 5: Number of local population and number of beds in selected spa destinations in Serbia, 2022

Destination	Vrnjačka Banja	Sokobanja	Banja Palić	Bukovička Banja	Banja Vrdnik	Banja Koviljača
Number of local population	9912	7982	7771	24797	3092	5151
Number of beds	7224	8270	1635	505	2174	1502

Source: Authors' calculations, based on data published by the Statistical Office of the Republic of Serbia (2023), *Statistical Yearbook*. Retrieved from <https://publikacije.stat.gov.rs/G2023/pdf/G20232056.pdf>, Accessed on 10 January 2024

A group of economic indicators of sustainable development evaluates the economic effects of tourism in destination. They are certainly the most important and represent the first group of indicators that we must analyse. Table 6 shows the obtained values of the three analysed economic indicators.

Table 6: Economic indicators for spa destinations in Serbia, 2022

Selected spa destinations	Economic indicator		
	Seasonal character of the circulation: % visits during the season	Ratio of overnight stays and accommodation capacities	Coefficient of local tourism growth
Vrnjačka Banja	36.00 green zone	104.67 red zone	Medium
Sokobanja	48.78 yellow zone	92.84 red zone	Medium
Banja Palić	37.16 green zone	74.71 red zone	Low
Bukovička Banja	34.91 green zone	122.84 yellow zone	Low
Banja Vrdnik	31.11 green zone	92.85 red zone	Medium
Banja Koviljača	39.51 green zone	119.61 red zone	Medium

Source: Authors' calculations

The seasonal character of the circulation shows the number of tourists in the period of the 3 most visited months in relation to the total number of visits during the year. The obtained values are acceptable from the point of view of sustainable tourism, because in all destinations, with the exception of Sokobanja, they are below 40%, and they are marked as a green zone-sustainable solution. These results show that spa tourism in the analysed destinations is relatively uniform throughout the year, without significant monthly fluctuations, which should be maintained in the future. Sokobanja shows the highest number of visits during the summer months (July, August and September), which is a consequence of the insufficiently developed tourist offer for the rest of the year. In order to make the value sustainable, it is necessary to diversify the tourist offer and create tourist products that will attract tourists in the period beyond the mentioned four months.

The results of the second analysed economic indicator - the ratio of the number of overnight stays and accommodation capacity - show completely opposite values. This indicator shows the degree of utilization of accommodation capacities, i.e. represents the relationship between the number of overnight stays during the year and the number of accommodation capacities. The obtained values are in all destinations, with the exception of Bukovička Banja, marked with a red zone, that is, completely unacceptable from the point of view of sustainable tourism. This clearly shows that the further development of tourism should not go in the direction of expanding accommodation capacities, but rather in better occupancy of the existing ones. This can be achieved by creating new tourist products.

The coefficient of local tourism growth aims to indicate all the effects (direct and indirect) that the development of tourism has on the local economy. Looking at the contribution of the development of spa tourism to other economic branches, it can be concluded that no sustainable results have been achieved. A greater connection between tourism and other branches is needed, so that the effects are acceptable from the point of view of the development of sustainable tourism.

The degree of satisfaction of tourists with a certain destination is measured by repeated visits, where a period of 5 years is taken. This indicator is also important from the point of view of the destination's competitiveness, because the more repeated visits are, it means that the destination has positioned itself well on the tourist market and that the tourist product it offers is acceptable to existing tourists. Bearing in mind the relatively undeveloped competition on the domestic market and the specifics of the products that spa destinations offer to tourists, the values of this indicator are relatively acceptable in all analysed destinations.

Table 7: Satisfaction of tourists for spa destinations in Serbia, 2022

Indicator type	Indicator	Spa destination					
		Vrnjačka Banja	Sokobanja	Banja Palić	Bukovička Banja	Banja Vrdnik	Banja Koviljača
Satisfaction of tourists	Repeated visits: % repeated visits in the period of 5 years	75 green zone	65 green zone	40 yellow zone	45 yellow zone	60 green zone	65 green zone

Source: Authors' calculations

The cultural and social component is becoming more and more challenging in achieving sustainable development of tourism, because modern tourism implies a significant connection with the local population, but also with the cultural heritage of the area where the destination is being developed. The results of the groups of these indicators in the analysed spa destinations in the Republic of Serbia are shown in Table 8.

As for the first cultural indicator, the ratio of accommodation capacity and the number of local residents, it shows sustainable values in all analysed destinations. This is the result of a relatively larger number of local residents compared to accommodation units. With the further development of tourism, which will certainly lead to an increase in the number of accommodation units, the value of the indicator will probably move into the yellow zone, which will lead to a violation of the achieved level of sustainability. The intensity of tourism

development, as another analysed cultural indicator, shows the relationship between the number of tourist overnight stays (in thousands) and the number of local residents (in hundreds). The value of this indicator in the observed destinations shows diametrically opposite values. Unsustainable values were observed in the most developed destinations (Vrnjačka Banja, Sokobanja and Banja Vrdnik), while sustainable values of this parameter were achieved in the other analyzed destinations (Banja Palić, Banja Koviljača and Bukovička Banja). It has been proven that the intensification of tourism development, viewed through the number of overnight stays, inevitably leads to unsustainable values. In the coming period, it should be expected that other destinations will also follow the trend towards an unsustainable state.

Table 8: Cultural and social indicators for spa destinations in Serbia, 2022

Selected spa destinations	Cultural indicator		Social indicator	
	Ratio between accommodation capacities and no. of local population	Tourism intensity: no. of overnight stays (000) compared to local population no. (00)	Share of tourism in local net social product	% of tourists who do not arrive through tour operators
Vrnjačka Banja	0.73:1 green zone	2.09:1 red zone	Significant and growing	80 green zone
Sokobanja	1.04:1 green zone	2.01:1 red zone	Significant and growing	55 yellow zone
Banja Palić	0.21:1 green zone	0.61:1 green zone	Significant and stagnating	75 green zone
Bukovička Banja	0.02:1 green zone	0.11:1 green zone	Significant and growing	25 red zone
Banja Vrdnik	0.71:1 green zone	2.56:1 red zone	Significant and growing	85 green zone
Banja Koviljača	0.29:1 green zone	0.48:1 green zone	Significant and stagnating	25 red zone

Source: Authors' calculations

The participation of tourism in the local net product is the first social indicator. It shows the contribution of tourism to the creation of the social product of the area where the tourist destination is located. This indicator belongs to the group of qualitative indicators and has a significant share in all analysed destinations, which is quite understandable, because tourism is one of the most important economic branches of those areas. In most destinations (Vrnjačka Banja, Sokobanja, Bukovička Banja and Vrdnik Banja) that participation is simultaneously growing, while in Banja Palić and Banja Koviljača it is stagnant. The percentage of tourists who do not come through a tour operator is the second analysed social indicator. From the point of view of the social component of sustainable development, it is acceptable for a larger number of tourists to come individually or in smaller groups. Such a situation is present in Vrnjačka Banja, Banja Palić and Banja Vrdnik, relatively sustainable development of tourism (yellow zone) is in Sokobanja, while the unsustainable value of this indicator is in Bukovička Banja and Banja Koviljača.

According to many authors of the theory of sustainable development, the ecological component is the most important. The impact that tourism development has on the environment is evident. The values of environmental indicators are shown in Table 9.

Table 9: Environmental indicators for spa destinations in Serbia, 2022

Selected spa destinations	Environmental indicator		
	Land: % land area where construction was permitted but is not realized	Usage and occupation of land: % allowable lot coverage	Transport: % of arrival of tourists not using private cars
Vrnjačka Banja	5 green zone	Excessive land development	15 yellow zone
Sokobanja	8 green zone	Excessive land development	25 green zone
Banja Palić	12 yellow zone	Adequate land development	15 yellow zone
Bukovička Banja	15 yellow zone	Adequate land development	25 green zone
Banja Vrdnik	17 yellow zone	Adequate land development	5 red zone
Banja Koviljača	15 yellow zone	Excessive land development	25 green zone

Source: Authors' calculations

The first indicator from this group is the percentage of land on which construction is permitted but not implemented. It represents the degree of missed opportunities for tourism development and quite logically the lowest value of this indicator is in the most developed destinations (Vrnjačka Banja and Sokobanja), which represents a sustainable solution. Other analysed spa destinations have higher values of this indicator (12-17%), which means that there is a significant part of unused space for tourism development. Land use and occupation shows how much land has been used for the construction of tourist facilities. This indicator belongs to the group of qualitative indicators and depends on the type of tourism in question. Analysing this indicator in spa destinations, we conclude that the destinations of Vrnjačka Banja, Sokobanja and Koviljača Spa are overbuilt, which is an unsustainable solution, while the other destinations have an acceptable value of this indicator. The percentage of tourists who do not come by private car directly affects the quality of the environment. The goal is to make the value of the indicator as high as possible. Sokobanja, Bukovička Spa and Koviljača Spa have sustainable values, which is a consequence of relatively good connections by public transport, but also the very structure of tourists who visit this destination. On the other hand, Vrnjačka Banja and Banja Palić have a relatively unsustainable value of this indicator (yellow zone), while Vrdnik Spa has an unsustainable value (red zone).

Conclusion

Spa destinations represents one of the most developed forms in the Republic of Serbia. The current development of tourism in the analysed spa destinations was not in line with sustainable development. The insufficient use of accommodation capacities shown through the ratio of overnight stays and accommodation capacities as well as the

coefficient of local tourism growth show that economic sustainability has not been fully realized through the development of spa tourism. Achieving economic sustainability can be achieved by diversifying the tourist offer, introducing new products, as well as by better cooperation with other branches of the local economy. The values of cultural and social indicators, and in particular, tourism intensity and share of tourism in local net social product, show that there is a need for more significant involvement of the local population in the creation of the tourist offer, as well as the valuation of cultural heritage in spa tourism destinations. The group of environmental indicators shows relatively acceptable values. However, one should be careful because it is expected that the intensification of tourism development will lead to a deterioration of the value of these indicators. Special attention should be paid to the use of land, that is, excessive infrastructural construction should not be allowed in the most attractive areas of the destination. Also, the use of tourists' own cars should be reduced to an acceptable minimum.

Future forms of tourism that can be developed in spa destinations should be oriented towards the development of wellness tourism. Resource availability, along with built accommodation capacity, especially in Vrnjačka Banja, Banja Palić, Bukovička Banja and Banja Vrdnik represent a good basis for such development. With the built image of spa destinations and the development of health-remedial forms of tourism, it is possible to achieve sustainable development in the future period.

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SCIENTIFIC REVIEW PAPER

10.5937/ESD2401025F

Received: December 12, 2023

Accepted: February 29, 2024

THE IMPORTANCE OF THE EU STRATEGIC APPROACH FOR PROGRESS TOWARDS THE SUSTAINABLE DEVELOPMENT GOALS

Abstract

Sustainable development is a process with continuous changes in the relationships between social, economic, and natural systems and processes. This is a long-term process and requires carefully guided and gradual development policies, as the complex challenges faced by humanity on a global level. Some of the contemporary challenges of sustainable development include: raising the level of ecological awareness of people, increasing responsibility, applying economic instruments and innovative solutions to environmental protection issues, etc. Therefore, a strategic approach to sustainable development and environmental protection is necessary. By studying initiatives and achieved results that the EU has aimed in the previous period, viewed through the prism of sustainability, climate action, and the fight against poverty, this paper highlights significant steps that the EU has taken in these key areas, but also key challenges in the future. The paper employs statistical data analysis from the Sustainable Development Goals Report to assess the ten-year progress of EU countries. The obtained results indicate that all EU-27 have shown an increase in the Sustainable Development Index in the period 2012/2022. Based on the analysis of achieved results, the aim of the paper is to highlight significant successes, but also to identify areas where additional efforts should be invested and attention should be directed in future EU sustainable initiatives.

Keywords: sustainable development, environmental protection, EU-27, Agenda 2030, European Green Deal.

JEL classification: Q58, C10

ЗНАЧАЈ СТРАТЕШКОГ ПРИСТУПА ЕВРОПСКЕ УНИЈЕ ЗА НАПРЕДАК У ОСТВАРИВАЊУ ЦИЉЕВА ОДРЖИВОГ РАЗВОЈА

Апстракт

Одрживи развој је процес сталних промена у односима између друштвених, економских и природних система и процеса. Овај процес је дугорочан и

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захтева пажљиво вођену и постепену политику развоја, пошто су и изазови на глобалном нивоу са којима се човечанство суочава комплексни. Неки од савремених изазова одрживог развоја су: подизање нивоа еколошке свести људи, повећање одговорности, примена економских инструмената и иновативних решења проблема заштите животне средине итд. Због тога је неопходан стратешки приступ одрживом развоју и заштити животне средине. Проучавање иницијатива и постигнутих резултата којима је ЕУ тежила у претходном периоду, посматрано кроз призму одрживости, климатских акција и борбе против сиромаштва, овај рад истиче значајне кораке које је ЕУ предузела у овим кључним областима, али и кључне изазове у будућности. У раду је примењена статистичка анализа података из Извештаја о остваривању циљева одрживог развоја како би се оценио десетогодишњи напредак земаља ЕУ. Добијени резултати указују на то да су све земље чланице ЕУ-27 показале раст индекса одрживог развоја у периоду 2012/2022. На основу анализе постигнутих резултата, циљ рада је да истакне значајне успехе, али и да идентификује области у којима треба уложити додатне напоре и усмерити пажњу у будућим одрживим иницијативама ЕУ.

Кључне речи: одрживи развој, заштита животне средине, ЕУ-27, Агенда 2030, Европски зелени договор.

Introduction

Discussions, conferences and debates on solving ecological issues and reaching sustainable development have been held in the past fifty years. The idea of sustainability originated from a necessity to protect the endangered environment, but that idea of resources and the environment could not have been reached without concrete economic measures.

The concept of sustainable development developed together with the understanding that ecological management and irrational use of natural resources were preconditions for the achievement of development without ecological degradation. The base of sustainable development is a strong bond between economic development and environmental protection. Environmental pollution has been considered one of the most serious limitations of industrial progress in developed countries, in which the growth of the material output is considered a quality of life. However, a rise in the popularity of environmental protection is a product of greater consciousness of the connection between the economy and the environment (Radukić, Petrović-Ranđelović, 2019, p. 53).

The sustainable development concept focuses on a better quality of life has been adopted by governments, companies and various organisations. Based on this definition, achieving sustainable development is the only way to reach a better quality of life.

Focus on the goals of sustainable development (SDGs) is a key step towards the progress of economic sustainability. It offers instructions for the optimal development and the establishment of long-term sustainable economies. Integration of the SDGs in the political strategies secures reliability towards the environment and welfare of the society, besides inclusivity. Initiatives of the European Union (EU) show commitment

to the integration of the SDGs in various fields. In this context, the European Green Deal is particularly important. It highlights the transformation to the green economy by focusing on the importance of ecological practices and renewable energy sources. This comprehensive approach leads countries towards sustainable development but also supports global efforts towards a resilient and prospective future. Also, this transforming venture of the EU “has a goal of making Europe the first climate-neutral continent in the world by 2050” (European Commission, 2023). “As an integral part of sustainable development, it promotes energy efficiency as a target, in order to give a range of economic, environmental and energy benefits. Along with energy intensity decline, there is a GDP rise and greenhouse gases (GHG) emission decrease both in EU27 and Serbia.” (Jednak et al., 2020, p. 473). It comprises a wide spectre of policies, strategies and investments, with an intention to encourage the growth of sustainable development, reduce the emissions of oxygen and promote an ecologically resilient planet.

This article offers a review of the key initiatives and relevant documents related to the sustainable development goals and transition toward a green and sustainable economy in the EU. Also, it shows new and various ways for achieving the SDGs. In the second part, the key results in the context of sustainable development in the EU-27 will be presented. The importance of the progress made by the EU in achieving the SDGs suggests its seriousness and commitment. Indicators show remarkable progression, but reports also show that additional efforts are still to be conducted in all the fields.

1. Agenda 2030

United Nations Agenda 2030 is a global framework for the achieving of goals, including the eradication of poverty, reducing inequality and taking action in the fight against climate change and its consequences. The SDGs of the Agenda 2030 are applied from the 1st January 2016, after the adoption of the resolution at the UN Summit in September 2015, which is about the global development agenda for the period after 2015. It is expected that countries which signed the resolution to mobilise their resources and reduce poverty, fight against inequalities and find the answers to climate change in the next 15 years. The SDGs, known also as global goals, originated from the Millennium Development Goals. The SDGs recognise that fight against the poverty aligns with economic growth and industrialisation and they include health, education, social protection, environment and resilience to climate change as objectives. The SDGs are universal.

Agenda 2030 captures 17 SDGs and 169 subgoals as a result of more than two years of global public consultations. They cover all three key dimensions of sustainable development: economic, social and environmental dimension. The basic motto of Agenda 2030 is that none shall be forgotten and left aside (Center for Democracy Foundation, Center for High Economy Studies, Belgrade Open School, 2020, p. 9). Analysis of Kuc-Czarnecka et al. (2023) about the implementation degree of SDGs in EU countries “reveals a certain regularity; the leaders are usually from countries with stronger economies (Scandinavian countries, Germany, France, Netherlands, Ireland, Belgium and Austria). Therefore, even if they rank lower in some SDGs, their socio-economic potential will be conducive to catching up quickly”.

Since the sustainable development concept has four dimensions, all the goals of the Agenda 2030 could be divided into four groups: economic growth, human resources development, environment and climate, and institutions, finances and cooperation (Radukić, Kostić, 2019, p. 432). For the implementation of SDGs in every country, strategic documents, action plans and other public policies are essential. Although EU has incorporated SDGs into its strategic priorities, there are still possibilities to improve it. Further integration of SDGs and the European Green Deal should be conducted according to recommendations specific to every country given by the European Commission (Koundouri et al., 2021).

1.1. Best-ranked EU countries according to the Sustainable Development Index

Achievements in SDGs could be compared between the countries using the Sustainable Development Report (formerly the SDG Index & Dashboards), which has been published since 2015 on the initiative of the United Nations members. The competencies of some countries to achieve SDGs have been followed through the Sustainable Development Report, based on which advantages and shortcomings could be identified. Also, based on the Index value (ranges from 0 to 100), countries could be compared to each other. This is important for the definition and implementation of sustainable policies on a national level.

Table 1. Best-ranked countries according to the Sustainable Development Report in 2022 and 2023

Rank	Country	Index value	
		2022	2023
	Finland	86.5	86.8
	Denmark	85.7	86.0
	Sweden	86.0	85.7
	Norway	82.3	83.4
	Austria	82.3	82.3
	Germany	83.4	82.0
	France	82.0	82.0
	Switzerland	80.8	81.9
	Ireland	80.1	81.8
	Estonia	81.7	81.7
	United Kingdom	80.6	81.7
	Poland	81.8	81.5
	Czechia	80.5	81.0
	Latvia	80.7	80.7
	Slovenia	81.0	80.5

Source: Sachs, J., Lafortune, G., Kroll, C., Fuller, G., Woelm, F. (2022) *Sustainable Development Report 2022*. Cambridge: Cambridge University Press; Sachs, J.D., Lafortune, G., Fuller, G., Drumm, E. (2023). *Implementing the SDG Stimulus. Sustainable Development Report 2023*. Paris: SDSN, Dublin: Dublin University Press, 2023. 10.25546/102924

Table 1 shows that the greatest conditions to achieve SDGs have Scandinavian countries and other most developed countries, while the poorest countries of the world are at the very end of the list. Based on the level of achieving individual goals, specific problems for each country could be determined.

1.2. Progress in the achievement of SDGs in EU-27

Analysing the Sustainable Development Report, we classified 27 EU countries into three groups by the level of the achievement of SDGs: countries with the highest level of sustainable development (HSD), countries with the middle level of sustainable development (MSD) and countries with the lowest level of sustainable development (LSD). The HSD has been reached by: Finland, Sweden, Denmark, Germany, Austria, France, Czechia, Poland and Estonia. The MSD have Croatia, Slovenia, Latvia, Spain, Ireland, Portugal, Belgium, Netherlands, and Hungary. The LSD countries are Slovakia, Italy, Greece, Luxemburg, Romania, Lithuania, Malta, Bulgaria, and Cyprus.

This classification is based on their indices from the Sustainable Development Report for 2022. All three groups have the same number of states (9 countries each). The analysis of the EU-27 sustainable development indices points out that all countries achieved a higher index of sustainability from 2012 to 2022, regardless of their starting point. This collective success comes from the general commitment to the progress of SDGs across the EU. It is important to stress that the LSD group of countries (Slovakia, Romania, Bulgaria, Malta, etc.) is a group with the highest growth rates at the same time. Also, basic segmentation shows that Western European and Scandinavian countries are in the HSD group, while Central and Eastern Europe countries are in the LSD group (Table 2).

Table 2 shows the Sustainable Development Index for 27 European Union countries in 2012 and 2022, divided into three groups: HSD, MSD and LSD countries.

Table 2. Indices of sustainable development for the EU-27 in 2012 and 2022

	Country	Index of Sustainable Development 2012	Index of Sustainable Development 2022	Average yearly growth rate 2022/2012
Countries with the highest level of sustainable development	Finland	85.45	86.76	1,53%
	Sweden	85.48	85.98	0,58%
	Denmark	83.97	85.68	2,04%
	Germany	80.10	83.35	4,07%
	Austria	80.84	82.28	1,77%
	France	78.71	82.04	4,23%
	Czechia	78.12	81.87	4,80%
	Poland	77.42	81.80	5,65%
	Estonia	76.78	81,68	6,38%
Countries with a middle level of sustainable development	Croatia	76.59	81,49	6,40%
	Slovenia	79,68	81.01	1,65%
	Latvia	77,75	80.68	3,77%
	Spain	77.04	80.42	4,39%
	Ireland	78.94	80.14	1,52%
	Portugal	76.10	80.01	5,15%
	Belgium	76.73	79.45	3,54%
	Netherlands	77.58	79.42	2,36%
	Hungary	77.19	79.39	2,85%

Countries with the lowest level of sustainable development	Slovakia	76.69	79.12	3,16%
	Italy	76.47	78.78	3,02%
	Greece	73.87	78.36	6,08%
	Luxemburg	74.46	77.64	4,27%
	Romania	74.28	77.46	4,28%
	Lithuania	73.71	76.80	4,20%
	Malta	72.54	75.52	4,11%
	Bulgaria	74.57	74.62	0,06%
	Cyprus	69.68	72.49	4,03%

Source: Authors view on the basis of Eurostat (2012) SDGs database; Sachs, J., Lafortune, G., Kroll, C., Fuller, G., Woelm, F. (2022) Sustainable Development Report 2022. Cambridge: Cambridge University Press

Table 3 displays basic indicators (minimum, maximum, mean and standard deviation), descriptive statistical analyses is conducted based on the sustainable development index database.

Table 3. Descriptive statistics for 3 groups of EU-27 countries

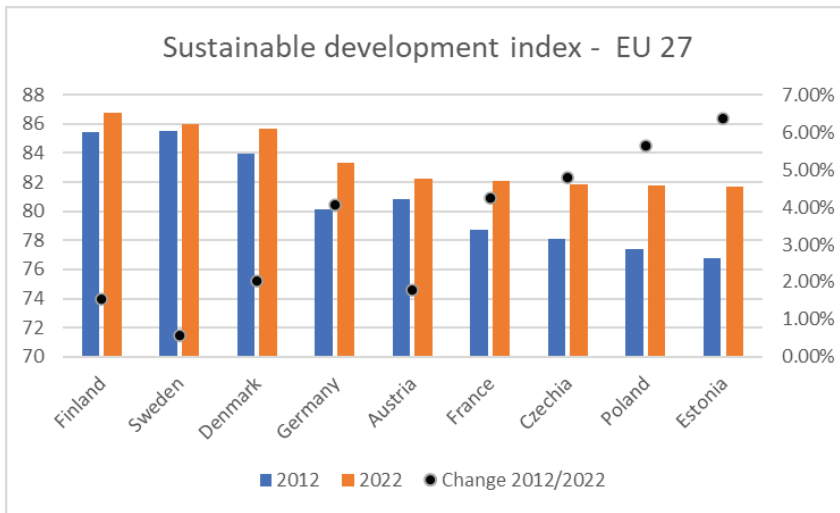
Descriptive statistics values	Groups of EU-27 countries		
	HSD countries	MSD countries	LSD countries
MINIMUM VALUE			
2012	76.7	76.1	69.6
2022	81.6	79.3	72.4
Average yearly growth rate 2022/2012	0,69%	0,47%	0,44%
MAXIMUM VALUE			
2012	85.4	79.6	76.0
2022	86.7	81.4	79.1
Average yearly growth rate 2022/2012	0,16%	0,25%	0,35%
AVERAGE VALUE			
2012	80.7	77.5	74.0
2022	83.4	80.2	76,7
Average yearly growth rate 2022/2012	0,37%	0,38%	0,40%
STANDARD DEVIATION			
2012	3.2	1.0	1.9
2022	1.9	0.7	2.0
Average yearly growth rate 2022/2012	-39.57%	-35,27%	4,25%

Source: Authors' analysis

The first group captures HSD countries. Here, Finland scores the impressive 86.7 index of sustainable development. On the other hand, Estonia in this group scores 81.6. Although it is currently in last place, Estonia is a country that has achieved the greatest improvement over the study period, with a 6.4% increase (from 76.8 to 81.7). This result is a great success, considering that Estonia has been among the countries with the lowest scores in 2012. This group of countries made it to increase their average index by 0.4%

per year in the period from 2012 to 2022. The average index for this group of countries has been increased from 80.8 to 83.5. Besides Estonia, in this group are also countries like Poland, with a growth of 5.7% (from 77.4 to 81.8), Czech Republic with 4.8% (from 71.1 to 91.9), France with 4.2% (from 78.7 to 82.0) and Germany with 4.1% of an increase (from 80.1 to 83.5). Sweden had the highest score in 2012 (85.4), but its growth has been the lowest, which allowed Finland to take the leading position.

Graph 1. HSD countries in EU-27 for 2012/2022



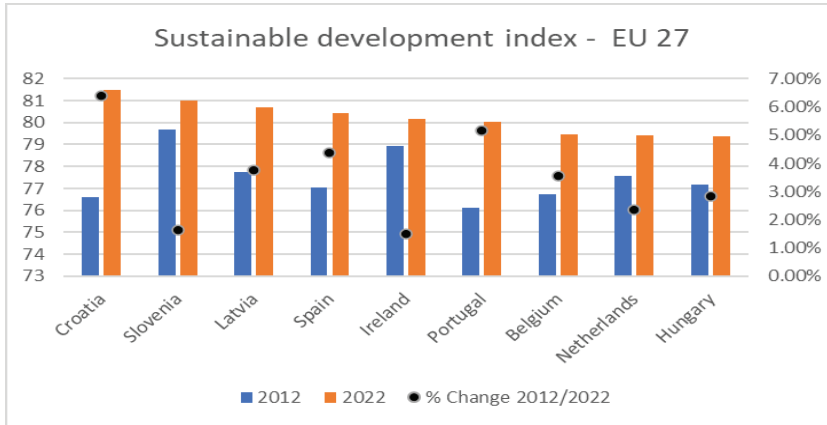
Source: Authors' analysis

On graph 1, HSD countries are depicted along with the growth rate of the index for 2012 and 2022. The sustainable development index is presented for both 2012 and 2022.

The standard deviation in the HSD group dropped by almost 40% in the study period, from 3.2 to 1.9. This drop indicates greater homogeneity in achieving sustainable development among countries from this group in the study period.

Croatia, with an index of sustainable development at 81.5, leads the MSD group. Hungary is in the last place with an index of 79.4 in 2022. Croatia achieved significant growth, a 6.4% increase from 2012 to 2022, which enabled it to move from the bottom of the list to the leading position. The average score of the index for this group is continually growing with an average yearly rate of 0.38%. This resulted in a growth of the average index for this group of countries from 77.5 to 80.2. Besides Croatia, significant growth has been achieved by Portugal and Spain with a rate of 5.15% (from 77.7 to 80.6) and 4.39% (from 77.04 to 80.6), respectively. In addition, significant progress has been made by Latvia, which increased its index by 3.7% (from 77.7 to 80.6). With a growth of 1.65%, Slovenia dropped to the second position. Noticeable are results made by Hungary and the Netherlands which have also increased their indices of sustainable development for 2.85% and 2.36%, respectively. The standard deviation in this group of countries fell by 35.27%, from 1.08 to 0.7.

Graph 2. MSD countries in EU-27 for 2012/2022

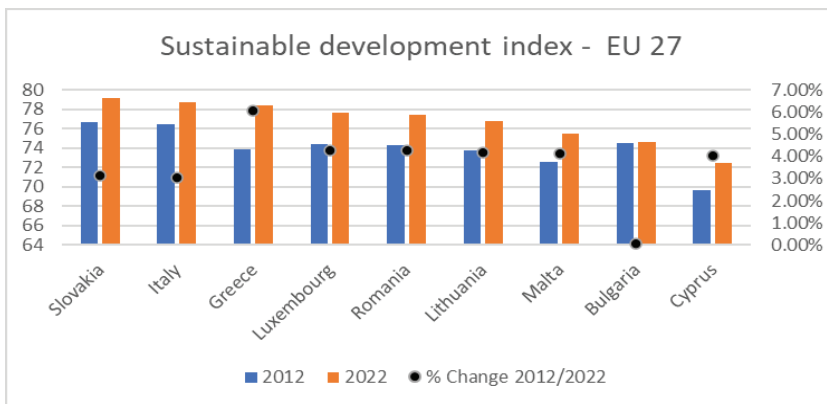


Source: Authors' analysis

On Graph 2, the MSD countries are depicted along with the growth rate of the index for 2012 and 2022. The sustainable development index is presented for both 2012 and 2022.

In the LSD group, Slovakia has the highest index of sustainable development (79). Cyprus is at the bottom of all 27 EU members with an index of 72 in 2022. This group of countries has, however, achieved higher growth rates faster than those in the rest two groups. The average yearly growth rate is 0.40%, and thereby average index of the group increased from 74 to 76.5. A unique characteristic of this group of countries is the growth of the standard deviation in the study period, from 1.9 to 2.05 (4% increase). 8 out of 9 countries in this group achieved a growth rate of 3%. For example, Italy achieved growth of 3% (from 76.4 to 78.78), Greece 6% (from 73.7 to 77.7), Luxembourg 4% (74.4 to 77.76), Romania 4.2% (from 74.3 to 77.4), Lithuania 4.2% and Malta 4.1%. Noticeable is that Bulgaria has achieved the smallest growth, not only in this group but considering all the countries. Bulgaria increased its index by only 0.06% in the study period. The data implies that these countries have achieved significant growth in sustainable development.

Graph 3. LSD countries in EU-27 for 2012/2022



Source: Authors' analysis

On graph 3, the LSD countries are depicted along with the growth rate of the index for 2012 and 2022. The sustainable development index is presented for both 2012 and 2022.

Analysis of the Sustainable Development Index for EU-27 from 2012 to 2022 shows that all three groups of countries and all individual members achieved growth, independently of their starting position. The HSD and MSD groups have achieved significant progress, while the LSD group, which is led by Slovakia, achieved the fastest growth in their rates. It is also significant that the difference between indexes of all 27 countries decreased by 9.5% (from 3.55 to 3.20). This has additional value in the results since it increases homogeneity in the achievement of sustainable development goals among those countries.

2. European Green Deal

European Union showed commitment to protecting the environment and to climate actions recently through several key initiatives, strategies and action plans.

At the centre of these efforts stands the European Green Deal (EGD), established by the end of 2019, which represents a new strategy for economic development EU. EGD is a key strategy that navigates developmental policies towards the models which encourage innovations and investments into sustainable technologies and services. It recognises significant possibilities for economic growth through the protection of the environment. This strategy obligates “the EU to become a carbon-neutral economy by 2050, in more than several sectors such as energy and agriculture” (Mert Mentes, *Sustainability and Society*, 2023, p. 7).

As a part of the EGD Strategic Framework about 20 strategic documents have been adopted recently (the Circular Economy Action Plan (2020), the EU Biodiversity Strategy for 2030 (2020), the Farm to Fork Strategy (2020), the Action on Critical Raw Materials Supply (2020) and the European Climate Law (2021). “Along with this, the EGD will require significant investments, with an estimated 260 billion euros a year (about 1.5% of EU, 2018 GDP) to achieve the 2030 climate and energy targets” (Almeida et al., 2023).

Key initiatives include *Fit for 55* (cutting emissions by at least 55% by 2030), with an aim to prepare laws based on the climate ambitions of the EGD by changing the climate, energy and transport legislations (European Council, European Green Deal, 2019).

The part of the EGD is also the “EU’s strategy on adaptation to climate change“, which was adopted in June 2021 and aims towards the EU society that will be adapted to the inevitable influences of climate change by 2050. This should also directly contribute to sustainable development (Climate Action).

The biodiversity strategy for 2030, as a part of EGD, aims to recover the biodiversity of Europe, while the “Farm to Fork“ strategy aims to make food systems competitive, healthy and environmentally friendly as a path to sustainability. These two strategies should contribute directly to Goal 15 (Life on land), and Goal 2 (Zero hunger) of sustainable development. European industrial strategy (European Council, European Green Deal, 2019) is also important since it supports the role of the industry in

the shift towards climate neutrality by contributing to Goal 9 (Industry, innovation and infrastructure).

The Circular Economy Action Plan is also an important part of the EGD that aims to promote sustainable economies through waste reduction and the encouragement of re-usage, repair and recycling of products and resources. The mechanism for just transition is another key part of the EGD that secures financial and technical support to the regions affected by the transition to the low-carbon economy (LCE). This mechanism helps in the mobilisation of at least 55 billion euros in the period 2021-2027 (European Council, European Green Deal, 2019).

European Green Deal can contribute to the carbon-neutral Europe by 2050 while strengthening European cohesion. “A co-evolutionary development of policies, technologies, cultural values and economic institutions seems to offer the best chance of successfully designing and implementing the European Green Deal” (Wolf et al., 2021, p. 105).

3. Other EU sustainable development initiatives

At the UN meeting in New York in July 2023, the EU presented their first Voluntary Review on the implementation of the 2030 Agenda, which highlighted its commitment to the SDGs. Review is presented as part of the regular reviews of the High-Level Political Forum on Sustainable Development under the UN Economic and Social Council (European Commission, The EU’s Voluntary Review reaffirms commitment to delivering the Sustainable Development Goals at home and around the world, 2023).

The meeting’s objectives were to deliver successful stories, best practices and discussions on challenges and knowledge to enhance the implementation of the 2030 Agenda. European Commission conducts the 2030 Agenda through the “whole-of-government” approach, by integrating SDGs into all proposals, policies and strategies.

From 2020, yearly working programs of the EC place goals of sustainable development into the centre of EU policies, which is seen in the leading initiatives like, for example, European Green Deal, NexGenerationEU and REPowerEU.

NextGenerationEU, as a plan for economic recovery, is aiming towards achieving a green, digital and resilient Europe as a response to the crisis caused by COVID-19. The plan includes a financial package of 800 billion euros which supplements the EU budget for the period 2021-2027, to support the recovery of member countries (European Commission, NextGeneration EU, 2020). An important part of the funds is intended for projects that support the European Green Deal.

Strategic plan REPowerEU was brought in May 2022 as a response to the disruption of the energy supply caused by the Russian invasion in Ukraine. The objective of this plan is to amplify the energetic resilience and independence of the EU, by enhancing a transition to clean energy which directly supports Goal 13 (Climate action). This initiative is key to protecting the EU’s citizens and enterprises from energy deficiency. According to the REPowerEU, energy saving is the most efficient way to reduce dependence on fossil fuels. Therefore, ambitious goals for the reduction of gas consumption have been established across the EU, which directly supports Goal 12 (Responsible consumption and production). The plan highlights a significant increase in

the production of reusable energies, including wind and sun, to reduce the dependence upon fossil fuels. Diversification of energy sources is a key element of REPowerEU with a focus on the reduction of dependence upon Russian fossil fuels and finding alternative ways for energy supply. Since it came into force, REPowerEU successfully reduced the EU's dependence on Russian gas from 41% in August 2021 to 8% in September 2022. This has been achieved by agreements with third countries on the import of gas through pipelines, investments into liquefied natural gas (LNG) and strategic partnerships for green oxygen. REPowerEU plan demanded big investments and reforms. It mobilised "almost 300 billion euros – approximately 72 billion euros through grants, while around 225 billion euros in loans" (European Commission, REPowerEU, 2022).

European Union has also conducted several measures to reduce carbon emissions from fossil fuels and to promote the transition to clean energy sources. EU Emissions Trading System (EU ETS) is a key element in the EU policy against climate change and a basic tool for the profitable reduction of greenhouse gas emissions. In line with Sustainable Development Goals, especially Goal 13, EU ETS aims towards a sustainable and low-carbon European future. In addition, the EU is planning to introduce a Carbon Border Adjustment Mechanism (Filipović et al., 2022). This mechanism is designed to stop the leakage of carbon when companies move production into countries with weaker limitations of emissions. The Carbon Border Adjustment Mechanism will ensure that the price of carbon when importing goods is according to the levels of carbon itself, aligning with Goal 12 (Responsible consumption and production) and promoting ecological sustainability in global trade transactions.

Between 2014 and 2019, the EU had significant economic growth which contributed to the 14.5 billion new workplaces and the achievement of a high employment rate of 74.6% by 2021-2022, although there were obstacles such as COVID-19 pandemics. In 2022, the EU and its members achieved 92.8 billion euros of Official Development Aid (ODA), which is 43% of global ODA (European Commission, The EU's Voluntary Review reaffirms commitment to delivering the Sustainable Development Goals at home and around the world, 2023).

4. The eight Environment Action Programme of the European Union for Environmental Protection

The impact of the EU on the planet's resources is unequal. EU uses almost 20% of Earth's biocapacities although it makes up only 7% of the world's population. It would take 2.8 planets if everyone would spend like an average EU citizen. This is far above the world average of 1.7 planets. In addition, contemporary trends of transforming fertile land into infrastructure, industrial and commercial capacities endanger fertile soil, one of the most valuable natural resources. "Soil erosion costs European farmers 1.25 billion euros per year" (WWF European Policy Office, 8th Environment action programme: The EU to-do list for immediate action, 2023).

The newest 8th Environmental Action Programme (EAP), which came into force on the 2nd May 2022, is another step that shows the commitment of the European Union towards a sustainable future. This programme, which will lead the European policy of environmental protection until 2030, is a continuation of the fundamentals of the EGD

and it has an aim to speed up the transition to climate neutrality and a resource-efficient economy. Programme amplifies the significance of healthy ecosystems for human wealth and prosperity. It tends towards a vision for Europeans to live in 2050 following the limits of our planet and that the economy uses resources according to the possibilities of their recycling. Implementation of environmental protection queries into the economic decision-making process begins at the international level, where key decision makers are supranational institutions (like the EU) or countries, followed by sectoral level (Radukić and Petrović-Randelović, 2019, p. 60). 8th EAP calls on active participation of interested parties on all levels of governance, to ensure efficient implementation of EU laws on climate and environment.

To follow and report on the progress of these ambitious goals, the EU adopted a set of indicators on the 26 of July 2022. These indicators will help to inform citizens about the influence of EU policies on climate and the environment and to make easier discussions between politicians on the parts that need additional efforts to be addressed adequately. European Environment Agency (EEA) and European Chemicals Agency (ECHA) play key parts in this process by securing yearly reports since December 2023. These reports will assess a progress to the goals of the 8th EAP. Middle-term revision is scheduled for the 31st of March 2024, while complete evaluation should be done by 31st of March 2029.

5. Monitoring the achievement of SDGs in the EU for 2023

Key steps in following the progress have been also taken by Eurostat. In published the newest report “Sustainable Development in the European Union“ – a report on the progress towards of SDGs in the context of the EU for 2023, where Eurostat offers detailed statistical analysis. The results of the Report are encouraging and show that the EU has reached significant progress in most of the SDGs in the last five years. This progress is following the focus of the Commission on the key political fields, including the EGD, the 8th Environment Action Plan and the European Pillar of Social Rights Action Plan (Eurostat, Sustainable development in the European Union - Monitoring report on progress towards the SDGs in an EU context, 2023).

A new aspect of this Report is its analysis of factors of recent crises on sustainable development. That includes the consequences of the energetic crisis caused by the conflict between Russia and Ukraine, as well as that caused by the COVID-19 pandemic. Key findings from the Report reveal significant progress in several fields including dignified work and economic growth (SDG 8), reducing poverty (SDG 1) and gender equality (SDG 5). Progress is also visible in the reduction of inequalities (SDG 10), promoting quality education (SDG 4) and peace, justice and strong institutions (SDG 16). Although there were challenges caused by the pandemic, progress in the field of good health and well-being (SDG 3) was significant. The report also finds moderate progress in Responsible consumption and production (SDG 12), Sustainable cities and communities (SDG 11), Life below water (SDG 14), Zero hunger (SDG 2), Clean water and sanitation (SDG 6), and Affordable and clean energy (SDG 7) (European Commission). Furthermore, there is a need for the EU to put additional efforts into Climate action (SDG 13), Life on land (SDG 15) and Partnership for the goals (SDG 17) (Eurostat, Sustainable development in

the European Union - Monitoring report on progress towards the SDGs in an EU context, 2023, p. 10).

The report also highlights that emissions have fallen due to energy consumption reduction and increased usage of renewable sources. Sectoral analysis for the period from 1990 to 2021 shows that all the economic sectors reduced the emission of gases with the green garden effect in this period, except for the traffic sector. Fuel combustion in energy industries, which captures electricity production and central heating, has shown the most significant reduction. That is a result of the general reduction and an increase of participation of renewable energy sources, by achieving 37.5% in consumption of electricity by 2021. Also, electricity consumers' fuel combustion (excluding transport) changed energy industries as the biggest source of emissions in 2020 and stayed as the biggest sector with 27.4% of summed emissions with the effect of the green garden in 2021 (Eurostat, Sustainable development in the European Union - Monitoring report on progress towards the SDGs in an EU context, 2023, p. 235).

Summed funds invested by the EU into the green transformation (including EU-27, as well as EU institutions) "grew from approximately 12,9 billion euros in 2014 to 23,4 billion euros in 2020" (Eurostat, Sustainable development in the European Union - Monitoring report on progress towards the SDGs in an EU context, 2023). "Germany and France were countries that invested the greatest budgets for green incentives among member states" (Mentes, 2023). On the other hand, the European Investment Bank (EIB) and the European Commission were the third and fourth biggest donors of public funds to fight against climate change in developing countries.

Conclusion

Every branch of the economy, as well as the economy in general, are, to some extent, "guilty" for the pollution in their environment and above. Therefore, every country leads active policy in environmental protection and financing projects. EU has developed its economic and law system in this field. EU has brought guidelines to help environmental protection and sustainable development. These guidelines become obligations for candidates for EU membership. The most significant is the Agenda 2030. Its goals are an ambitious and complex project in general. To be implemented by 2030, active commitment of governments and institutions is needed, but also partnership with organizations of civil society, citizens and the private sector. Criteria and standards in the field of the EU environmental protection are at a high level.

The analysis of the Index of Sustainable Development for EU-27 from 2012 to 2022 points to the growth of the sustainable development level. The HSD and MSD groups of countries scored more significant growth, while LSD countries achieved certain growth rates faster than others. Furthermore, the difference between indices of all 27 countries fell by 9.5% (from 3.55 to 3.20), which additionally highlights progress and increased homogeneity in the achievement of SDGs among members.

European Union showed a strong commitment to sustainable development and green transition by policy harmonization with the global SDGs. This harmonization is seen through efforts of the EU to harmonize national laws on environmental protection with the EU's legislation of environmental protection. Key initiatives like the EGD, 8th

Action Environment Programme, NextGenerationEU, REPowerEU, and the Emission Trading System are central to the EU's strategies. These programs are designed to transform the EU into a resource-efficient economy that aims towards zero emissions by 2050 and promotes sustainable development.

Through various programs, the EU provides the necessary financial support to smaller and candidate countries to the EU which face challenges in achieving these ambitious goals. The support is crucial for the transition of these countries to green economies and alignment with EU environmental standards. This partnership highlights the EU's role not only in advancing its green agenda, but also in supporting its neighbours and partners in achieving common sustainability goals. On this road to sustainable development, the EU has also taken important steps in the systematic monitoring of progress.

Last year EU presented its Voluntary Review on the Implementation of the Agenda 2030 at the UN meeting, together with the Eurostat Report on the reduction of energy consumption. They represent the concretization of these goals and send the message that even significant progress has been achieved in the past, due to the rise of global geopolitical problems and ambitious goals set, more intense efforts should be undertaken in the upcoming period.

Acknowledgment: This research is part of the 101136834 – CROSS-REIS - HORIZON-WIDERA-2023-ACCESS-03 project, funded by the European Union. Views and opinions expressed are however those of the authors only and do not necessarily reflect those of the European Union or the European Research Executive Agency. Neither the European Union nor the European Research Executive Agency can be he responsible for them.

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SCIENTIFIC REVIEW PAPER

10.5937/ESD2401041D

Received: October 10, 2023

Accepted: February 29, 2024

ACCUMULATION OF FOREIGN EXCHANGE RESERVES IN THE FUNCTION OF PREVENTING CURRENCY CRISIS

Abstrakt

The purpose of the paper is to explain the importance of foreign exchange reserves (FER) for the protection of the country from potential currency vulnerability. FER are controlled by the central monetary institution of the country - the central bank. We have witnessed many currency, financial and economic crises that have hit various parts of the world in the past three decades. If there is no appropriate and timely reaction of the central bank in crisis conditions or there is a bad choice of the exchange rate regime (ERR), it can lead to unforeseeable consequences for the economy and the entire society of the country. The paper will benefit monetary policy makers in order to review the optimality of FER and the sustainability of the current ERR.

Keywords: exchange rate regime (ERR), foreign exchange reserves (FER), central bank, currency crises, external liquidity.

JEL classification: E44, F31

AKUMULACIJA DEVIZNIH REZERVI U FUNKCIJI SPREČAVANJA VALUTNIH KRIZA

Апстракт

Сврха рада јесте да објасни важност девизних резерви за заштиту земље од потенцијалне валутне рањивости. Девизне резерве контролише централна монетарна институција земље – централна банка. Сведоци смо многих валутних, финансијских и економских криза које су погодиле разне делове света у претходне три деценије. Уколико не постоји одговарајуће и правовремено реаговање централне банке у кризним условима или постоји лош одабир режима девизног курса, то може довести до несагледивих последица по економију и читаво друштво једне земље. Рад ће користити креаторима монетарне политике у циљу преиспитивања оптималности девизних резерви и одрживости актуелног режима девизног курса.

Кључне речи: режим девизног курса, девизне резерве, централна банка, валутне кризе, екстерна ликвидност.

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Introduction

Success in achieving dynamic economic development depends on many economic and financial factors. One of the important factors is the adopted exchange rate regime (ERR) and policy. The ERR affects many monetary and economic indicators such as price stability, the level of the money supply, employment and economic growth (Vujanić, Gligorić & Žarković, 2019). The stability of the national currency and resistance to currency crises are a key element of country's economic development strategy. In the last three decades, many countries have faced the consequences of a currency crisis, which is easily transferred to the economy and country's economic system. It is an indisputable fact that financial and currency crises do not bypass any country; they occur in developed and developing countries; small and large countries, regardless of the choice of ERR (Reinhart & Rogoff, 2010). They can be caused by internal factors, problems in the public or private sector, external shocks, speculation on the foreign exchange market, but also by irrational factors such as negative investor expectations and market panic.

Economic and financial crises are a threat to all countries, whether they lead an adequate economic policy or not (Marjanović & Marković, 2019). This is because nowadays crises are quickly transferred from country to country, bearing in mind the financial and economic connection of countries. Given the degree of globalization, countries are highly interdependent (Đokić, 2022). Besides, financial crises can start from both the public and the private sector. Either way, financial crises destroy the economic and political system, and affect losses in the real sector due to the accompanying difficult financing. Therefore, such crises cause many costs, increase the country's public debt and cause systemic socio-economic disturbances. This is the reason why this study aims to show the basic factors of the choice and sustainability of the applied ERR, the function of foreign exchange reserves (FER), as well as the reasons why in modern conditions there is a considerable increase in FER in the world.

1. On the determinants of the choice of ERR

The choice of the ERR is one of the most important issues of a country's macroeconomic policy. When selecting the ERR, at least two facts must be taken into account:

- a regime chosen once does not mean that the decision should not be reconsidered over time,
- the decision is made in accordance with the economic structure, macroeconomic trends in the specific country and the characteristics of the external environment.

The starting point for choosing a regime is the understanding of the hypothesis of the impossible trinity, which is also known in the literature as the "monetary trilemma" or the "open macroeconomic trilemma" (Aizenman, 2019). In fact, there are three theoretical goals in monetary policy: monetary independence, stability of the exchange rate, and full financial integration (Frankel, 1999). Complete financial integration is unattainable under conditions of perfect capital mobility, so, in practice, a country can choose between exchange rate stability that ensures a fixed exchange rate and monetary

independence, on the other hand. Monetary independence implies that the country can conduct its monetary policy without restrictions, and this provides it with a flexible ERR. However, as there are different modalities with more or less flexibility between fixed and floating exchange rates, the practical consideration of the monetary trilemma is called into question (Table 1).

Table 1: Classification of exchange rates according to the International Monetary Fund

Hard peg	Soft peg	Floating	Residual
<i>Exchange arrangements with no separate legal tender - Monetary union</i>	<i>Conventional pegged arrangement</i>	<i>Floating exchange rate</i>	<i>Other managed exchange rate arrangement</i>
<i>Currency board arrangement</i>	<i>Pegged exchange rate within horizontal bands</i>	<i>Free floating exchange rate</i>	
	<i>Stabilized arrangement</i>		
	<i>Crawling peg</i>		
	<i>Crawl-like arrangement</i>		

Source: International Monetary Fund, 2023

According to the latest International Monetary Fund Report for 2022, the largest number of countries opted for soft exchange rates (soft pegs) (46.9%); 34% of member states apply floating exchange rates, 13.4% adopt and implement fixed regimes (hard pegs), while the remaining 5.7% have other (residual) regimes of exchange rates (International Monetary Fund, 2023).

As a rule, large open economies and highly developed economies choose a floating exchange rate because in this way they can achieve favourable rates of economic growth and accelerated economic development. They have a developed financial market, which gives them the ability to adapt more quickly to external circumstances and maintain macroeconomic balance. On the other hand, in practice, smaller and developing countries most often choose a fixed ERR. It helps them more easily overcome the consequences of a bad economic structure and high inflation and serves as a nominal anchor until the moment when the benefits outweigh the costs. That way they can avoid the so-called “fear of floating” (Calvo & Reinhart, 2002) bearing in mind the inflexibility of wages and prices, as well as the high import dependence that are characteristic of this group of countries. Weak institutions, an underdeveloped foreign exchange market and poor economic conditions are additional reasons why a fixed exchange rate is appropriate for underdeveloped countries. A fixed exchange rate can “discipline” economic policymakers and increase the credibility of monetary policy.

It is important to know that a certain regime will not have the same effects in all countries. In other words, the theoretical advantages and disadvantages of a particular ERR may not be reflected in the practices of some countries. Natakani (2018) in his study assesses that countries with fixed exchange rates are less prone to currency crises. However, there are also different understandings according to which the floating exchange rate protects against the overvaluation of the national currency and the depletion of FER of the central bank in order to defend the exchange rate (Abubakar, Utari & Azwar, 2020). Therefore, the decision on the choice of regime is very complex and requires the

consideration of many factors and the involvement of all relevant actors at the macro level. The ultimate goal is that the selected exchange rate can ensure macroeconomic balance in the medium term.

2. The role of FER as an instrument of the central bank

FER are one of the basic instruments of central banks for operations on the foreign exchange market (Martin, 2020). They are the guarantor of external liquidity and serve in the first line of defence of the external balance. Bošnjak, Bilas & Kordić (2020) point out that FER are an indicator of the strength of the national economy to resist an exogenous shock. They are most often used to prevent major disorders caused by external factors. Their goal is to maintain confidence in the national currency, increase resistance to the economic crisis and preserve the entire financial system. FER are used in all countries regardless of the choice of ERR. In the fixed ERR, their use is mandatory in order to defend the established level, while in the floating ERR, they are occasionally used to prevent a significant outflow of capital and to defend against potential currency crises, but also excessive strengthening of the currency, which causes uncompetitive exports. They especially play a role in small open economies due to the nature (volatility) of short-term capital, which is often represented in developing countries.

In the scientific and professional literature, the research community classifies three basic functions of FER (Gray, 2011; Agénor, Alper & da Silva, 2015):

- microprudential function (related to preservation of external solvency in cases of accelerated capital outflow from the country),
- function of monetary control (implies the use of various monetary aggregates), and
- liquidity management function (refers to the sterilization of FER in order to curb inflation in cases of massive capital inflow).

Financial and currency crises can arise as a result of real events, but also the opinion that certain unexpected situations will occur. Thus, they are the result of rational expectations, but also the panic of investors who can massively withdraw their investments. A particularly bad situation is when there is panic among depositors, because a sudden withdrawal of deposits can collapse the country's monetary and financial system. Currency crises leave behind enormous economic losses: decline in economic activity, investor distrust, withdrawal of capital from the country. Russia, the countries of Latin America and East Asian countries are the countries that faced the devastating consequences of currency crises. It is obvious that no country can be completely immune to currency crises. Therefore, reducing the risk of external vulnerability and creating confidence in the currency should be the basic imperative of holding FER. Dabrowski (2021) emphasizes that FER are a key instrument in the management of currency crises under the jurisdiction of the central bank, as the central institution of the country's monetary system. That is why it is important that FER are maintained at an optimal level.

In the literature, there are several indicators for evaluation the optimality of FER that can be divided into two groups (Marković & Marjanović, 2021):

- indicators of external liquidity (the ratio of FER and short-term external debt, coverage of imports with FER, and coverage of FER with gross domestic product),

- indicators of exposure to financial risk (ratio of FER and primary money; ratio of FER and money supply M1) (Table 2).

Table 2: Criteria for the optimality of the FER level

Indicator group	Indicator	Preferred value
Indicators of external liquidity	FER/Short-term foreign debt	minimum 100%
	FER/Average monthly imports	from 3 to 6 months of average import value
	FER/Gross domestic product	as high as possible
Indicators of exposure to financial risk	FER/Primary money	more than 100%
	FER/Money supply M1	more than 100%

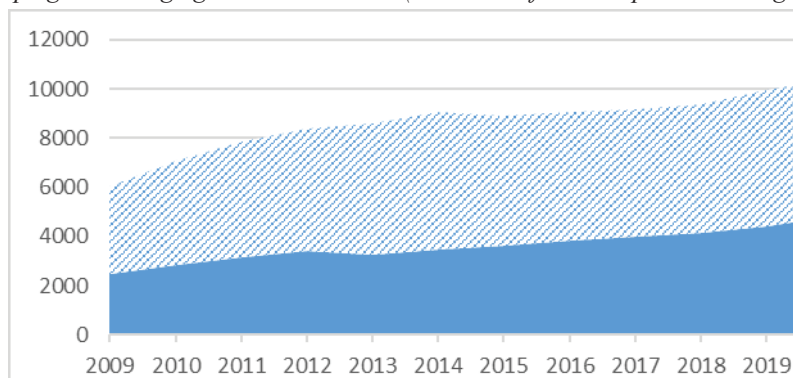
Source: Marković & Marjanović, 2021

3. Tendency of accumulation of FER in modern (crisis) conditions

Recently, there is a practice of increasing FER in the world, both in developed and underdeveloped economies. International disruptions in the flow of products, services and capital are the main reason for the rapid increase in FER at the international level (Kovačević, 2021). A drastic growth of FER in the world has been recorded since the nineties of the twentieth century, in the sense that countries held FER that corresponded to the value of eight months' worth of imports (Rodrik, 2006; Lee & Yoon, 2020), which is significantly higher than the optimal level. In that period, crises appeared in many countries: Brazil, Mexico, Argentina, Russia, as well as hints of the East Asian currency and financial crisis. Financial globalization and liberalization made it easy to transfer financial disturbances from country to country, so that economies wanted to provide increased protection, security and external liquidity by increasing FER.

Chart 1 aims to show the movement and allocation of FER in the world, taking into account the division of countries into developed (advanced) economies and developing countries and emerging (market) economies.

Chart 1: Regional distribution of FER in the world – advanced (developed) economies and developing and emerging market economies (in billions of SDRs - special drawing rights)



Source: Author's presentation based on data from the International Monetary Fund (2022)

It is noticeable that developing countries have more FER (including monetary gold) than advanced economies. However, the average growth of FER in developed countries for the period from 2009 to 2021 was 6.75%, which is higher than the average growth of FER in developing economies where the same rate was 4.49%. Also, advanced economies recorded a growth of FER of 116% in the period of analysis, while the growth of FER in emerging market economies and developing countries was lower and amounted to 66%.

Taught by the experience of the world economic (financial) crisis of 2007-2008, almost all countries accumulated the increasing levels of FER in order to avoid the negative consequences of a sudden capital outflow, such as a fall in gross domestic product, an increase in poverty and an increase in public debt (Abdelsalam & Abdel-Latif, 2020). A high amount of foreign reserves was expected to calm the financial market from disturbances and prevent currency crises thanks to increased external liquidity in that case (Céspedes & Chang, 2020). In a theoretical sense, countries with higher amounts of FER at their disposal can more easily overcome or prevent a crisis. But, FER accumulation can create a gap between the money supply and goods on the market, which usually causes inflation (Polterovich & Popov, 2003). Due to the danger of overheating of the domestic economy, the question of the optimality of the FER level has arisen. In addition, Rodrik (2006) believes that FER carry with them opportunity costs of holding, and that is why the upper and lower thresholds of the FER (zone of optimality) are determined in the literature. Amounts of FER depend on exports, imports, exchange rate movements in the previous period, inflation rate and inflationary expectations (Sanusi et al., 2019).

Conclusion

Financial stability and the possible appearance of a currency crisis depend on the adequacy of the selection of ERR and the level (optimality) of FER. First, the chosen ERR must be adequate in the medium term in terms of ensuring a low inflation rate and foreign trade balance. The decision on the choice is made in accordance with the current characteristics, but also projections of certain economic parameters, monetary policy objectives and characteristics of the external environment. In a narrower sense, the holders of monetary policy in the country can choose between a fixed and a floating exchange rate (the so-called bipolar view). The fixed ERR undoubtedly ensures the stability of the exchange rate if the FER are sufficient to avoid the pressure on the devaluation of the national currency and the rupture of the applied regime. On the other hand, a flexible exchange rate makes it possible to achieve the goal of monetary independence, but only in cases of developed market economies. However, it should be noted that the bipolar point of view is valid only in a theoretical sense, because between a fixed and a floating exchange rate, there are a number of other regimes that countries massively opt for.

The central bank, as the central monetary authority, must lead such a policy of FER that will ensure financial and economic stability. Therefore, it must keep the amounts of FER in accordance with the defined criteria of their optimality. Despite higher FER in developing countries compared to advanced economies, the following facts should be taken into account:

- FER in advanced economies (both in absolute and relative amounts) grew faster in the observed period (2009-2021),

- during the pandemic (2020 and 2021), the growth rates of FER were significantly higher in developed countries and amounted to close to 10%.

If the central bank is not successful in implementing its own policy, there may be a currency crisis that spreads rapidly and affects all parts of the economy. In addition, currency crises are quickly transmitted to neighbouring markets, so the management of foreign exchange policy and FER can become a global problem. An adequate choice of measures and the expediency of policy in crisis conditions will depend on a proper understanding of the essence, causes and nature of the problem of currency crises.

Acknowledgments

This research was financially supported by the Ministry of Science, Technological Development and Innovation of the Republic of Serbia [Contract No. 451-03-47/2023-01/200371].

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SCIENTIFIC REVIEW PAPER

10.5937/ESD2401051R

Received: October 25, 2023

Accepted: March 9, 2024

CORPORATE INCOME TAX AND THE RACE TO THE BOTTOM PHENOMENON

Abstract

The taxation of business profits has recently garnered considerable attention, not only in developing countries but also among the member states of the European Union (EU). Significant changes in tax rates, the definition of taxable income, tax benefits, and legislation to avoid double taxation, driven by competition in this tax area, have resulted in significant consequences for the economic growth of countries. Although the balance sheet importance of corporate income tax (CIT) is limited, its significance is directly attributed to its impact on economic activities. The focus of this study is the competition within the area of CIT and the examination of the phenomenon related to the "race to the bottom" that arises as a result of this competitiveness. The main goal of the paper is to examine the repercussions of CIT competitiveness on economic growth in the EU and Serbia in the specified time frame from 2007 to 2023. The research results show that CIT competitiveness has a positive and statistically significant impact on economic growth in most of the analysed countries. Based on the obtained results, the authors make recommendations for increasing revenue from CIT.

Keywords: standard rate, race to the bottom, CIT, EU, Serbia.

JEL classification: E62, H20, O23

ПОРЕЗ НА ДОБИТ ПРЕДУЗЕЊА И ФЕНОМЕН „ТРКА КА ДНУ“

Апстракт

Опорезивање добити је у последње време изазвало значајну пажњу, не само у земљама у развоју, већ и међу државама чланицама Европске уније. Битне промене у погледу висине пореских стопа, начина дефинисања пореске основице, пореских олакшица, правила за избегавање двоструког опорезивања, изазване конкуренцијом пореза на добит предузећа, имале су за резултат последице на привредни раст земаља. Иако је билансни значај пореза на добит предузећа ограничен, његов значај приписује се, управо, његовим ефектима на економске токове. У фокусу анализе овог рада је конкурентност пореза на добит

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предузећа и испитивање феномена „трке ка дну” који је последица његове конкурентности. Основни циљ рада је да испита ефекте конкурентности пореза на добит предузећа на привредни раст земаља Европске уније (ЕУ) и Србије у периоду од 2007. до 2023. године. Резултати истраживања показали су да конкурентност пореза на добит предузећа има позитиван и статистички значајан ефекат на привредни раст, у већини анализираних земаља. Ослањајући се на добијене резултате, аутори дају препоруке за повећање прихода од пореза на добит предузећа.

Кључне речи: законска пореска стопа, трка ка дну, порез на добит предузећа, ЕУ, Србија.

Introduction

The inception of CIT occurred in 1913 when it was initially levied as an independent tax category in the United States. Since that point, it has been extensively employed as a tax form in other countries. Simultaneously, both tax collections and tax rates started to rise. CIT was implemented and expanded following World War II, leading to tax rates above 50% (Arsić & Randelović, 2017, p. 101). CIT rates have experienced a substantial decline since the early 1980s as a result of tax reforms.

This type of tax serves as the fundamental method for directly taxing legal entities. Its primary purpose, aside from generating fiscal income, is to fulfil its economic and social role. CIT is prevalent in many jurisdictions, yet continuous arguments persist questioning its justification. The prevailing argument in the literature is that companies are artificial legal entities, distinct from their owners, with independent assets, income, and liabilities. However, despite ongoing disagreements over its validity, several scholars consider CIT significant and influential in the current tax structures of modern nations (Djurović Todorović et al., 2019, p. 156). While it may not generate substantial revenue, this tax form serves a crucial function in stabilizing and fostering the economy. The imposition of CIT can exert a significant influence on the economic expansion and advancement of a nation. Hence, the research seeks to examine and evaluate the competitiveness of CIT by focusing on its nature and characteristics. In addition to the great importance of CIT for the tax system of most countries, the effects of this tax can possess detrimental or adverse repercussions on the economy. Some of the negative reflections of CIT are due to its competitiveness. Namely, the competitiveness of CIT has initiated the emergence of several phenomena, among which is the phenomenon often referred to in the literature as the “race to the bottom.” The “race to the bottom” phenomenon is a consequence of tax competitiveness caused precisely by CIT instruments. The negative effects of this phenomenon are due to the tax competition that is undoubtedly present everywhere in the world. CIT competitiveness is also present in the EU, where, to date, no significant results have been achieved in the field of direct tax harmonization. Member States apply different methods for calculating taxable profit, which differ in many aspects. Tax competition occurs when individuals may minimize their tax obligations by relocating factors of production from countries with high tax burdens to jurisdictions where tax rates are not high (Mitchell & Foundation, 2004). This scenario exists everywhere in the globe, not only in the EU. So, the competitiveness of CIT has led to four decades of CIT

reform. Multinational companies had too much power in the market, making it harder for local businesses to make new investments (Grubišić & Marčetić, 2013). This phenomenon, known as the “race to the bottom,” led to the paradox of “collecting.” Specifically, tax rates have been declining while revenues have remained stable or, in some countries, increased. Changes in the taxation system are taking place in an environment riddled with numerous contradictions, as a direct reflection of current socio-political, economic, and social trends. Transformations of tax structures have been accomplished in a way that indicates that the direction and priorities of tax policy of each state individually change substantially and that numerous tax issues, as an important part of the political procedures for making choices, gradually move from the national to the supranational level (Dimitrijević, 2015, p. 278).

1. The literature on corporate tax revenues

The fiscal impact of CIT on economic expansion is the primary focus in many books that delve into business tax. Đurović Todorović et al. (2020) scrutinized the influence of Serbia’s CIT on the country’s economic growth. They concluded that an increase in CIT positively affects the economy’s growth (Đurović Todorović et al., 2020, p. 321). In the context of global tax competition, countries are reshaping their tax structures to enhance competitiveness. Each nation’s economic policy should significantly incorporate various tax forms (Đurović Todorović et al., 2019). To ensure the economy functions optimally, tax levels and shares must be defined in alignment with growth. Any tax increase has the potential to negatively impact key economic indicators. Thus, information on the adverse effects of different taxes has become crucial for designing optimal tax systems (Dackehag & Hansson, 2012).

There is a vast body of literature investigating the link between tax revenues and economic expansion (e.g., Arnold, 2008; Plosser, 1992). The results of various research differ, depending on the fact that in some studies, the CIT has a positive impact, while in others, this tax is shown to harm economic growth. Koester & Kormendi (1989) examined the impact of income tax across over sixty countries and found results that confirm the negative effect of CIT. Slemrod (1995) emphasizes the dilemma of the impact of CIT on economic activities. However, several studies point out that reducing taxes and tax rates increases economic growth.

On the other hand, evidence of negative effects is also found in the investigation of Padovano & Galli (2001). According to some research, CIT has a considerable detrimental economic impact. Using panel data from 70 countries, Lee & Gordon (2005) analyse the influence of legally mandated rates for corporate taxes on the rate of economic expansion. Their analysis revealed that the only tax rates that statistically and adversely affect economic growth are those on corporations. Since the impact of taxes on economic development probably differs substantially across wealthy and poor countries, they concentrate on the more prosperous members of the OECD. Romer and Romer’s (2010) study examines how taxes affect the economy as a whole. Their analysis revealed how tax hikes hurt the actual national income. Using a similar methodology, Mertens & Ravn (2013) investigate the effect of corporate taxation on economic expansion. Their research demonstrates how the CIT hinders economic expansion. Veronika & Lenka (2012) examined data from 1998

to 2010 and found that CIT has a detrimental effect on economic development over time. Also, Etale et al. (2016) examined the influence of the same factors in Nigeria between 2005 and 2014. Their research points out the considerable effect of CIT on the economy. The authors have found a link between CIT and economic development. In a study conducted by Macek (2004), the author investigated the influence of CIT on the economic development of OECD nations throughout the time frame of eleven years. A statistical model based on multiple regression was used to represent the linear correlation between the parameters under examination. The parameters, according to the relevant categorization, include CIT. Macek uncovered that CIT produced a negative influence on the economy. The author recommended that OECD nations minimize CIT rates. Dackehag and Hansson (2012) conducted a study of the countries of the OECD spanning the years 1976 to 2010. Through their investigation of twenty-five economies, they discovered a robust link between corporation tax and economic expansion. The study investigates the influence of CIT on the economy. Scientists specifically examine the effects of statutory tax rates on economic development. They use data collected on panels from some countries of the OECD. It was shown that both the taxes on corporate and personal income had a detrimental impact on economic development.

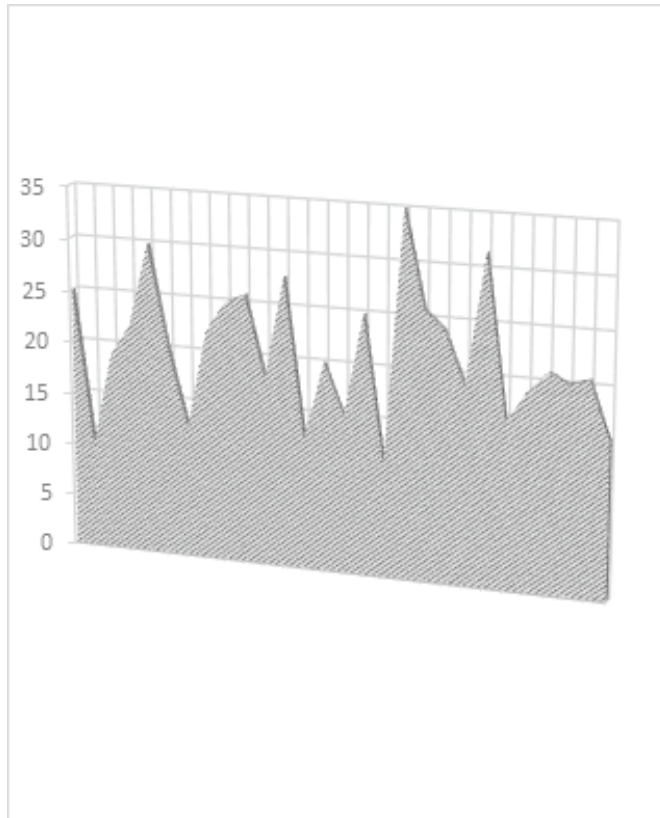
Additionally, the beneficial impact of CIT on economic development was ascertained. From 1995 to 2010, Stoilova & Patonov (2012) examined how taxes affected economic development in 27 EU member states. Regression analysis was conducted, along with a comparative cross-country study. The research discovered that direct taxation had a stronger effect on the economic development of EU countries than indirect taxes. Using two independent variables and a proxy for taxes, Ihenyen & Mieseigha (2014) investigated taxation, where CIT served as an explanatory factor. The effects of CIT on gross domestic product were shown to be positive, according to data collected using the Ordinary Least Squares approach (OLS).

2. The puzzling reductions in corporate statutory tax rates as the result of corporate tax competitiveness

Significant changes to CIT have been made in the main developed economies over the last forty years. By the end of the 1990s, the average statutory rate had dropped from 35% to 23.7%, and this decline continues to persist today. The situation among the 27 EU members is similar; while the median legal rates stood at 27.9% at the beginning of the 2000s, they have already decreased to 21.12% during the 2023s.

Very few tax regimes that exist today levy CIT at statutory rates higher than 35 percent. The CIT rates in 28 countries (EU, Serbia) are distributed in the following figure for 2023. Many nations enforce a rate in the range of 20 to 30 percent.

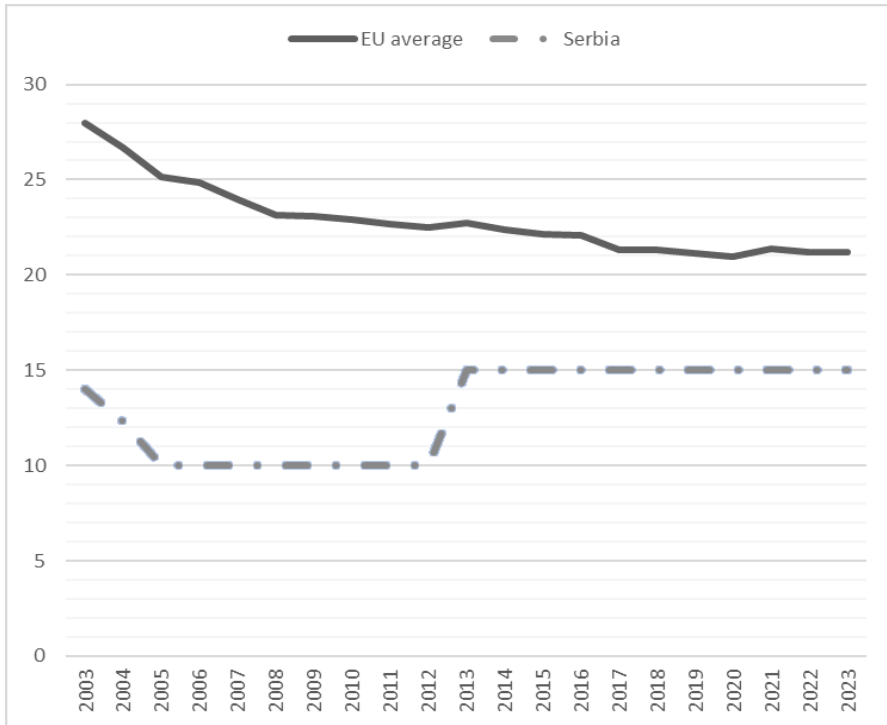
Figure 1: Distribution of Corporate Tax Rates in EU and Serbia (in %), 2023



Source: European Commission (2023). Taxation Trends in the European Union: Data for the EU Member States, Iceland and Norway

A country might choose to tax at the same rate or establish minimum tax rates, which is known as explicit tax harmonization. For example, the EU mandates a minimum value-added tax of fifteen percent for its member states. It is essential to note that EU member states have different CIT rates. In essence, a satisfactory level of harmonization has not yet been achieved. Figure 1 shows corporate tax rates in the EU and Serbia in 2023. It can be explicitly observed that there is a presence of tax competition and a lack of harmonized tax rates. Competition in taxes helps the economy grow by pushing lawmakers to make smart tax decisions. On the other hand, tax uniformity is often linked to heavier financial loads (Mitchell & Foundation, 2004, p. 10).

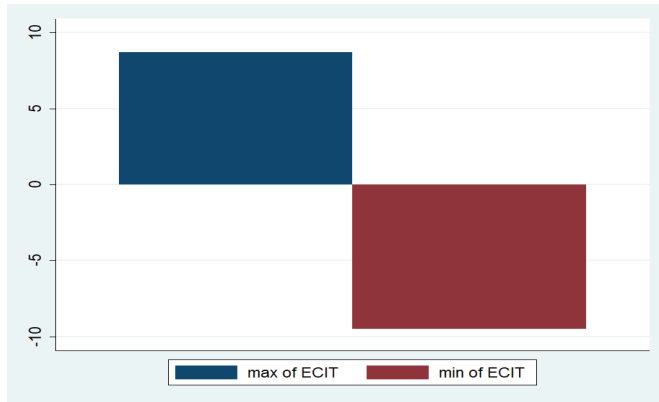
Figure 2: Modifications in the average CIT rates (in %), 2003-2023



Source: European Commission (2023). *Taxation Trends in the European Union: Data for the EU Member States*

In EU countries, the average tax rate is still declining. The contrary trend is being continued with the latest modifications to Serbia’s business taxation. The company tax rate in Serbia is now closer to the average in the EU. EU countries aim to stimulate company spending and make the tax system more advantageous by lowering their CIT rates (Tax Foundation, 2023). Nonetheless, corporate tax receipts have not decreased. This situation, sometimes referred to as the CIT problem or the tax rate-revenue contradiction, has been the focus of previous academic research (Nicodeme et al., 2018). This issue was first described as “the paradox of collection” (Albi, 2010) and was explained by the fact that two strategies included in the budget reforms—lowering tax rates and changing the tax base—had opposite consequences.

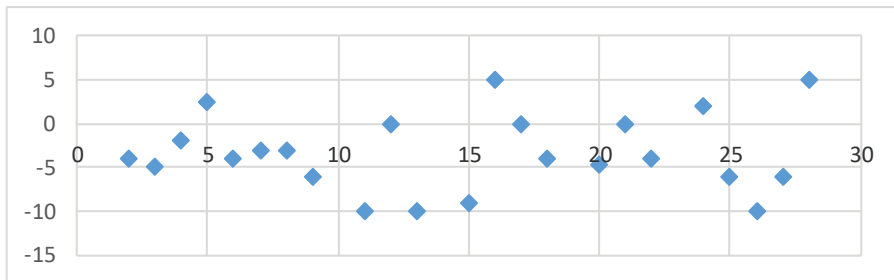
Figure 3: Minimum and maximum in the change of the corporate effective tax rate (%), 2007-2023



Source: Authors

Figure 3 represents the minimum and maximum of ECIT. In the period from 2007 to 2023, the most substantial reduction in the effective CIT rate was -9.5%, while the maximum increase in this rate was +8%. The most significant decrease was recorded in Greece in 2010. The maximum increase in the effective CIT rate was also recorded in Greece in 2009. Such changes followed the Great Economic Crisis (Financial Crisis of 2007-2008).

Figure 4: Change in the standard tax rate, 2007-2023.



Source: Authors

Figure 4 is a cut-off of the great tax rivalry and illustrates the regular fluctuations in the lawful tax rate. The largest total change in the standard CIT rate was recorded in Germany, Hungary, and Spain, in the analysed period.

3. Corporate income tax and Economic growth: An Empirical Analysis of EU and Serbia

This research looked at how Serbian and EU country's CIT affected economic development, as measured by GDP per capita. Table 1 below displays the linear regression analysis's findings.

Table 1: Results of the regression analysis

C	1.	2.	3.	4.	5.	6.	7.
R ²	.772	.017	.006	.653	.038	.550	.709
B ₁	.449	.452	.182	1.823	4.499	.911	.768
Sig.	(.000)**	(.701)	(.815)	(.003)	(.567)	(.009)	(.001)
C	8.	9.	10.	11.	12.	13.	14.
R ²	.696	.892	.805	.822	.645	.281	.896
B ₁	11.352	1.003	.058	.105	1.427	.517	3.807
Sig.	(.001)	(.000)**	(.000)**	(.000)**	(.003)	(.093)	(.000)**
C	15.	16.	17.	18.	19.	20.	21.
R ²	.679	.211	.105	.002	.979	.835	.002
B ₁	.162	2.965	2.174	-.202	14.509	.175	-.055
Sig.	(.002)	(.155)	(.332)	(.896)	(.000)**	(.000)**	(.889)
C	22.	23.	24.	25.	26.	27.	28.
R ²	.451	.230	.702	.561	.432	.814	.826
B ₁	.546	.569	1.468	.2865	.070	.793	1.102
Sig.	(.024)	(.136)	(.016)	(.008)	(.000)**	(.000)**	(.000)**

** $p < .001$ (2-tailed).

Note: 1-Austria, 2-Belgium, 3-Bulgaria, 4- Croatia; 5-Cyprus, 6-Czech Republic, 7-Denmark, 8-Estonia, 9-Finland, 10-France, 11-Germany, 12-Greece, 13-Hungary, 14-Ireland, 15-Italy, 16-Latvia, 17-Lithuania, 18-Luxembourg, 19-Malta, 20-Netherlands, 21-Poland, 22-Portugal, 23-Romania, 24-Slovakia, 25-Slovenia, 26-Spain, 27-Sweden, 28-Serbia.

Source: Authors' calculation, SPSS output

CIT is expressed as a percentage of GDP (CIT-to-GDP). The results demonstrate a highly positive influence on economic growth, assessed through GDP per capita, and prove to be highly significant. Each regression equation has a high R-squared value, indicating that a significant portion of the variance in GDP can be explained by CIT. For the period from 2007 to 2023, Table 1 shows the results of regression analysis for Serbia and EU member states. The explanatory ability of a predictor variable is assessed by its R². The positive correlation between GDP per capita and CIT-to-GDP is evident in Table 1. There is only a weak, non-statistically significant negative connection in Luxembourg (-0.202) and Poland (-0.055). It is clear from the findings of the regression studies that the influence of the CIT-to-GDP ratio on economic growth varies significantly across governments. The countries with the greatest correlation include Ireland, the Netherlands, Slovakia, Greece, Italy, Denmark, Finland, Austria, Estonia, France, Croatia, Germany, and Serbia.

At the one percent significance level, a statistically significant link between the analysed variables (p less than 0.001) is observed in the following countries: France, Austria,

Malta, Spain, Finland, Germany, the Netherlands, Serbia, Ireland, Spain, and Sweden. Based on Pearson's coefficient, there is a beneficial relationship in Estonia, Portugal, Denmark, Slovenia, Croatia, Greece, and Italy at the five percent statistical significance level (p less than 0.05). Estonia, Malta, and Ireland have the largest absolute value of the beta coefficient ($B1$), indicating that the independent variable in these cases significantly contributes to explaining the dependent factor.

Twenty governments had statistically significant findings, according to Table 1. We may infer that, in the countries mentioned above, economic development is positively correlated with a rise in the independent factor. We may infer that CIT-to-GDP is not a reliable predictor for whole countries. Malta F provides the best explanation for this model [$(97.9) = 97.9$, p less than 0.001].

Even though the creators of fiscal policy in the examined economies recognize this circumstance, the majority of them have enacted several CIT revisions in recent decades. In order to improve the efficiency of CIT and save revenue, these tax changes were primarily characterized by a decrease in the CIT rate. However, other nations, like Malta, maintained very high tax rates despite the global trend and tax competitiveness. Germany, which holds the top spot on the Global Competitiveness Index, has seen two significant changes between 2001 and 2008. Specifically, the CIT rate decreased by an average of 20.8 percent for the analysed period. Germany held the highest statutory CIT rate in the EU up until 2008 (Delgado et al., 2018).

Conclusion

We have compiled various pieces of information, formulated several facts, and generated a multitude of insights. The primary observation indicates a decrease in CIT rates from the years 2007 to 2023. The second aspect underscores the broadening of the tax base during this time span. Since 2009, CIT receipts have exhibited a predominantly constant pattern.

One of the main goals of many economic development programs is to determine how tax competition influences the placement of production and employment globally. According to Mutti's (2003) results, small, open, and middle-income countries achieved more tax reductions. The effective rates display notable variances across governments. The effective tax burden on investors may be significantly impacted by differences in how tax bases are defined across nations, as well as other considerations.

This research studied how CIT in Serbia and EU member states impacts economic growth, as measured by GDP per capita. Twenty nations were found to have statistically significant findings, as presented in the research. We can conclude that, given the greater prevalence of the positive correlation economic growth, in a large number of countries that are part of the sample, is a direct result of a higher CIT contribution to GDP.

The worldwide competitiveness of CIT is evident. The CIT is often reformed due to competition. Governments often draw in foreign investment, which lowers CIT rates and improves the size of the taxable base. When the issue transcends national borders, it becomes even more significant. Our study's findings indicate that, in twenty of the twenty-eight nations examined, there is a close connection between CIT and economic expansion. Depending on

the circumstances in a given nation, CIT and competitiveness have different effects. The significant negative correlations found are in Luxembourg (-0.202) and Poland (-0.055).

According to the findings, the study recommends that tax authorities in the examined countries enhance their tax administration systems, as tax revenue has proven to be a substantial contributor to government income for sustained economic development in the long run. Competition in the CIT domain contributes to the advancement of nations' economic expansion and may be seen as an option to promote economic upturn and progress, as long as it is perceived as non-detrimental. The reduction in CIT rates, as the primary outcome of tax competition in CIT, could hold distinctive significance for the endeavours of global investors, which is why their consideration is granted extraordinary attention. Decision-makers must establish standards for recognizing spending and income. Tax authorities should improve the tax administration system to a comprehensive tax base and raise tax revenue. The study introduces the issue by investigating the implications of tax rates and establishing optimum tax rates in a competitive setting.

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ECONOMICS of Sustainable Development =
Економика одрживог развоја / editor-in-chief
Zoran Simonović. - Vol. 5, br. 1 (2021)- . - Niš :
Society of Economists "Ekonomika", 2020 - (Niš :
"Medivest"). 68 стр. - 24 cm

Dva puta godišnje.

ISSN 2560-421X = Economics of Sustainable
Development

