

## THE SOCIO-ECONOMIC IMPACT OF SPORTS INDICATORS ON THE DEVELOPMENT OF THE COUNTRIES OF CENTRAL AND EASTERN EUROPE

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### Abstract

Sport brings many social benefits that are reflected in general physical and mental health, building sportsmanship, increased satisfaction, as well as socially desirable forms of behaviour. However, investments in sport also cause numerous economic effects such as the creation of new jobs, local and national economy growth, the development of local tourism, the growth of the construction industry, the growth of tax revenues, the development of infrastructure, the promotion of the country's image, etc. The aim of this paper is to assess the impact of the sports industry, expressed in the export of sports goods and public allocations for sports and recreation, on the economic development of eleven post-socialist countries of Central and Eastern Europe in the period between 2012 and 2022. The paper applied the Within two-way panel regression fixed effects model, the results of which were confirmed by further using of the Artificial Neural Network model. Both methods used confirmed that the strongest and statistically significant impact on the economic development of the considered countries belongs to the exports of sporting goods, followed by a somewhat weaker, but also positive and statistically significant impact of public expenditure on sport and recreation. The article concludes that, although positive and statistically significant, the impact of these variables is still minor compared to some other factors that largely determine the economic trends of the country. Despite this, investments in sport and the development of the sports industry should be increased due to the numerous wider, direct and indirect benefits that sport brings to the entire society.

**Key words:** export of sporting goods, government expenditure on sports, panel regression analysis, Artificial neural networks, economic development.

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## ДРУШТВЕНО-ЕКОНОМСКИ УТИЦАЈ СПОРТСКИХ ИНДИКАТОРА НА РАЗВОЈ ЗЕМАЉА ЦЕНТРАЛНЕ И ИСТОЧНЕ ЕВРОПЕ

### Апстракт

Спорт доводи до многих друштвених користи које се огледају у општем физичком и психичком здрављу, изградњи спортског духа, повећаном задовољству, као и у друштвено пожељним облицима понашања. Међутим, улагања у спорт носе са собом и бројне економске ефекте попут отварања нових радних места, развоја локалне и националне привреде, развоја локалног туризма, грађевинске индустрије, раста пореских прихода, развоја инфраструктуре, промоције имиџа земље и др. Циљ овог рада је да процени утицај индустрије спорта исказане извозом спортске робе и јавних издвајања за спорт и рекреацију на привредни развој једанаест постсоцијалистичких земаља централне и источне Европе у периоду од 2012. до 2022. године. У раду је примењен Within двосмерни панел регресиони модел фиксних ефеката, чији су резултати били потврђени даљом применом модела Вештачких неуронских мрежа. Обе коришћене методе су потврдиле да најјачи и статистички значајан утицај на привредни развој разматраних земаља има извоз спортске робе, праћен нешто слабијим, али такође позитивним и статистички значајним утицајем јавних издвајања за спорт и рекреацију. У чланку се закључује да је, иако позитиван и статистички значајан, утицај ових варијабли ипак мали у односу на неке друге факторе који у већој мери опредељују привредна кретања земље. Упркос томе, треба повећавати улагања у спорт и развој индустрије спорта због бројних ширих, директних и индиректних користи које спорт доноси целом друштву.

**Кључне речи:** извоз спортске робе, владина издвајања за спорт, панел регресиона анализа, Вештачке неуронске мреже, привредни развој.

### INTRODUCTION

It is widely known that sports activities are recognised as essential elements of mental and physical health, providing various benefits to individuals (Mitić et al., 2023, p. 207). Sport and recreation once served as important indicators of national identity and the international recognition of the country under socialism, symbols of state power, and ideological tools, but they were also drivers of educational processes, wider social progress and a means of deeper social integration. This especially applies to the post-socialist countries of Central and Eastern Europe (CEE) where, before their reforms and transition processes, sport served as an instrument of state promotion and a means of the ruling elites' progress in ideological, political, social and other human life areas. Sport once had an emancipatory and mass character in the former socialist countries, insisting on the active participation of women, achieving the best possible results, mass physical culture, as well as the progressive striving of the ruling order (Simonović, 2022). Professional sports in the former socialist society were not commercialised, did not strive for profit and belonged to the athletes themselves,

who competed in their true desire for glory and out of pure love for sport. In contrast to capitalism, which perceives sport as a key market for the commercialisation of sports services, consumerism, purchasing mood and placement of consumer goods, in socialism sport provided an important segment of social life and socialist development programs, representing a common platform for the personal, social and cultural development of all social segments. People had more free time, and therefore greater access to sports, cultural, artistic, recreational, environmental and other social facilities and contents. In the CEE countries, the widespread ideology of physical education was essential to foster education, modernise society, and demonstrate soft power. However, along with the process of their economic transition, political leaders' promises to maintain the previous welfare state model began to fade. Today, these countries strive to realise their development strategies and interests, to build a unique institutional design and to allocate sport as a significant area of public policy (Kustec and Ličen, 2020).

Many researches, as well as insight into the relevant data, indicate that in less developed countries, sport is generally given less attention compared to other spheres of social life. Namely, in most developing countries, the promotion of sports is usually not the main priority of public funding, leading to the appearance of a kind of *circulus vitiosus*, within which there remain symbolically less funds for the development of the athletes themselves. There are studies that confirm that the level of economic development is a key determinant of national sports performance, usually measured by the number of medals won at continental or world competitions. Nevertheless, emphasising the lack of relevant research studies that would deal with these important issues, especially in developing countries, Andreff (2006, pp. 308-312) also points out that sport is not the main priority of state funding, nor is it a pillar of the educational system of any developing country in which social issues, underdevelopment and living standard growth gain priority over sports development issues. Moreover, a more precise assessment of the state of the sports industry is hampered by the lack of relevant statistical data on sports.

After the end of the Cold War and the fall of the Berlin Wall, the countries of CEE gradually moved to the model of democratic, liberal and parliamentary Western nations, freeing themselves from the constraints of autocratic regimes and taking an active approach in the reshaping and social affirmation of sports, leisure and physical culture (Parks and Zwicker, 2021, pp. 1501–1516). However, by reforming their economies and political systems, many former socialist countries at the beginning of their transition processes reduced their emphasis on sports, so that, at the beginning of the 21st century, the relationship between sports and society changed dramatically, along with the reduction of public resources intended for mass sports development and the population real income conditioned by the transition.

Bearing in mind the absence of relevant research dedicated to the contemporary role of sports in the CEE countries' economic development, the aim of this study is to review the place and role of sports in the context of these social and political upheavals, as well as to bridge the noticeable literature gap on the assessment of sports' impact on the economic development of the observed countries. The second section of the paper provides a brief overview of the available literature, while its third section is devoted to the analysis of the sample data. Its fourth section deals with the methodological discussion of the obtained results, while its last section concludes the article. The scientific contribution of this article is reflected in the fact that there are almost no published studies examining the socio-economic impact of the sports industry and government spending on sports on the economic development of contemporary countries.

#### *BRIEF LITERATURE REVIEW*

The sports economics literature is colourful and diverse: in addition to the inevitable economic impacts, it largely discusses other related aspects of the construction of sports facilities and the organisation of sports events, such as tourism, health, medical and sociological effects, effects of investment, effects of entertainment and leisure, educational effects, effects of investment in construction works and real estate, etc. There is also a large body of published studies that examine the microeconomic effects and social benefits of individually observed sports events and manifestations, as well as of the construction or reconstruction of sports stadiums and arenas on the local economy of communities, cities and regions. Such studies usually apply an assessment of the total economic impact, which is calculated by aggregating direct impacts (spending in a given city or economy due to an organised sports event), indirect impacts (purchase of goods and services by companies participating in its organisation) and induced impacts (additional earnings and other income related to its organisation that are realised at the local level) (KPMG, 2018, p. 4).

In addition, even in scientific journals that are strictly devoted to the economics of sports, there is a dominant presence of articles that mostly deal only with the local and microeconomic effects of the organisation of sports events. Baumann, Matheson, and Muroi (2009) examined the net changes in tourist arrivals during various sporting events in Hawaii and found that all events generate similar economic positive net impacts on the local economy, regardless of the fact that the state subsidises some of them to a greater extent, and others to a lesser extent. Unlike them, somewhat later, Kobierecki and Pierzgalski (2022), on the example of mega sports events such as the Olympic Games of the FIFA World Cup in football, concluded that such manifestations do not bring tangible economic benefits for the host countries. Namely, by examining the effects of these events on

the example of Canada, Great Britain, South Africa and Brazil from 2010 to 2016, the authors conclude that they do not contribute significantly to the economic growth of the country, fitting in with the results of other studies on the economic impact of large sporting events. However, this still does not mean that sports mega events should not be launched.

When it comes to macroeconomic aspects of sports contents in European countries, Mamcarczyk and Szyszko (2020) examine the importance and impact of the sports sector on gross domestic product (GDP) and value added. These authors track employment in sports, statistics of sports companies and international trade flows and conclude that sport has a greater contribution to the economy of more developed countries, while its influence has increased over time in other, less developed members of the European Union (EU). However, even in the developed economies of the EU, the contribution of sports to GDP or added value has not reached double digits. They also note that official statistics do not cover the entire sports sector, that they cover a rather short time span, and that this topic has not been examined in detail until now, all of which objectively limits the scope of such analyses.

By studying the macroeconomic effects of the organisation of the Olympic Games, Müller et al. (2016) suggest that, although it is difficult to quantify the effects of such sports events, they bring stimulating economic benefits for the host country, which are reflected in the creation of additional income, additional demand for tourist services, multiplied effects of tourism, employment effects, economic growth and improved image of the country by further attracting foreign capital. In this way, in the era of intense commercialisation of sports, the host country structures its economy through its improved image and attracting investments and new orders, even in the years after the held Olympic Games. However, Langer et al. (2015, p. 1), in their extensive study on the impact of betting during the Olympic Games on the country's economic growth, also emphasise that when taking into account a sufficiently large number of growth determinants, it can be concluded that these sports events do not always lead to the anticipated economic effects. Bearing in mind all of the above, when reviewing the available literature sources, the authors of this manuscript noticed a serious lack of relevant studies that would deal with the examination of the macroeconomic effects of the sports industry and public allocations for the financing of sports activities, especially since some authors also note that the given micro analysis should be extended to the macroeconomic level (Kobierecki and Pierzgalski, 2022; Muguerza et al., 2021).

#### *DATA AND SAMPLE ANALYSIS*

The paper considers a balanced panel of  $N=11$  observed countries in  $T=11$  considered time periods after the first differentiation of the original variables, totalling 121 observations. The purpose of the article is to exam-

ine the socio-economic impact of Exports in sporting goods in millions of euros, and Government expenditure on sport and recreation in millions of euros on the economic development of the considered countries of Central and Eastern Europe (Bulgaria, the Czech Republic, Estonia, Croatia, Lithuania, Latvia, Hungary, Poland, Romania, Slovenia and Slovakia) measured by the trend of their real GDP in constant 2015 millions of euros in the period from 2012 to 2022. At the same time, in the research, *Number of tourist establishments* is used as a control variable, bearing in mind that sport and tourism represent mutually connected complementary activities. The data used was derived from the Eurostat database, while the objective limitation of this study is reflected in the still insufficiently available data on sports activities, both from the aspect of the types of sports variables coverage, and from the point of view of the length of the available time series. This is especially true for the European countries under consideration, where sports statistics have only recently begun to be included. Descriptive statistics of the variables used are given in Table 1.

*Table 1. Results of descriptive statistics*

	GDP	Exports in sporting goods	Government expenditure on sport and recreation	Tourist establishments
Mean	113167.3	288.1103	482.8282	11923.67
Median	50799.50	186.7270	192.3316	3896.500
Maximum	574015.6	2009.261	2476.311	113761.0
Minimum	18928.40	21.87400	38.50000	538.0000
Standard deviation	125882.1	335.3939	601.4857	24266.64
Skewness	2.104735	2.761657	1.724701	3.178316
Kurtosis	6.835498	11.82754	4.938297	11.87973

*Source:* Authors' calculations

A closer look at the common sample data indicates that the highest mean was recorded by the variable *GDP* (113167.3 million of euros), while the lowest average value belonged to the variable *Exports in sporting goods* (288.11 million of euros). On the other hand, the variable *GDP* also had the largest deviation from the group mean value (125882.1), indicating the pronounced economic progress of the countries under consideration, while the smallest standard deviation, and thus relative stability, was recorded by the variable *Exports in sporting goods* (335.4 million of euros). It is also observed that all considered variables are positively skewed, indicating that they have a longer right tail, and that their most extreme values are on the right side of the distribution. On the other hand, the variables *Exports in sporting goods* and the *Number of tourist establishments* collectively record higher kurtosis values, suggesting greater data instability and the prob-

ability of significant deviations from the arithmetic mean. Moreover, the share of average *Exports of sporting goods* in the average GDP of the observed countries is 0.25%, while the share of average *Government expenditures for sports and recreation* in this parameter amounts to 0.43%.

Of the individually observed sports variables, the highest average value of Exports of sporting goods was recorded by Poland, as the largest and most developed country from the observed sample, with an average value of real GDP of 466068.3 million euros (Figure 1). This country also experienced the biggest jump in the value of *Exports of sporting goods* – from 367.4 million euros in 2011 to 2009.3 million euros in 2022. In this respect, Poland was followed by the Czech Republic, Romania, Hungary, Bulgaria and Slovakia. On the other hand, Latvia (39.4 million euros), Estonia (63.8 million euros) and Croatia (about 88 million euros) had the lowest average value of sports exports. Figure 2 provides an overview of the individually observed GDP regression lines of the considered countries as a function of the export of sporting goods.

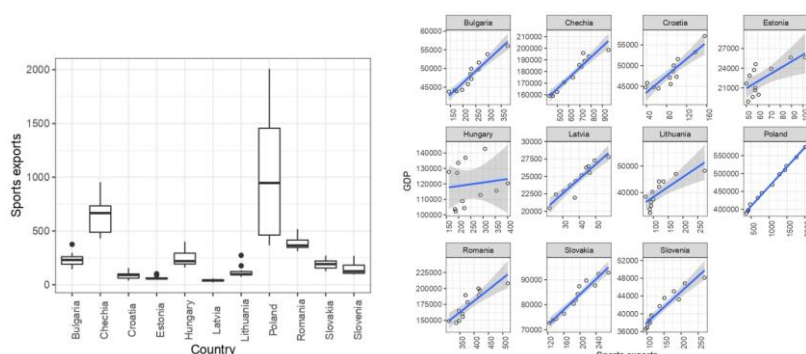


Figure 1. Exports in sporting goods boxplot

Figure 2. Individual GDP regression lines as a function of sports exports

Source: Authors' contribution

On the other hand, Poland (1969.3 million of euros) also had the highest average value of *Government expenditures for sports and recreation*, with their growth from 2157.8 million euros in 2011 to 2476.3 million euros in 2022, followed by Hungary (1026.4 million euros), the Czech Republic (831.3 million euros), Romania (542.4 million euros) and Croatia (240 million euros). At the same time, Hungary stands out with its most pronounced growth of state expenditure on sports activities, which has more than quadrupled in the observed period (a jump from 341.5 million of euros in 2011 to 1438.6 million of euros in 2022), followed in this respect by Poland, the Czech Republic and Romania. At the same time, Latvia (about 72 million euros), Lithuania (100.6 million euros) and Bulgaria (113.8 million euros) recorded the lowest average values of *Government*

*expenditures for sports and recreation*, as small and/or least developed countries from the sample (Figure 3). It is also observed that the sample countries proportionally increased their allocations to other areas such as health care, education, environmental protection and social policy, since their correlation coefficients with *Government expenditure on sports and recreation* were positive, extremely high and statistically significant. Figure 4 provides a detailed overview of individually observed GDP regression lines of the considered countries as a function of government expenditures on sports and recreation.

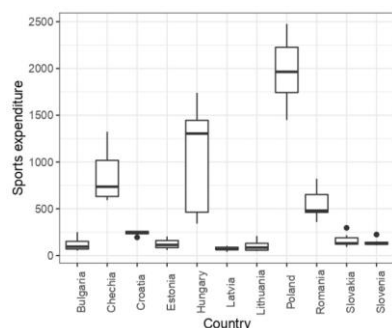


Figure 3. Government expenditure on sport and recreation boxplot

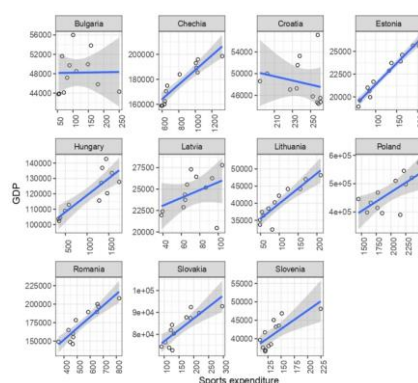


Figure 4. Individual GDP regression lines as a function of public sports and recreational expenditure

Source: Authors' contribution

## RESULTS AND DISCUSSION

### Results of Panel Regression Analysis

The initial results of Pearson's correlation analysis, Tolerance and Variance Inflation Factor (VIF) indicated the absence of multicollinearity between the predictors. Due to the length limitations of this paper, the results of these tests, as well as the results of descriptive statistics for individually observed countries are available upon request from the authors. The existence of a unit root, i.e. stationarity of the variables, was checked by applying the Im, Pesaran and Shin (IPS) test, the results of which are presented in Table 2.

Table 2. Im, Pesaran and Shin (IPS) test results

Variables	Level		First differences	
	Test statistics	p-value	Test statistics	p-value
GDP	5.0650	1.0000	-3.1079***	0.0009
Exports in sporting goods	5.5238	1.0000	-2.7850**	0.0027
Government expenditure on sport and recreation	0.5762	0.7178	-2.9395***	0.0016
Tourist establishments	2.2353	0.9873	-1.7856**	0.0371

Note: \*\*\* denotes statistical significance at the level of 0.01, \*\* denotes statistical significance at the level of 0.05, while \* denotes statistical significance at the level of 0.1

Source: Authors' calculations

The results of the IPS test confirmed the existence of a unit root in the case of all variables at the level, which is why their differentiation was performed. All observed variables became stationary after differentiation, allowing for the continuation of the analysis. The results of the regression panel analysis are presented in Table 3. The table presents the results of the Within two-way model with fixed effects. This model was selected with the aim to control country specificities (individual effects), but also the impact of time effects, including the COVID-19 pandemic on all observed countries.

Table 3. Results of regression analysis – Within two-way model with fixed effects

Variables	Coefficient	Standard error	t-value	p-value
Exports in sporting goods	46.100682***	8.092559	5.6967	1.308e-07
Government expenditure on sport and recreation	6.142120*	2.957441	2.0768	0.04046
Tourist establishments	-0.060205	0.087715	-0.6864	0.49412
R-squared (R <sup>2</sup> )		0.41002		
Adjusted R-squared (R <sup>2</sup> )		0.27013		
Total sum of squares		1581800000		
Residual sum of squares		933250000		
F-statistics		22.4707***		
p-value		3.9525e-11		
Degrees of freedom		97		

Note: \*\*\* denotes statistical significance at the level of 0.01, \*\* denotes statistical significance at the level of 0.05, while \* denotes statistical significance at the level of 0.1

Source: Authors' calculations

The results of the tests for assessing the model validity in choosing among the OLS model, the Within two-way fixed effects model, and the Random effects model are presented in Table 4. This table also shows the results of the tests for assessing the cross-sectional dependence, serial cor-

relation, heteroscedasticity, and structural breaks of the selected Within two-way fixed effects model.

*Table 4. Results of model evaluation tests*

Type of tests	t-statistics	p-value
F-test	F = 5.2631***	1.089e-08
Hausman Test	chisq = 17.19***	0.0006458
Lagrange Multiplier Test (Breusch-Pagan)	chisq = 8.0532***	0.004542
Pesaran CD test	z = 0.060196	0.952
Durbin-Watson (DW) test	DW = 2.2037	0.8881
Studentized Breusch-Pagan test	BP = 3.9859	0.263
F-statistics (pooltest)	F = 2.2843***	0.001985

*Note:* \*\*\* denotes statistical significance at the level of 0.01, \*\* denotes statistical significance at the level of 0.05, while \* denotes statistical significance at the level of 0.1

*Source:* Authors' calculations

The authors selected the Within two-way fixed effects model based on the results of the statistically significant F-test (5.2631), the statistically significant Hausman test (17.19), and the statistically significant Breusch-Pagan test (8.0532). The results of the Pesaran CD test (p-value 0.952), the Durbin-Watson test (p-value 0.8881), the Studentized Breusch-Pagan test (p-value 0.263), and the Pool test (p-value 0.001985) confirmed the absence of problems of cross-sectional dependence, serial correlation, heteroscedasticity, and parameter instability.

The results of the panel regression analysis obtained by applying the Within two-way fixed effects model from Table 4 confirm the research hypothesis that an increase in government spending on sports and recreation and exports of sporting goods have a positive impact on the GDP of the countries under consideration. The largest positive and statistically significant impact on the GDP trend is from the export of sporting goods, followed by a slightly weaker, but also positive and statistically significant impact of public allocations for sports and recreation. The  $\beta$  value of the sports goods export coefficient is 46.1007, while its p-value amounts to 1.308e-07. On the other hand, the  $\beta$  value of the government spending on sports and recreation is 6.1421, while the p-value of this variable amounts to 0.0405. The adjusted coefficient of determination ( $R^2$ ) is 0.2701, explaining 27.01% of GDP, which is logical considering the fact that investments in sports, compared to investments in some other factors, still make a modest contribution to the overall economic growth and development of the observed countries. The results of the F-statistics (22.4707, p-value 3.9525e-11) also indicated a statistically significant joint impact of all predictors on GDP trend. In the next step of the analysis, the article approached the application of Artificial Neural Networks with the aim of confirming the results, i.e. the significance of the variables' coefficients obtained by applying panel regression analysis.

Based on the conducted panel regression analysis, the following regression equation was obtained:

$$GDP_{it} = 46,10ESG_{it} + 6,14GE_{it} - 0,06TE_{it} + \varepsilon_{it} \quad (1)$$

where

$GDP_{it}$  is the economic development,

$ESG_{it}$  is the export of sporting goods,

$GE_{it}$  are government expenditures on sports and recreation,

$\varepsilon_{it}$  is the random error of the regression.

#### *Results of applying Artificial Neural Networks*

Recently, the popularity of Artificial Neural Network (ANN) models has been growing—they have found a wide application in the prediction and approximation of continuous functions, making them suitable for the classification, clustering, and prediction of variables of interest. ANNs belong to the group of correct prediction models, primarily due to their non-linear capabilities, but also due to their high tolerance threshold for noise. Their application is first based on training a neural network on the basis of collected historical data, and then on using the created network to predict future values of dependent variables (Hossain et al., 2017, pp. 2-5). These phases allow ANNs to learn from experience and to generalise conclusions based on previously acquired knowledge, all in accordance with predetermined mapping rules established by their structure. As intelligence-based nonparametric approaches, ANNs use input and output levels (Sanusi et al., 2020, p. 111) to create many optimised models. As a branch of artificial intelligence, neural networks imitate the functioning of the human brain in their attempt to recognise regularities and patterns in data. More specifically, these predictive models consist of so-called nodes, that is, highly interconnected processing elements that are simultaneously engaged in solving specific problems (Khorshid et al., 2009, p. 32).

In this article, we apply the Multilayer Perceptron model in order to validate the results obtained by the panel Within two-way fixed effects model. Multilayer perceptron usually consists of several layers of processing units, also known as neurons or nodes. While input data (independent variables) is fed to neurons in the so-called input layer, the processed output values are then passed to neurons in the hidden layers. At the end of the process, output values (dependent variable) are obtained, which lie in the output layer. In this case, each constructed connection between neurons is characterised by a certain weight that suggests the strength of the connection. In this way, a learning and training algorithm is created (Önder et al., 2013, p. 81), on the basis of which one can approach the performance of specific data testing and the prediction of variables of interest. In accordance with the approach of Kim et al. (2025, p. 5), we performed data normalisation using *Z*-score analysis, also known as data standardisation

and often used in machine learning techniques. This technique centres the data around zero and reduces it to a unit standard deviation based on the following formula:

$$x' = \frac{x - \text{mean}(x)}{\text{Std}(x)} \quad (2)$$

where  $x$  is the original value of the variable  $x$ ,  $x'$  is the normalized value of the variable  $x$ ,  $\text{mean}(x)$  is the arithmetic mean of the variable  $x$ , while  $\text{Std}(x)$  is the standard deviation of the variable  $x$ .

In the next step, we applied other popular data standardisation techniques such as normalisation and adaptive normalisation procedures. However, since they gave a higher value of the sum of squared errors (SSE) in the training and testing phases, we opted for the normalisation model that gave us the lowest value of this parameter in the training and testing phases (Model 4 in the following Table 5), in accordance with the approach of Andreas and Korn (1996, p. 3).

Table 5. Selection of an adequate ANN model

Model number	Standardization method	Type of training	Model architecture		Training phase		Testing phase	
			Number of hidden layers	Number of neurons in the hidden layer	Sum of squares errors (SSE)	Relative error	Sum of squares errors (SSE)	Relative error
1	Normalized	Batch	1	3	5.738	0.132	1.818	0.060
2	Adjusted normalized	Batch	1	3	6.137	0.129	1.812	0.073
3	Adjusted normalized	Online	1	1	4.564	0.093	1.514	0.192
4	Standardized	Batch	1	1	4.114	0.087	1.336	0.201

Source: Authors' calculations

We decided to choose the optimised Model 4 – a standard ANN with a Hyperbolic Tangent Activation Function in the hidden layer, together with an Identity Activation Function in the output layer due to its simplicity and one neuron in the hidden layer. In doing so, we used the following approach in the evaluation of the generated neural network: a training phase (72.7% of the data) and a testing phase (27.3% of the data). In this way, we obtained the final 3-1-1 neural network model (Figure 5), which confirmed that the variable *Exports in sporting goods* has the greatest significance and predictive power (0.623), followed by the variables *Government expenditure on sports and recreation* (0.371) and *Tourist establishments* (0.006) (Table 6). It is also important to note that the other models considered gave completely identical results and conclusions.

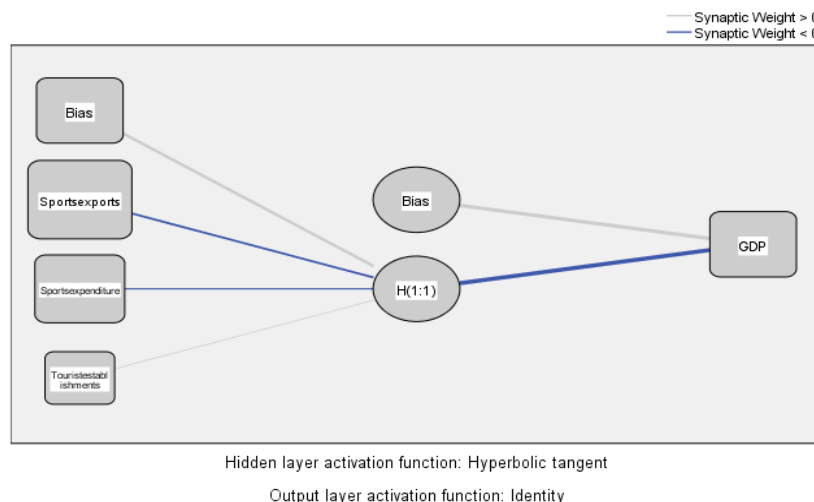


Figure 5. Architecture of the selected ANN model  
 Source: Authors' contribution

Table 6. Significance of independent variables in the selected model

Variables	Model 4	
	Importance	Normalized importance
Exports of sporting goods	0.623	100%
Government expenditure on sport and recreation	0.371	59.5%
Tourist establishments	0.006	1%

Source: Authors' calculations

### CONCLUSION

Given the very noticeable lack of research studies examining the socio-economic impacts of sport on a country's economic growth, this article attempts to bridge the identified literature gap by examining the effect of the sports industry, expressed in the exports of sports goods and public spending on sports and recreation, on the economic development of 11 considered countries of Central and Eastern Europe in the period between 2012 and 2022. The paper first applied the Within two-way fixed effects panel regression model, which indicated that the strongest and statistically significant impact on the considered countries' economic development belongs to the export of sports goods, followed by a somewhat weaker, but also positive and statistically significant impact of public spending on sports and recreation. However, although positive and statistically significant, the impact of these variables is still minor compared to some other factors that determine economic trends to a greater extent. This is espe-

cially true if one take into account the fact that, in the sample data, the share of average exports of sporting goods in the average GDP of the observed countries is 0.25%, while the share of average government expenditures on sports and recreation in this indicator is somewhat higher and amounts to 0.43%. In the next step of the analysis, the authors applied the Artificial Neural Network model with the aim of verifying the obtained results. The ANN analysis confirmed the panel regression technique findings, suggesting that the export of sporting goods has the greatest importance in the selected ANN model, followed by government expenditures on sports and recreation and tourist facilities as a control variable.

The objective limitation of this study is the still insufficient availability of data on sports, as well as their relatively short time span, especially in the case of the European countries under consideration where sports statistics have only recently begun to be collected. Therefore, some time must pass before more specific recommendations on some other, future research can be made. However, the current findings still indicate that sport, albeit modestly, contributes to the economic development of the observed countries, implying the need for further investments in the sports industry. In addition to contributing to general physical and mental health, increased satisfaction, and building sportsmanship, as well as socially desirable forms of behaviour, investments in sports undoubtedly influence the creation of new jobs and support the local and national economy, bringing its numerous positive indirect effects on the development of local tourism, the construction industry, foreign exchange inflow, tax revenues, infrastructure development, promotion of the country's image, development of the service sector, etc. All of the above are good reasons for further and more efficient affirmation of the sports industry development. Additionally, it is encouraging for additional investments, especially in sports advertising, given that it has a huge impact on consumer attitudes and decisions about purchasing a particular sports product (Klačar and Popović, 2010, pp. 1223-1224), thus strengthening the position of the entire sports industry.

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## ДРУШТВЕНО-ЕКОНОМСКИ УТИЦАЈ СПОРТСКИХ ИНДИКАТОРА НА РАЗВОЈ ЗЕМАЉА ЦЕНТРАЛНЕ И ИСТОЧНЕ ЕВРОПЕ

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### Резиме

Спорт доводи до многих друштвених користи које се огледају у општем физичком и психичком здрављу, изградњи спортског и тимског духа, повећаном задовољству, као и у друштвено пожељним облицима понашања. Међутим, улагања у спорт носе са собом и бројне економске ефекте попут отварања нових радних места, развоја локалне и националне привреде, развоја локалног туризма, раста грађевинске индустрије и пореских прихода, развоја инфраструктуре, промоције имиџа земље и др. Циљ овог рада је да процени утицај индустрије спорта исказане извозом спортске робе и јавних издвајања за спорт и рекреацију на привредни развој једанаест постсоцијалистичких земаља централне и источне Европе (ЦИЕ) у периоду од 2012. до 2022. године. Спорт и рекреација су својевремено у социјалистичким земљама ЦИЕ представљали важан показатељ националног идентитета и међународне препознатљивости земље, симболе државне моћи, идеолошко оруђе, али и покретаче образовних процеса, ширег друштвеног напретка и средство за дубљу друштвену интеграцију. Ово се посебно односи на разматраних 11 земаља ЦИЕ (Бугарску, Републику Чешку, Естонију, Хрватску, Литванију, Летонију, Мађарску, Пољску, Румунију, Словенију и Словачку) у којима је пре њихових реформских и транзиционих процеса спорт служио као инструмент државне промоције и средство напретка владајућег система у идеолошком, политичком, социјалном и другим областима хуманог живота. Међутим, реформисањем својих привреда и политичких система, многе су од ових земаља на почевима својих транзиционих процеса смањивале свој нагласак на спорт, да би се почетком 21. века однос спорта и друштва у њима драматично променио, упоредо са смањивањем јавних средстава намењених развоју масовног спорта и реалног дохотка становништва условљеног процесом транзиције. Данас ове земље теже реализацији својих развојних стратегија и интереса, изградњи јединственог институционалног дизајна и реафирмацији спорта као значајније области јавних политика. Имајући у виду опречне истраживачке налазе, као и одсуство релевантних истраживања посвећених савременој улози спорта у привредном развоју земаља ЦИЕ, циљ овог рада је да сагледа место и улогу спорта у контексту насталих друштвених и политичких преврата, као и да премости уочљиви јаз у литератури о процени утицаја спорта на привредни развој посматраних земаља. У раду је примењен Within двосмерни панел регресиони модел фиксних ефеката, чији су резултати били потврђени даљом применом модела Вештачких неуронских мрежа. Обе коришћене методе су потврдиле да најјачи и статистички значајан утицај на привредни развој разматраних земаља има извоз спортске робе, праћен нешто слабијим, али такође позитивним и статистички значајним утицајем јавних издвајања за спорт и рекреацију. Међутим, иако позитиван и статистички значајан, утицај ових варијабли је ипак миноран у односу на неке друге факторе који у већој мери опредељују привредна кретања. У чланку се закључује да упркос свему треба повећавати улагања у спорт и развој индустрије спорта због бројних ширих, директних и индиректних користи које ова грана доноси целом друштву.