Original Paper

Comparison of the employment rate in the sports sector of the Slovak Republic, the Czech Republic and the EU average

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ABSTRACT

Sport plays an important role in society mainly for its health and social benefits. The essence of sport also lies in its great influence on society in areas such as politics and economics. If we look into the past, the Olympic Games themselves were organized with the aim of meeting the individual states of ancient Greece and solving political issues and strengthening friendly relations. Sport also has an impact on the economic situation of the country, as it directly participates in the creation of GDP and creates job opportunities within the sports sector and indirectly through reduced health care costs, which is caused by an active and healthy lifestyle. The purpose of this paper was, based on the analysis, to forecast the employment rate in the sports sector in the Slovak Republic, the Czech Republic and the EU average. We applied Box-Jenkins methodology, ARIMA models, performed in R. Following the study's results, the analysis revealed significant disparities in employment rates within the sports sector across countries. Slovakia recorded one of the lowest rates in 2023, while the Czech Republic performed slightly better but remained below the EU average. Based on the forecast, employment rates in Slovakia and the Czech Republic are expected to fluctuate between 2024 and 2026, although still remaining below the overall EU average. The EU average is expected to increase.

KEYWORDS: sports sector, the employment rate, ARIMA, forecast

JEL CLASSIFICATION: C53, J21, Z22

INTRODUCTION

Sport plays a vital role in society by promoting health, fostering social connections, influencing politics, and contributing to the economy through GDP creation, job opportunities, and reduced healthcare costs (Šišková, M., 2024). The development of sports,

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scientific, and pedagogical potential should be a priority of state policy in education (Kubitskyi, S. et al., 2022). Sports activities are valued not only for their educational benefits but also as an essential part of social interaction. Therefore, it is crucial to encourage people to participate in sports, whether for recreation or competitively (Tafuri, D. et al., 2019). The European Commission (2008), based on The Vilnius Definition of Sport, defines sport as follows: 1) Statistical definition (agrees with the CPA 2008 category 93.1, which includes sports activities such as the operation of sports facilities, activities of sports clubs, fitness centers, and other sports-related activities); 2) Narrow definition (includes goods and services necessary for the practice of sports activities); 3) Broad definition (encompasses the statistical and narrow definitions, as well as goods and services that are directly or indirectly related to any sport activity but are not essential for its practice).

There is also an emphasis on encouraging the active participation of young people in society, with sports being one of the primary tools for engaging youth, as it is considered as a common factor in development of young people. Further studies are needed to explore the multi-level and cross-sector collaboration between youth policies and sport. Additionally, new management tools are required to strengthen the sport´s role in the European Union's youth policy (Djobova, S., 2017). Sports research at the macro level, particularly in terms of international collaboration, lags other scientific disciplines. However, the significant increase in international cooperation in the field of sports science over the past decade is considered positively. Based on their research, Asian countries are falling behind in international collaboration, while Nordic countries, such as Denmark, have shown considerable activity (Wang, L. et al., 2015)

In terms of its economic impact, sports in Slovakia ranks among the lowest compared to other European Union countries, contributing only 0.44% to overall employment and 0.76% to GDP. The primary reasons for this are the lack of systematic funding, which limits the development of professional sports, as well as grassroots sports and youth and children's sports activities. It can be concluded that the financing of the sports sector poses a significant issue, also affecting employment, as this underfunding may reduce interest in working within this economic sector (PWC, 2021).

It is important to note that the category of employees in sports sector does not include only professional athletes, but it also includes a) professional coaches, b) non-sport occupations within the sports sector, such as sales staff in sporting goods stores, c) and jobs related to sports outside the sports sector, such as club officials or sports instructors in schools (Eurostat, 2023).

In Slovakia, as well as the Czech Republic, professional athletes can carry out their activities in two ways: 1) as employees, under a Professional Sports Performance Contract, and 2) as self-employed individuals. Professional athletes tend to be well-paid and highly mobile employees, often responding to tax burdens through migration. There are differences between the sports market and traditional labor market, such as the elasticity of labor or capital mobility, where labor is highly mobile while capital remains largely immobile (Hembre, E., 2022). Athletes who cannot rely on income from their sports achievements after retiring often look for job opportunities in the labor market to attain greater personal as well as financial stability (Tekavc, J. et al., 2015). Smismans, S. et al. (2021) highlight the importance of successfully transferring the skills gained from high-level sports to new occupations, providing a competitive edge over employees who have never been elite athletes.

Additionally, Coffee, P. & Lavallee, D. (2014) identified key attitudes and skills valued in the job market, such as discipline, commitment to excellence, goal orientation, resilience under pressure, teamwork, dedication, and planning. Some companies actively seek former athletes for job positions due to the added value they bring to the business environment. (Chalfin, P. L. et al., 2015)

MATERIAL AND METHODS

One of the indicators used to evaluate the economic aspect of the sports sector is the employment rate in that sector. For the analysis, we obtained data from Eurostat database, with the analyzed period from 2011 to 2023 and provided forecast for next 3 years. Based on the available data, we focused on the overall employment rate in the Slovak Republic, the Czech Republic and the EU Average. For the time series analysis and the employment rate forecast, we used R.

Regarding the time series analysis and the employment rate forecast in the sports sector, we used the Box-Jenkins methodology, which is one of the most used approaches. It consists of three phases: 1) model identification (selection of appropriate models based on stationarity, trend, seasonality, and autocorrelation), 2) parameter estimation of the selected model (based on the maximum likehood method or the least squares method), and 3) diagnostics (model verification, including residual analysis to check if the residuals represent white noise). Following the Box-Jenkins methodology, we applied ARIMA models, which are relatively simple to implement in the context of using automatic model selection – autoarima (Hyndman, R. J. & Athanasopoulos, G., 2018), Grid Search (Beane, R., 2020); flexible, and capable of capturing and modelling both linear and nonlinear relationships. They also allow to capture various types of patterns in time series, which enables more accurate forecasting of future values. The general formula of the model is as follows:

$$y'_t = c + \phi_1 y'_{t-1} + \cdots + \phi_p y'_{t-p} + \phi_1 \varepsilon_{t-1} + \cdots + \theta_q \varepsilon_{t-q} + \varepsilon_t \tag{1}$$

where y'_t is the different series (which can be differenced more than once). The right side of the equation includes lagged values of y_t and lagged errors. This is called the ARIMA model with parameters (p, d, q), where:

- p = the order of the autoregressive part,
- d = the degree of differencing,
- q = the order of the moving average (Hyndman, R. J. & Athanasopoulos, G., 2018).

RESULTS AND DISCUSSION

The following chart shows the employment rate in the sports sector as a share of total employment achieved in 2023 in the mentioned countries. In addition to EU member states, countries from the EFTA are also included: Iceland, Norway, Switzerland, and the EU candidate country, Serbia.
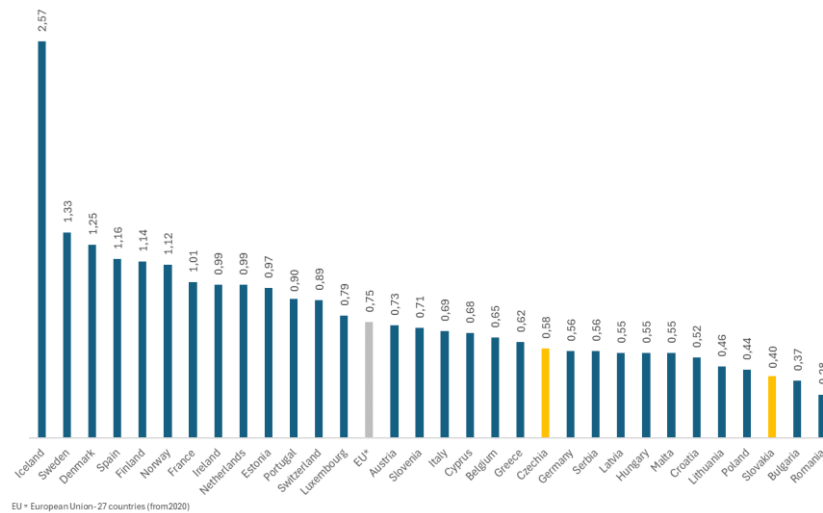
Figure 1 The Employment Rate in Selected Countries in 2023
Source: own processing based on the data available on Eurostat

Iceland recorded the highest employment rate by far, at 2.57%. It is followed by countries such as Sweden, Denmark, Spain, and Finland. This is a result of strong infrastructure and government support for sports in these nations. On the other hand, at the bottom of the chart, with the lowest employment rate in the sports sector, is Romania at 0.28%, followed by Bulgaria (0.37%) and Slovakia (0.40%). The Czech Republic reached a level of 0.58%, ranking in the lower half, but placed higher compared to Slovakia.

The ARIMA (0,0,1) with non-zero mean was chosen as the most suitable model for the Slovak Republic based on the minimization of AIC (Akaike Information Criterion), which reached a value of -34.36. The (0,0,1) model is based on one past error term, with no autoregressive component. The model assumes that the time series is stationary, so no differencing is needed. In the next step, we carried out the forecast.

Table 1 Forecast Results (the Slovak Republic)

	Point Forecast	Lo 80	Hi 80	Lo 95	Hi 95
2024	0.3747461	0.3060286	0.4434637	0.2696518	0.4798405
2025	0.4234551	0.3356808	0.5112293	0.2892159	0.5576942
2026	0.4234551	0.3356808	0.5112293	0.2892159	0.5576942

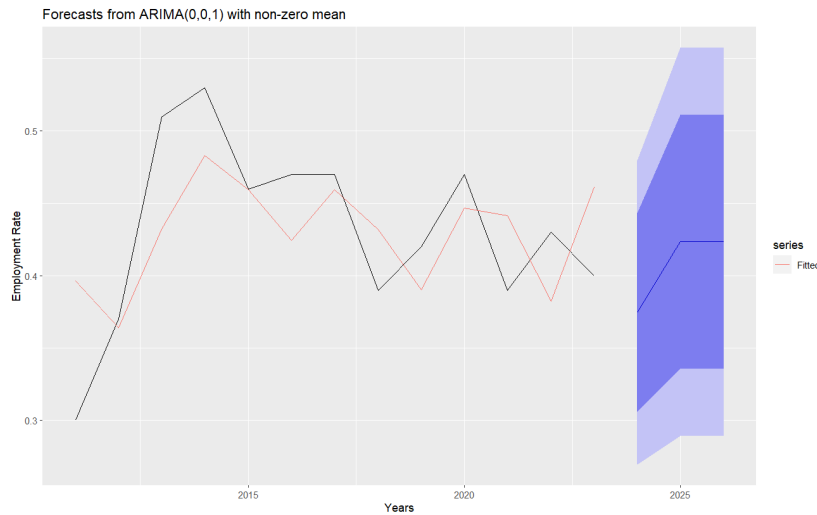Source: Output from R; own processing

Figure 2 Employment Rate Forecast in the Sports Sector (the Slovak Republic)
Source: Output from R; own processing

We found that the forecast indicates an employment rate of 0.374 % for the forecasted period in 2024, with a 95% confidence interval ranging from 0.269 % to 0.479 %. However, in the following two years, there is expected increase to 0.423 %, with a 95% confidence interval of 0.289 % to 0.557 %. Figure 2 graphically illustrates the trend of the employment rate during the observed period, including the predicted values based on the most suitable model. We applied Box-Ljung test, which is used to check for white noise, whether the residuals of the given model are uncorrelated. The p-value is 0.6031, meaning that compared to the significance level (0.05), we do not reject the null hypothesis. This indicates that the residuals are uncorrelated and behave like white noise. Therefore, the model is suitable for use in forecasting.

Based on the AIC, the most suitable model for the Czech Republic was defined as ARIMA (0,0,1), with an AIC value of -35.8. The AR(p) parameter is 0, meaning that the model does not include an autoregressive component and previous values do not affect the model. The I(d) parameter indicates that the data did not need differencing to achieve stationarity. The MA(q) parameter, with a value of 1, describes that the model includes a moving average component based on one past error term.

Table 2 Forecast Results (the Czech Republic)

	Point Forecast	Lo 80	Hi 80	Lo 95	Hi 95
2024	0.589481	0.5242403	0.6547217	0.4897039	0.6892580
2025	0.575799	0.4933661	0.6582319	0.4497287	0.7018692
2026	0.575799	0.4933661	0.6582319	0.4497287	0.7018692

Source: Output from R; own processing

In 2024, we expect an employment rate of 0.589 % with a 95% confidence interval ranging from 0.489 % to 0.689 %. In 2025 and 2026, the employment rate is expected to decrease to

0.575 %, with a 95% confidence interval of 0.449 % to 0.701 %. The Box-Ljung test indicates that we do not reject the null hypothesis, which suggests that the residuals are uncorrelated and behave like white noise, the model is suitable for forcasting.
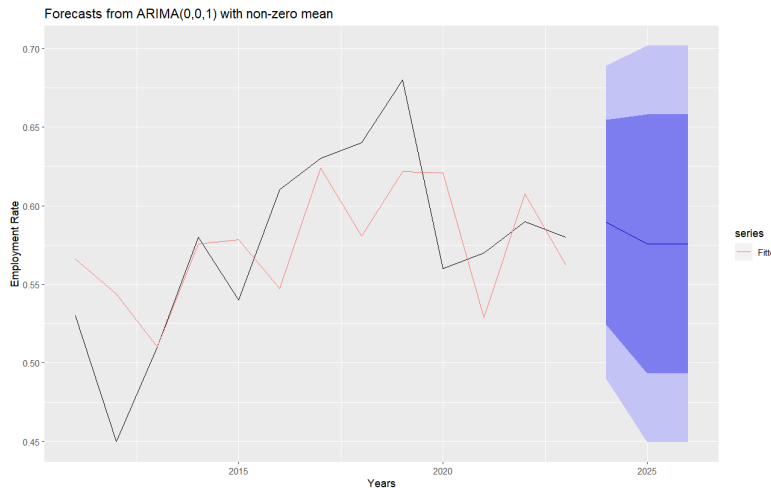

Figure 3 Employment Rate Forecast in the Sports Sector (the Czech Republic)
Source: Output from R; own processing

To determine the forecast for the employment rate in the EU average, we used the auto.arima function to select the most suitable model. Thus, the model with the lowest Akaike Information Criterion value (-57.37) is ARIMA (0,1,0) with drift, which we consider to be the most appropriate model.

Table 3 Forecast Results (the EU average)

	Point Forecast	Lo 80	Hi 80	Lo 95	Hi 95
2024	0.7625	0.7373828	0.7876172	0.7240866	0.8009134
2025	0.7750	0.7394789	0.8105211	0.7206752	0.8293248
2026	0.7875	0.7439958	0.8310042	0.7209660	0.8540340

Source: Output from R; own processing

Based on the model, the employment rate is expected to show an increasing trend over the forecasted period. In 2024, it should be 0.762 %, with a 95% confidence interval ranging from 0.724 % to 0.800 %. In the following year, it is expected to be 0.775 %, with a confidence interval of 0.720 % to 0.829 %. By the final year of the forecast, it should reach 0.787 %, with a 95% confidence interval of 0.720 % to 0.854 %.
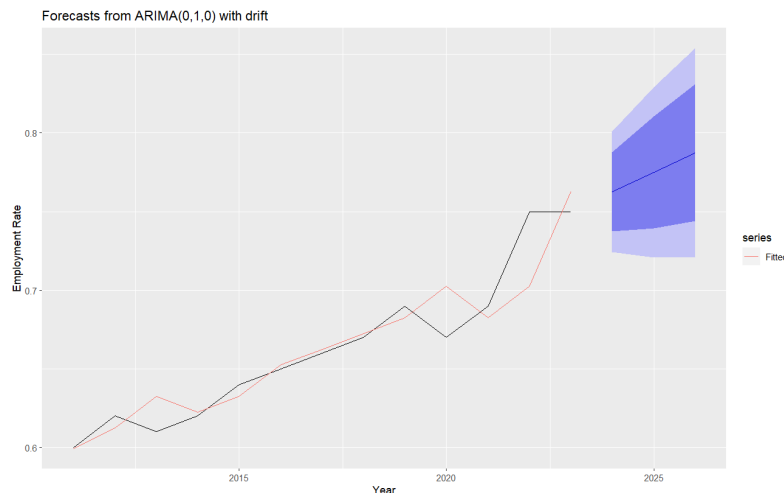
Figure 4 Employment Rate Forecast in the Sports Sector (the EU average)
Source: Output from R; own processing

The Ljung-Box test, as in previous cases, supports the suitability of the model by comparing the p-value with the significance level of 0.05. Thus, the residuals appear uncorrelated, suggesting that they behave like white noise.

Employment in sports continued to grow in 2023 after a strong recovery in 2022 from the COVID-19 pandemic. The years 2020 and 2021 had seen declines in sports jobs due to reduced participation caused by pandemic restrictions. In 2022, 23 EU countries saw an increase in sports employment compared to 2021, with Malta (+137.5%), Greece (+47.6%), and Estonia (+42.9%) leading the gains. However, Bulgaria (-16.4%), Latvia (-13.3%), Cyprus (-13.2%), and Finland (-3.0%) experienced declines. In some countries, even small changes in employment numbers can have a big impact on the overall percentage (European Commission, 2024). Following the results of this paper, we found that Slovakia was among the three countries with the lowest employment rate in the sports sector in 2023, while the Czech Republic had an employment rate 0.18 percentage points higher, but it was also well below the EU average.

CONCLUSIONS

The employment rate in the Slovak Republic and the Czech Republic between 2011 and 2023 was consistently below the EU average. The employment trends in both countries were notably fluctuating, influenced by various factors. Chief among these is the inconsistent state funding of the sports sector, which hampers the creation of favorable conditions for employment in this field, and the overall level of government support. Additionally, the tax burden on professional athletes can also be seen as a contributing factor. The forecast based on ARIMA models for both Slovakia and Czech Republic indicated fluctuating trends for next three years, while the average EU employment rate appears to be increasing.

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