Impact of European Structural and Investment Funds on the Slovak Economy

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Abstract. The European Structural and Investment Funds (ESIF) represent a valuable tool of the European Union. EU countries use the funds to finance activities focused on different areas. They are primarily aimed at reducing regional disparities between regions. The objective of this paper is to examine the effect of the European Structural and Investment Funds on economic indicators in Slovakia. To achieve this aim, the paper examines the evolution of economic indicators between the years 2007 and 2021. Secondary data on the drawing of the European Structural and Investment Funds in Slovakia in the period under review are identified. The impact is detected in the paper based on regression and correlation analysis. Established on the correlation and regression analysis outcome, we can argue that there is a dependence between the implementation of ESIF and the economic indicators, although the implementation of the ESIF has a small impact on gross domestic product and unemployment.

Keywords: European Structural and Investment Funds, Economic Growth, Regression and Correlation Analysis.

JEL classification: *C02, A10, F63*

1   Introduction

European Commission and Member States of the European Union founded a multiannual economic scheme. The main objective of this framework was to revive the European economy. Another objective was to improve the coordination between national and European policies. The funds were also intended to enable market integration and improve citizens' well-being (Becker, Egger, von Ehrlich, 2018). The European Structural and Investment Funds represent the main investment instrument

for promoting economic growth in the Member States and developing their economic convergence (Nishimura, Au-Yong-Oliviera, Sousa, 2021). At the same time, promotes competitiveness and reduces regional disparities. European Commission (2017) claims the funds are a significant source of investment and account for up to 70% of total investment (European Commission, 2017). The investment is focused on four key sectors that generate growth. That includes research, and innovation, digital technologies, support of low carbon economy, and small businesses (European Commission, 2017).

The importance of the ESIF is also highlighted in the European Commission Report. It shows that Central and Eastern European countries benefit most from the Cohesion policy. The report also tells that European Union funding for cohesion policy has increased from an average of 34 percent in the previous 2007-2013 programming period to 52 percent in the programming period 2014-2020. This implies that the share of European funds in public finances is increasing in member states, which is contrary to the basic principle of cohesion funds: they are intended to complement public finances, not to replace them. Figure 1 displays the trend in public investments. It is expressed as a share of the GDP of the Member States.
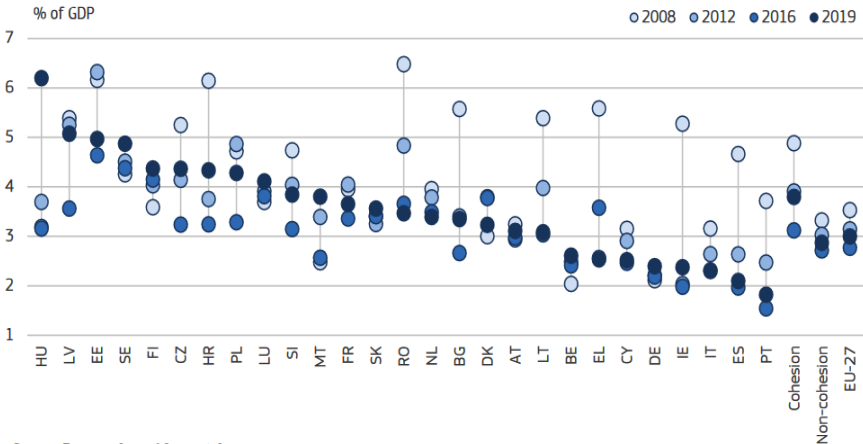
Fig. 1 Trends in public investment as a share of GDP, Source: European Commission p. 288,2023.

The 8th Cohesion Report issued by the European Commission (2022) declared that through cohesion policy regional and social disparities amongst regions have been reduced. The Commission expects cohesion funding to increase the gross domestic product per capita of less developed regions in EU countries by up to 5 percent by 2023 (European Commission, 2022). Cohesion investments to Report "have contributed to a 3.5 percent decrease in GDPs per capita in the least developed regions and 10 percent in most developed regions" (European Commission 2022, p.

288). Convergence between Member States has enhanced over the years, but intra-regional disparities within fast-growing Member States have increased (European Commission, 2022). And while the value of employment is increasing, disparities between regions stay wider than before the year 2008.

1.1   Literature Review

The literature is full of studies assessing the effect of European Union funds on economic expansion, and development. However, the findings of individual studies vary considerably. On the one hand, some studies have found a positive impact of the European Structural and Investment Funds on the economy. A positive impact was found by Žáček, Hrůza, and Volčík (2018), who examined it on quantitative modeling approaches and dynamic panel data regression techniques (Žáček, Hrůza, and Volčík, 2018). Pellegrini et. al. (2013) and Maynou (2014) also confirmed the positive relationship during the programming period (Pellegrini et. al., 2013, Maynou, 2014). Dicharry (2021) finds that the size of the effects of EU funds depends on the pace of implementation of the funds. Faster disbursement of funds decreases the effectiveness of the Cohesion Policy and therefore reduces the ability of the funds to stimulate economic growth (Dicharry, 2021). Durova (2022), based on an empirical survey, finds that in the short run, funds have a positive effect on the economy in Bulgaria, but overall, she rejects a positive impact (Durova, 2022). According to Bähr (2008), the cohesion policy has a significant effect on economic expansion when the states demonstrate a higher degree of decentralization (Bähr, 2008).

The negative attitude stems from the assumption of the inefficiency of public finances due to corruption and the dislocation of private investment. The following authors Canova and Marcet (1995), and authors Fagerberg and Verspagen (1996) find no significant effect of funds examined through convergence regressions (Canova and Marcet, 1995, Fagerberg and Verspagen 1996). A similar result was reached by Vanhoudta et al. (2000), who looked at the impact of both national and European public investment in the European Union regions (Vanhoudta et al., 2000) Dapkus and Streimikiene (2014) explored the impact of EU funds using Lithuania as a case study. The authors considered the European funds as a main opportunity for the new Member States, which can draw the attention of foreign investors. Although, according to Dapkus and Streimikiene the contribution of EU funds is still not sufficient to have a considerable effect on the country's development (Dapkus and Streimikiene, 2014).

According to Dall´Erba and Fang (2015), there are three theoretical approaches to the interpretation of the impact of European funds on economic growth. The first approach is called the traditional and accepts declining returns to investment and exogenous technological change (Dall´Erba &Fang, 2015) The endogenic growth theory has constant or increasing returns to investment and endogenic technological change (Barro & Sala-i-Martin, 2004). The third approach named the new economic geography says that integration can lead to differences. The regional policy according

to Mohl and Hagen (2010) can only lead to economic convergence (Mohl and Hagen, 2010). Mohl and Hagen (2010) suggest that cohesion policy may have a long-term impact whether it supports research and development and investments in human capital (Mohl and Hagen,2010)

2   Methodology

The paper is purposed to find out the effect of the European Structural and Investment Funds on the Slovak economic indicators. Gross domestic product and unemployment were taken as economic indicators. Correlation and regression analysis were used in the paper to investigate the impact.

Correlation analysis is used to analyze the correlation between two variables. The degree of correlation between the above variables has been interpreted in the paper based on Pearson's correlation coefficient. Pearson correlation coefficient can reach the values in the interval (-1,1) (Nekrep et al., 2018). A positive result indicates a positive correlation, and the observed variables are developing in the same direction. A negative result shows a negative correlation. It means that one variable is increasing, and the other variable is decreasing.

The interpretation of the results corresponds to the interpretation of the correlation by Nekrep et al (2018). We consider the results in the range $r > 0 \cap r \leq 50$ as a weak correlation. A medium correlation is a result in the range $r > 0.50 \cap r < 0.80$. We interpret a correlation greater than 0.80 and less than 0.99 as strong. In the case of a correlation of 0, we speak of zero dependence and 1 of perfect dependence. To address the correlation coefficients' significance, the Student's t-test was also applied in the paper. The significance level was set at 0.05.

Data on gross domestic product and unemployment were drawn from secondary sources. The main source was the database of the Statistical Office of the Slovak Republic. Data on the implementation of the European Structural and Investment Funds were taken from the European Commission. The Ministry of Investment, Regional Development, and Informatization does not provide data throughout the whole time under the review.

The main research question of the paper is to analyze whether the implementation of the European Structural and Investment Funds has an impact on gross domestic product and unemployment.

3   Main findings

In this part, we investigate whether there is a dependence between the drawing of the European Structural and Investment Funds in Slovakia and economic indicators, namely gross domestic product per capita and unemployment. A positive feature of the monitoring of the development of the gross domestic product per capita is its annual increase between 2007 and 2021. In this period, the absolute value of this indicator increased by 6 369 €, which stands for a 56 % percentual increase. The

development of the unemployment rate is also positive, with a decrease of 119 329 persons between the years 2007 and 2021. The decrease represents a 41 % change.
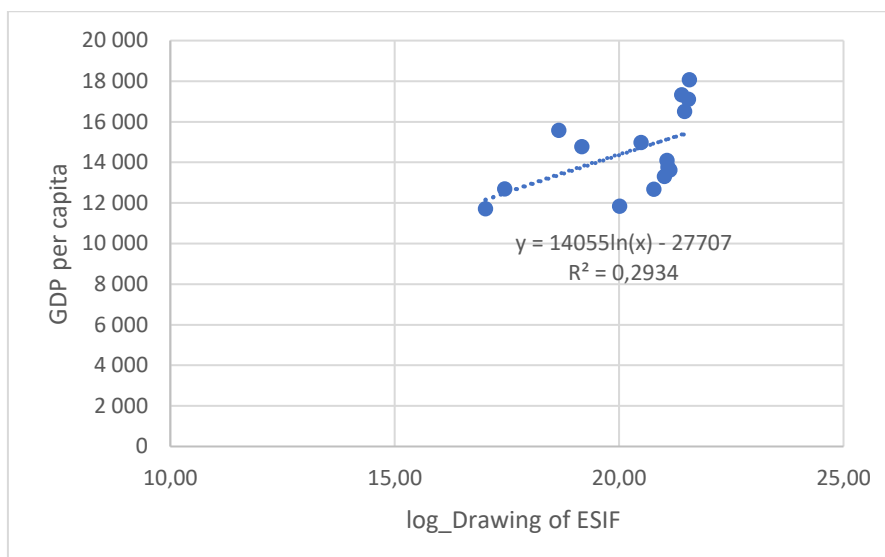

Fig. 2 Scatter chart of GDP per capita and implementation of European funds in the Slovak Republic in the years 2007-2021, Source: Processed on data from the Statistical Office of the Slovak Republic and the European Commission

In Figure 2, the dependence between GDPs per capita and the absorption of ESIF. Looking at the correlation between the spending of the European Structural and Investment Funds and the gross domestic product per capita in the Slovak Republic, we can see that the regression relationship is characterized by a medium correlation (correlation coefficient = 0,5417) and the F-test confirms that the chosen model is correct. The Significance F < 0.05 is valid. The linear-logarithmic equation of the relationship is y=-27707 + 14055ln(x) and indicates that if the drawing of the EU funds increases by 1 %, the gross domestic product will increase by 140,55 €.

Table 1. Dependence between ESIF implementation and gross domestic product per capita

Regression Statistics	
Multiple R	0,685727
R Square	0,293471
Adjusted R Square	0,239122
Standard Error	1766,443
Observations	15

Source: Proceed on the data from the European Commission and the Statistical Office of the Slovak Republic, 2023.

The value of the coefficient of determination came out to be 0.2934, indicating that the chosen regression line explains about 29% of the variability, the rest being unexplained variability, the effect of random factors, and other unspecified effects. There is a correlation between the two mentioned indicators, namely gross domestic product per capita and the implementation of the ESIF.

In the next section, we examine whether the drawing of ESIF affects unemployment in Slovakia. Based on the graphical representation and the data from the correlation analysis, this relationship cannot be examined based on linear dependence.

On this basis, the paper investigated the nonlinear relationship through several nonlinear functions. From the nonlinear functions, the hyperbola and logarithmic functions were calculated. In addition, the exponential function (logY) was also calculated. The results of examining the relationship between unemployment and fund utilization through the above methods are presented in the following table.

Table 2. Results of non-linear functions between employment and fund absorption

Non-linear function	Significance F	P -value
Hyperbola	0,8870	5,8E-08
Logarithmic Function	0,8678	0,314
Exponential Function	0,0016	0,0010

Source: Processed on data from the Statistical Office of the Slovak Republic and the European Commission, 2023.

In Table 2 we can see the logarithmic and power function models are not appropriate because of Significance F (0.8678 > 0.05). The P-value for the regression coefficient of logarithmic and power function (0.314) is higher than 0.05, so the regression coefficient is statistically insignificant. The models mentioned above are not appropriate. The exponential function achieves a p-value of 0.0010 and Significance F is x > 0.05. In this case, we can say that the model is right to establish the correlation between the indicators. The graphical illustration of the dependence between unemployment and implementation can be seen in Figure 3.

The plot shows a scatter of points with a fitted exponential trend line labeled:
$$y = 12658e^{1E\text{-}10x}$$
$$R^2 = 0{,}4603$$
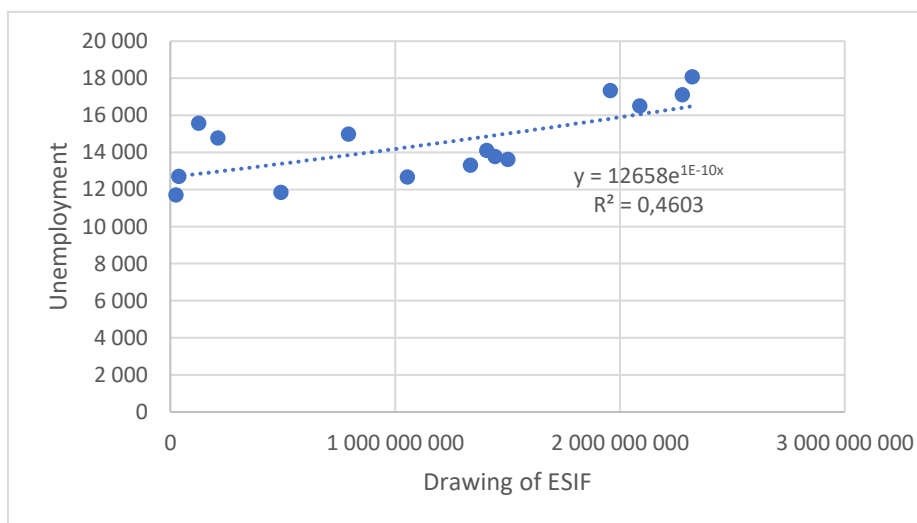with x-axis "Drawing of ESIF" and y-axis "Unemployment".

Fig. 3 Scatter chart of dependence between unemployment and implementation of European and Structural Funds in the Slovak Republic, Source: Processed on data from the European Commission and the Statistical Office of the Slovak Republic, 2023.

The result of the regression analysis may be seen in Table 3. The value of the coefficient of determination came out to be 0.544, indicating that the chosen regression line explains about 54% of the variability, the rest being unexplained variability, the effect of random factors, and other unspecified effects.

Table 3. Dependence between ESIF implementation and unemployment.

Regression Statistics	
Multiple R	0,738027
R Square	0,544684
Adjusted R Square	0,50966
Standard Error	60362,86
Observations	15

Source: Processed on data from the Statistical Office of the Slovak Republic and the European Commission, 2023.

Based on the performed correlation and regression analysis, we can argue that there is a dependence between unemployment and the implementation of the ESIF.

4   Conclusion

European funds are the major financial tool. European Structural and Investment Funds are aimed at promoting economic growth and development, increasing the competitiveness of regions, and reducing disparities between them. Their significance is confirmed by the increasing share of EU funds in the public finances of the Member States which rose from 34 percent in the earlier programming period to 54 percent in the 2014-2020 programming period.

The major objective of the paper was to find out whether there is a dependence between the drawing of European Structural and Investment Funds and economic indicators in Slovakia.

The main research question of the paper was to analyze whether the implementation of the European Structural and Investment Funds has an impact on gross domestic product and unemployment.

On the base of the results of correlation and regression analysis, we can conclude that there is a dependence between the implementation of the European Structural and Investment Funds and both economic indicators - gross domestic product and unemployment. Although the dependence between the examined values is there, the real effect of ESIF on the gross domestic product and employment is according to the results of correlation and regression analysis low. The relationship between the ESIF and gross domestic product has been detected through linear function. The

dependence between ESIF and employment has been investigated through the exponential function.

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