Proceedings of the Faculty of Economics in East Sarajevo
Year 2022, Issue 25, pp. 11-20
Received: 19th Osctober 2022

UDC 330.34:316.454.56(497.6)„1996/2021“
DOI: 10.7251/ZREFIS2225011A
Original Scientific Paper

**Srđan Amidžić**
Faculty of Economics,
University of Banja Luka,
Bosnia and Herzegovina
✉ srdjan.amidzic@ef.unibl.org

**Siniša Kurteš**
Faculty of Economics,
University of Banja Luka,
Bosnia and Herzegovina
✉ sinisa.kurtes@ef.unibl.org

**Drago Kurušić**
Elite Fair d.o.o.,
Banja Luka,
Bosnia and Herzegovina
✉ drago.kurusic@elitefairbl.com

# OKUN`S LAW IN BOSNIA AND HERZEGOVINA (1996-2021): AN EMPIRICAL ANALYSIS OF OKUN`S COEFFICIENT VARIATIONS

# ОКУНОВ ЗАКОН У БОСНИ И ХЕРЦЕГОВИНИ (1996-2021): ЕМПИРИЈСКА АНАЛИЗА ОКУНОВОГ КОЕФИЦИЈЕНТА ВАРИЈАЦИЈЕ

**Summary:** *Economic growth and unemployment are two macroeconomic quantities that have the greatest research interest among economists. The connection established between these two variables, which also describes their inverse relationship, is known in the literature as Okun's law. The subject of this research was to examine Okun's regularity between the movement of gross domestic product and unemployment in Bosnia and Herzegovina during the period from 1996 to 2021. We divided the observed period into two parts, and we observed the total sample, pre-crisis and post-crisis period, and we took 2008 and the economic crisis as the relevant year. The aim of the work was to quantify Okun's coefficient for the entire sample, pre-crisis and post-crisis period. The research results showed the existence of Okun's coefficient with variations of the coefficient over time. Namely, the value of the coefficient in the period from 1996 to 2008 is higher in absolute terms compared to the entire period, as well as the post-crisis period. The value of the coefficient for Bosnia and Herzegovina in the pre-crisis period was 0.79, and 0.66 is the calculated value of the coefficient for the post-crisis period. The coefficient value of 0.76 was calculated for the period from 1996 to 2021. From this we can conclude that the elasticity of the coefficient in Bosnia and Herzegovina is higher in the post-crisis period compared to the pre-crisis period.*
**Keywords:** *economic growth; unemployment; Okun's law; gross domestic product; Bosnia and Herzegovina*
**JEL Classification:** ***E24, F16, O40, O52***

**Резиме:** *Економски раст и незапосленост су двије макроекономске величине које имају највећи истраживачки интерес међу економистима. Веза која је успостављена између ове двије варијабле, која уједно описује и њихов инверзан однос позната је у литератури под називом Окунов закон. Предмет овог истраживања био је испитати Окунову правилност између кретања бруто домаћег производа и незапослености у Босни и Херцеговини кроз период од 1996. до 2021. године. Посматрани период подијелили смо на два дијела, те смо посматрали укупан узорак, предкризни и посткризни период, а као релевантну годину узели смо 2008. годину и економску кризу. Циљ рада био је квантификовати Окунов коефицијент за цијели узорак, предкризни и посткризни период. Резултати истраживања показали су постојање Окуновог коефицијента уз варијације коефицијента кроз вријеме. Наиме, вриједност коефицијента је у периоду од 1996. до 2008. године у апсолутном износу мања у односу на цијели период, као и на посткризни период. Вриједност коефицијента за Босну и Херцеговину у предкризном периоду износила је 0.79, а 0.66 је израчуната вриједност коефицијента за посткризни период. Вриједност коефицијента од 0.76 израчуната је за период од 1996. до 2021. године. Из овога можемо закључити да је еластичност коефицијента у Босни и Херцеговини већа у посткризном у односу на предкризни период.*
**Кључне ријечи:** *економски раст, незапосленост, Окунов закон, бруто домаћи производ, Босна и Херцеговина*
**ЈЕЛ касификација:** ***E24, F16, O40, O52***

## INTRODUCTION

Recognizing and modeling the connections and relationships that exist in the economic system of a country is the area in which economists from the field of macroeconomics have made their theoretical and practical contribution. The relationship that Okun's law explains in economics is the interdependence of the movements of the two most important macroeconomic variables, namely the domestic product and unemployment. Along with the Phillips curve, which explains the inverse relationship between inflation and unemployment, Okun's law is one of the most frequently used theoretical and empirical bases in macroeconomic research. This law was named after the American economist Arthur M.

Okun (1962), who conducted research in the United States, and on that occasion came to the conclusion of the existence of an inverse relationship between the movement of GNP and unemployment in the United States. With empirical research since establishing this law, but modeling the equation that connects unemployment and GDP, Okun's law is logically grounded. From its logic and simplicity comes its mass use in macroeconomic research. Namely, the intention of the economy to create a higher level of domestic product entails the fact that for this purpose it is necessary to engage more resources. Although by its nature this law is simple and logical, a significant number of theoretical considerations and empirical studies in the literature have been present since the appearance of this law until today. A significant contribution to the theoretical and empirical foundation of Okun's law was made in relevant works (Smith, 1976; Plosser & Schwert, 1979; Knoester, 1985; Kaufman, 1988; Moosa, 1997; Knotek, 2007; Ball et al., 2019). The result is that today in the literature we know more equations that model the unemployment/GDP relationship. However, the two most commonly used equations are the difference equation and the gap equation. The gap version of the Okun's Law equation looks at the relationship between potential output and realized output, and the gap between the natural unemployment rate and the actual unemployment rate. The difference version looks at the relationship between unemployment from a given period in relation to the previous one, and the relationship between GDP from the current and previous period. Both versions of the law are widely used today in numerous works in this field. Whether it is about works that examine the validity of Okun's law through economic cycles (Huang and Lin 2008; Gordon 2010; Cazes et al. 2011; Hashimi et al., 2021), through time (Zanin & Marra, 2011; Boda & Povazanova, 2019; Obst et al., 2019), macroeconomic shocks (Gelfer, 2020; Ziegenbein, 2021), then studies examining the validity of Okun's law for all countries (Freeman, 2001; Boda & Povazanova, 2019; Ball et al., 2013, 2017; Blazquez-Fernandez et al., 2018; Gil-Alana et al., 2020) but also studies examining the validity of the law for gender, age or level of education (Peiro et al., 2012; Hutengs & Stadtmann, 2014; Gusinger et al., 2018).

The validity of Okun's law has been confirmed to a large extent, however, as we have already stated, there are significant differences that certain authors have confirmed when it comes to the universal validity of the law and its application. Namely, numerous studies in this area have shown oscillations in the movement of Okun's coefficient, either over time, economic cycles or countries. There are numerous factors that influence variations in this coefficient. Furceri et al. (2019) identified several factors that influence the variation in the coefficient, if they are divided into factors located within and outside the country. According to the authors, the unemployment/GDP relationship is stable if there is a higher average unemployment, a higher percentage of employment in the public sector, and a lower participation of the informal and agricultural sectors. Within a country, the factors that affect the coefficient are labor market deregulation, product markets, and recession have the strongest impact on unemployment's response to cycles. Therefore, we can state that the coefficient describing the unemployment/GDP relationship is specific in relation to individual countries, i.e. grouping of countries according to the level of their development and the structure of the economy. In this paper, we will investigate the existence of Okun's connection on the example of Bosnia and Herzegovina, which is one of the least developed countries in Europe. The economy of Bosnia and Herzegovina largely deviates from the most developed European countries in terms of its structure and level of development. Also, the labor market in Bosnia and Herzegovina differs from European countries in terms of average unemployment, the regulation of labor market relations, and the educational structure of the workforce. Therefore, in the paper we ask the question, whether the validity of Okun's law is present in Bosnia and Herzegovina, and what is the elasticity of Okun's coefficient. In the paper, we will cover the time period from the creation of Bosnia and Herzegovina as an independent state, i.e. the period from 1996 until 2021. We will consider the period from 1996 to 2008 as the pre-crisis period, and the period from 2008 to 2021 as the post-crisis

period. The goal of the research is to quantify the relationship between the GDP and unemployment in Bosnia and Herzegovina through the observed period as a whole, as well as to quantify the Okun's coefficient in the pre-crisis and post-crisis period, based on the estimation of the Okun's coefficient using the gap version of the law. For this purpose, in this paper we will apply the Ordinary Least Squares (OLS) method to estimate Okun's coefficient, also in the paper we will use the Hodrick-Prescott (HP) filter to estimate potential GDP, as well as the natural rate. unemployment.

## 1. EMPIRICAL RESEARCH

A large number of relevant works have confirmed the link between unemployment and GDP. As Ball et al. (2017), based on the research they conducted, state that the Okun relationship is strong and stable in most countries, as well as that this relationship does not fundamentally change due to crises. According to Christopoulos et al. (2019) the unemployment gap is associated with a smaller output gap. Lim et al. (2019) looked at what happens to the unemployment/GDP ratio in periods of recession and in periods of growth. According to the research conducted by the authors, they concluded that it is easier to fire workers in periods of recession than to hire new workers in periods of growth. Namely, the empirical results showed that a 1% decrease in GDP leads to an increase in unemployment by 0.61%, while on the other hand, an increase in GDP leads to a decrease in unemployment by 0.24%. García-Ramos (2019), who on the example of Mexico through the period from 1987 to 2018, based on quarterly data, investigated the relationship between unemployment and GDP using the State-Space model, came to three conclusions. First, he calculated the long-term equilibrium unemployment rate, which is 3.06%. Second, he concluded that the unemployment rate does not evince the hysteresis. Thirdly, he came to the conclusion that when the actual GDP is lower than the potential, then that GDP growth affects the reduction of unemployment by 0.43%. And fourth, when real GDP is higher than potential, then the impact of GDP growth on unemployment approaches zero. Investigating the Okun relationship across business cycles and using the gap version and version-in-differences, Aguiar-Conraria et al. (2019) showed that the Okun coefficient has increased in absolute value since the mid-1960s, except for the period from 1985 to 1995, and that it is not particularly sensitive to recessions. Gelfer (2020) analyzed the impact of different economic shocks on the relationship between GDP and unemployment. According to the results he obtained, a decrease in investment as a component of GDP by 1% increases unemployment by about 0.5%, while productivity shocks of 1% increase unemployment by about 0.15%. Which, according to him, implies that macroeconomic shocks are an important cause when observing this relationship. Mussida & Zanin (2022) investigated the behavior of the unemployment/GDP relationship due to the shocks produced by the COVID-19 virus pandemic. The research showed that the shock in Okun's coefficient caused by the pandemic and the reduction of economic activity was most pronounced in the economies that had the largest decline in real GDP. However, this did not manifest itself through a significant increase in unemployment due to the programs that were undertaken.

Hashimi et al. (2021) confirmed the existence of Okun's law in BRICS countries using data from 1991 to 2018. They divided the period into the pre-crisis period from 1991 to 2008 and from 2008 to 2018. The results showed that the existence of Okun's law is more pronounced, i.e. that the strength is greater in the post-crisis period than in the pre-crisis period and the total period from 1991 to 2018. Kovačević et al. (2022) observed the movement of the Okun coefficient in the member countries of the Eurozone in the period from 2000 to 2020. The results show that there is an Okun relationship with high statistical significance for most of the countries in the sample, while the coefficients vary between countries. That is, for the more developed countries of the Eurozone, the elasticity of the

coefficient is higher compared to the countries that fall into the second order of development. Anderton et al. (2014) also used the example of the Eurozone countries in the period from 1993 to 2013 to observe the relationship between the various components of GDP from the aspect of the response of unemployment to changes in the components. The results showed that unemployment is most sensitive to consumption, while it is less sensitive to changes in foreign exchange. Using panel data in the period from 1992 to 2014 for the countries of Central and Eastern Europe, Soyly et al. (2018) investigated the existence of Okun's coefficient. Research has shown that a 1% increase in GDP will mean a 0.08% drop in unemployment. Unevska Andonova & Petrovska (2019) investigated some aspects of Okun's law in North Macedonia during the period from 2004 to 2016. The research showed that the relationship between GDP and unemployment is at the same level as in other growing markets and regional economies. They explain the weaker connection in the last years of the observed period due to labor-intensive growth and the financial crisis, as well as the European debt crisis. Eric et al. (2020) investigated the effect of Okun's law in the economy of Bosnia and Herzegovina in the period from 2000 to 2019. They explain the weaker relationship between GDP and unemployment as a result of the weaker economic structure of Bosnia and Herzegovina.

## 2. METHODOLOGY

There are several ways of estimating the coefficients and terms of the Okun's law equation. The two equations that are most often represented in the literature are the difference law and the gap version of Okun's law. The gap version of the law looks at the natural rate of unemployment, and real unemployment and long-term GDP, and real GDP. The equation that is most present in the literature is given by the expression:

$$U - U^{\bullet} = c - \beta \frac{Y - Y^{\bullet}}{Y^{\bullet}} + \epsilon \qquad 1$$

where: $U$ is the actual level of unemployment, $U^{\bullet}$ is the natural rate of unemployment, $Y$ is the actual level of GDP, $Y^{\bullet}$ is the potential level of GDP, the coefficient $c$ is unemployment when achieving full employment, $\beta$ represents Okun's coefficient, while $\epsilon$ accidental mistake. The natural rate of unemployment and the potential level of GDP are variables that cannot be observed. Therefore, there are several techniques in the literature that help estimate these variables. In this paper, we will use the HP filter, which is identical to relevant research in this area (Ball et al., 2013; 2017; 2019). The following table provides a specification of the variables used in the research:

*Table 1. Specification of variables in the research*

| Variable | Tip | Description | Source |
|---|---|---|---|
| Unemployment | *Dependent* | Gap between actual natural unemployment rate | International monetary fund |
| GDP | *Independent* | Gap version of GDP as the difference between actual GDP ($Y$) and potential ($Y^{\bullet}$) | Internationl monetary fund |

Source: Author's view

The time period that we are looking at in the paper covers the period from 1996 to 2021. We divide that period into two parts, and observe the movement of Okun's coefficient from 1996 to 2008 and characterize this period as a pre-crisis period, the second observation

period is from 2009 to 2021, and this period is a post-crisis period. We will also calculate the estimate of Okun's coefficient for the period from 1996 to 2021. Therefore, based on the basic model given in Equation 1, we estimate a total of three models, namely:

$$U_t - U_t^{\bullet} = -\beta\left(\frac{Y_t - Y_t^{\bullet}}{Y_t^{\bullet}} * 100\right) + \epsilon$$

$$U_{pre} - U_{pre}^{\bullet} = -\beta\left(\frac{Y_{pre} - Y_{pre}^{\bullet}}{Y_{pre}^{\bullet}} * 100\right) + \epsilon \quad (2)$$

$$U_{post} - U_{post}^{\bullet} = -\beta\left(\frac{Y_{post} - Y_{post}^{\bullet}}{Y_{post}^{\bullet}} * 100\right) + \epsilon$$

where $U_t$ is the unemployment rate from 1996 to 2021, $U_t^{\bullet}$ is the natural unemployment rate from 1996 to 2021, $Y_t$ is the realized real gross domestic product, $Y_t^{\bullet}$ is the potential domestic product from 1996 to 2021, $U_{pre}$ is the rate of unemployment in the years before 2008, $U_{pre}^{\bullet}$ estimated natural rate of unemployment before 2008 using the HP filter, $Y_{pre}$ is realized GDP from 1996 to 2008, $Y_{pre}^{\bullet}$ is potential GDP until 2008, equivalent to this $U_{post}$ is unemployment rate from 2008 to 2021, $U_{post}^{\bullet}$ is the natural unemployment rate from 2008 to 2021, $Y_{post}$ is realized GDP from 2008 to 2021, and $Y_{post}^{\bullet}$ is potential GDP estimated using the HP filter from 2008. until 2021, $\epsilon$ is the random error. When assessing the potential values of GDP and the unemployment rate, we will use the HP filter with a value of λ=100 in order to obtain the most pronounced linear trend. We will use the OLS method to evaluate the parameters of the previously given models.

## 3. RESEARCH RESULTS

The economy of Bosnia and Herzegovina suffered great destruction from 1992 to 1995, which manifested itself through the destruction of economic capacities. Also, after 1995, the process of transition began, that is, the transition to a market economy, which included the restructuring of former socialist companies and their sale, which was followed by the collapse of the company and the dismissal of workers. Therefore, in the period after 1996, the existence of a high unemployment rate, but also a low level of total GDP, is visible. The following table shows data on trends in real GDP and the unemployment rate from 1996 to 2021:

*Table 2. Trends in GDP and unemployment rates in Bosnia and Herzegovina from 1996 to 2021*

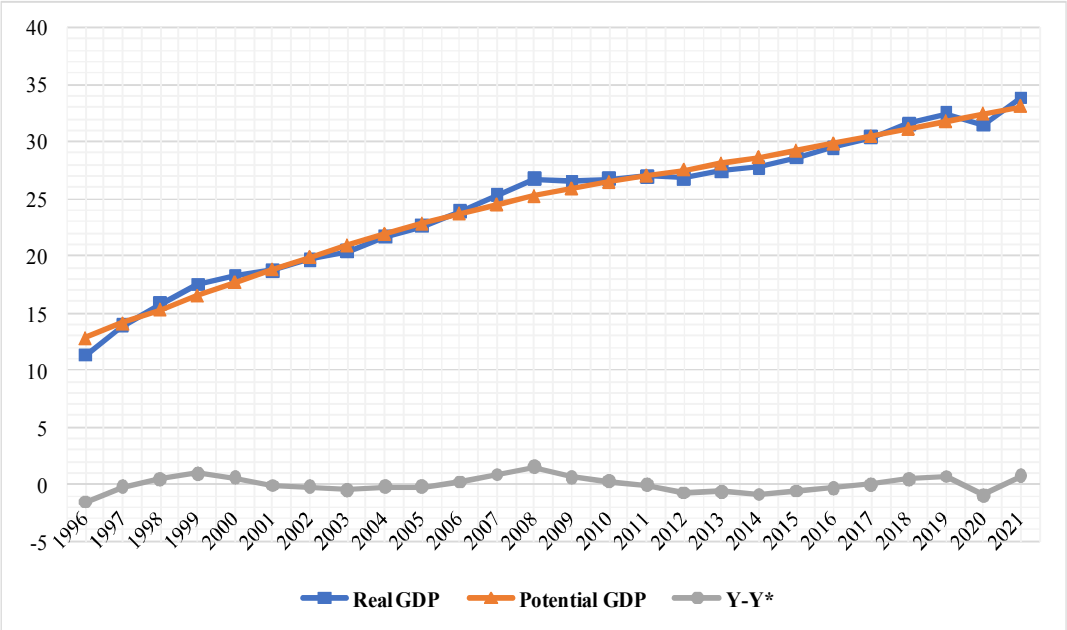
| Year | GDP in BiH in constant prices (billions BAM) | Unemployment rate |
|---|---|---|
| 1996 | 11.305 | 50 |
| 1997 | 13.889 | 32.3 |
| 1998 | 15.807 | 29.3 |
| 1999 | 17.506 | 31.1 |
| 2000 | 18.284 | 31.1 |
| 2001 | 18.716 | 31.1 |
| 2002 | 19.662 | 31.1 |
| 2003 | 20.42 | 31.1 |
| 2004 | 21.698 | 31.1 |
| 2005 | 22.617 | 31.1 |
| 2006 | 23.904 | 31.1 |
| 2007 | 25.334 | 29.0 |

| | | |
|---|---|---|
| 2008 | 26.751 | 23.4 |
| 2009 | 26.532 | 24.1 |
| 2010 | 26.736 | 27.2 |
| 2011 | 26.979 | 27.6 |
| 2012 | 26.788 | 28.0 |
| 2013 | 27.418 | 27.5 |
| 2014 | 27.733 | 27.5 |
| 2015 | 28.589 | 27.7 |
| 2016 | 29.488 | 25.4 |
| 2017 | 30.425 | 20.5 |
| 2018 | 31.563 | 18.4 |
| 2019 | 32.456 | 15.7 |
| 2020 | 31.444 | 15.9 |
| 2021 | 33.816 | 17.4 |

Source: International Monetary Fund 2022

We can see that the unemployment rate in 1996 was exactly 50%, while the GDP of Bosnia and Herzegovina in this year amounted to only 11 billion BAM. In the following 11 years, the unemployment rate hovered around the level of 30% with minor fluctuations, and in 2008 the unemployment rate dropped to the level of 23.4%. Due to the financial crisis that occurred until 2015, the unemployment rate in Bosnia and Herzegovina reached a level of around 27% and remained at that level. From 2016 until 2020, the unemployment rate decreased to a level of around 16%, and in 2021 it would rise to a level of 17.4%. Real GDP in Bosnia and Herzegovina increased significantly compared to 1996 as the starting year of the observed period. From 11 billion BAM in 1996, it increased to the level of around 26 billion BAM by 2008, as a result of which real GDP stagnated in the following four years. After this period, GDP continues to grow to the level of 33.8 billion BAM in 2021. In order to calculate the necessary coefficients from Equation 2, we need to look at the GDP potential and the natural unemployment rate. Their forecasting is based on the HP filter that takes the value of $\lambda$=100, the following graph shows the movement of potential and actual GDP:

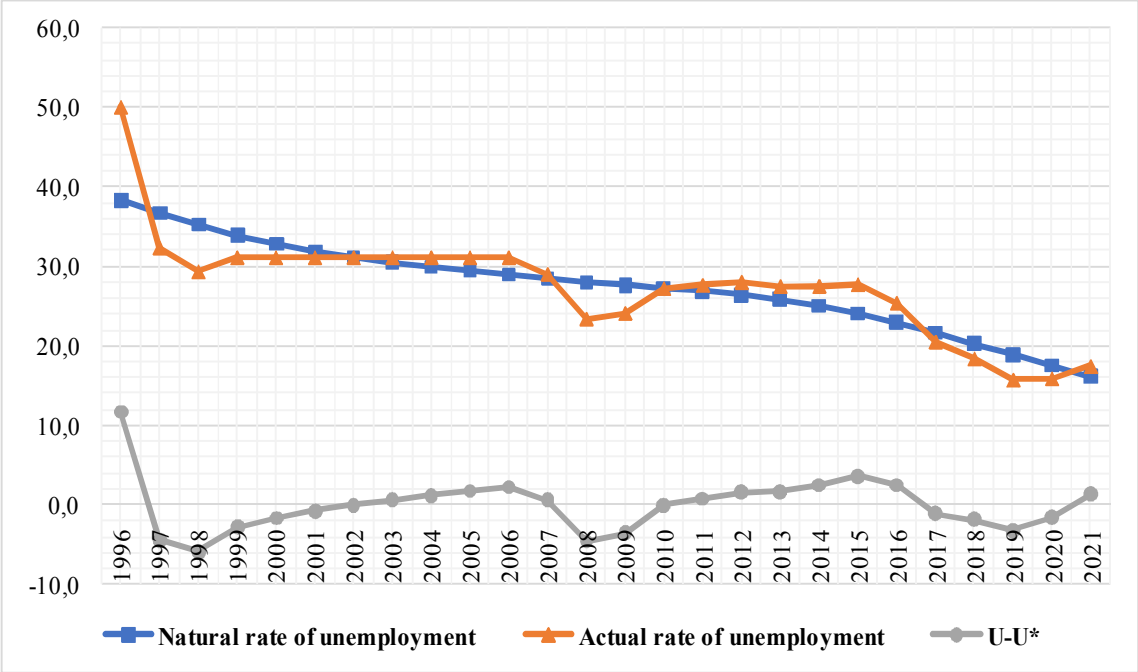
*Graph 1. Movement of realized and potential GDP in the period from 1996 to 2021*




Source: Author`s calculations

From the previous graph, we can see the movement of real GDP, potential GDP and the difference between real realized GDP and potential GDP. We can see that the period from 2004 until 2006 was a period of marked GDP growth that was below potential GDP, then from 2011 until 2017, real GDP was below potential GDP, so that in 2020 it would again deviated negatively from the long-term trajectory. In the same way, we can observe the differences between the real and natural unemployment rates in the following graph:

*Graph 2. Movement of the real rate and the natural rate of unemployment in the period from 1996 to 2021*




Source: Author`s calculations

As we have already seen in Graph 1, it can also be seen from the previous Graph 2 that the economic crisis had a significant impact on the deviation of the real unemployment rate from its natural level. The economic crisis, which manifested its negative impact on the overall economic performance, both in the world and in Bosnia and Herzegovina, undoubtedly influenced the reduction of production and the increase of unemployment. This can justify the fact that we took 2008 as the relevant year in order to divide the total time period of observation into two parts, the pre-crisis period and the post-crisis period. Therefore, in the next part of the paper, we will calculate the movement of Okun's coefficient, and look at the differences in the movement through these two periods.

In the previous two graphs, we observed the differences between real and potential GDP, as well as the differences between real and natural unemployment rates. Their calculation, which we performed through the HP filter, is important in order to estimate their values because there is no possibility of observing these values. Based on the real and estimated values of GDP and unemployment, we calculated the Okun coefficient in the pre-crisis, post-crisis period, and we also calculated the Okun coefficient for the entire period from 1996 to 2021. The results of the calculated Okun's coefficients are given in the following table:

*Table 3. Okun's coefficient results for Bosnia and Herzegovina in the period from 1996 to 2021*

| $a)\ U_{\downarrow}t - U_{\downarrow}t^{\uparrow} * = -\beta((Y_{\downarrow}t - Y_{\downarrow}t^{\uparrow} *)/(Y_{\downarrow}t^{\uparrow} *) * 100) + \in$ | | | | |
|---|---|---|---|---|
| Time | Okun coefficient | t-statistics | p-value | $R^2$ |
| 1996-2021 | **-0.76** | -6.2962 | 0.0000 | 0.613 |
| $b)\ U_{\downarrow}pre - U_{\downarrow}pre^{\uparrow} * = -\beta((Y_{\downarrow}pre - Y_{\downarrow}pre^{\uparrow} *)/(Y_{\downarrow}pre^{\uparrow} *) * 100) + \in$ | | | | |
| Time | Okun coefficient | t-statistics | p-value | $R^2$ |
| 1996-2008 | **-0.79** | -5.0094 | 0.0003 | 0.676 |
| $c)\ U_{\downarrow}post - U_{\downarrow}post^{\uparrow} * = -\beta((Y_{\downarrow}post - Y_{\downarrow}post^{\uparrow} *)/(Y_{\downarrow}post^{\uparrow} *) * 100) + \in$ | | | | |
| Time | Okun coefficient | t-statistics | p-value | $R^2$ |
| 2009-2021 | **-0.66** | -2.7645 | 0.0174 | 0.385 |

Source: Authors calculations

In the previous table, we presented the calculated Okun coefficients for the economy of Bosnia and Herzegovina in the observed period from 1996 to 2021. From the obtained results, it can be seen that the value of Okun's coefficient is higher in the pre-crisis period and for whole period, compared to the value of the coefficient in the period after the crisis. Namely, the value of the coefficient in the period from 2008 to 2021 was -0.66 with statistical significance at the level of 5%. The coefficient of determination for the post-crisis period is 0.385, which means that a total of 38.5% of the unemployment movement can be explained by the observed model. In the pre-crisis period until 2008, the calculated value of Okun's coefficient is -0.79 with statistical significance of the coefficient at the level of 1% and the value of the coefficient of determination, which says that a total of 67.6% of the variation in unemployment can be explained by the movement of real GDP. We calculated the value of Okun's coefficient for the entire observation period, its value is -0.76 with statistical significance at the level of 1% and a coefficient of determination that suggests that 61.3% of the variation in unemployment can be explained based on the movement of real GDP. From the obtained results, we can conclude that the elasticity of the coefficient is significantly higher in the pre-crisis period, compared to the period after 2008. Likewise, we can see that the value of the coefficient of -0.76 deviates from the values calculated for economies that are at a higher level of economic development.

## CONCLUSION

Macroeconomic forecasts of trends in unemployment, GDP and inflation represent the core of all macroeconomic research. As the three key macroeconomic variables that are viewed as indicators that show the level of social well-being achieved, the development and stability of the national economy, the interest in their observation and forecast is present among all relevant factors of economic policy in society. Among theoretical and empirical research, Okun's law, which is based on the inverse relationship between the movement of the domestic product and unemployment, is used as an instrument for forecasting the movement of unemployment based on the movement of the domestic product. The logic and simplicity of the proof of this law serve as support for further research. Authors in different studies approach proving the validity of Okun's law from different aspects. Thus, the authors observe the validity of the law for all groups of countries according to their level of economic development, according to economic cycles, post-crisis and pre-crisis periods, then the authors observe the elasticity of Okun's coefficient among population categories, according to gender, age, educational structure and the like.

The subject of research in this paper was the examination of the validity of Okun's law in the economy of Bosnia and Herzegovina over a period of 26 years, i.e. from 1996 to 2021. We looked at the observed period as a whole, and divided the period into pre-crisis (until 2008) and post-crisis (from 2009 to 2021), based on the estimation of three equations. We estimated the coefficient based on the OLS method. The research results showed that the value of Okun's coefficient for the period from 1996 to 2021 is -0.76, which means that if GDP increases by 1%, unemployment will decrease by 0.76%. The coefficient we calculated for the pre-crisis period takes the value of -0.79, which is equivalent to the previous interpretation, which says that an increase in GDP of 1% will mean a decrease in unemployment by 0.79%. The elasticity of the coefficient in the post-crisis period is significantly lower than in the pre-crisis period. The value of the calculated coefficient for the period from 2009 to 2021 says that a 1% increase in GDP will reduce the unemployment rate by 0.66%. All the results we obtained are at the 1% level of statistical significance. With this, we can conclude that the validity of Okun's law for the economy of Bosnia and Herzegovina is confirmed, as if the value of the law differs for the pre-crisis and post-crisis periods. Also, we see that the value of Okun's coefficient is quite low, which we can attribute to the insufficient development as well as the poor economic structure of Bosnia and Herzegovina, as well as the period of transition, i.e. mixed privatization that lasted until 2005. The implications of the research indicate that Okun's law can serve as a tool for predicting the trend of unemployment in the following post-crisis periods in Bosnia and Herzegovina. The higher value of Okun's coefficient in the pre-crisis period compared to the post-crisis period can be explained by the greater globalization of the economy of Bosnia and Herzegovina. With the greater opening of the economy towards the countries of Western Europe, there was a greater outflow of the working-age population from Bosnia and Herzegovina. Therefore, the reduction of unemployment in the post-crisis period can be attributed to other factors, and not only to the increase in GDP.

## REFERENCES


Aguiar-Conraria, Luís, Manuel M.F. Martins, and Maria Joana Soares. 2019. ‘’Okun’s Law Across Time and Frequencies.’’ *Núcleo de Investigação em Políticas Económicas e Empresariais Working Paper #13*.

Anderton, Robert, Ted Aranki, Boele Bonthuis, and Valerie Jarvis. 2014. “Disaggregating Okun’s Law: Decomposing the Impact of the Expenditure Components of GDP on Euro Area Unemployment.” *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.2533387.

Andonova, Danica Unevska, and Magdalena Petrovska. 2019. “Disaggregating Okun’s Law: A Case-Study for Macedonia.” *Journal of Central Banking Theory and Practice* 8 (1): 183–207. https://doi.org/10.2478/jcbtp-2019-0009.

Ball, Laurence, Daniel Leigh, and Prakash Loungani. 2017. “Okun’s Law: Fit at 50?” *Journal of Money, Credit and Banking* 49 (7): 1413–41. https://doi.org/10.1111/jmcb.12420.

Ball, Laurence, Davide Furceri, Daniel Leigh, and Prakash Loungani. 2019. “Does One Law Fit All? Cross-Country Evidence on Okun’s Law.” *Open Economies Review* 30 (5): 841–74. https://doi.org/10.1007/s11079-019-09549-3.

Blázquez-Fernández, Carla, David Cantarero-Prieto, and Marta Pascual-Sáez. 2018. “Okun’s Law in Selected European Countries (2005-2017): An Age and Gender Analysis.” *Economics & Sociology* 11 (2): 263–74. https://doi.org/10.14254/2071-789x.2018/11-2/18.

Bod’a, Martin, and Mariana Považanová. 2021. “Output-Unemployment Asymmetry in Okun Coefficients for OECD Countries.” *Economic Analysis and Policy* 69 (March): 307–23. https://doi.org/10.1016/j.eap.2020.12.004.

Butkus, Mindaugas, Kristina Matuzeviciute, Dovile Rupliene, and Janina Seputiene. 2020. “Does Unemployment Responsiveness to Output Change Depend on Age, Gender, Education, and the Phase of the Business Cycle?” *Economies* 8 (4): 98. https://doi.org/10.3390/economies8040098.

Cazes, Sandrine, Verick Sher, and Fares Al Hussami. 2011. ‘’Diverging Trends in Unemployment in the United States and Europe: Evidence from Okun’s Law and the Global Financial Crisis.’’ *ILO Working Papers 994676293402676*.

Christopoulos, Dimitris, Peter McAdam, and Elias Tzavalis. 2019. "Exploring Okun's Law Asymmetry: An Endogenous Threshold Lstr Approach." *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.3515399.

Erić, Ognjen, Goran Popović, and Jelena Bjelić. 2020. "Analysis of Okun's Regularity: The Case of Bosnia and Herzegovina." *ECONOMICS* 8 (2): 139–47. https://doi.org/10.2478/eoik-2020-0011.

Freeman, Donald G. 2001. "Panel Tests of Okun's Law for Ten Industrial Countries." *Economic Inquiry* 39 (4): 511–23. https://doi.org/10.1093/ei/39.4.511.

Furceri, Davide, João Tovar Jalles, and Prakash Loungani. 2019. "On the Determinants of the Okun's Law: New Evidence from Time-Varying Estimates." *Comparative Economic Studies*, December. https://doi.org/10.1057/s41294-019-00111-1.

García-Ramos, Manuel. 2019. "The Impact of the Output Gap on the Unemployment Rate: Evidence from Mexico, 1987q1-2018q4." *Ecos de Economía* 23 (48): 4–15. https://doi.org/10.17230/ecos.2019.48.1.

Gelfer, Sacha. 2020. "Re-Evaluating Okun's Law: Why All Recessions and Recoveries Are 'Different.'" *Economics Letters* 196 (November): 109497. https://doi.org/10.1016/j.econlet.2020.109497

Gil-Alana, Luis A., Marinko Skare, and Sanja Blazevic Buric. 2019. "Testing Okun's Law. Theoretical and Empirical Considerations Using Fractional Integration." *Applied Economics*, July, 1–16. https://doi.org/10.1080/00036846.2019.1646407.

Gordon, Robert J. 2010. "Okun's Law and Productivity Innovations." *American Economic Review* 100 (2): 11–15. https://doi.org/10.1257/aer.100.2.11.

Goto, Eiji, and Constantin Bürgi. 2020. "Sectoral Okun's Law and Cross-Country Cyclical Differences." *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.3541449.

Guisinger, Amy Y., Ruben Hernandez-Murillo, Michael T. Owyang, and Tara M. Sinclair. 2018. "A State-Level Analysis of Okun's Law." *Regional Science and Urban Economics* 68 (January): 239–48. https://doi.org/10.1016/j.regsciurbeco.2017.11.005.

Hashmi, Shabir Mohsin, Ali Gul Khushik, Muhammad Akram Gilal, and Zhao Yongliang. 2021. "The Impact of GDP and Its Expenditure Components on Unemployment within BRICS Countries: Evidence of Okun's Law from Aggregate and Disaggregated Approaches." *SAGE Open* 11 (2): 215824402110234. https://doi.org/10.1177/21582440211023423.

Huang, Ho-Chuan (River), and Shu-Chin Lin. 2008. "Smooth-Time-Varying Okun's Coefficients." *Economic Modelling* 25 (2): 363–75. https://doi.org/10.1016/j.econmod.2007.06.009.

International Monetary Fund. 2022. *World economic outlook (April 2022).* Washington, D.C: International Monetary Fund.

Kaufman, Roger T. 1988. "An International Comparison of Okun's Laws." *Journal of Comparative Economics* 12 (2): 182–203. https://doi.org/10.1016/0147-5967(88)90002-9.

Knoester, Anthonie. 1986. "Okun's Law Revisited." *Weltwirtschaftliches Archiv* 122 (4): 657–66. https://doi.org/10.1007/bf02707853.

Knotek, Edvard S. 2007. ''How useful is Okun's law.'' *Economic Review Fourth Quarter* 73-103.

Kovačević, Slaviša, Drago Kurušić, and Dragan Petrović. 2022. ''Okun's law in the member countries of the Eurozone (2000-2020): Empirical analysis.'' *Financing* 13(3): 33-44. doi:10.7251/FIN2203033K.

Lim, Guay C., Robert John Dixon, and Jan C. van Ours. 2019. "Beyond Okun's Law: Output Growth and Labor Market Flows." *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.3385856.

Moosa, Imad A. 1997. "A Cross-Country Comparison of Okun's Coefficient." *Journal of Comparative Economics* 24 (3): 335–56. https://doi.org/10.1006/jcec.1997.1433.

Okun, Arthur M. 1962. ''Potential GNP: Its Measurement and Significance.'' In Proceedings of the Business and Economic Statistics Section of the American Statistical Association. Alexandria, VA. American Statistical Association, 89-104.

Plosser, Charles I., and G.William Schwert. 1979. "Potential GNP: Its Measurement and Significance." *Carnegie-Rochester Conference Series on Public Policy* 10 (January): 179–86. https://doi.org/10.1016/0167-2231(79)90009-5.

Smith, Gary. 1974. "Okun's Law Revisited." *Cowles Foundation Discussion Papers No 380.* Yale University, https://EconPapers.repec.org/RePEc:cwl:cwldpp:380.

Soylu, Özgür Bayram, İsmail Çakmak, and Fatih Okur. 2018. "Economic Growth and Unemployment Issue: Panel Data Analysis in Eastern European Countries." *Journal of International Studies* 11 (1): 93–107. https://doi.org/10.14254/2071-8330.2018/11-1/7.

Ziegenbein, Alexander. 2021. "Macroeconomic Shocks and Okun's Law." *Economics Letters* 202 (May): 109826. https://doi.org/10.1016/j.econlet.2021.109826.