THE IMPACT OF MACROECONOMIC DETERMINANTS AND TAX FORM ON INFLATION IN SELECTED BALKAN COUNTRIES

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Abstract

The goal of this research is to reflect how the gross domestic product, unemployment, real interest rate, savings, government expenditures and value-added tax effect on inflation in selected Balkan countries for period 2008-2016. Research examines the impact of macroeconomic determinants on price movements in the general level, measured by the annual rate of inflation. Selected countries are Albania, Bosnia and Herzegovina, Croatia, Montenegro, North Macedonia, Serbia and Slovenia. This paper includes model where inflation is the dependent variable, while gross domestic product, unemployment, real interest rate, saving, government expenditures and value-added tax represent independent variables. Authors used LLC test and VIF test for stationary and multicollinearity, where confirmed that model is adequately designed. Using Hausman test, fixed effect model is chosen, where results have shown that gross domestic product, unemployment and value-added tax have a statistically significant impact on inflation compared to other explanatory variables in the model.

Keywords: inflation, macroeconomic determinants, panel model, Balkan countries.

1. INTRODUCTION

Inflation can be simply defined as a price rise in the general level in one country. Friedman (1976) points out that inflation is always and everywhere a monetary phenomenon and low inflation has an important place in the economic policy of each country because in the case of the pronounced volatility of this indicator may lead to adverse implications for economic growth (Klomp & Haan, 2009). Haderi et al. (1999) point out that when a country moves from a planned economy to a market economy, inflation could be a direct problem for the government. In the past, countries of the former Yugoslavia had negative experiences with inflation and Žižmond

(1991) indicates the annual inflation rate reached 1255.7% in 1989. The same author argues it was the result of inadequate measures of economic policy and economic system, as well as inflationary expectations.

2. LITERATURE REVIEW

There are many determinants which affect on inflation where gross domestic product and unemployment are the most common variables that related with inflation. There are a large number of papers which examine the nexus between these variables (Dotsey & Sarte, 2000; Malik & Chodwhury, 2001; Fountas 2010; Ferdous & Shahid, 2013; Enu et al., 2013; Amin & Manu, 2014; Yelwa, 2015; Ademola & Badira, 2016; Baharumshah et al., 2016). Malik and Chowdhury (2001) found a positive and statistically significant relationship between inflation and gross domestic product, noting that growth sensitivity on changes of inflation rate is less than inflation sensitivity on changes of economic growth. Ademola and Badira (2016) researched nexus between gross domestic product, inflation and unemployment and noticed there is a positive relationship between these variables. Contrary, Jha and Dang (2012) investigates that when inflation rate exceeds 10%, it has a negative effect on economic growth. Enu et al. (2013) found a negative correlation between inflation and gross domestic product and determined when inflation increases for 1%, it leads to the decline of economic growth for 0.08%. Also, Yelwa et al. (2015) determined a negative relationship between these variables with no statistically significance. Likewise, Rother (2002) cited Domac-Elbirt model (1998) which analysed causality between macroeconomic determinants and inflation and they identified that money and nominal exchange rate drives inflation. Bağci and Ergüven (2015) explored medium positive correlation between inflation rate and interest rate in Turkey for the period 2002-2015.

On the other hand, Attari and Javed (2013) investigated the relationship between inflation rate, economic growth and government expenditures in Pakistan. Using time series data during the period 1980-2010, the results confirmed there is a long term relationship between these variables, while in the short term, the inflation does not affect the economic growth. The study showed that there is unidirectional causality between inflation rate and economic growth, as well as economic growth and government expenditures. Milenković et al. (2017) found that there is no statistically significant correlation between inflation and gross domestic product, while monetary aggregate M3 is significantly correlated to inflation. Using annual time series data from 1980-2013, Edeme and Ifelunini (2015) examined the relationship between inflation, economic growth and savings in Nigeria. The study manifested that inflation and real interest rate are negatively related with economic growth, as well as economic growth, unemployment and real interest rate negatively affected inflation rate. Mehrara and Sujoudi (2015) found no significant effect of government on inflation in Iranian economy for the period 1959-2010.

In addition to macroeconomic factors, taxes are often associated with inflation. Value-added tax is tax form that often associated with inflation and his relevance is manifested through fact that movement can cause changes in inflation. There are many studies which are focus on relationship between inflation and tax forms (Schall,

1984; Stern, 1987; Poterba & Rotemberg, 1990; Bayoumi & Gagnon, 1992; Besley & Rosen, 1999; Mankiw & Reiss, 2002; Carare & Danninger, 2008; Pike et al. 2009; Christandl et al. 2011; Miki, 2011; Benkovskis et al. 2012; Claus, 2013; Ikpe & Nteegah, 2013; Benkovskis & Fadejeva, 2014; Gelardi, 2014; Gatawa et al. 2016). In their research, Poterba and Rotember (1990) determined the positive relationship between inflation and tax rates in United States. On the other hand, Miki (2011) looked how changes of value added tax can affect on aggregate consumption and noticed negative causality between them. Ikpe and Nteegah (2013) analysed the impact of the value-added tax on inflation and concluded there is a positive and statistically significant impact of this tax form. Similarly, Benkovskis and

Fadejeva (2014) evaluated the impact of value added tax on inflation and Latvia and found that changes of value-added tax rate could have a significant impact on price movements, whereby it is particularly likely at the time of change rate of this tax.

2. DATA AND ANALYSIS

In this segment, it is presented the trend of inflation, gross domestic product, unemployment, real interest rate, savings, government expenditures and value-added tax in seven selected economies from 2008 to 2016. Selected countries: Albania, Bosnia and Herzegovina, Croatia, Montenegro, North Macedonia, Serbia and Slovenia.

Figure 1 shows a trend of inflation rate in
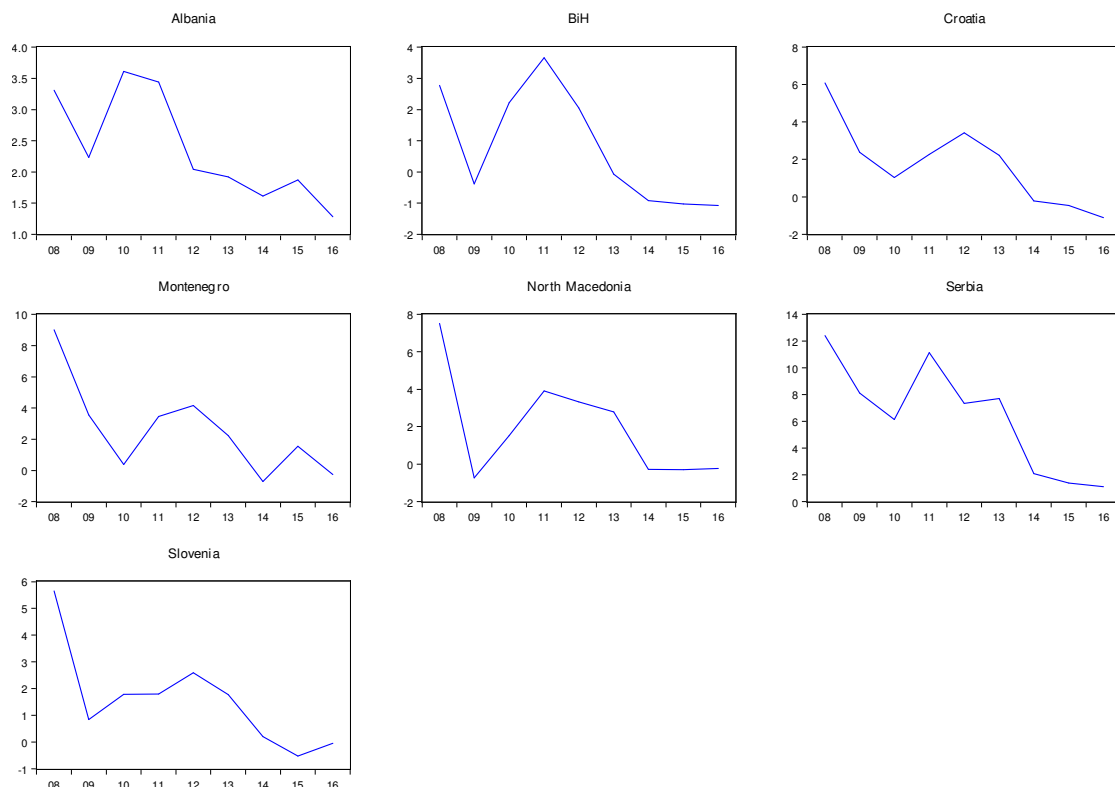
Source: Authors based on International Monetary Fund

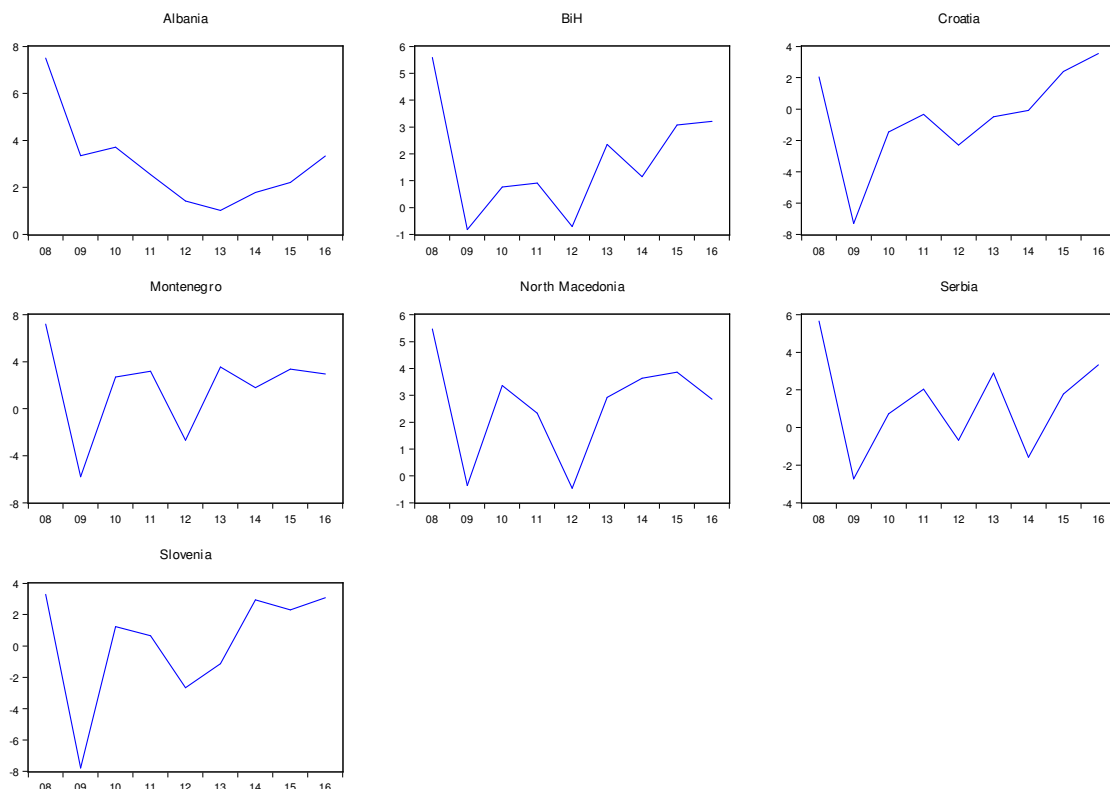*Figure 1. Inflation rate in Balkan countries*

(Source:Authors based on IMF (2016))

selected South East countries from 2008 to 2016. In observed period, Serbia has achieved the highest average inflation rate of 6.44%, which is almost three times more than other countries. The average increase was below 2% in Bosnia and Herzegovina, Croatia and Slovenia, while other countries had averaged between 2.4-2.8%.

After the escalation of the global economic crisis, there is a similar tendency of GDP rate. This is especially evident in 2009 when this indicator has fallen in all countries. Croatia and Slovenia had a drop of GDP more than 7%, while on the other hand, Albania represents the only economy which achieved a positive growth rate of 3.35%. Looking the unemployment rate, Slovenia had the lowest rate, where the average was 7.69%, which is far less than in North Macedonia where the average was above

30%. Mojsoska-Blazevski (2012) cited that in 1990 Macedonia was the least developed republic in the former Yugoslavia with the largest unemployment rate of 20% which is less than today. Slightly lower unemployment was recorded in Bosnia and Herzegovina, while in other countries, the average was at a level of 15% and 19%.

Finally, value-added tax is presented and as can be seen, Croatia has the highest tax rate of 25%, while value added tax is the lowest of 17% in Bosnia and Herzegovina. Albania, Bosnia and Herzegovina and North Macedonia didn't change rate of this tax form. In other countries, there was an increase of 1% or 2%, while Croatia recorded an increase of 3% from the beginning to the end of time period.

Source: Authors based on International Monetary Fund

Figure 2. Macroeconomic determinants in Balkan countries

(Source:Authors based on IMF (2016))
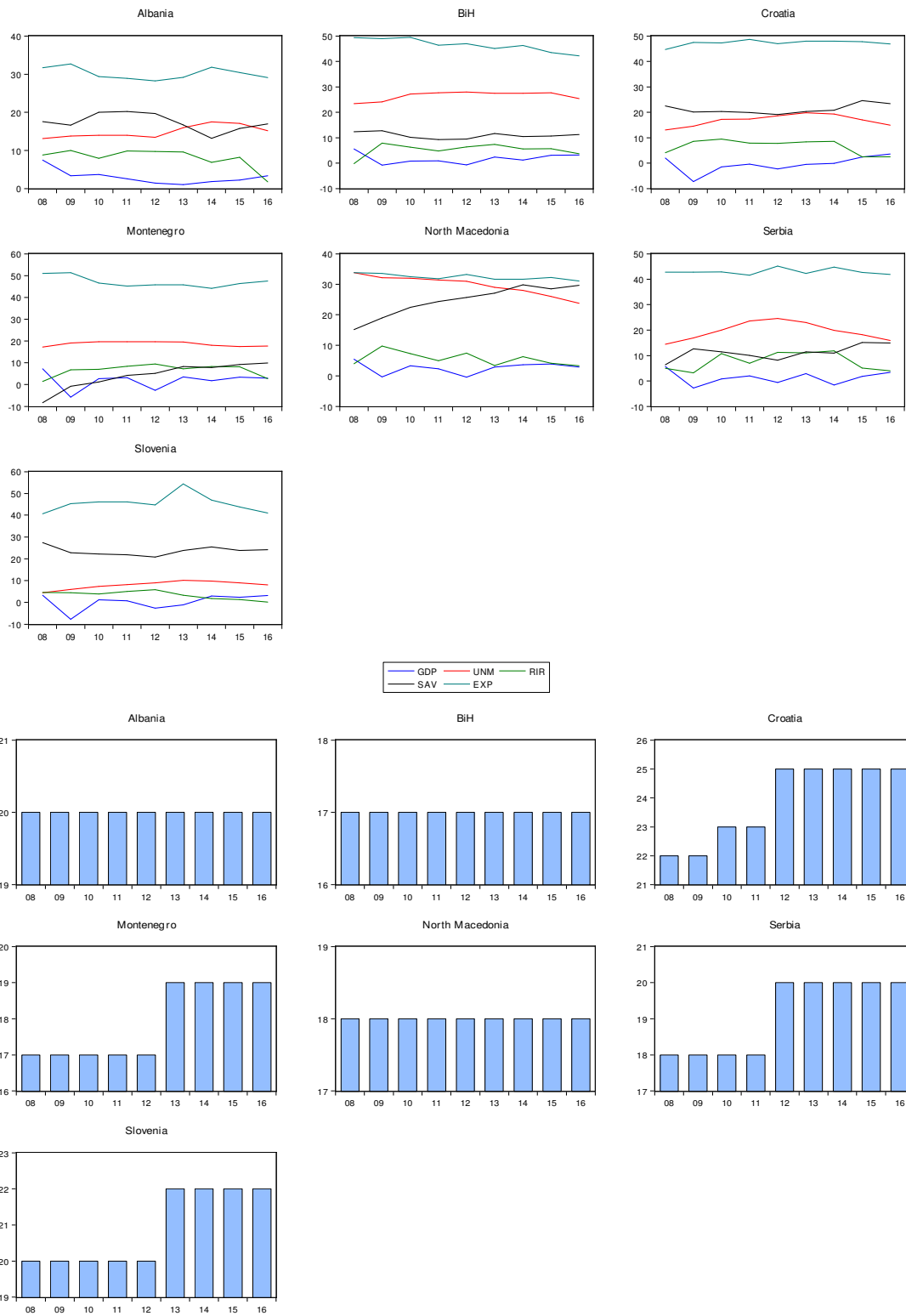
Source: Authors based on KPMG

Figure 3. VAT rate in Balkan countries

(Source: Authors based on KPMG (2016)

3. METHODOLOGY

The paper is focused on the examination of macroeconomic determinants (gross domestic product and unemployment) and tax form (value-added tax) and their impact on price level (inflation) in selected Balkan countries from 2008 to 2016.

Brooks (2008) defined panel regression model:

$$Y_{it} = \alpha + \beta x_{it} + \mu_{it} \qquad (1)$$

Y_{it} = inflation (INF)

α = constant

βx_{it} = coefficients of variables (GDP, UNM, VAT)

i = 7 countries

t = 2008 - 2016

μ_{it} = residual

Observed variables are explained as:
- Inflation – price's rise in the general level, measured by consumer price index;
- Gross domestic product – market value of final goods and services produced within a country in a year, measured by annual rate of growth;
- Unemployment – a situation where someone of working age is not able to get a job, measured by annual rate;
- Real interest rate - an interest rate that has been adjusted to remove the effects of inflation to reflect the real cost of funds to the borrower and the real yield to the lender or to an investor;
- Savings – an income not spent, or deferred consumption measured by percentage share of gross domestic product;
- Government expenditures - includes all government consumption, investment, and transfer payments measured by percentage share of gross domestic product;
- Value-added tax – a general consumption tax which is calculated and paid for the delivery of goods and services at all stages of production and trade, as well as their imports, measured by standard rate.

3.1 Panel model specification

The Levin-Lin-Chu test is one of the first unit root tests developed for panel data. In order to determine stationary of time series. Levin Lin Chu test is based on analysis of the equation (Levin et al. (2002)):

$$\Delta Y_{it} = \alpha_i + \delta_{it} + \theta_t + \rho_i Y_{i,\ t-1} + \varsigma i,\ t,$$
$$i = 1,2,...N,\ t = 1, 2, ... T. \qquad (2)$$

The null hypothesis of this test is:

$$H_0: \rho = 0$$
$$H_0: \rho < 0 \qquad (3)$$

Table 1. Variable review

Variable	Notation	Calculation	Source
Inflation	INF	Annual rate %	International Monetary Fund
Gross domestic product	GDP	Annual rate %	International Monetary Fund
Unemployment	UNM	Annual rate %	International Monetary Fund
Real interest rate	RIR	Annual rate %	World Bank
Savings	SAV	Annual rate %	
Government expenditures	GE	% of GDP	International Monetary Fund
Value added tax	VAT	Annual rate %	KPMG

Source: Authors' illustration

This test assumes cross-sectionally independence of individual processes. To understand multicollinearity consider the next model (Asteriou & Hall, 2007):

$$Y = \beta_1 + \beta_2 X_2 + \beta_3 X_3 + \mu \qquad (4)$$

where hypothetical values for X_2 and X_3 are below:

$$X'_2 = 1\ 2\ 3\ 4\ 5$$
$$X'_3 = 2\ 4\ 6\ 8\ 10 \qquad (5)$$

We can see that $X_3 = 2X_2$ which means two variable are linearly dependent if one can be expressed as a linear function of the other variable. Hausman test enables making a choice between the fixed effect and random effects model.

$$H = (\beta^{FE} - \beta^{RE})'[Var(\beta^{FE}) - Var(\beta^{RE})]^{-1}(\beta^{FE} - \beta^{RE}) \approx \chi2(k) \qquad (6)$$

If statistic value is large, then the difference between the estimates is significant, so we can reject the null hypothesis that the random effects model is consistent and we use the fixed effects estimators. Contrary, a small value of the Hausman test implies that the random effects estimators is more appropriate.

4. RESULTS

Considering that paper researches seven countries in the nine-year period, authors used panel regression model and diagnostics tests for proper selection. First, descriptive statistics presented the value of explanatory variables.

Based on Table 2, the analysis includes seven countries for the period 2008-2016 with 63 analysed observation. As it can see, savings and unemployment, government expenditures have the highest standard deviation, which is three times higher compared to other variables. This can be explained by the fact there is a wide range between the lowest and highest values in selected countries.

Based on Table 3, it can conclude that alternative hypothesis is accepted and confirms that panel series are stationary (p-value < 0.05).

Authors used VIF test to confirm there is no problem of multicollinearity between observed variables. As we can see, the reference value is lower than 10 which indicates there is no problem of multicollinearity.

Table 5 includes panel regression models which measure the impact of gross domestic product, unemployment, real interest rate, savings, government expenditures and value-added tax on inflation by evaluation of random effect model and fixed effect model.

Table 2. Descriptive statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
INF	63	2.743651	2.919295	-.9	12.41
GDP	63	1.313651	2.979413	-7.78	7.53
UNM	63	18.93968	7.50545	4.4	33.8
RIR	63	6.169841	2.916457	-0.25	11.78
SAV	63	16.15238	7.861274	-8.29	29.79
GE	63	41.69889	7.12930	28.23	54.41
VAT	63	19.66667	2.334869	17	25

Source: Authors' calculation

Table 3. Levin-Lin-Chu unit-root test

Variable	Statistic	p-value	Number of panels	Accepted/Rejected Hypothesis
H_0: Panels contain unit roots				
H_a: Panels are stationary				
INF	-7.7677	0.0000	7	Rejected H_0
GDP	-6.2486	0.0000	7	Rejected H_0
UNM	-4.9825	0.0000	7	Rejected H_0
RIR	-6.7181	0.0000	7	Rejected H_0
SAV	-1.8896	0.0294	7	Rejected H_0
GE	-1.9030	0.0285	7	Rejected H_0
VAT	-2.3864	0.0085	7	Rejected H_0

Source: Authors' calculation

Table 4. Multicollinearity test

Variable	VIF	1/VIF
GDP	1.56	0.640
UNM	1.47	0.680
RIR	1.7	0.588
SAV	2.59	0.386
GE	2.72	0.440
VAT	2.29	0.436
Mean VIF	2.05	

Source: Authors' calculation

Table 5. Panel regression model - estimation

Variable	Model	
	Random effect model	Fixed effect model
GDP	0.062180	**0.274984**
	(0.5598)	(0.0183)
UNM	-0.055244	**-0.188978**
	(0.1981)	(0.0446)
RIR	0.063792	-0.047026
	(0.5686)	(0.7065)
SAV	**-0.148039**	-0.172554
	(0.0052)	(0.1303)
GE	-0.058426	0.116191
	(0.2714)	(0.3950)
VAT	-0.025939	**-1.714977**
	(0.8734)	(0.0002)
R-square	0.451589	0.6473
Prob F	0.0014	0.0000
Observation	63	63

Source: Authors' calculation

Both models show a positive impact of the gross domestic product on inflation, where fixed effect model confirms significance of this determinant. It is similar with unemployment, where there is no statistically significant effect on inflation by random effect model, but fixed effect model reflects a significant impact of unemployment. The real interest rate and government expenditures have no significant effect on inflation measured by both models. However, value added significantly affects the inflation measured by fixed effect model, while there is no significance at random effect model.

Table 6. Hausman test

	Result	Conclusion
Random effect model vs fixed effect model	chi2(3) = (b-B)'[(V_b-V_B)^(-1)](b-B) =12.65	FE model is an appropriate
	Prob>chi^2 = 0.0000	

Source: Authors' calculation

In order to make an adequate selection of model, it was used Hausman test, where result shows that fixed effect model is appropriate (p-value = 0.0055). The results showed that 1% increase of gross domestic product enhances inflation for 0.27% in observed period. On the other hand, 1% increase of unemployment decreases inflation for 0.19%. Finally, value added tax negatively affects the inflation, where 1% increase of this tax declines inflation for 1.71%.

5. CONCLUSION

Inflation is one of the most important phenomena in the economy. The concept of inflation and its presence in economic flows can be a problem if there is no adequate monetary policy. Namely, the price increase is a process that can't be stopped, but it can be controlled. There are many factors can have an impact on inflation. In order to define these factors, it is necessary to examine the nature of their nexus with inflation and analyse their potential impact on price growth. The paper manifests the impact of a gross domestic product, unemployment, real interest rate, savings, government expenditures and value-added tax on inflation in countries of the region. The results have shown that gross domestic product and government expenditures have a positive impact on the price level, while on the other hand, unemployment, real interest rate, savings and value-added tax have a negative effect on inflation. Interestingly, results have identified negative relationship between value-added tax, where increase of this tax declines inflation rate. These findings are confirmed previous research of Usman and Adejare (2013) where 1% increase of VAT decreases inflation for 1.28%. Also, it was identified that gross domestic product and unemployment are significant for inflation in studies such as Malik and Chowdhury (2001) as well as Ademola and Badira (2016). These results enable government of observed countries to focus on growth of gross domestic product and decline of unemployment. Bearing in mind that value-added tax is the most generous tax in selected countries this tax form can cause the inflation rate change. The contribution is reflected through adequate information support to a policy maker about the impact of selected determinants on inflation. Recommendation for policy maker can be intensity growth of gross domestic product which enhances inflation, but simultaneously declines of unemployment can control previous inflation growth. Future research will be focus on OECD countries in order to show comparison and potentially different impact of the same factors on inflation in these economies.

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УТИЦАЈ МАКРОЕКОНОМСКИХ ДЕТЕРМИНАНТИ И ПОРЕСКОГ ОБЛИКА НА ИНФЛАЦИЈУ У ПОЈЕДИНИМ БАЛКАНСКИМ ЗЕМЉАМА

Нада Миленковић, Бранимир Калаш, Вера Мировић и Јелена Андрашић

Извод

Циљ истраживања је да се прикаже како бруто домаћи производ, незапосленост, реална каматна стопа, штедња, државни расходи и порез на додату вредност утичу на инфлацију у посматраним балканским земљама за период 2008-2016. године. Истраживање испитује утицај макроекономских детерминанти на кретање цена на општем нивоу, мерено годишњом стопом инфлације. Посматране земље су Албанија, Босна и Херцеговина, Хрватска, Црна Гора, Северна Македонија, Србија и Словенија. Овај рад укључује модел где је инфлација зависна промењива, док бруто домаћи производ, незапосленост, реална каматна стопа, штедња, државни расходи и порез на додату вредност представљају независне промењиве. Аутори су користили LLC тест и VIF тест за стационарност и мултиколинеарност, где је потврђено да је модел адекватно дизајниран. Путем Hausman тест-а, изабран је модел фиксног ефекта где је потврђено да бруто домаћи производ, незапосленост и порез на додату вредност имају статистички значајан утицај на инфлацију у поређењу са осталим посматраним варијаблама у моделу.

Кључне речи: инфлација, макроекономске детерминанте, панел модел, балканске земље.

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