

# Cointegration analysis of indirect taxes and economic growth in the Republic of Serbia

Коинтеграциона анализа индиректних пореза и економског раста у Републици Србији

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**Abstract:** This research examines the relationship between indirect taxes and gross domestic product per capita in the Republic of Serbia from 2005 to 2019. The aim of this paper is to evaluate the long-run relationship between value added tax, excises and gross domestic product per capita based on Johansen cointegration test. The empirical analysis includes descriptive statistics, unit root test, cointegration test and FMOLS model. The results reveal a long-run relationship between indirect taxes such as value added tax and excises and the gross domestic product per capita in the Republic of Serbia for the observed period. Empirical findings confirm that revenues of value added tax and excises have positive and significant effect on the gross domestic product per capita in the long-run.

**Keywords:** value added tax, excises, economic growth, cointegration, Republic of the Serbia

**JEL classification:** C32, H20, O40

**Сажетак:** Истраживање испитује однос између индиректних пореза и бруто домаћег производа по глави становника у Републици Србији од 2005. до 2019. године. Циљ овог рада је оценивање дугорочне везе између пореза на додату вредност, акциза и бруто домаћег производа по глави становника на основу Јохансеновог теста коинтеграције. Емпиријска анализа укључује дескриптивну статистику, тест јединичног корена, тест коинтеграције и FMOLS модел. Резултати указују на дугорочну везу између индиректних пореза као што су порез на додату вредност и акциза и бруто домаћег производа по глави становника у Републици Србији за посматрани период. Емпиријски налази потврђују да порез на додату вредност и акцизе имају позитиван и значајан ефекат на бруто домаћи производ по глави становника у дугом року.

**Кључне речи:** порез на додату вредност, акцизе, економски раст, коинтеграција, Република Србија

**ЈЕЛ класификација:** C32, H20, O40

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## **Introduction**

Taxes reflect economic expression of the state existence (Andrašić et al. 2018) where taxation involves an exchange relationship between citizens and government (Castañeda Rodríguez, 2018). In modern government, taxes play an essential role in their programs and they are a powerful tool for achieving main goals in the economy (Kalaš et al. 2018). Collection of taxes allows the government to create maximum development projects for the public interest and improve the basic infrastructure of health, education, as well as people's quality of life (Streimikiene et al. 2018). For the optimal design of taxes it is essential to be aware of its built-in revenue capacity which implies that automatic revenues respond to changes in the economy (Sanz-Sanz et al. 2016). Government expenditures are supposed to be financed by increasing taxes, changing the consumption of expenditures or raising public debt (Iyidoğan et al. 2017).

It is very important for the tax policy holders to determine potential effects that changes in individual tax forms will have on overall economic performance (Grdinić et al. 2017). Hodžić et al. (2018) indicate that tax system should be business-friendly so it can have an essential positive effect on the economy. Milasi and Waldmann (2017) argue that raising top marginal tax rates which are below their growth maximum has the greatest positive effect on growth when the related additional revenues are used to finance public expenditures and reduce budget deficits. Feher et al. (2019) argue that value added tax is the most effective tax during the crisis to reduce budget deficits.

The structure of this paper is as follows. After the introduction, there is theoretical background about relationship between economic growth and taxes with focus on indirect taxes such as value added tax and excises. The third section includes an analysis of value added tax and excises in the Republic of Serbia from 2005 to 2019. The greatest part of this paper includes empirical analysis and results which consist of descriptive statistics, ADF test, Johansen cointegration test, as well as FMOLS model in order to identify long-run effect of indirect taxes on the gross domestic product per capita in the Republic of Serbia.

## **1. Literature review**

Many empirical studies suggest that there is a robust link between tax structure and economic growth (Xing, 2011). Prichard (2016) highlighted that direct taxes such as personal and corporate income tax are bad for growth compared to indirect taxes. On the other hand, there are many empirical studies that have estimated the relationship between indirect taxes and economic growth (Alm & El-Gannainy, 2012; Li & Lin, 2015; Simionescu et al. 2016; Loganathan et al. 2017; Kalaš & Milenković, 2017; McNabb, 2018; Dobranschi & Nerudová, 2018).

Alm and El-Ganainy (2012) examined relationship between value added tax and consumption in fifteen EU countries for the period 1961-2005. Results of dynamic panel GMM-System estimator indicated that effective value added tax rate is negatively correlated with the consumption. Namely, a one percentage point increase in the tax rate leads to about a one percent reduction in the consumption.

Around that, Benkovskis and Fadejeva (2014) investigated the effect of value added tax rate on inflation in Latvia using the CPI microdata provided by the Central Statistical Bureau of Latvia. Their findings reflect that changes in the VAT rate could have an essential effect on price movement in Latvia.

Li and Lin (2015) examined the impact of sales tax on economic growth in the United States for the period 1960–2013. Results of empirical study confirmed that economic growth in the United States responds negatively to sales tax in the long run, although it produces positive impact in the short run. Empirical analysts Simionescu et al. (2016) analyzed the impact of standard value added tax rate on economic growth in Bulgaria, Czech Republic, Hungary, Poland and Romania for the period 1995–2005. Their findings showed bidirectional causality between these variables and negative effect of value added tax rate on economic growth in most observed countries. Namely, value added tax rate had positive impact only in Hungary, while other countries recorded lower gross domestic product rates.

Loganathan et al. (2017) researched the nexus between taxation and economic growth for emerging Asian countries, namely China, India, Indonesia, Republic of Korea, Malaysia and Thailand for the period 1990–2014. Their findings indicate bidirectional causality between growth and taxation, as well as unidirectional causality from stock traded to taxation in observed countries. Kalaš and Milenković (2017) examined the relationship between value added tax and economic growth measured by gross domestic product rate in the Republic of Serbia for the period 2005–2014. Their findings indicated strong and positive correlation between observed variables, which implies that revenues of value added tax are significantly related to gross domestic product rate in the Republic of Serbia. McNabb (2018) analyzed panel relationship between tax structure and economic growth for 100 countries and confirmed that revenue-neutral increases in income taxes are related to lower GDP in the long-run. On the other hand, results showed that revenue-neutral reductions in trade taxes have not always had positive impact on economic growth.

Dobranschi and Nerudová (2018) analyzed the effect of value added tax and excise duties in the European Union and their findings indicated that tax burden resulting from ad valorem and ad unit taxes imposed on goods tend to be borne more by the final consumers than by the seller. On the other hand, the excise duty burden is close to fully shifted towards consumers. Using the common correlated effects (CCE) panel cointegration approach, Durusu-Ciftci et al. (2018) estimated the long-run effect of taxes on economic development in thirty OECD countries for the period 1995–2016. Their findings indicated that only consumption tax has a statistically significant negative impact on long-run income.

Laković et al. (2019) argue that an increase in excise taxes could be a very efficient tool in decreasing the adverse effect on household members' health, productivity and budget. Luong and Vu (2020) highlighted that excises are identified for specific goods and services that are not encouraged due to their bad effects on health.

## 2. Methodology and data

This research analyzes value added tax and excises as two most generous taxes in the Republic of Serbia. The analysis included annual data available for the Republic of Serbia and measures these taxes in local currency value (RSD). On the other hand, economic growth is measured by gross domestic product per capita which is also expressed in local currency value (RSD).

The data was obtained from the Ministry of Finance of the Republic of Serbia and the International Monetary Fund. Likewise, the data series is annual, ranging from 2005 to 2019 for 15 years.

FMOLS was proposed by Phillips and Hansen (1990) and this model was applied to estimate the long-run effect of value added tax and excises on gross domestic product per capita in the Republic of Serbia since cointegration test confirmed the presence of long-run relationship between selected variables.

$$LGDPp_{cit} = \alpha + \beta_1 LVAT_{it} + \beta_2 LEXC_{it} + \varepsilon \quad (1)$$

where  $i$  refers to the cross-section,  $t$  refers to the time,  $\alpha$  refers to the constant term,  $LGDPp$  refers to logarithmic value of gross domestic product per capita,  $LVAT$  – logarithmic value of value added tax,  $LEXC$  – logarithmic value of excises and  $\varepsilon$  refers to the error or residual term.

## 3. Empirical analysis and results

This segment includes analysis trend of gross domestic product per capita, as well as indirect taxes such as value added tax and excises in the Republic of Serbia for the period 2005-2019. After presenting descriptive statistics of observed variables, we proceed to ADF unit root test, as well as Johansen cointegration test. Finally, a fully modified ordinary least Squares model is presented in order to determine the long-run effect of value added tax and excises on the gross domestic product per capita in the Republic of Serbia.

*Table 1: Descriptive statistics*

Variable	GDPpc	VAT	EXC
Mean	515668	368265	186734
Median	529242	367472	181097
Maximum	753544	550563	306546
Minimum	248207	216008	71275
Std. Dev.	155688	100381	77665
Skewness	-0.1576	0.1518	0.0645
Kurtosis	1.9467	2.0626	1.7274

*Source: Authors calculation*

Results of descriptive analysis show that average gross domestic product per capita was 515668 RSD for the period 2005 to 2019. The highest value of gross domestic product per capita was recorded in 2019, when it was 753544 RSD, while the smallest level was

identified in 2005 (248207 RSD). On the other hand, average revenues of value added tax are 368265, where this tax form represents the most generous tax in the Republic of Serbia. Excises are second tax form which contribute to budget more than other tax in the Republic of Serbia. It is necessary to highlight that value added tax and excises have share more than 60% in the total tax structure and manifest two most important tax in the Republic of Serbia.

*Table 2: Augmented Dicky-Fuller (ADF) test*

Variable	Level	First difference	Critical value (5%)	I(D)
Intercept				
GDPpc	-1.315185	-3.58544	5%	I (1)
VAT	1.277150	-4.328078	5%	I (1)
EXC	0.150827	-4.071807	5%	I (1)

*Source: Authors calculation*

The results of ADF test reflect that selected variables are not stationary at level, but variables are stationary at first difference. It implies that null hypothesis can be rejected at the 5% level of significance when applying each variable at first difference. We can conclude that these variables are stationary at first difference and integrated of order one process or I (1).

*Table 3: Unrestricted Cointegration Rank Test (Trace)*

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	Critical Value	Prob.**
None*	0.903208	49.93758	29.7907	0.0001
At most 1*	0.785451	21.91532	15.49471	0.0047
At most 2	0.249532	3.444694	3.84146	0.0635

*Source: Authors calculation*

Table 3 shows that there is long run relationship between gross domestic product per capita, value added tax and in the Republic of Serbia for the period 2004-2019. The result of Johansen cointegration test shows that these variables converge in the long-run.

*Table 4: Unrestricted Cointegration Rank Test (Maximum Eigenvalue)*

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	Critical Value	Prob.**
None*	0.903208	28.02226	21.13162	0.0046
At most 1*	0.785451	18.47062	14.26460	0.0102
At most 2	0.249532	3.44694	3.84146	0.0635

*Source: Authors calculation*

The long-run relationship exists at 5% level of significance according to the trace test statistics which implies that there is existence of long-run relationship between indirect taxes and gross domestic product per capita in the Republic of Serbia.

*Table 5: Fully Modified Least Squares (FMOLS model)*

Variable	Coefficient	Std. Error	t-Statistic	Prrob.
$\Delta$ VAT	0.590405	0.147328	3.939530	0.0028
$\Delta$ EXC	0.587636	0.144250	4.073733	0.0022
C	-0.011280	0.008642	-1.305348	0.2210
R-squared			0.722609	
Adjusted R-squared			0.627131	
S.E. of regression			0.013487	
Long-run variance			0.000101	
Mean dependent var			0.031412	
S.D. dependent var			0.017819	
Sum squared resid			0.001819	

*Source: Authors calculation*

Table 5 shows Fully Modified Least Squares model which examined the long-run impact of value added tax and excises on gross domestic product per capita in the Republic of Serbia. From the FMOLS results above, the adjusted R-squared of 0.63 indicates that these variables jointly explain 62.71% variations in the gross domestic product per capita in the Republic of Serbia. The probability value of the individual explanatory variable reveals that value added tax and excises are statistically significant at level of 5%. Namely, in the long run, 1% increase of revenues by these taxes would rise gross domestic product per capita for 0.59% and 0.58%.

## **Conclusion**

This research investigates the relationship between indirect taxes such as value added tax and excises and gross domestic product per capita in the Republic of Serbia for the period 2005 to 2019. The aim of this paper is to estimate the long-run relationship between these variables based on Johansen cointegration test.

The analysis includes descriptive statistics, unit root test, cointegration test, as well as, fully modified ordinary least squares model. Empirical results reveal long-run relationship between indirect taxes and gross domestic product per capita in the Republic of Serbia for the analyzed period. Empirical findings confirm that revenues of value added tax and excises have positive and statistically significant effect on economic growth measured by gross domestic product per capita in the long-run. Results of FMOLS model reflect that a 1% increase in revenues of indirect taxes increases GDPpc for 0.59% (in case of value added tax growth) and 0.58% (in case of excises growth). The contribution of the research is presented in fact that we have ensured the quantitative measurement of relationship between indirect taxes and gross domestic product per capita in the long-run. The paper has provided a better understanding of the relationship between this type of taxes and economic growth, as well as, their effect on gross domestic product per capita in the long-run.

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