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## MEASURING AND ESTIMATING TAX ELASTICITY IN THE REPUBLIC OF SERBIA

### Abstract

*The paper analyzes tax elasticity in the Republic of Serbia in terms of tax revenues, personal income tax, corporate income tax, value added tax, social security contributions and excises for the period 2005-2019. Tax elasticity manifest sensitivity of tax forms to a change in the gross domestic product, where results have shown that indirect taxes have higher coefficients of elasticity compared to direct taxes. Results of empirical analysis have manifested that tax revenues are elastic to a change in gross domestic product, where 1% increase in GDP makes to a change of tax revenues for 1.31%. Also, tax elasticity is the highest at corporate income tax, while revenues from value added tax and excises are also elastic in the observed period. On the other hand, personal income tax and social security contributions are inelastic to a change in the gross domestic product in the Republic of Serbia.*

**Key words:** taxes, revenues, elasticity, Republic of Serbia

**JEL classification:** H2, H20, H21

## МЕРЕЊЕ И ОЦЕЊИВАЊЕ ЕЛАСТИЧНОСТИ ПОРЕЗА У РЕПУБЛИЦИ СРБИЈИ

### Апстракт

*Рад анализира еластичност пореза у Републици Србији у погледу пореских прихода, пореза на доходак грађана, пореза на добит правних лица, пореза на додату вредност, доприноса за социјално осигурање и акциза за период 2005-2019. године. Еластичност пореза манифестује осетљивост пореских облика на промену бруто домаћег производа, где су резултати показали да индиректни порези имају веће коефицијенте еластичности у односу на директне порезе. Резултати емпиријске анализе су показали да су порески приходи еластични на промену бруто домаћег производа, где повећање ГДП за 1% доводи до промене пореских прихода за 1.31%. Такође, еластичност пореза је највећа код пореза на добит правних лица, док су такође приходи од пореза на додату вредност и акциза еластични у посматраном периоду. С друге стране, порез на доходак*

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*грађана и доприноси за социјално осигурање су нееластични на промену бруто домаћег производа у Републици Србији.*

**Кључне речи:** *порези, приходи, еластичност, Република Србија*

## 1. Introduction

Tax policy of an economy is one of the components of the implementation of short-term and long-term priorities determined in the economic policy that has an essential role in creating revenues (Lakatos and Karai, 2019). One of the most important issue is tax elasticity that evaluates the percentage increase in tax revenues due to changes caused by gross domestic product (Kleven, 2004). Similarly, tax elasticity tends to vary systematically over economic cycles and empirical evidences suggest that tax revenues tend to fall more strongly than their tax bases during recession, as well as, recover more strongly than their tax bases during booms (Poghosyan, 2011). Tax revenue elasticity with respect to tax base is a main parameter for the modeling of public finances (Havranek et al. 2016). It is important to estimate tax elasticity that evaluates percentage growth of tax revenue due to the changes in the base implied by a percent movement in GDP (Acharya, 2011). The structure of this research is as follows. After the introduction, there is a theoretical background about tax elasticity in the economy, as well as, analysis of tax forms in the Republic of Serbia from 2005 to 2019 i terms of elasticity coefficients. The last segment inculdes summarizes and conclusion about tax elasticity level in the Republic of Serbia.

## Implications of tax elasticity

There are many studies that have examined tax elasticity in the world (Choudry 1979; Bruce et al. 2004; Girouard and Andre, 2005; Cotton, 2012, Bunesco and Comaniciu, 2013; Belinga et al. 2014; Deli et al. 2018; Khadan 2019). Bruce et al. (2004) have investigated tax elasticity from 1967 to 2000 in the United States and results show that the elasticity for income taxes in the long-run is more than double that for sales taxes. Deli et al. (2018) have emphasized that role of tax revenue buoyancy is one of the essential issue in the consequence of the financial crisis. Belinga et al. (2014) have applied Error Correction Model for estimating tax buoyancy in thirty-four OECD countries from 1965 to 2012. Results have suggested that long-run buoyancy is not significantly different from one in about half of the observed economies. Likewise, long-run buoyancy has decreased since the late 1980, while short-run buoyancy has shown a marked increase in the same period. Tagkalakis (2015) estimated the elasticity of corporate income tax revenue to output gap in Greece from 1993 to 2013, where results have shown that elasticity is about 1.40 to 1.55.

Kalaš et al. (2017) have revealed that personal income tax and corporate income tax are not significant for economic growth in Serbia, but value added tax has significant effect to to GDP from 2006 to 2015. Khadan (2019) has examined tax buoyancy for a twelve Caribbean countries over the period 1991-2017. Findings of this research implic

that direct taxes have higher coefficients of elasticity compared to indirect taxes.

Tax elasticity manifests indicator that defines how strongly tax revenues response to a change of GDP (Bunescu and Comanicu, 2013, p. 611).

$$\text{Tax elasticity} = \frac{\Delta TR}{\Delta GDP}$$

where: TR - tax revenues, GDP - gross domestic product.

**Table 1. Elasticity form**

TR/GDP = ∞	Perfect elasticity	A minimal change in GDP makes to a maximum change in TR
TR/GDP > 1	Elasticity	A change in GDP makes an over proportional change in TR
TR/GDP = 1	Unitary elasticity	A change in GDP by 1% makes a change in TR by 1%
TR/GDP < 1	Inelasticity	A change in GDP implies a less proportional change in TR
TR/GDP = 0	Perfect inelasticity	A maximum change in GDP does not implicate a change in TR

*Source:* Bunescu and Comanicu (2013, p. 611)

Table 1. reflects four potential situations in terms of tax elasticity which depending on GDP variations. First, if tax elasticity coefficient is more than 1, TR are elastic and change in GDP manifests to an over proportional change in TR. Second, if tax elasticity coefficient is less than 1, TR are inelastic and change in GDP makes to a less proportional change in TR. Finally, if tax elasticity is ∞ or 0, TR are perfect elastic or perfect inelastic. In first situation, a minimal change in GDP cause a maximum change in TR. In second situation, a maximum change in GDP does not change in TR.

**Table 2. Taxes in the Republic of Serbia (mill RSD)**

Year	TR	PIT	CIT	VAT	SSC	EXC
2005	669.372	94.282	10.308	216.007	214.343	71.275
2006	792.164	118.591	18.313	225.197	267.555	86.850
2007	912.749	115.772	29.686	265.465	313.025	98.601
2008	1.051.717	136.451	39.007	301.689	364.081	110.137
2009	1.054.588	133.482	31.213	296.927	373.073	134.781
2010	1.111.492	139.051	32.593	319.369	378.047	152.167
2011	1.191.079	150.824	37.806	342.446	406.706	170.949
2012	1.292.564	165.262	54.779	367.472	445.566	181.097
2013	1.366.595	156.085	60.665	380.624	488.496	204.761
2014	1.439.037	146.484	72.744	409.564	509.433	212.473
2015	1.463.590	146.775	62.668	416.056	505.695	235.781

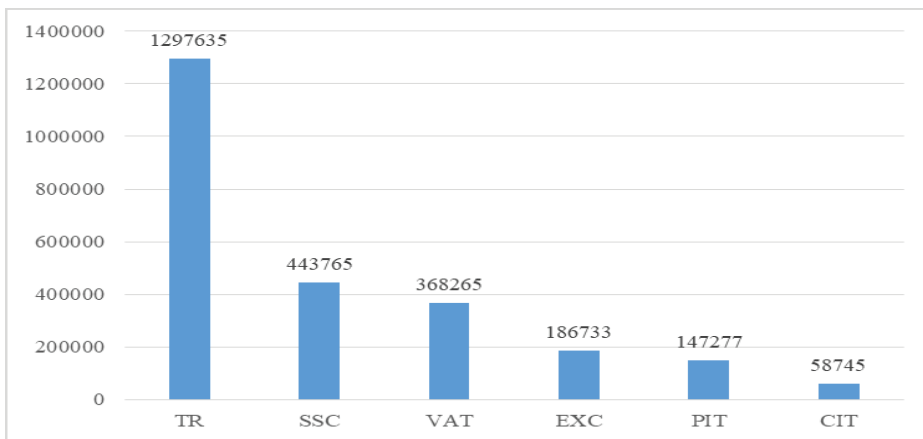
2016	1.585.767	155.065	80.415	453.503	527.489	265.606
2017	1.717.897	167.882	111.778	479.267	567.426	279.943
2018	1.822.236	179.423	112.488	499.828	619.666	290.039
2019	1.993.677	203.739	126.719	550.563	675.875	306.546

*Note:* **TR** – tax revenues, **PIT** – personal income tax, **CIT** – corporate income tax, **VAT** – value added tax, **SSC** – social security contributions, **EXC** – excises.

*Source:* Authors based on <https://www.mfin.gov.rs/en/document-type/macroeconomic-and-fiscal-data/>

Table 2. shows taxes in the Republic of Serbia from 2005 to 2019, where tax forms are expressed in million RSD. Analyzing by years, all tax forms have growth trend where TR are increased for 1.324.305 million RSD. VAT and SSC had the greatest growth above 300.000 or 400.000 million RSD, while other taxes such as PIT and CIT are increased around 110.000 million RSD in the analyzed period.

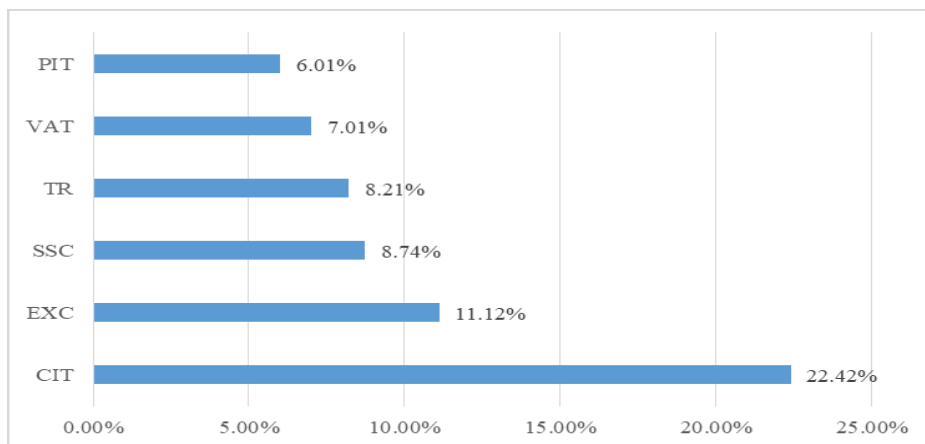
**Figure 1. Average level of tax forms in the Republic of Serbia**



*Note:* **TR** – tax revenues, **PIT** – personal income tax, **CIT** – corporate income tax, **VAT** – value added tax, **SSC** – social security contributions, **EXC** – excises.

*Source:* Authors based on <https://www.mfin.gov.rs/en/document-type/macroeconomic-and-fiscal-data/>

Figure 1. represents average level of tax revenues, as well as, personal income tax, corporate income tax, value added tax, social security contributions and excises from 2005 to 2019 in the Republic of Serbia. As it can see, average tax revenues are 1.297.635 million RSD, while SSC and VAT are the most generous taxes in the Republic of Serbia. Precisely, Kalaš and Milenković (2017) have determined that revenues by value added tax consist quarter of total revenues. Namely, these taxes consist more than 60% of tax revenues in the analyzed period. On the other hand, direct taxes such as PIT and CIT together have share 15.88% of tax revenues.

**Figure 2. Average growth of tax forms in the Republic of Serbia**

*Note:* TR – tax revenues, PIT – personal income tax, CIT – corporate income tax, VAT – value added tax, SSC – social security contributions, EXC – excises.

*Source:* Authors based on <https://www.mfin.gov.rs/en/document-type/macroeconomic-and-fiscal-data/>

Analyzing growth rate of tax forms at average level for the period 2005-2019 in the Republic of Serbia, results have shown that corporate income tax had the greatest growth rate of 22.4%. Beside corporate income tax, only excises have double growth rate of 11.12% in the observed period. The most generous tax forms such as VAT and SSC have similar growth rate of 7% or 8% compared to tax revenue growth. Finally, personal income tax had the smallest growth rate of 6.01% from 2005 to 2019.

**Table 3. Tax forms (% in tax revenues)**

Year	PIT	CIT	VAT	SSC	EXC	TR
2005	15.55%	1.70%	35.63%	35.36%	11.76%	100%
2006	16.55%	2.56%	31.43%	37.34%	12.12%	100%
2007	14.07%	3.61%	32.27%	38.06%	11.99%	100%
2008	14.34%	4.10%	31.71%	38.27%	11.58%	100%
2009	13.77%	3.22%	30.63%	38.48%	13.90%	100%
2010	13.62%	3.19%	31.27%	37.02%	14.90%	100%
2011	13.60%	3.41%	30.89%	36.68%	15.42%	100%
2012	13.61%	4.51%	30.27%	36.70%	14.92%	100%
2013	12.09%	4.70%	29.49%	37.85%	15.87%	100%
2014	10.85%	5.39%	30.32%	37.72%	15.73%	100%
2015	10.74%	4.58%	30.44%	36.99%	17.25%	100%
2016	10.46%	5.43%	30.60%	35.59%	17.92%	100%

2017	10.45%	6.96%	29.84%	35.33%	17.43%	100%
2018	10.55%	6.61%	29.38%	36.42%	17.05%	100%
2019	10.93%	6.80%	29.55%	36.27%	16.45%	100%

*Note:* **TR** – tax revenues, **PIT** – personal income tax, **CIT** – corporate income tax, **VAT** – value added tax, **SSC** – social security contributions, **EXC** – excises

*Source:* Authors calculation

Table 3. reflects percentage share of tax forms in tax revenues by years in the Republic of Serbia. VAT and SSC have the greatest percentage share in tax revenues in every year, where their shares are above 30% of tax revenues. After them, EXC are the third generous tax in the Republic of Serbia, where it's share is increased for 4.69% from 2005 to 2019.

CIT is only tax which share is below 10%, although percentage share is increased for 5.7% from 2005 to 2019. Finally, PIT has percentage share around 10% in tax revenues, while share is smaller for 4.62% from 2005 to 2019.

**Table 4. Tax elasticity in the Republic of Serbia**

Year	TR/GDP	PIT/GDP	CIT/GDP	VAT/GDP	SSC/GDP	EXC/GDP
2006	1.01	1.42	4.29	0.23	1.37	1.20
2007	0.96	-0.15	3.95	1.13	1.08	0.86
2008	0.99	1.17	2.05	0.89	1.06	0.76
2009	0.05	-0.44	-4.04	-0.31	0.49	4.52
2010	0.82	0.64	0.67	1.16	0.20	1.98
2011	0.64	0.76	1.43	0.64	0.68	1.11
2012	1.55	1.74	8.19	1.33	1.74	1.08
2013	0.70	-0.67	1.31	0.43	1.17	1.60
2014	5.55	-6.44	20.85	7.96	4.48	3.94
2015	0.46	0.05	-3.80	0.43	-0.20	3.01
2016	1.72	1.16	5.83	1.85	0.88	2.60
2017	1.61	1.60	7.56	1.10	1.46	1.04
2018	0.91	1.04	0.09	0.64	1.39	0.54
2019	1.36	1.97	1.84	1.47	1.32	0.82
<b>ATE</b>	<b>1.31</b>	<b>0.28</b>	<b>3.59</b>	<b>1.36</b>	<b>0.01</b>	<b>1.23</b>

*Note:* **TR** – tax revenues, **PIT** – personal income tax, **CIT** – corporate income tax, **VAT** – value added tax, **SSC** – social security contributions, **EXC** – excises, **GDP** – gross domestic product

*Source:* Authors calculation

Analyzing tax elasticity in the Republic of Serbia from 2005 to 2019, results manifest positive average coefficient of elasticity from aspect of all tax forms. The

highest value of average tax elasticity is identified at CIT , while the smallest value of average tax elasticity is recorded at SSC. It means that tax forms such as CIT, VAT and EXC are elastic to a change in GDP. Finally, personal income tax are not elastic to a change in the GDP for the period 2005-2019. Research results show that 1% increase in GDP leads to average growth of 1.31% at tax revenues, where maximum level of sensitivity is recorded in 2014 (5.55%). Also, 1% increase in GDP leads to growth of 3.59% at corporate income tax, 1.36% at value added tax, 1.23% and 1.23% at excises.

**Table 5. Tax elasticity by type of revenues in the Republic of Serbia**

Year	DT	IT	%GDP	% DT	% IT	Tax elasticity - DT	Tax elasticity - IT
2005	104.590	287.282	-	-	-	-	-
2006	136.904	354.405	18.09	30.89	23.36	1.70	1.29
2007	145.458	411.626	15.70	6.24	16.14	0.39	1.03
2008	175.458	474.218	15.25	20.62	15.20	1.35	0.99
2009	164.695	507.854	4.94	-6.13	7.09	-1.24	1.43
2010	171.644	530.214	6.50	4.21	4.40	0.64	0.67
2011	188.630	577.655	11.12	9.89	8.94	0.88	0.80
2012	220.041	626.663	5.47	16.65	8.48	3.04	1.54
2013	216.750	693.257	8.16	-1.49	10.62	-0.18	1.30
2014	219.228	721.906	0.95	1.14	4.13	1.19	4.32
2015	209.443	741.476	3.64	-4.46	2.71	-1.22	0.74
2016	235.480	793.095	4.85	12.43	6.96	2.56	1.43
2017	279.660	847.369	5.15	18.76	6.84	3.63	1.32
2018	291.911	909.705	6.61	4.38	7.35	0.66	1.11
2019	330.458	982.421	6.86	13.20	7.99	1.92	1.16
<b>ATE</b>						<b>1.09</b>	<b>1.37</b>

*Note:* **DT** – direct taxes, **IT** – indirect taxes, **GDP** – gross domestic product

*Source:* Authors calculation

If we taxes sorted in direct and indirect, results of analysis have shown that coefficient values of elasticity is higher at indirect taxes. Namely, indirect taxes are elastic (1.37) to a change in gross domestic product at average level from 2005 to 2019. On the other hand, direct taxes are unitary elastic (1.09) to a change in GDP at average level for the observed period. These results implicate that indirect taxes such as VAT and EXC are more sensitive to a change in GDP compared to direct taxes such as PIT and CIT. In conditions when GDP increase for 1%, direct taxes will rise for 1.09% at average level, while indirect taxes have greater growth by 1.37% at average level for the analyzed period.

## Conclusion

The research has examined tax elasticity in the Republic of Serbia in terms of tax revenues, personal income tax, corporate income tax, value added tax, social security contributions and excises for the period 2005-2019. Empirical analysis have reflected that tax revenues are elastic to a change in gross domestic product, where 1% increase in GDP makes to a change of tax revenues for 1.31%. Also, tax elasticity is the highest at corporate income tax, while revenues from value added tax and excises are also elastic in the observed period. Namely, 1% increase in GDP leads to growth of 3.59% at corporate income tax, 1.36% at value added tax, 1.23% and 1.23% at excises. On the other hand, personal income tax and social security contributions are inelastic to a change in GDP in the Republic of Serbia. Finally, results have implied that indirect taxes are more sensitive to a change in GDP compared to direct taxes. In conditions when GDP increase for 1%, direct taxes will rise for 1.09% at average level, while indirect taxes have greater growth by 1.37% at average level for the analyzed period.

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