EE
E u r o E c o n o m i c a
Issue 1(37)/2018 *ISSN: 1582-8859*

Fiscal Variables and Economic Growth: Measuring the Impact for Romania

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Abstract: The present paper envisages the identification of fiscal variables with influence on economic growth, in the case of Romania. The results of studies from the literature show that there are various influences of fiscal variables on growth, which differ depending on countries and periods analyzed. The study presents a model which underlines the influence of fiscal variables on the economic growth, with GDP as proxy for economic growth, for 1991-2013 period. The results suggested that fiscal variables have a statistically significant impact on growth. The extent to which fiscal policy may influence economic growth continues to attract the attention of scholars, and the results of the paper may represent one starting point for future research to identify the relevant types of taxes and public spending to be analyzed in relationship with growth. The paper underlines the impact of fiscal variables on the economic growth in the case of Romania. Also, another goal of this paper is to underline the importance of checking the hypotheses for the regression model, knowing that their violations are leading to inaccurate results.

Keywords: fiscal policy; economic growth; distortionary taxes; non-distortionary taxes; productive expenditure; unproductive expenditure; Romania

JEL Classification: H71; H72; O47

1. Introduction

Fiscal policy refers to taxation and public spending measures which have important effects on the economy. When a tax increase is adopted, higher revenues to the budget may be recorded, but households and businesses may encounter difficulties in their activities because they will have lower after tax income. By raising or lowering taxation, the disposable income is influenced, an increase in taxes reduces the disposable income, and a reduction in taxes leads to increases of the disposable income.

The experts' opinions regarding the effect of an increase in public spending on economic growth are divided. Those who support an increase in public spending underline that government programs provide valuable public goods, such as education and infrastructure. On the other hand, supporters of public spending cuts explain that higher spending could negatively influence the economic growth, by transferring resources from the productive sectors that might be then used in an inefficient way.

The present paper envisages identifying the factors with influence on economic growth for the case of Romania. The study presents a model which underlines influences on economic growth from fiscal variables such as distortionary taxes, non-distortionary taxes, productive expenditures, and unproductive expenditures, for 1991-2013 period. Another goal of this paper is to underline the importance of checking

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the hypotheses for a regression model. The paper is structured as follows: the second section presents some aspects concerning the relationship between fiscal policy and economic growth, the third section presents the methodology used in the paper, the fourth section presents the model and discusses the results and the final section concludes.

2. The Relationship between Fiscal Policy and Economic Growth

In the literature, the analysis of the economic growth in different countries has an important place. Economic growth refers to a positive trend of the national economy, but does not exclude cyclical fluctuations and even some temporary decreases. (Dobrotă, 1995) Fiscal policy influences the economic growth, but beneficial changes in fiscal policy may have modest effects on increasing production. (Engen & Skinner, 1996) According to studies conducted by Barro (1989, 1990, 1991), Grier and Tullock (1989), the share of expenditure to GDP has a negative association with economic growth. Devarajan et al (1996) consider that changes in the composition of expenditure can lead to a higher rate of economic growth, noting that an increased share of current expenditure has statistically significant positive effects, but there is a negative relationship between the capital component of public expenditure and per capita growth. Also, according to literature, increased public spending has a negative significant impact on economic growth rate (Guseh, 1997; Fölster & Henrekson, 1999, 2001), and increasing the share of public spending in GDP would result in an increase of unemployment. (Abrams, 1999)

Widmalm (2001) identified that the tax structure influences the economic growth, and there is a negative relationship between income tax and growth, the progressivity being associated with slow growth. Scully (2003) developed two models that put in connection the government spending and taxation with economic growth, providing estimates of the tax rate that maximizes growth, a model being developed to identify the trade-off rate between the economic growth and the income inequality.

Obreja Braşoveanu (2007) applies various methods for analysis of the relationships between tax revenues and economic growth (correlation matrix, regression with Least Squares, Vector Autoregression) for Romania (the 1990-2011 period). If VAR method is employed, distortionary tax revenues have positive effects on growth, non-distortionary taxes show a positive relationship with growth and other revenues show a negative relationship with growth. Obreja Braşoveanu (2007) also examines the relationship between budget spending and economic growth for Romania (1990-2005 period), using same methods, and if VAR method is employed, productive expenditures have a stimulating effect on the activity, unproductive expenditures show effects related to slowing the growth, and the "other expenditures" category has ambiguous effects.

According to the results obtained by Afonso and Furceri (2008), of total revenue, the variables that influence in an undesirable way the economic growth, both in terms of size and volatility, are represented by indirect taxes and social contributions. Poulson and Kaplan (2008) analysed the impact of taxation on growth and highlighted the negative impact of high marginal tax rates and income taxes on economic growth. Obreja Braşoveanu and Braşoveanu (2008) tested the relationship between taxation and growth, the model revealing a negative relationship between the economic growth and the tax revenues.

The development spending increases the investment and boost economic growth, but current spending negatively influences investment and growth. (Hadiwibowo, 2010) According to the results of Husnain et

al (2011), public spending has a negative effect on economic growth, and if the government involvement exceeds a certain level, the positive effect of FDI on growth becomes fragile.

Katircioglu (2010) aims to identify long-run equilibrium relationship between real GDP growth and tax revenues increases, but the results show that there is no such relationship. Mashkoor et al (2010) focused on the idea that the low ratio between direct taxation and total taxation promotes a strong economic growth.

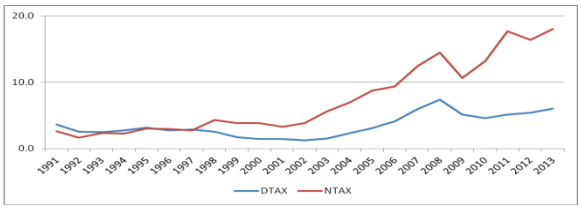
In the literature, there are papers with results that emphasized the situation in which public spending and economic growth are positively correlated (Dandan, 2011; Herath, 2012), or education expenditures have a positive influence on economic growth. (Chude & Chude, 2013) Olatunji and Sunday (2012) identified a positive relationship between productive expenditure, tax revenues, capital expenditures, and growth. Gangal and Gupta (2013) analysed the impact of public spending on growth and stressed that there are a long-run equilibrium and a positive impact on growth. Acosta-Ormaechea and Morozumi (2013) analysed the effects of reallocations of public spending on long-run growth, pointing out that a reallocation implying an increase of expenditure on education has a positive and statistically significant impact on growth when is associated with a reduction in spending on social protection. Surugiu et al (2012) identified a positive relationship between the growth rate of total tax revenue and growth rate of GDP and between the growth rate of total government expenditure and GDP growth rate. Canavire-Bacarreza et al (2013) examined the effects of fiscal policy on economic growth, stressing that the income tax has no significant effect, the corporation tax has a reduced negative effect, and the consumption taxes have a significant positive effect on growth. Alm and El-Ganainy (2013) underline the link between an increase in the VAT rate and a reduction in aggregate consumption. Ugwunta and Ugwuanyi (2015) analysed the effects of distortionary and non-distortionary taxes on economic growth, emphasizing that there are no significant effects. The results from literature differ depending on the countries, periods analyzed, and so on. In such an analysis it is important to clearly identify the variables which have a significant influence on growth.

3. The Methodology Adopted

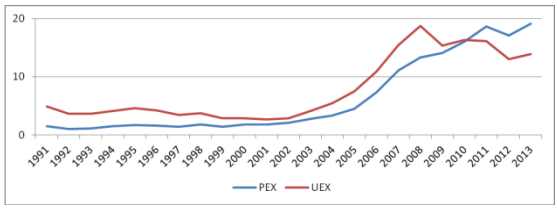
In order to test the impact of fiscal policy on economic growth, Barro and Sala-i-Martin (1995) proposed the classification of budget revenues depending on their distortionary character, and expenditures classification in productive and unproductive. (Obreja Brașoveanu, 2007) Classification of budget revenues consists of **distortionary taxes** (income tax, corporation tax, social security contributions, tax on wealth, tax on property), **non-distortionary taxes** (value added tax, excise duties), and **other taxes** (other tax revenues, other non-tax revenues). The classification of budget expenditures consists of **productive expenditures** (general public services, defence, public order and national security, education, health, housing, environment and water, transport and communication; these expenditures have an impact on the efficiency of the private sector), **unproductive expenditures** (insurance and social assistance, culture, recreation and religion, economic actions; these expenditures influence consumer welfare, but does not include effects on the efficiency of the private sector), and **other expenditures**. In this paper, the taxes were grouped into “distortionary taxes” and “non-distortionary taxes” categories, and the

expenditures were grouped in "productive expenditures" and "unproductive expenditures" categories, in order to highlight their impact on economic growth in Romania.

In the following figure the **distortionary taxation** (the following tax revenues were included: income tax, corporation tax, capital gains, wage tax, and taxes on property) and **non-distortionary taxation** levels are highlighted for Romania, 1991-2013 period (i.e. taxes on goods and services, tax on foreign trade and international transactions, other taxes). Also, the **productive expenditures** (general public services, defence, public order and national security, public services and development, housing, environment, and water) and **unproductive expenditures** levels (social and cultural expenditures, economic actions) are highlighted.



(a)



(b)

Figure 1. (a) Distortionary (DTAX) and non-distortionary taxes (NTAX), (b) Productive (PEX) and unproductive expenditures (UEX) in Romania, 1991-2013, billion US dollars

Source: Created with data from Tempo Online-National Institute of Statistics

Note: data were transformed in US dollars based on the average annual exchange rate RON/US dollar (source: www.bnr.ro).

From this analysis, positive signs of coefficients for non-distortionary taxes and productive expenditures and negative signs of coefficients for distortionary taxes and unproductive expenditures are expected. The hypotheses of regression analysis, that will be checked, are related to aspects such as the absence of measurement errors, homoscedasticity, errors' uncorrelation, etc.

Table 1. Description of the variables used in the analysis

Variables	Description	Expected sign
GDP	gross domestic product, the proxy for economic growth	
DTAX	distortionary taxes	(-)
NTAX	non-distortionary taxes	(+)
PEX	productive expenditures	(+)
UEX	unproductive expenditures	(-)

Source: Authors' contribution

Table 2. The hypotheses regarding the impact of fiscal variables on economic growth and the hypotheses of the regression analysis

No.	Hypotheses regarding the impact of fiscal variables
1	there is an inverse relationship between economic growth and distortionary taxes - DTAX
2	there is a direct relationship between economic growth and non-distortionary taxes - NTAX
3	there is a direct relationship between economic growth and productive expenditures - PEX
4	there is an inverse relationship between economic growth and unproductive expenditures - UEX
No.	Hypotheses of the regression analysis
1	the absence of measurement errors in observed values
2	errors' mean is equal to zero (tends to zero)
3	the homoscedasticity of the model (constant variance of the residuals in relation with any value of *xi* variable)
4	independent residuals or uncorrelated errors
5	independent residuals in relation to exogenous variables

Source: Authors' contribution

The data source for tax revenues and expenditures is the state budget, Tempo Online Database – National Institute of Statistics (which is also the source for GDP data). On the data used in the model, the inflation rate (for tax revenues and expenditures) and GDP deflator (for GDP) were applied (computed in constant prices of 2013). The inflation rate and GDP deflator were collected from the World Economic Outlook Database 2014 – International Monetary Fund.

4. Model Presentation and Discussion of the Results

The analysis aims to develop an econometric model to highlight the relationships between economic growth and variables such as distortionary taxes, non-distortionary taxes, productive expenditures, and unproductive expenditures for the case of Romania, 1991-2013 period. Using the Least Squares method, the regression model is described as follows:

Equation 1 Formula for the regression model

$$Y_t = \alpha + \beta X_t + u_t$$

where Y_t is the dependent variable (GDP) and X_t is the set of explanatory variables (distortionary taxes, non-distortionary taxes, productive expenditures, and unproductive expenditures). In the following, the hypotheses of the regression analysis are checked. (Săvoiu, 2011)

The absence of measurement errors in observed values is checked by validating the relationships $x \in (\bar{x} \pm 3\sigma_x)$ and $y \in (\bar{y} \pm 3\sigma_y)$. A descriptive statistics is the starting point for testing this hypothesis. Thus, the data in **Table 3** validates the hypothesis of the absence of measurement errors.

Table 3. Descriptive statistics of the variables used

	GDP	DTAX	NTAX	PEX	UEX		GDP	DTAX	NTAX	PEX	UEX
Mean	484.67	19.80	35.53	27.17	39.55	Kurtosis	1.47	3.53	2.60	2.24	1.64
Median	438.54	18.82	30.19	16.61	39.71	Jarque-Bera	2.75	3.52	2.84	4.08	1.78
Max.	642.05	40.65	60.08	63.70	60.29	Prob.	0.25	0.17	0.24	0.13	0.41
Min.	368.90	9.03	21.12	11.15	20.24	Sum	11147.38	455.48	817.07	624.82	909.58
Std. Dev.	97.81	8.17	11.93	19.15	13.35	Sum Sq. Dev.	210482.2	1467.93	3132.02	8068.69	3923.47
Skewness	0.37	0.92	0.84	0.96	0.0002	Obs.	23	23	23	23	23

Source: Authors' contribution

The validation of the hypothesis is made through the following steps:

- $y \in (\bar{y} \pm 3\sigma_y)$, for y = (484.6687 $\pm$ 3 x 97.81295) or the interval (191.2299; 778.1076) which captures the values of y (GDP);
- $x \in (\bar{x} \pm 3\sigma_x)$, for x_1 = (19,80328 $\pm$ 3 x 8.168485) or the interval (-4.70218; 44.30874) which captures the values of x_1 (DTAX); for x_2 = (35.52475 $\pm$ 3 x 11.93167) or the interval (-0.27026; 71.31976) which captures the values of x_2 (NTAX); for x_3 = (27.16617 $\pm$ 3 x 19.15094) or the interval (-30.2867; 84.61899) which captures the values of x_3 (PEX); for x_4 = (39.54674 $\pm$ 3 x 13.35439) or the interval (-0.51643; 79.60991) which captures the values of x_4 (UEX).

The hypothesis regarding the absence of measurement errors in observed values (x_i and y_i) is satisfied by capturing all of the values in the computed intervals.

Errors' mean is equal to zero (tends to zero) - this hypothesis is checked by appealing to the residuals' descriptive statistics and observing the value of the residuals' mean. Also, there are the following steps in the analysis:

a. in the group of variables, the correlation relationships between y and x_1, y and x_2, and so on are checked with the correlation matrix.

Table 4. Results regarding the correlation between variables

	DTAX	NTAX	PEX	UEX
GDP	-0.21	0.90	0.91	0.62

Source: Authors' contribution

The correlation coefficient is high in the case of the relationship between GDP and NTAX, and between GDP and PEX, underlying strong positive relationships. For GDP and DTAX, the result suggests a weak negative relationship, and for GDP and UEX the coefficient underlines a moderate positive relationship.
b. the parameters are estimated.

Table 5. Estimation of the regression model parameters

Dependent Variable: GDP; Method: Least Squares; Sample: 1991 2013; Included observations: 23								
Variables	Coeff.	Std. Err.	t-Stat.	Prob.	R-sq.	0.92	Mean dep. var	484.67
DTAX	-5.82	1.50	-3.90	0.00	Adj. R-sq.	0.90	S.D. dep. var	97.81
NTAX	4.11	1.58	2.61	0.02	S.E. of reg.	30.17	Akaike info crit.	9.84
PEX	-0.28	1.24	-0.22	0.82	Sum sq. resid	16387.37	Schwarz crit.	10.09
UEX	4.94	1.25	3.95	0.00	Log likl.	-108.18	F-stat.	53.30
C	266.21	44.68	5.96	0.00	DW stat	1.10	Prob(F-stat.)	0.00

Source: Authors' contribution

The next step is to check the descriptive statistics for the residuals, to see if the mean tends towards zero or even equals zero.

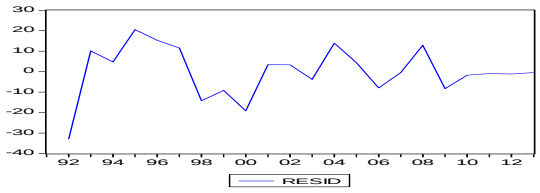


Figure 2. The variation of the residuals around zero mean

Source: Authors' contribution

Table 6. The residuals and the descriptive statistics for the residuals

Residuals								Descriptive statistics for the residuals			
1991	NA	1997	11.57	2003	-3.77	2009	-8.29	Mean	-1.02E-14	Kurtosis	3.63
1992	-32.99	1998	-14.21	2004	13.96	2010	-1.74	Median	-0.46	Jarque-Bera	2.24
1993	10.14	1999	-9.18	2005	4.37	2011	-0.94	Max.	20.56	Prob.	0.33
1994	4.73	2000	-19.15	2006	-7.95	2012	-1.14	Min.	-32.99	Sum	-2.27E-13
1995	20.56	2001	3.43	2007	-0.46	2013	-0.46	Std. Dev.	12.37	Sum Sq. Dev.	3210.96
1996	15.30	2002	3.35	2008	12.87			Skewness	-0.71	Obs.	22

Source: Authors' contribution

According to the results, the mean clearly tends towards zero, being equal with -1.02×10^{-14}.

The homoscedasticity of the model (constant variance of the residuals in relation with any value of *xi* variable) - homoscedasticity or heteroscedasticity can be identified by the White test. White test results show that the heteroscedasticity is not present (see **Table 7**).

Table 7. White Heteroscedasticity Test

		Prob	Test Equation: Dep. Var. - RESID^2, Method: Least Squares, Sample: 1991
F-stat.	1.08 .	0.43	2013, Incl. obs.: 23
Obs*R-sq.	8.77 .	Prob 0.36	Variables: C, DTAX, DTAX^2, NTAX, NTAX^2, PEX, PEX^2, UEX, UEX^2
			R-sq.: 0.38

Source: Authors' contribution

For a significance threshold of 0.05 with a value from the table of the test $\chi^2_{0.05/8} = 15.51$, the White test statistics being 8.768026 (or n x R^2 = 23 x 0.381219), which points out that the model is not heteroscedastic ($LM < \chi^2_{0.05/8}$). The hypothesis of homoscedasticity is confirmed.

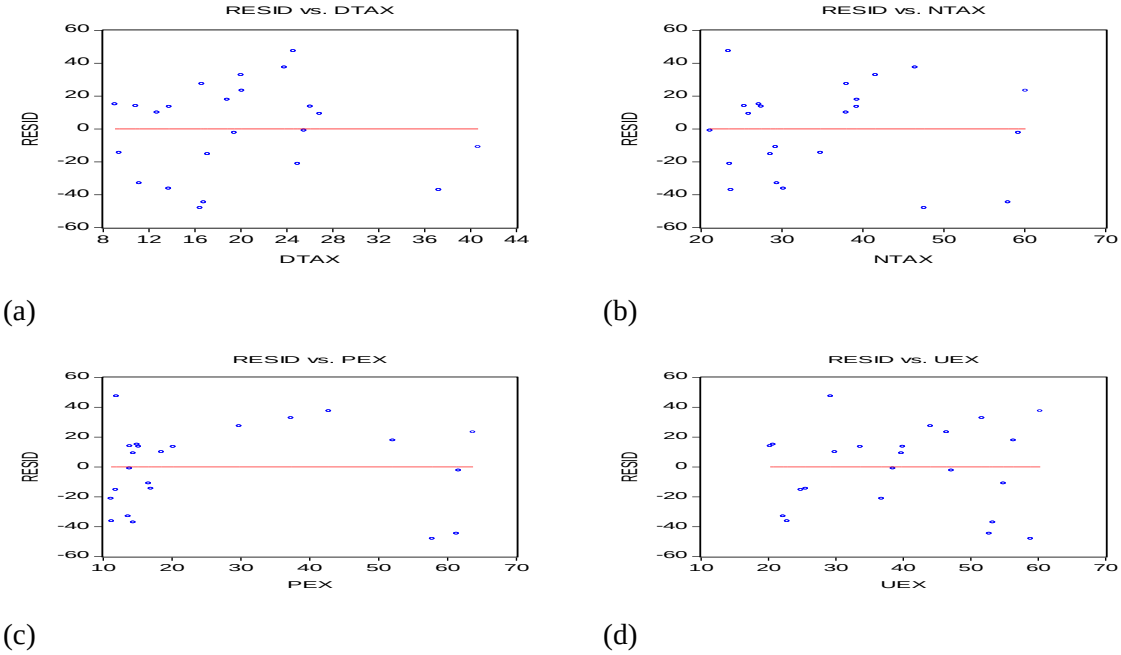


Figure 3. The relationships between residuals and exogenous variables: (a) RESID vs. DTAX; (b) RESID vs. NTAX; (c) RESID vs. PEX; (d) RESID vs. UEX

Source: Authors' contribution

Independent residuals or uncorrelated errors - this aspect may be highlighted using the Durbin-Watson test. In this case, d = 1.103610, and the values for dL and dU, for n = 23, are 0.986, and 1.785 respectively, generating the situation $dL \leq d \leq dU$, meaning an indecision, the test is inconclusive for 0.05 threshold. Independent residuals in relation to exogenous variables – for this analysis the scatter charts with the relationships between residuals and exogenous variables are used, showing that there is no relationship between them (see **Figure 3**). Regarding the fiscal variables' influence on economic growth and the obtained signs of the coefficients, the results are consistent with the hypotheses only in the case of the relationships between economic growth and tax revenues (a negative sign for distortionary taxes and a positive sign for non-distortionary taxes), and not in the case of the growth – expenditures relationships. Thus, a direct influence on economic growth from productive expenditures was expected, but the results

underlined that the coefficient is a negative one and it is not statistically significant. Also, a negative sign for unproductive expenditures was expected, but a positive one was obtained.

5. Conclusions

In this paper, the model developed underlined the influence of fiscal policy on economic growth, with data for Romania, 1991-2013 period. The analysis identified statistically significant relationships between variables. The results suggested that: three variables of four have a statistically significant impact on growth (distortionary taxes, non-distortionary taxes, and unproductive expenditures); distortionary taxation has a negative relationship with growth and non-distortionary taxation has a positive relationship with growth, as expected; unproductive expenditures show a direct relationship with growth, but a negative sign of the coefficient was expected. The importance of this topic requires further research and the use of various methodologies. The most difficult aspect of the approach refers to defining the relevant types of taxes and public spending to be analyzed. Another goal of this paper is to underline the importance of checking the hypotheses for a regression model. Violations of the hypotheses for a regression model can lead to inaccurate results. Thus, five hypotheses that have substantial benefits for the developed research are presented and checked.

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