Iulia ROȘOIU
Academy of Economic Studies, Bucharest, Romania

THE IMPACT OF FISCAL POLICY ON ECONOMY GROWTH

Review Article

Keywords
Fiscal shock;
Revenues structure;
Simple VAR model;
Structural VAR model

JEL Classification
E62, H20, H50

Abstract

The purpose of this article is to analyze the impact of the fiscal shocks on the economic growth in Romania. Firstly, the article considers the total fiscal shock by using total government revenues and then it studies their structure. Three categories of revenues are used: distortionary taxation, non-distortionary taxation and other revenues. The first estimation is done by using a simple Vector Autoregressive model and the second is based on a Structural Vector Autoregressive model. The results indicate a positive impact if total revenues increase and a negative one when the groups of taxation are considered individually. Among the revenues' categories, the most significant impact is obtained for distortionary taxation and other revenues.

INTRODUCTION

Government revenues are important for the economy because they represent financial resources collected from the taxpayers or loans and are allocated to cover public expenses. Fiscal policy is one of the state instruments used for controlling the economy development and for ensuring the welfare of the population.

The analysis of the impact of fiscal policy on the economy growth in Romania uses annual variables published by AMECO databased, over the period 1995-2020 (with estimated values for 2019 and 2020). The economy growth is measured by the real GDP growth rate. Two Vector Autoregressive models (VAR) are estimated: a simple VAR model that considers total government revenues and a Structural VAR model that includes the structure of the revenues: distortionary taxation, non-distortionary taxation and other revenues.

The results indicate that the economy growth increases, in the first period, after a shock into the total government revenues; however, the real GDP growth rate decreases when shocks into one of the three revenues' categories are introduced. The negative effect is more significant when the distortionary taxation category and other revenues increase compared with the effect of the non-distortionary taxation category.

Section 2 focuses on the conclusions described by other economic analysts. Section 3 explains the econometric methodology used and variables transformations. Section 4 presents the results of the estimation and section 5 summarizes the findings.

THEORETICAL LITERATURE

Arthur Laffer (2004) defines "Laffer curve" in 1980, which illustrates how to determine the optimal level of the taxation by showing the relationship between the tax rate and tax revenues. Since then, many authors have been interested in understanding how fiscal policy instruments should be used by the government in order to determine sustainable economic growth and to demonstrate the importance of the private sector for financial support considering that government resources are limited.

Benos (2009) split the total government revenues in two categories: distortionary taxation, which does not encourage the investments in human capital so the growth is reduced and non-distortionary taxation, which does not influence the above investments, therefore the growth. Kneller, Bleaney and Gemmell (1999) use the same grouping and they explain that distortionary taxation includes current taxes on income and wealth, capital taxes and actual social contributions while non-distortionary taxation refers to taxes on production and imports. Their results show that for a group of 22 OECD countries, over the period 1970-1995, distortionary taxation prevented growth while non-distortionary taxation did not. Cashin (1995) estimated a negative impact between distortionary taxes and growth for 23 developed countries, over the perid 1971-1988. Poot (2000) collected the results from articles published between 1983-1998 and he found that the impact of total taxes on growth was negative.

The different results are justified by the literature in the field by the fact that the development of the countries is different. The period analyzed is very important considering that only few countries follow long term fiscal policy strategies while most of them are easily influenced by endogenous and exogenous factors. Also, the variables transformation process and the econometric method applied can lead to different results.

ECONOMETRIC METHODOLOGY AND DATA USED

In order to analyze the impact of fiscal policy on the economy growth in Romania, annual variables published by the AMECO database over the period 1995-2020 are used (with estimated values for 2019 and 2020). The economy growth is measured by the growth rate of real GDP. In the first model, fiscal policy is represented by the total government revenues and in the second model by their structure (distortionary taxation, non-distortionary taxation and other revenues).

This analysis uses Vector Autoregressive models (VAR) framework (Brooks, C., 2002). The standard VAR model is described in the equation (1):

$$Y_t = A(L)*Y_{t-1} + B(L)*X_t + v_t. \quad (1)$$

where:

- Y_t – the endogenous variables vector;
- X_t – the exogenous variables vector;
- v_t – the errors vector;
- A(L) and B(L) – the coefficients of the endogenous and exogenous variables vector.

Table 1 shows the notations of the variables used for estimating the VAR models.

Figure 1 shows the descriptive statistics of the five variables used in the estimated models. The average value recorded by the real economic growth rate over the analyzed period is 3.35 and it fluctuates between -5.91 (the minimum value) and 8.26 (the maximum value). The average of total government revenues (as % of GDP) is 32.56 with a minimum of 29.4 and a maximum of 35.50. The average values of the revenues' categories are 16.25 for distortionary taxation, 11.41 for non-distortionary taxation and 4.90 for other revenues. Standard deviation shows whether series are volatile or are not present over the period considered. Real economic growth rate series is more volatile than total government revenues series and non-distortionary taxation is the most volatile among the revenues' categories. The values recorded by Skewness coefficient and Kurtosis coefficient show that variables are not normally distributed, even if Jarque-Bera probability is higher than 5%. For a variable to be normally distributed, the skewness coefficient should equal zero and the kurtosis coefficient three.

The series of data used are verified whether they are stationary or not (results presented in table 2). Since the analysis uses annual data, it is not necessary to check for seasonal adjustment. Hodrick-Prescott filter is used first, with the purpose of removing the trend from the series and it was applied for distortionary taxation and other revenues (probability is smaller than 5%). The second test used is Augmented Dickey-Fuller (ADF), which indicates that variables are stationary when probability is smaller than 5%. The results indicate that non-distortionary taxation and other revenues must be integrated first.

The impact of fiscal policy on economic growth is analyzed by estimating 2 VAR models (equation 2 and 3), both being stable for lag length equal 2.

- The impact of total government revenues on economic growth:

VAR(1): Y_t = [rata_PIB$_t$, v_bug$_t$] (2)

- The impact of categories of revenues on economic growth:

VAR(2): Y_t = [rata_PIB$_t$, v_distor$_t$, v_nedistor$_t$, v_alte$_t$] (3)

In order to state that the two VAR models are significant according to econometric theory, three hypotheses should be verified: residual series follow a normal distribution, residual series are not autocorrelated and residual series are homoscedastic. Tests probabilities greater than 5% indicate that models support the hypotheses and the conclusions can be drawn using simple VAR models, otherwise econometric theory recommends utilizing the Structural VAR model (SVAR). Table 3 summarizes the results, which indicate that the first model can be estimated by using a simple VAR and the second one by using a SVAR.

The SVAR model is estimated by identifying short term restrictions of the variable relationships. These are presented in table 4. The variable from the row is influenced over a period by the variable in the column. Lack of influence is marked by 0, while 1 signifies that there is influence. Thus, over a time horizon, the real GDP growth rate is impacted by the evolution of the three categories of total government revenues.

RESULTS OF THE ESTIMATED VAR MODELS

Figure 2 shows the results obtained after estimating the simple VAR(1) model and the impulse response of the economic growth to a shock into the total government revenues. The fiscal shock determines the increase of the real GDP growth rate. The sign of the coefficients estimated for the fiscal variable are not the same in both periods, which makes it impossible to conclude whether the impact on the growth rate is positive or negative.

The results of the Structural VAR(2) model are represented by figure 3. The sign of the coefficients C(1), C(2) and C(3) indicates the negative impact of the three revenues categories on the economic growth. C(1) represents the restriction of the distortionary taxation category, C(2) the restriction of the non-distortionary taxation and C(3) the restriction of the other revenues. The probability of the variables with short term restrictions is smaller than 5% or 10% (for the category of other revenues), meaning that contemporary influences are significant. The coefficients of the restriction C(1) and C(3) are almost equal and much bigger compared with the coefficient of the restriction C(2). In other words, the impact of the distortionary taxation and other revenues categories are similar and more significant compared with the influence of the non-distortionary taxation category on real GDP growth rate.

CONCLUSIONS

This paper first aimed to analyze the impact of the taxation on the real GDP growth rate by using a simple VAR model and then to go into more detail with a Structural VAR model that included three categories of revenues. The results indicated that the composition of government revenues should be considered when interpreting the impact on the economy growth because the total fiscal shock can be misleading.

The increase in the total taxes determines a positive reaction of the economy in the first period soon followed by a decline. The reaction is not the one described by the economic theory, therefore categorizing shocks on the level of taxation will help to identify the fiscal policy strategy used in Romania. The use of the Structural VAR model allows maintaining contemporaneous restrictions. As the goal was to emphasize the effect of fiscal policy on economic growth the restrictions used were related only to one-way relationships.

It has been found that unexpended increase in one of the three revenues' categories used determined a decline in economy. The effect is similar and more significant when shocks happened to the distortionary taxation and other revenues. The findings are similar to the conclusions reached and published by other authors. Non-distortionary taxation category does not have a significant impact on the economic growth; therefore government should focus on how to manipulate distortionary taxation category and other revenues.

REFERENCES

[1] Benos, N. (2009). "Fiscal policy and economic growth: empirical evidence from EU countries", RePEc MARA-Munich University Library in Germany.

[2] Brooks, C. (2002). Introductory econometrics for finance, Marea Britanie: editura Cambridge University Press.

[3] Cashin P. (1995). "Government Spending, Taxes and economic growth", IMF Staff Papers, 42(2), 237-269, June.

[4] Kneller, R.; Bleaney, M.; Gemmell, N. (1999). "Fiscal policy and growth: evidence from OECD countries".

[5] Laffer, A. (2004). "The Laffer curve: Past, Present and Future"; The Heritage Foundation, June.

[6] Poot, J. (2000). "A Synthesis of Empirical Research on the Impact of Government on Long-Run Growth", Growth and Change, 31, 516-546.

TABLES & FIGURES

Table No. 1
Variables notations used in the regression analysis

Notations	*Variables (not seasonally adjusted data)*
$rata\_PIB_t$	Real GDP growth rate (%)
v_bug_t	Total government revenues (% of GDP)
v_distor_t	Distortionary taxation (% of GDP)
$v\_nedistor_t$	Non-distortionary taxation (% of GDP)
v_alte_t	Other revenues (%of GDP)

*Note: "**T**" at the end of variable notation - variables for which Hodrick-Prescott filter was applied with the purpose of removing the trend from the series;*
*"**DIF**" at the end of variable notation - variables that are integrated at first order and were differentiated once in order to become stationary.*

Table No. 2
Analysis of variables stationarity

Hodrick-Prescott filter

Variables	rata_PIB	v_bug	v_distor	v_nedistor	v_alte
Probability	0,5619	0,4701	**0,0000**	0,3397	**0,0000**
Variables obtained	-	-	*v_distor_T*	-	*v_alte_T*

Augmented Dickey-Fuller test

	with constant; MAXLAG=8		with constant; MAXLAG=8	
Variabiles	**rata_PIB**		**v_bug**	
ADF test	t-statistic	Probability	t-statistic	Probability
Test critical values	-3,156364	0,0351	-4,721064	0,0010
1%	-3,724070		-3,737853	
5%	-2,986225		-2,991878	
10%	-2,632604		-2,635542	
Variabiles obtained for I(1)	-		-	

	with constant; MAXLAG=8		with constant; MAXLAG=8		with constant; MAXLAG=8	
Variabiles	**v_distor_T**		**v_nedistor**		**v_alte_T**	
ADF test	t-statistic	Probability	t-statistic	Probability	t-statistic	Probability
Test critical values	-5,883774	0,0001	-2,063323	**0,2600***	-1,918125	**0,3184***
1%	-3,769597		-3,724070		-3,769597	
5%	-3,004861		-2,986225		-3,004861	
10%	-2,642242		-2,632604		-2,642242	
Variabiles obtained for I(1)	-		*v_nedistor_DIF*		*v_alte_T_DIF*	

* series need to be differentiated once in order to become stationary

Source: author's estimations based on AMECO database

Table No. 3
VAR model hypotheses – tests results

Hypotheses	Test	VAR(1)	VAR(2)
Normal distribution	Probability of JB's statistic	0,2047	0,0438
Residual autocorrelation	Probability of LM's statistic (3 lag)	0,8612	0,0062
Residual homoscedasticity	Probability of Chi-sq's statistic	0,1788	0,3762

Source: author's estimations based on AMECO database

Table No. 4
Variables restrictions used for estimating Structural VAR(2) model

	rata_PIB	**v_distor**	**v_nedistor**	**v_alte**
rata_PIB	1	1	1	1
v_distor	0	1	0	0
v_nedistor	0	0	1	0
v_alte	0	0	0	1

Source: author's estimations based on AMECO database

	RATA_PIB	V_BUG	V_DISTOR	V_NEDISTOR	V_ALTE
Mean	3.355385	32.56538	16.25000	11.41538	4.900000
Median	3.815000	32.40000	16.05000	11.65000	4.800000
Maximum	8.360000	35.50000	19.00000	13.20000	7.600000
Minimum	-5.910000	29.40000	14.50000	8.700000	3.300000
Std. Dev.	3.839474	1.456006	1.274755	1.313832	1.172689
Skewness	-0.908118	-0.165647	0.596204	-0.497659	0.334648
Kurtosis	3.199951	2.718496	2.420909	2.225946	2.291290
Jarque-Bera	3.616917	0.204750	1.903617	1.722304	1.029411
Probability	0.163907	0.902691	0.386042	0.422675	0.597677
Observations	26	26	26	26	26

Figure No. 1
Descriptive statistic of variables used for the analysis
Source: author's estimations based on AMECO database

	RATA_PIB	V_BUG
RATA_PIB(-1)	0,357584	-0,081302
RATA_PIB(-2)	0,111966	-0,049923
V_BUG(-1)	1,279734	0,538779
V_BUG(-2)	-0,327621	-0,302735
C	-29,38597	25,44390
R-squared	0,344366	0,510649

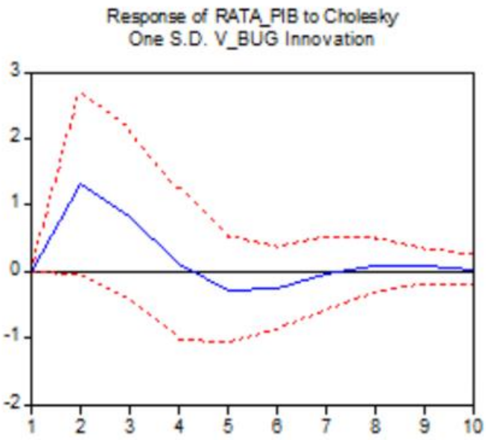

Figure No. 2
Results of simple VAR(1) model
Source: author's estimations based on AMECO database

Structural VAR Estimates
Date: 04/24/19 Time: 22:51
Sample(adjusted): 1997 2019
Included observations: 23 after adjusting endpoints
Estimation method: method of scoring (analytic derivatives)
Convergence achieved after 18 iterations
Structural VAR is over-identified (3 degrees of freedom)

	Coefficient	Std. Error	z-Statistic	Prob.
C(1)	-167.1075	57.54500	-2.903946	0.0037
C(2)	-3.031118	0.472047	-6.421226	0.0000
C(3)	-166.8499	94.52815	-1.765082	0.0775
C(4)	2.148176	0.316731	6.782330	0.0000
C(5)	0.007784	0.001148	6.782330	0.0000
C(6)	0.948902	0.139908	6.782330	0.0000
C(7)	0.004739	0.000699	6.782330	0.0000

Model: Ae = Bu where E[uu']=I
Restriction Type: short-run pattern matrix

A =				Estimated A matrix:			
1	C(1)	C(2)	C(3)	1.000000	-167.1075	-3.031118	-166.8499
0	1	0	0	0.000000	1.000000	0.000000	0.000000
0	0	1	0	0.000000	0.000000	1.000000	0.000000
0	0	0	1	0.000000	0.000000	0.000000	1.000000
B =				Estimated B matrix:			
C(4)	0	0	0	2.148176	0.000000	0.000000	0.000000
0	C(5)	0	0	0.000000	0.007784	0.000000	0.000000
0	0	C(6)	0	0.000000	0.000000	0.948902	0.000000
0	0	0	C(7)	0.000000	0.000000	0.000000	0.004739

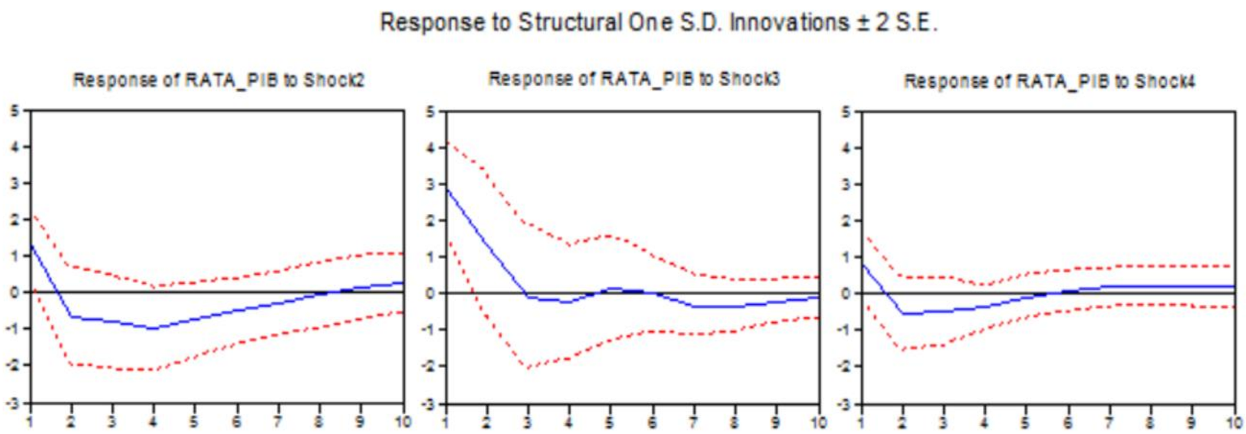

Figure No. 3
Results of Structural VAR(2) model
Source: author's estimations based on AMECO database