



BUCHAREST UNIVERSITY OF ECONOMIC
STUDIES

DOCTORAL SCHOOL OF FINANCE AND
BANKING



The Evolution of Fiscal Multipliers during the Global Financial Crisis. The Case of Romania

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- ✓ **Motivation and objectives**
- ✓ **Literature Review**
- ✓ **Econometric Methodology, Data and Results**
- ✓ **Conclusions and Areas for Further Research**
- ✓ **References**

Motivation

- ✓ The economic crisis that started in 2008-2009 determined governments and central banks to focus on the role of **fiscal policy**.
- ✓ Fiscal policy is a tool for macroeconomic stability. Lately, public debates concentrated on fiscal consolidation strategies and mostly on short term results.
- ✓ European countries have faced high levels of public debt. The crisis met a new phase, where the initial problems of private sector insolvencies shed over the public sector.
- ✓ The traditional monetary policy transmission mechanism lost its capacity to encourage private consumption. Furthermore, many countries reached their zero lower bound on interest rate, with no room to reduce it.
- ✓ This paper completes the research about fiscal policy efficiency in emerging countries.

Objectives

- ✓ **Calculating fiscal multipliers for government spending and revenues in Romania**
 - ✓ SVAR Model with two identification schemes (recursive approach and Blanchard-Perotti approach)
- ✓ **Checking for robustness and implementing alternative models**
 - ✓ Decomposition of fiscal variables in their constitutive elements
 - ✓ Introduction of new variables in the model
- ✓ **Explaining the results through describing the key factors that determine the size of the fiscal multipliers in Romania**

Fiscal multipliers

- ✓ Represent the ratio of a change in output to an exogenous change in the fiscal deficit with respect to their respective baselines (Spilimbergo et al., 2009).
- ✓ There are several definition that are of interest:

$$\textit{The impact multiplier} = \frac{\Delta Y(t)}{\Delta Z(t)}$$

$$\begin{aligned} \textit{The peak multiplier over a time horizon } N \\ = \max_N \frac{\Delta Y(t + N)}{\Delta Z(t)} \end{aligned}$$

$$\textit{The cumulative multiplier at a time horizon } N = \frac{\sum_{j=0}^N \Delta Y(t + j)}{\sum_{j=0}^N \Delta Z(t + j)}$$

- ✓ Fiscal policy is transmitted through a complex mechanism of institutional and human elements. Government's measures to stimulate economic growth are conditioned by private agents' behavior, anticipations and reactions.

Factors of influence

- ✓ Ilzetzki, Mendoza and Végh (2011), Batini, Eyraud and Weber (2014) describe the key factors of the size of fiscal multipliers:
 - ✓ Trade openness degree
 - ✓ Exchange rate regime
 - ✓ Indebtedness
 - ✓ Size of automatic stabilizers
 - ✓ Public finances management and administration
 - ✓ State of the business cycle
 - ✓ Degree of monetary accommodation to fiscal shocks

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Literature Review

- ✓ **Linear VAR models**
 - ✓ The recursive approach – Fatás and Mihov (2001)
 - ✓ The structural VAR approach (SVAR) – Blanchard and Perotti (2002) and Perotti (2004)
 - ✓ The sign restriction approach – Uhlig (2005), Mountford and Uhlig (2010) and Caldara and Kamps (2008)
 - ✓ The narrative approach – Ramey and Shapiro (1998), Perotti (2007) and Caldara and Kamps (2008)
- ✓ **Non-linear VAR models**
 - ✓ Smooth Transition VAR models – Auerbach and Gorodnichenko (2010), Batini, Callegari and Melina (2012)
 - ✓ Threshold VAR models – Baum and Koester (2011), Fazzari et al. (2012)
 - ✓ Time Varying Parameter VAR models – Karagyozyova-Markova et al. (2013)
- ✓ **DSGE models** – Sims and Wolff (2014)

Fiscal multipliers in emerging economies

Authors	Sample (quarterly data)	Government spending		Government revenue		Identification strategy
		Short term	Medium term	Short term	Medium term	
Ilzetzki, Mendoza and Végh (2011)	24 developing countries of the world (1960s-2000s)	(-0.2; 0.3)	0.2	-	-	Panel VAR
Crespo Cuaresma, Eller and Mehrotra (2011)	Czech Republic	-	-0.04	-	0.03	Blanchard- Perotti
	Hungary	0.01	0.01	-	-0.01	
	Poland	-	-0.02	-	0.02	
	Slovakia	-0.01	0.00	-0.02	-0.1	
	Slovenia	-0.01	-0.01	0.01	0.02	
Karagyozyova- Markova, Deyanov and Iliev (2013)	Bulgaria (1999:1 – 2011:3)	(0.03; 0.17)	(0.48; 0.7)	(0; 0.91)	(1.02; 1.48)	Cholesky decomposition, Blanchard- Perotti and TVP-VAR
		(0.01; 0.41)	(0.87; 0.92)	(-0.19; 0.3)	(-0.21; 0.43)	
		(0.15; 0.3)	(0.18; 0.40)	-	-	
Petrović, Arsić and Nojković (2014)	10 European emerging countries (1999:1 – 2012:3)	(0.2; 0.58)	0.2	-0.4	0	Blanchard- Perotti

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Econometric Methodology

Data description

✓ Romanian quarterly data, 2000Q1 – 2014Q4

Variable and notation	Description and calculation	Unit	Source	Transformation
Government spending (g)	Government spending = Intermediate consumption + Compensation of employees + Gross fixed capital formation	Log millions units of domestic currency	Eurostat	The variables were deflated using the GDP deflator (2005=100) and seasonally adjusted using Tramo Seats method in Eviews. The first difference was applied in order to ensure stationarity
Net government revenue (t)	Net government revenue = direct taxes + indirect taxes + social contributions – subsidies – social benefits			
Real GDP (y)		Chain linked volumes (2005=100), log millions units of domestic currency, seasonally adjusted series	Eurostat	First difference in order to achieve stationarity
Inflation rate (p)	Quarterly modification of prices, calculated based on the Consumer Price Index	%	National Institute of Statistic	
Short term interest rate (i)	3 months interbank offered rate (ROBOR 3M)	% per annum	National Bank of Romania	First difference in order to achieve stationarity

VAR Model Specification

- ✓ Structural form of the VAR model:

$$A_0 X_t = A(L) X_{t-1} + B \varepsilon_t$$

$A_0 = (m \times m)$ matrix of contemporaneous effects

$X_t =$ vector of endogenous variables, $(g_t \ y_t \ p_t \ t_t \ i_t)'$

$A(L) =$ describes the impact of lagged effects (L-th order lag polynomial matrix)

$B = (m \times m)$ structural form parameter matrix

$\varepsilon_t =$ vector of structural shocks

$$E(\varepsilon_t) = 0, \quad E(\varepsilon_t \varepsilon_t') = \Sigma \varepsilon = I, \quad E(\varepsilon_t \varepsilon_s') = 0, \quad \forall t \neq s$$

- ✓ Reduced form model:

$$X_t = A_0^{-1} A(L) X_{t-1} + A_0^{-1} B \varepsilon_t = C(L) X_{t-1} + u_t,$$

$$u_t = A_0^{-1} B \varepsilon_t \quad \text{or} \quad A_0 u_t = B \varepsilon_t$$

$u_t =$ vector of reduced form residuals:

$$E(u_t) = 0, \quad E(u_t u_t') = \Sigma u, \quad E(u_t u_s') = 0, \quad \forall t \neq s$$

- ✓ The informational criteria **Schwarz** and **Hannan-Quinn** suggest using a VAR(1) and **Akaike** criterion – a VAR(4) model. In small sample, the latter leads to better results, so 4 lags will be used, similar to Blanchard and Perotti (2002).

The recursive approach

- ✓ Allows for the identification of the fiscal shocks through a Cholesky decomposition of the variance-covariance matrix of errors (Lütkepohl, 2005).

- ✓ It can be written:

$$\Sigma_u = P P'$$

by defining a diagonal matrix D that has the same main diagonal as P and by specifying:

$$A_0^{-1} = P D^{-1} \text{ and } \Sigma_\varepsilon = D D'$$

- ✓ It gives:

$$\Sigma_u = A_0^{-1} \Sigma_\varepsilon (A_0^{-1})'$$

- ✓ The system can be expressed as:

$$\begin{pmatrix} 1 & 0 & 0 & 0 & 0 \\ -\alpha_y g & 1 & 0 & 0 & 0 \\ -\alpha_p g & -\alpha_p y & 1 & 0 & 0 \\ -\alpha_t g & -\alpha_t y & -\alpha_t p & 1 & 0 \\ -\alpha_i g & -\alpha_i y & -\alpha_i p & -\alpha_i t & 1 \end{pmatrix} \begin{pmatrix} u_g \\ u_y \\ u_p \\ u_t \\ u_i \end{pmatrix} = \begin{pmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix} \begin{pmatrix} \varepsilon_g \\ \varepsilon_y \\ \varepsilon_p \\ \varepsilon_t \\ \varepsilon_i \end{pmatrix}$$

- ✓ **The sequence of the variables requires certain assumptions:**

- ✓ government spending does not react contemporaneously to any shock in other variables;
- ✓ output is affected within a quarter only by the government spending innovations;
- ✓ revenues do not react within a period to a interest rate modification, but are influenced by the shocks in spending and output, as a result of changing their respective macroeconomic base.

Blanchard - Perotti approach

- ✓ Reduced VAR model:

$$X_t = C(L) X_{t-1} + u_t$$

- ✓ Matrix A_0 is no longer lower triangular and B is no longer an identity matrix.
- ✓ The system can be written:

$$\begin{pmatrix} 1 & -\alpha_{gy} & -\alpha_{gp} & -\alpha_{gt} & -\alpha_{gi} \\ -\alpha_{yg} & 1 & -\alpha_{yp} & -\alpha_{yt} & -\alpha_{yi} \\ -\alpha_{pg} & -\alpha_{py} & 1 & -\alpha_{pt} & -\alpha_{pi} \\ -\alpha_{tg} & -\alpha_{ty} & -\alpha_{tp} & 1 & -\alpha_{ti} \\ -\alpha_{ig} & -\alpha_{iy} & -\alpha_{ip} & -\alpha_{it} & 1 \end{pmatrix} \begin{pmatrix} u_g \\ u_y \\ u_p \\ u_t \\ u_i \end{pmatrix} = \begin{pmatrix} \beta_{gg} & 0 & 0 & \beta_{gt} & 0 \\ 0 & \beta_{yy} & 0 & 0 & 0 \\ 0 & 0 & \beta_{pp} & 0 & 0 \\ \beta_{tg} & 0 & 0 & \beta_{tt} & 0 \\ 0 & 0 & 0 & 0 & \beta_{ii} \end{pmatrix} \begin{pmatrix} \varepsilon_g \\ \varepsilon_y \\ \varepsilon_p \\ \varepsilon_t \\ \varepsilon_i \end{pmatrix}$$

- ✓ In order to achieve identification, restrictions in contemporaneous responses in the system are imposed:

- ✓ $\alpha_{gt} = \alpha_{tg} = 0$ → Public spending and revenue do not influence each other contemporaneously.
- ✓ $\alpha_{gy} = 0$ → Government spendings are net of transfers, so acyclic.
- ✓ $\alpha_{ji} = 0, \forall j$ → The interest rate does not influence within a quarter any of the variables.
- ✓ $\alpha_{yp} = 0$ → Real GDP does not respond to inflation.
- ✓ $\beta_{gt} = 0$ → Spending decision comes first.

Exogenous elasticities

- ✓ The aggregate values are calculated as weighted averages of the sub-elasticities of each component, using their shares in total revenues or spending.

✓ Government revenues

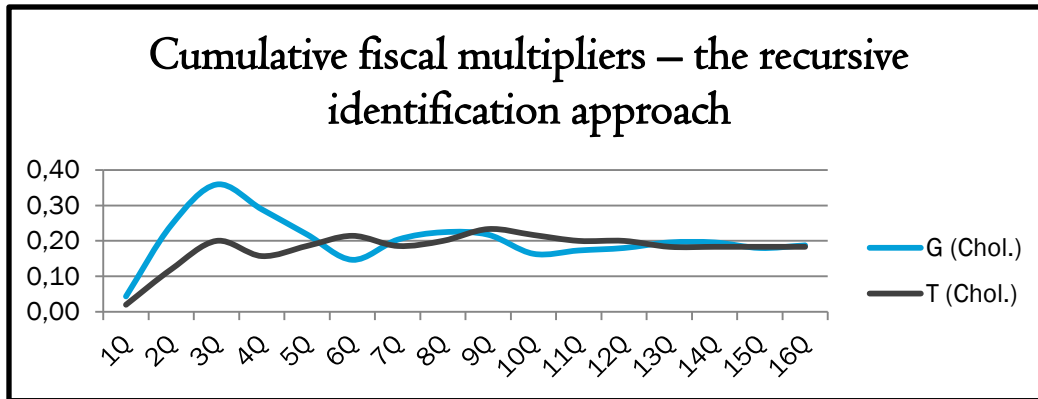
	PIT	CIT	Indirect taxes	Social contributions	Subsidies	Social benefits	Total elasticity
Output elasticity	0.20	1.59	0.94	0.18	0	-0.20	1.20
Price elasticity	0.35	0	0	-0.10	-1	-1	0.84
Share in total government revenue (%)	29.89	9.75	77.31	63.18	-6.43	-73.70	

✓ Government spendings

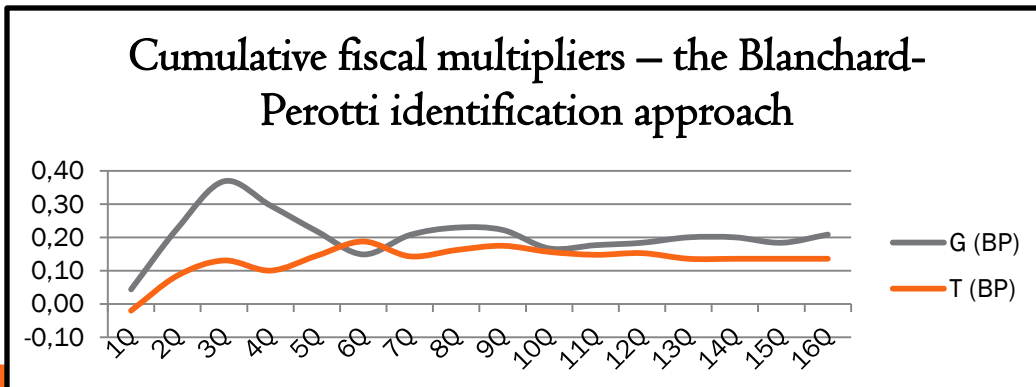
	Intermediate consumption	Gross fixed capital formation	Compensation of employees	Total elasticity
Price elasticity	0	0	-1	-0.45
Share in total government spending (%)	32.65	21.76	45.59	

Results

Baseline model : Fiscal multipliers have small dimensions.



- ✓ Results for the expenditure multiplier are in line with Ilzetki et al. (2011).
- ✓ After 5 quarters, the revenue multiplier overpasses the one of spending, but in the long run they have similar dimensions (0.18).
- ✓ Peak values: G: 0.35 ; T: 0.23



- ✓ Spending multiplier has a similar value as in the recursive approach.
- ✓ Revenue multiplier is smaller and negative at impact (long run value:0.13).
- ✓ Results are in line with the Keynesian theory (higher spending multipliers)
- ✓ Peak values: G: 0.36; T: 0.18

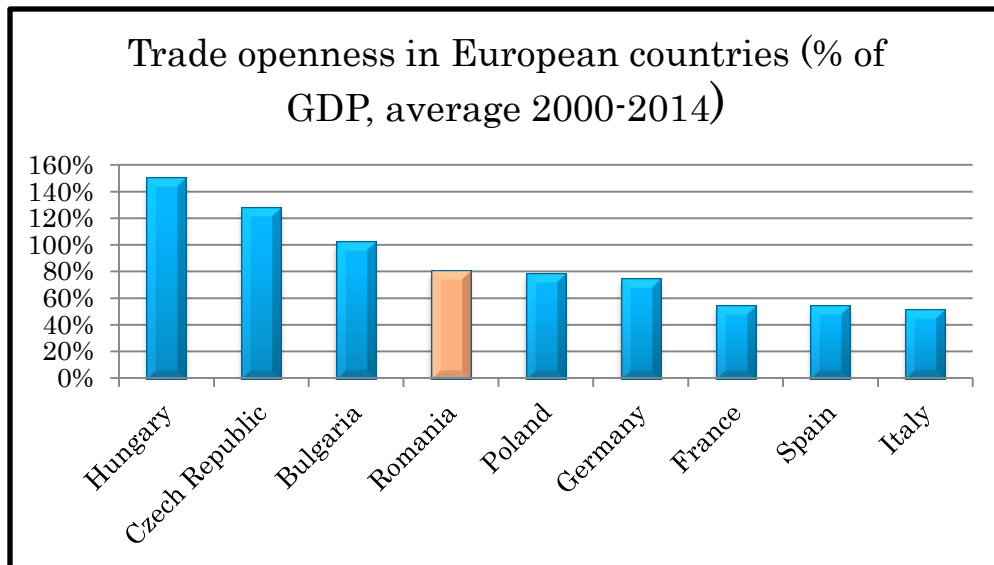
Identification approach	Fiscal multiplier	Quarters after the shock				
		1	4	8	12	16
Cholesky decomposition	G	0.04	0.29	0.22	0.18	0.18
	T	0.02	0.15	0.20	0.20	0.18
Blanchard-Perotti	G	0.04	0.29	0.22	0.18	0.20
	T	-0.02	0.10	0.16	0.15	0.13

Key factors of the size of fiscal multipliers

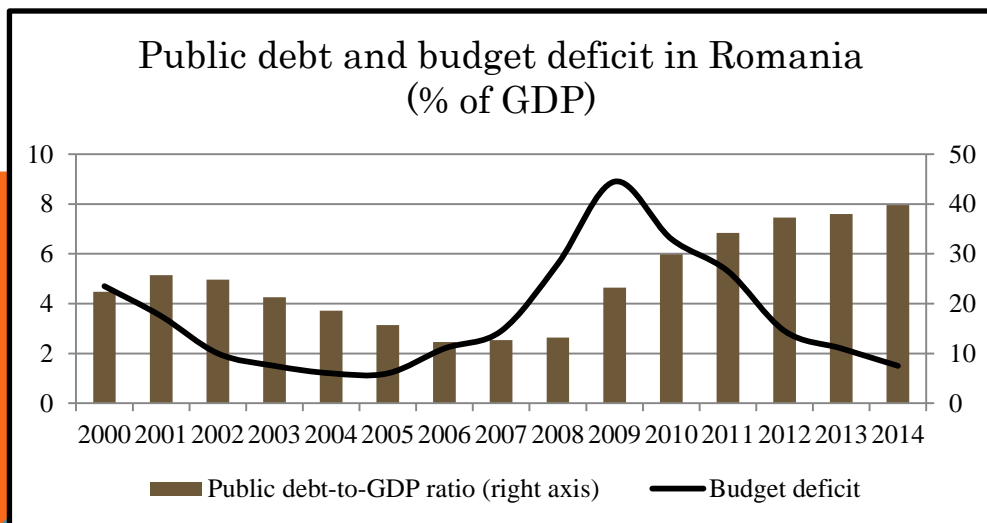
✓ Trade openness degree

- ✓ Romania is a small open economy, which reduces the fiscal multipliers.

✓ Flexible exchange rate regime



Source: Eurostat, European Commission

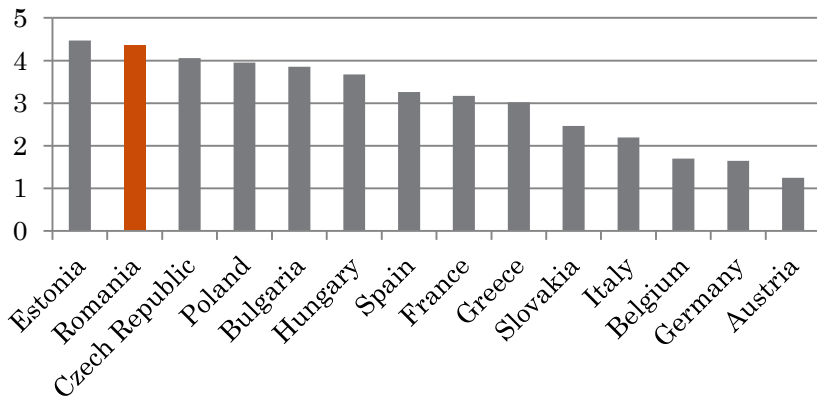


✓ Public debt and budget deficit

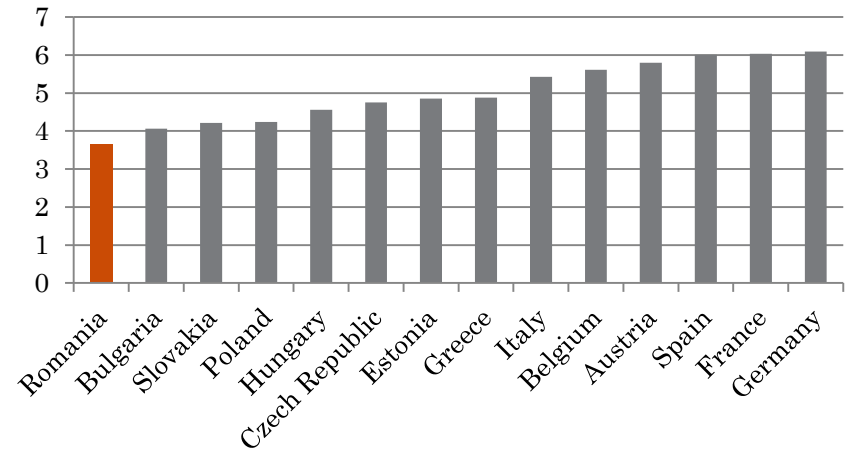
- ✓ The public debt-to-GDP ratio is relatively small, but fiscal policy is not predictable and trustworthy. Between 2009 and 2013 there were over 130 changes of the Fiscal Code.
- ✓ Budgetary equilibrium suffers in the absence of a coherent long term fiscal strategy.

✓ Public finances management and administration

Public investment spending (% of GDP, average 2000-2014)



Infrastructure score (2014)



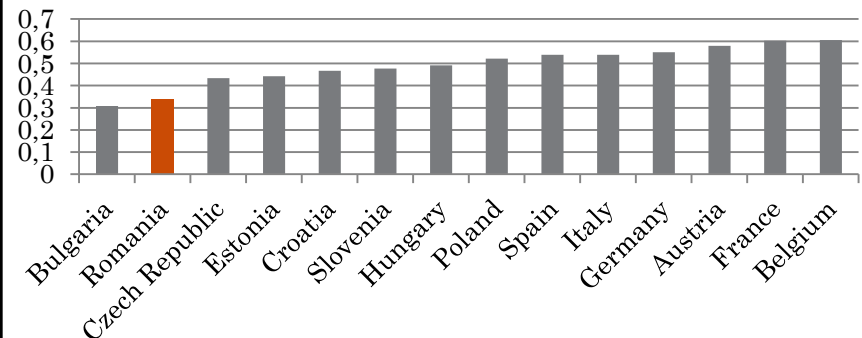
- ✓ High allocation of investment spending, but weak infrastructure → inefficient expenditures

Source: Eurostat, World Economic Forum, The Global Competitiveness Report 2014-2015

✓ Small size of automatic stabilizers

- ✓ They are measured as the semi-elasticity of budget balance and their level acts inversely on fiscal multipliers.

Automatic stabilizers in European countries



Source: European Commission (2014)

Robustness Check

a. VAR(1) vs VAR (4)

b. Different elasticities of taxes with respect to output and prices

(following Crespo

Cuaresma et al., 2011,

$\alpha_{ty} = 0.8$ and $\alpha_{tp}=0.5$)

c. Different price

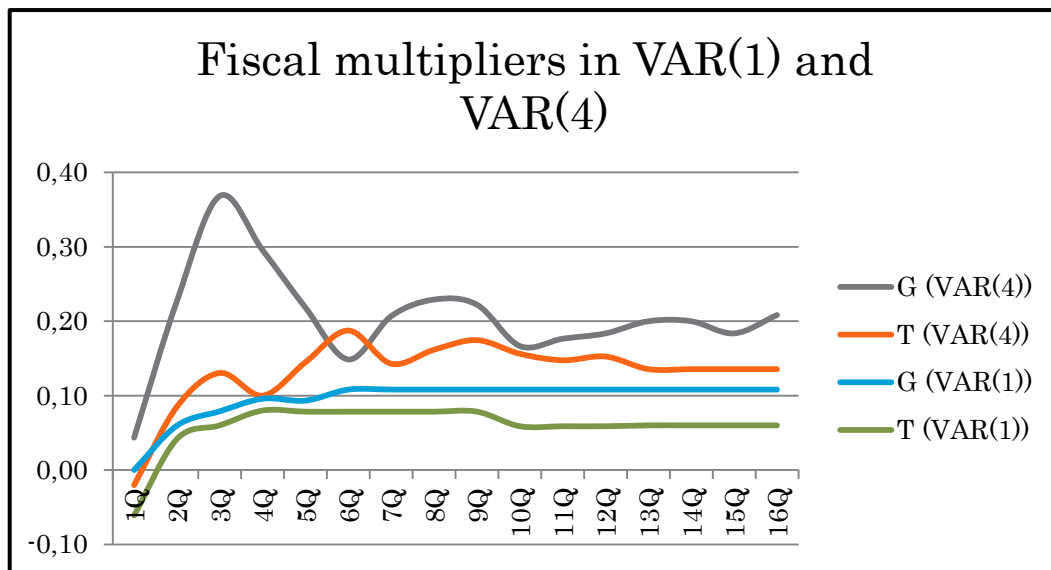
elasticity of

government spending

(α_{gp} from -1 to 0)

d. Taxes decision comes

first: $\beta_{tg} = 0$



- ✓ Lower and flat-shaped multipliers in a VAR(1) model → VAR(4) better captures the system dynamics.
- ✓ When the output elasticity of taxes is set to 0.8, the multiplier is smaller.
- ✓ In the other cases, the results do not change significantly.

Extended models

Cumulative fiscal multipliers of government spending and revenue components

Component	Quarters after the shock					Peak multiplier
	1	4	8	12	16	
Intermediate consumption	0	0.17	0.12	0.15	0.14	0.44 (5Q)
Gross fixed capital formation	0	0.08	0.06	0.05	0.05	0.08 (3Q)
Compensation of employees	0.11	0.30	0.23	0.23	0.22	0.33 (3Q)
Direct taxes	0	0.12	0.08	0.08	0.09	0.13 (3Q)
Indirect taxes	-0.01	0.23	0.11	0.14	0.12	0.38 (5Q)
Social contributions	0.03	0.42	0.34	0.30	0.31	0.45 (3Q)

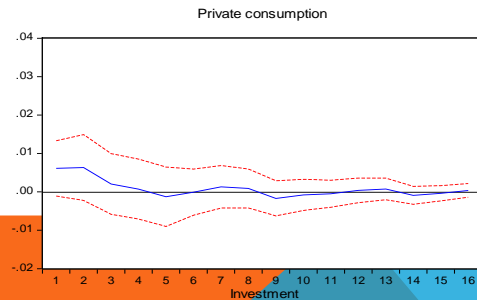
- ✓ Public spending for employees compensation have the biggest impact on output, given their share in total expenditures (45.6%).
- ✓ Social contributions revenues are the second largest component of revenue, but they are higher than the VAT component of indirect taxes (average of 9% compared to 7.9%)

Extended models (2)

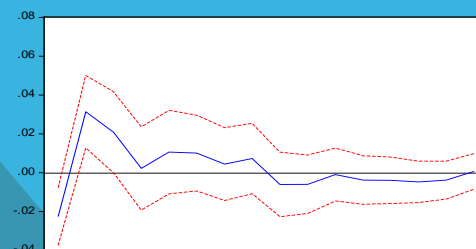
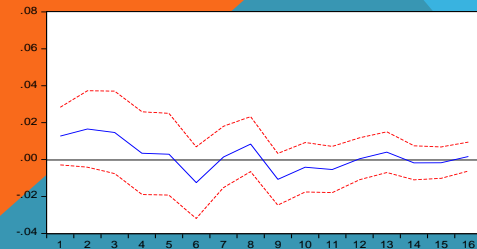
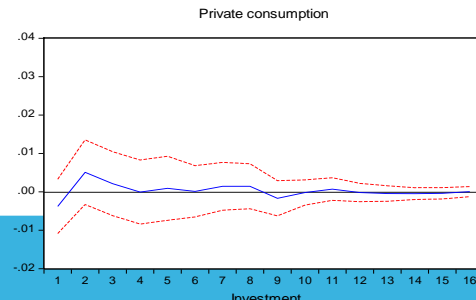
Cumulative multipliers of private consumption and of investment
(following Heppke-Falk et al., 2006)

Endogenous variables	Cumulative multiplier			Peak value	
		Impact	First year		Long term
Government spending, private consumption, inflation, government revenue, interest rate	G	0.07	0.33	0.25	0.39 (3Q)
	T	-0.08	0.04	0.08	0.11 (8Q)
Government spending, investment, inflation, government revenue, interest rate	G	0.14	1.00	0.65	1.10 (3Q)
	T	-0.48	0.49	0.71	0.96 (8Q)

Impulse responses to a positive government spending shock



Impulse responses to a positive government revenue shock



- ✓ Neo-Keynesian theory: private consumption is crowded in by government spending and crowded out by taxation.
- ✓ Neoclassical theory: a positive shock in public spending leads to a raise in investment.
- ✓ The effects of spending and revenue have opposite signs on impact.


Extended models (3)

Following Ilzetzki, Mendoza and Végh (2011) and Petrović et al. (2014)

VAR Model	Quarters after the shock				Peak multiplier
		Impact	First year	Long term	
Baseline model with Blanchard-Perotti identification	G	0.04	0.29	0.20	0.36 (3Q)
	T	-0.02	0.10	0.15	0.18 (6Q)
Exogenous variable: public debt (Ilzetzki, Mendoza and Végh, 2011)	G	0.03	0.25	0.16	0.36 (3Q)
	T	-0.06	0.08	0.09	0.14 (6Q)
Endogenous variables: g, y, current account, Δ reer (Petrović et al., 2014)	G	0.01	0.12	0.07	0.15 (3Q)
Endogenous variables: g, t, y; Exogenous variables: current account, Δ reer, output gap of EU-15 (Petrović et al., 2014)	G	0.02	0.16	0.05	0.25 (3Q)
	T	-0.04	0.05	0.08	0.10 (3Q)

- ✓ Fiscal multipliers tend to have a smaller value when other variables are included in the model, because they bring additional information about macroeconomical factors (exchange rate regime, public finances sustainability) that diminish the impact of fiscal stimuli.

Caveats

- ✓ Shortness of data series – it can lead to inconclusive results.
 - ✓ VAR model is linear and it does not take into consideration the relationship between fiscal shocks and the business cycle.
 - ✓ Assumption of restrictive hypotheses (exogenous elasticities)
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Conclusions

- ✓ The fiscal multipliers obtained in Romania for period 2000-2014 are in line with other studies in the literature:
 - ✓ first-year spending multipliers: 0.01 to 0.36
 - ✓ first-year revenue multipliers: -0.06 to 0.15.
- ✓ Their dimension is reduced compared to advanced economies, Romania being a small open country. The flexible exchange rate regime lowers this value, while the automatic stabilizers and public debt levels acts on it in the opposite way. The collective lack of confidence of agents makes it hard for the government revival actions to take effect.
- ✓ Among the fiscal variables components, changes in compensations of public sector employees and in social contributions spread the most efficiently in the economy.
- ✓ Private consumption reacts more slightly than investment to a fiscal shock, fact that reinforces the idea of a need for reorganization of public expenditures, in the sense of directing them into investment plans that could sustain the long term economic development.
- ✓ Raising the question of public debt influence leads to smaller values for the multipliers.
- ✓ The large palette of values in the literature can be explained by a plurality of political, financial and economic factors and by the absence of a commonly accepted econometric methodology to identify exogenous fiscal shocks.

Areas for Further Research

- ✓ Non-linear fiscal multiplier analyze: applying a Threshold VAR, a Time-Varying Parameter VAR or a Regime-Switching VAR, to highlight the effects of business cycles over fiscal policy efficiency in Romania.
- ✓ Transmission of foreign fiscal shocks (from an important trading partner) in domestic output, considering that Romania is an emerging country that can support many influences.
- ✓ Avoiding data series length restrictions by implementing models calibrated with explicit macroeconomic basis (DSGE models)

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THANK YOU FOR YOUR ATTENTION!

