Fiscal Policy and Economic Growth – The Crisis Aftermath

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ABSTRACT

The purpose of this study is to analyze the effectiveness of government spending and net taxes in Bulgaria for the period after the recent crisis. An empirical evaluation is based on two approaches. First, the ARDL analysis based on the Index of industrial production monthly data shows that the long term multiplier effects are valued 1.35 for spending, and close to 0.7 for net taxes. Second, using SVAR robust check based on GDP data the estimated values of the first-year multipliers are respectively 0.5 and 0.2 while the cumulative impact effect reaches up to 0.8 and 0.4.

Keywords: Fiscal Policy, Economic Growth, Fiscal multipliers, SVAR, ADRL

JEL Codes: C32, E62

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The views expressed herein are those of the author and do not necessarily represent the views of the Communications Regulation Commission. All remaining errors in the paper are solely the responsibility of the author.

INTRODUCTION

With the effects of the global economic crisis, the signals for recovery of the Bulgarian economy are contradictory, as the optimistic expectations for increasing external and domestic demand alternate with adverse factors. Despite near-zero economic growth after 2009, sustainable deflation from mid 2013 to early 2015 and the bankruptcy of a major banking institution, the budgetary authorities in charge lack a clear coherent strategy on how to stimulate growth after the depression – whether spending should be increased or whether austerity should be applied. The ECB policy of monetary easing, i.e. buying bonds, significantly reduced the interest rates in the euro zone countries, which again beg the question of how justified is the policy of budget deficit financed through long-term bonds. Considering the importance of these issues, the main goal of this work is to calculate the value of the multiplication effect of net taxes and government spending during the last depression of the Bulgarian economy. This is accomplished through the implementation of several research tasks that determine the structure of the material, namely: (1) Clarifying the role and determinants of fiscal multipliers discussed in Section I; (2) Descriptive analysis of the dynamics, structure and trends in long-run economic growth in Bulgaria, and the impact of Government decisions in this process in Section II, and, (3) Selection and application of econometric methods to achieve quantitative measurement of fiscal multipliers and robust check, specified in Section III. The document ends with a conclusion of the empirical results.

I. THE IMPORTANCE AND DETERMINANTS OF FISCAL MULTIPLIERS

Fiscal multipliers provide a quantitative estimate of the change in the final product as a result of changes in government spending and (negative) change in net taxes. Mathematical formulas are as follows:

$$\Delta Yt / \Delta G = \mu \qquad (1a)$$

$$\Delta Yt / -\Delta T = \mu_{tax} \qquad (1b)$$

Measured in this way, the fiscal multipliers are a key parameter to assess the effectiveness of fiscal policy. A multiplier greater than 1 means that fiscal expansion is able to stimulate economic activity and leads to an increase in GDP of greater size than the initial increase in aggregate demand. When a multiplier is less than 1 the initial

increase in aggregate demand is undermined by effects such as crowding out the production activities in the private sector and/or because a fiscal impulse turns into a larger volume of imported goods and services. Since theoretically the multiplier of net taxes is derived from the multiplier of government spending, further analysis will be provided on the second one.

Significant theoretical and empirical evidence supports the idea that the fiscal stimulus can increase productivity and speed up recovery, and *vice versa*. As noted by Corsetti (2011), it can be expected that in a depression it is possible that the multiplier of government spending to grow significantly compared to other phases of the economic cycle. In support of this Rendahl (2012) identifies three key conditions under which the multiplier of government spending can exceed 1, regardless of the financing methods. These conditions are the existence of: 1) a liquidity trap, 2) high unemployment and 3) persistence unemployment.

On the other hand the multiplier depends on many others circumstances, as those which are shown by Buti (2012)[2]:

$$\mu = f\left(\frac{[\,1 - \text{“Confidence“}\,]}{[\text{„Competitiveness“} - \text{„Financial constrains“}]}\right) \qquad (2)$$

The "Confidence"[3] effect in equation (2) reflects: 1) the favorable impact of austerity on the risk premium if accepted for permanent and 2) the non-Keynesian effect of wealth on consumption and investment caused by expected reductions in taxes in the future. According to Bhattacharya and Muherjee (2010) the effect of confidence is most expressed in countries with high levels of public debt to household income ratio while the traditional Keynesian effect exists in countries with low levels of that ratio. The "Competitiveness" effect reflects the improvement in net exports in a policy of austerity due to a reduction in labor costs as a result of pressure from the highest unemployment rate, i.e. in small open economies it is possible that the multiplier of government spending is lower than in closed economies due to export price competitiveness in open economies. The "Financial constrains" effect is expressed as the lack of access to the financial sector of households, which does not allow maximization of lifecycle consumption in a long-run horizon. In this case the current expenditures are primarily a

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[2] Buti and Pench use also "Monetary policy" variable in equation, but this is not the case with Bulgarian national bank (BNB) , so that variable is deleted.
[3] The "Confidence" effect is recognized in vital Giavazzi and Pagano's paper (1990).

function of current income (Keynesian effect), so the multiplier of government spending should be close to the theoretical formulation of Keynes. In addition to these determinants one can add the effect of the fixed exchange rate, known as the Mundell-Fleming effect under which countries with fixed exchange rate have larger multipliers (for empirical evidence see Ilzetzki et. al. 2010). A full examination of the traditional determinants of fiscal multipliers can be found in research of the Bulgarian National Bank and the IMF in 2013.

Along with the traditional factors on the value of the multiplier we should take into account the influence of the mechanisms by which the public spending are operationally established. For example, due to asymmetric information or the opportunity to apply ineffective (even corrupt) practices, it is likely that the value of the multiplier of government spending is low. Beev's study (2012) provides the theoretical interpretation of the causes of inefficiency in the public sector, defined as "quasi-market sector". Generally, in this sub-sector the public authorities satisfy mostly insolvent demand by imitating market rule (procurements). The result is inefficiency, proportional to the difference between "procurement price" (quasi-market price) and the market price[4].

Another aspect of the theory of fiscal stimulus looks into the impact between the changes in aggregate demand and aggregate supply, i.e. potential GDP. There is no consistent evidence for such a claim, but an original study of Blanchard and Summers (1986) raises the idea that there are "hysteresis" links between short-term cycle and long-term trend. Before them Cambel and Mankiw (1987) concluded that any accidental deviation from the trend continues more or less forever. In this case, due to hysteresis effect (π) current GDP would affect potential (Yp), thus:

$$\Delta Yp = \pi \Delta Yt \qquad (3)$$

Then, combining of equations (1) and (3) it follows that:

$$\Delta Yp = \pi \mu \Delta G \qquad (4a)$$

$$\Delta Yp = \pi \mu_{tax} \Delta G \qquad (4b)$$

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[4] Quasi-market price cannot be lower than the market price, because undertakings themselves that supply would propose it to the free market. It is appropriate to say, that quasi-market price cannot exceed the budget price cap, too (cf. additionally Beev 2012).

The above equations (4a and 4b) show that the cumulative long-run effect (V) steamed by undertaken fiscal expansion is the sum of the change in the current GDP and this amount of change in potential GDP, arising from ΔG:

$$V = \mu + \mu\pi/r \qquad (5a)$$

$$V = \mu_{tax} + \mu_{tax}\pi/r \qquad (5b),$$

where r is the social discount rate that calculates present value of the future flows into infinity period.

DeLong and Summers (2012) consider it very likely that hysteresis effect are to be significantly higher in periods of crisis than under normal conditions, and therefore the value of the multiplier of government spending also to be higher. In this connection, the study of the duration of the effects of the change in fiscal variables is far more complex and important for the implementation of a specific policy matter.

II.   THE GOVERNMENT IMPACT ON LONG-RUN ECONOMIC GROWTH STRUCTURE

In accordance with the tasks in determining the spending multiplier value and its interpretation, this section examines the state of the economy in terms of the dynamics and trends of the major factors of economic growth in Bulgaria, based on the methodological framework of growth accounting for almost two decades, focusing on the years after the economic crisis in 2009. This section contributes to clarifying the importance of the public sector in the growth process. Detailed analysis takes into account that in addition to aggregate demand, fiscal instruments also impact on aggregate supply. Hence, theoretically, there are two interrelated (generated by similar source) effects, that operating as movement on demand curve and shift the aggregate supply curve. Thus the concept of hysteresis effect should be integrated into the interpretation of the assessment of fiscal multipliers for different time horizons.

Over the past few years the boom and bust periods have clearly been outlined, distinct from the beginning of the global economic crisis in Bulgaria in 2009, just before the first signs of "overheating" of the Bulgarian economy in which the current GDP exceeds the potential GDP. As shown in Figure 1, for the whole period the pace of

growth in core total factor productivity (TFP)[5] decreases by around 2 percentage points. between its average levels for 1998 to 2008 compared to 2009 to 2014 (respectively average growth rates are 2.8% and 0.9%). This gives us reason to believe that, besides the negative external environment, in the Bulgarian economy there are structural factors that limit rapid economic and technological growth. On the other hand, the cyclical component of TFP reflects the degree of use of production factors and lagged effects of production factors dynamic related to current output dynamic. The data for the cyclical part of TFP gives ground to assert that the pace of growth in capacity utilization of factors of production (approximation to the optimal production at a technological level) in the last five years have not yet been sufficient to neutralize the negative shock in 2009.
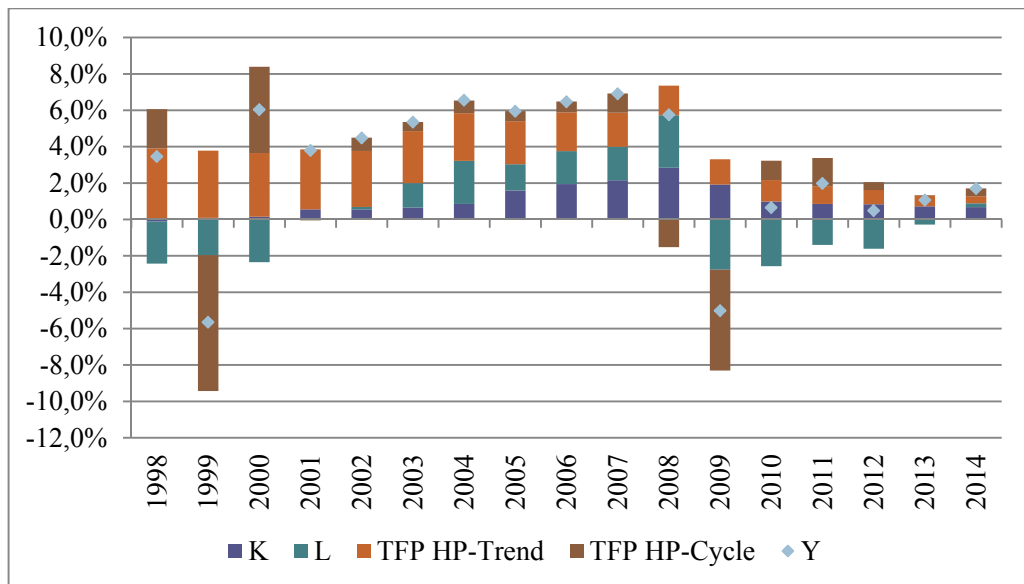
Figure 1 – Factors of economic growth in Bulgaria for the period 1998 – 2014

Source: Own calculations, based on National Statistical Institute data.
*Legend: **K** – capital contribution; **L** – labor contribution; **TFP HP-Trend** – core TFP contribution; **TFP HP-Cycle** – cyclical TFP contribution; **Y** – GDP growth.*

With the beginning of the global financial crisis in late 2007, with some delay, the external shock reached the Bulgarian economy, transported mainly through transmission mechanisms of trade with the EU and the flows of foreign direct

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[5]Assuming that aggregate output is a function of production factors, technological development and efficiency coefficient, which reflects the distance between the optimum production such that match the relevant technological level, and presence of Single-elasticity of substitution between factors of production, one might decompose TFP, such as: dTFP = dT+dTE + (v-1)(α/vdL+β/vdK), where dT e technologic change, dTE is technical change, α, β and v are respectively elasticity of production to labor, capital and sum of the last two.
As assuming (α+β=v=1), the change of "core" TFP (dT) is derivate from HP-trend of Solow residual (λ = 400).

investment[6] (FDI). For the period 2009 – 2014, the gross fixed capital formation decreased by about 40%, while hours worked declined by nearly 9% with a slight increase in 2014. This decrease in domestic investment and labor input has a main supply side impact on the slow economic growth after 2009.

Figure 2 depicts the decomposition of capital contribution to economic growth. It shows a decline in the rate of formation of private capital and an oscillatory contribution of the public capital, including EU funding. Ultimately, despite the relative increase in capital expenditures at the end of the period, the last one (public capital contribution) is not able to offset the decrease in private investment. Given these trends, total capital impact slows significantly by 3 percentage points compared to the peak in 2008. It is still below its historical levels for the period 1998 – 2008.
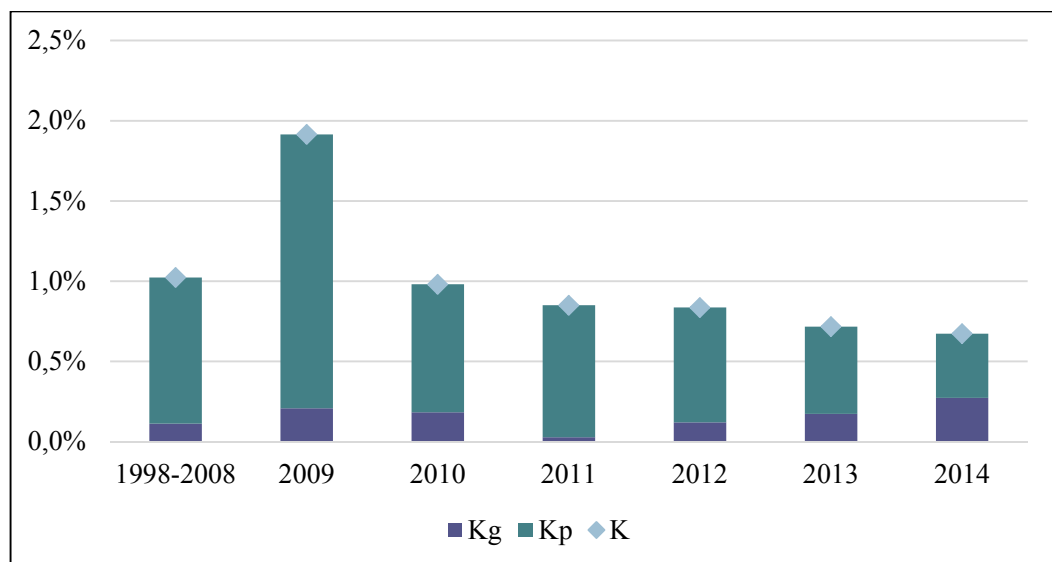
Figure 2 – The contribution of public and private capital on economic growth in Bulgaria for the period 1998-2014

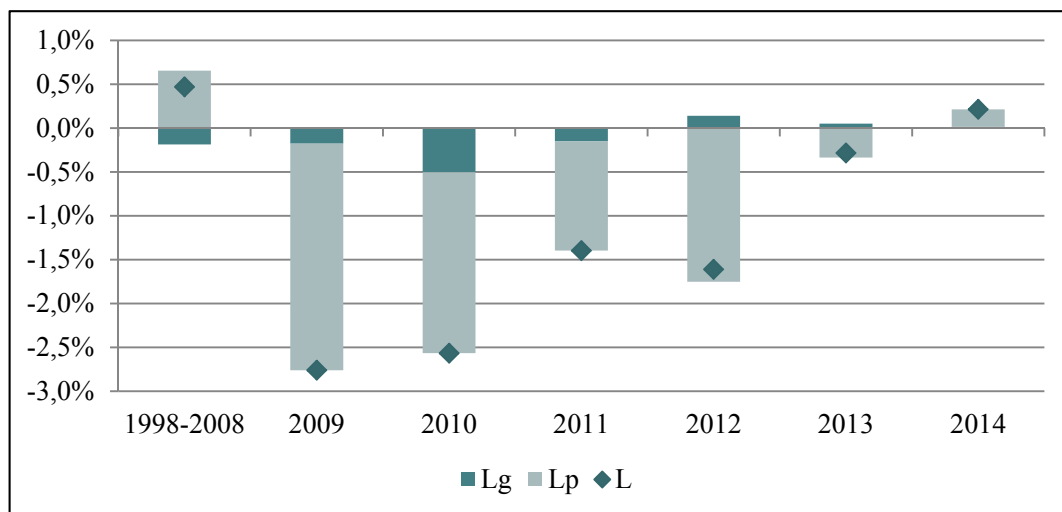*Source: Own calculations, based on National Statistical Institute data*
*Legend: **Kg** – public capital impact; **Kp** – private capital impact; **K** – total capital impact.*

Regarding the labor input, the preferred measure for assessing the impact on growth in most studies is the level of employment, P particularly the indicators number of employees and hours worked. Logically second measurement should be more accurate for comparisons and research, as it shows the actual amount of labor input, regardless of changes in the institutional environment, the regulations of the labor market, flexible forms of employment and others. According to Figure 3 below, during the last economic depression, the public sector employees' impact in economic growth

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[6] FDI decreased more than 5 times compared to peak year 2008.

is negative until 2011, while private sector employees' growth was observed as positive only at the end of the period. Although the focus of the study is the period after 2009, it is appropriate to note that hours worked in the "government" have a negative contribution to growth at the expense of the private sector in the historical aspect.

Figure 3 - Contribution of employment in the public and private sector in the economic growth of Bulgaria for the period 1998 – 2014

Source: Own calculations, based on National Statistical Institute data
*Legend: **Lg** - contribution of employees in the government sector; **Lp** - contribution of employees in other sectors; **L** - total employment contribution to GDP growth.*

In conclusion on the contribution of the main production factors to the economic growth it is worth mentioning that the role of government spending (in this case mainly for compensation of employees and capital expenditures) is essential in the structure of growth. Furthermore, by allocating funds to specific sectors and activities, government spending can shift as the aggregate for both, demand curve and supply curve, allowing through investments in research, education and basic infrastructure to improve the quality characteristics of the production activities. This feature is essential for stability and persistence of the multiplier effect in the fiscal policy conduction. However, government participation in the mixed type economy determines the need for additional resources for the functioning of the state apparatus. In this regard, each reallocation of resources by government has its opportunity cost, thereby measuring the pure effect becomes more complex, as stated in section I.

III. FISCAL MULTIPLIERS ESTIMATION

1. Data

The definition of fiscal variables to be tested is carried out by the functional separation to government spending (G) and net government revenue (T). As noted in the previous section, except for capital expenditures and labor costs, government spending also includes maintenance of the state apparatus. Net taxes on the other hand take into account revenues in the consolidated budget, excluding revenues from the EU corrected with social payments and subsidies. A similar division is used and stated in the IMF study (2012), but given the prevailing solidarity component of the social security and pension system in Bulgaria, social security contributions paid by the budget are counted as positive transfers here (for more details see Appendix 1, Table 1).

After components aggregation, the fiscal variables are consistently converted from nominal to real terms by deflating with an index of industrial prices for monthly data and the GDP deflator in the data on a quarterly basis, with the aim of comparability with the used proxy of final output. Then, the fiscal variables are made to logarithms and are seasonally adjusted by TRAMO/SEATS. As shown in Figure 4 below, for the period 2009 – 2014 government spending have managed to make up for the loss during the shock in 2009 and grow by the end of the period, reaching pre-crisis levels. In observed net taxes there is deeper and steady decline.
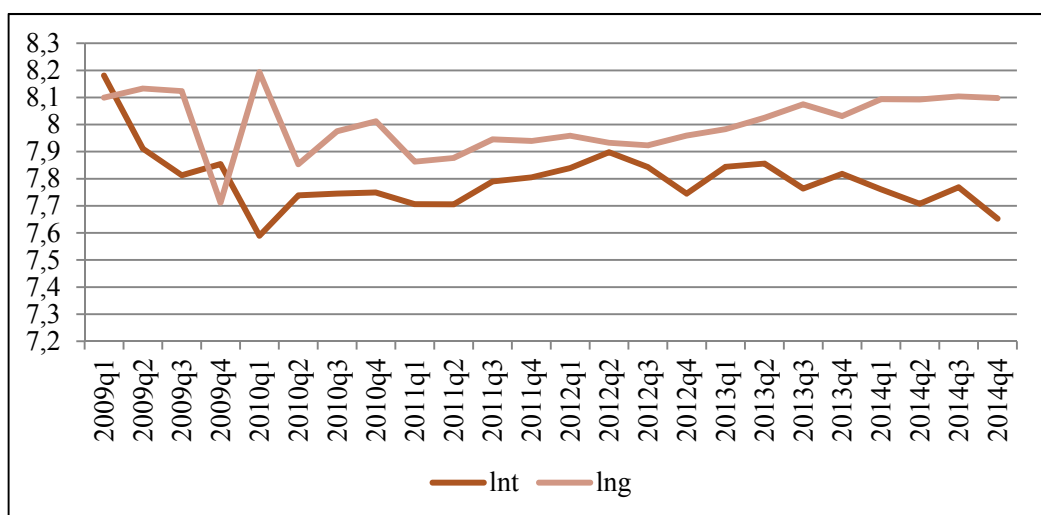
Figure 4 - Dynamics of fiscal variables on quarterly basis for the period 2009Q1 - 2014Q4 (Constant prices 2010, logarithms and seasonally adjusted)

Source: Own calculations based on data of the Ministry of Finance and the National Statistical Institute
*Legend: **lnt** - net tax revenues; **lng** - government spending;*

On the other hand, during the researched period 2009 – 2014, the economic activity is strongly influenced by the negative external shock, as well as the tentative recovery of its trading partners. This is evident from Figure 5 whereby the dynamics of GDP and index of industrial production is illustrated.
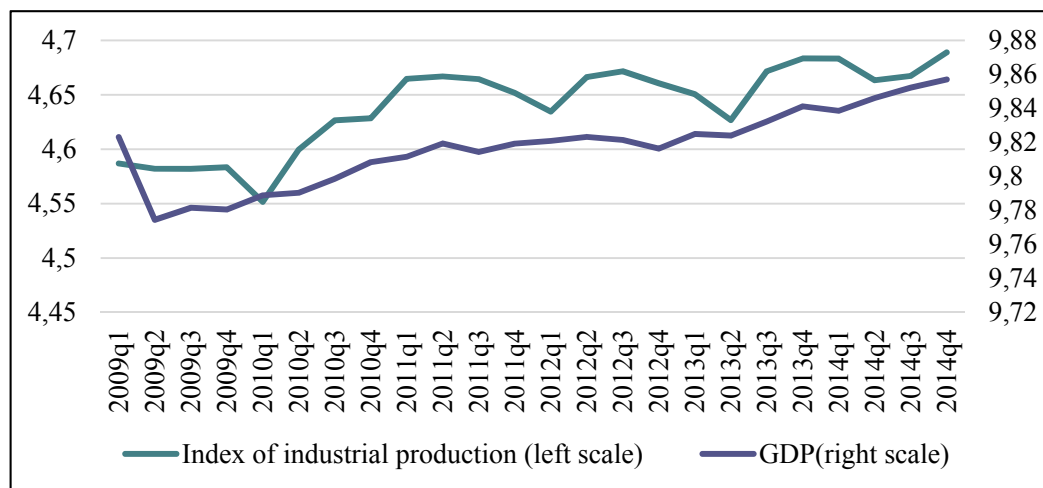
Figure 5 - Dynamics of GDP at prices of 2010 and Index of industrial production on a quarterly basis for the period 2009Q1 - 2014Q4 (Logarithms and seasonally adjusted)

Source: Own calculations based on NSI data
Note: IIP on a quarterly basis is obtained as the simple average of monthly data

2. Methodology

Before proceeding to the quantification of the fiscal multipliers from the methodological point of view it is necessary to determine the degree of integration of the variables considered. In the absence of a unit root given variables can be analyzed using least squares (OLS) in respect to their levels while the presence of a unit root in the general application of OLS would lead to an inaccurate result. In the latter situation it is possible to transform data into stationary through the use of their first differences, which however will result in the loss of valuable information about the long-term relationship between the variables. However, provided that the non-stationary data are integrated of the same order (I(1)) and if they are also co-integrated, it is possible to apply regression analysis with error correction, enabling the study of long-term relationship between them. Very often in practice it happens that the surveyed data to be structured by stationary and non-stationary variables. This situation allows the use of the Bound test technique, known as *Autoregressive Distributed Lag*, *ARDL* or *Unrestricted Error Correction Model*, which is based on the development of Pesaran (2001). This approach allows the use of variables that are integrated by I(1) and I(0)

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order. In general ARDL technique has the advantage because it does not require specific identification of the range of the basic data to explore the availability of long-run relationship between them. In addition, this method is suitable for small sample size, which is an advantage in our case.

After the use of the Augmented Dickey-Fuller (ADF) unit root test of quarterly data, the results show that the null hypothesis for the logarithms of fiscal variables and external demand (as measured by GDP EU28) is rejected, but not for levels of the final product - GDP. However, in the last variable the null hypothesis of a unit root in the first difference is rejected.

Variable	Lags	Schwarz criteria on level data	Schwarz criteria on 1st difference data	Order
Government spending (G)	0	0.0009***	-	I(0)
Net taxes (T)	0	0.0005***	-	I(0)
GDP (Y2)	0	0.8484	0.0000***	I(1)
External demand (Exo)	1	0.0022*	-	I(0)

Table 1 - test for a unit root in the quarterly data

*Note .: *, **, *** reflect the level of statistical significance of 10%, 5% and 1%*

Table 2 below presents the results from the ADF unit root test for the monthly data, where it is seen that again, some of the series are I(1) others are I(0). Null hypothesis of a unit root is rejected for fiscal variables, but cannot be rejected on levels of IIP, as well as foreign demand, measured as an index of industrial production for the EU28. The null hypothesis with respect to the last two variables is rejected when the ADF test is being applied for their first differences.

Variable	Lags	Schwarz criteria on level data	Schwarz criteria on 1st difference data	Order
Government spending (G)	1	0.0194**	-	I(0)
Net taxes (T)	0	0.0000***	-	I(0)
Index of industrial production (Y1)	0	0.1217	0.0001***	I(1)
External demand (Exo)	0	0.4392	0.0001***	I(1)

Table 2 - test for a unit root in the monthly data

*Note .: *, **, *** reflect the level of statistical significance of 10%, 5% and 1%*

ARDL approach

Following Pesaran (2001), the variables can be both I(1) and I(0), but not in the I(2) order. There is long-term relationship if the coefficients to the first lags of the levels on the regressed variables are both non-zero and Wald Test F-statistics are higher than the reference value(s) as mentioned in Pesaran's study. Judging by the results in Tables

1 and 2, this particular method is most appropriate for the purpose of this study, therefore the unrestricted vector error correction model (UVECM) should be applied:

$$dY = Y_{t-1} + X_{t-1} + dY_{t-1..-n} + dX_{t-1..-n} \quad (6),$$

where Y is the dependent variable (final product - GDP or Index of industrial production), and X is the vector of explanatory variables.

Equation (6) indicates that the economic growth is influenced and explained by its past values. The long-term elasticity coefficients are derived as dividing the coefficient before first lag of leveled explanatory variables and the module to the coefficient before first lag of leveled dependent variable. The final equation should be tested for the presence of autocorrelation. Furthermore, if the long-term relationship exists, a second stage of the regression analysis can be performed, which applies error correction using the first lag of the residual obtained by OLS with the levels of the variables. The resulting coefficient before the residual lag should be negative and statistically significant to confirm the existence of a long-run relationship, while its specific value has the information for the speed of converge to the equilibrium level.

In a situation in which there is no evidence for existing long-run relationship between the variables, the SVAR approach was preferred for the purpose of this study. This approach is similar to the findings in Section I, which explains why it's being used to test the stability of those findings.

SVAR approach
As described above, by rejecting the hypothesis for presence of long-term relationship between fiscal variables and the final product at ARDL, this research alternatively applies the structural vector auto-regression (SVAR) method. The VAR method is a linear equation with n variables, each variable is explained by its own lags, along with current and past values of the other $n-1$ variables, so the structural form of the VAR model with n variables in turn has the form:

$$A_0 X_t = \sum A_i X_{t-i} + B e_t \quad (7)$$

The reduced VAR form may be expressed as:

$$X_t = A(L) X_{t-1} + U_t \quad (8),$$

where U_t is the corresponding vector of the reduced form of the residuals with the non-zero cross-correlations.

The relationship between the reduced form of the residuals and their structural form may be expressed as follows:

$$e_t = B^{-1} A_0 U_t \qquad (9),$$

where the matrix A_0 describes the simultaneous connection between variables in vector X_t.

Following Blanchard and Perotti (1999), to find A_0 and B matrix in a model with three variables (GDP, government spending and net taxes) it is can be assumed that the reduced form of the residuals are linear combination of three components:

• Automatic response;

• System-discretionary reaction;

• Random discretionary (structural) shocks.

The third type of shock (structural) has a central role in the analysis of the impulse responses of the final product compared to fiscal shocks, i.e. for calculating the value of multipliers. According to the approach followed in Blanchard and Perotti (2002), the reduced form of the residuals has the following types:

$$u_t^g = \alpha_{gy} u_t^y + \beta_{gt} e_t^t + e_t^g \qquad (10a)$$

$$u_t^t = \alpha_{ty} u_t^y + \beta_{tg} e_t^g + e_t^t \qquad (10b)$$

$$u_t^y = \alpha_{yg} u_t^g + \alpha_{yt} u_t^t + e t^y \qquad (10c)$$

The next step requires the construction of cycle-adjusted fiscal shocks (denoted by CA), by assuming that taxes can not react to shocks in spending within a reporting period (a quarter), then:

$$u_t^g - \alpha_{gy} u_t^y = CAu_t^g = \beta_{gt} e_t^t + e_t^g \qquad (11a)$$

$$u_t^t - \alpha_{ty} u_t^y = CAu_t^t = e_t^t \qquad (11b)$$

Then β_{gt} coefficient from equation (11a) can be obtained by OLS regression, and further using structural shocks e_t^g and e_t^t, the unknown parameters of the equation (10c) can be calculated. In the presence of all demand factors in A_0 and B, structural factorization can be applied to evaluate the effects on the variables in the original model, but this time compared to structural shocks in net taxes and government spending.

3. Results

As referred in the previous paragraph, it was possible to confirm whether there is a long-run relationship between fiscal variables and the corresponding measure of economic activity through ARDL approach. According to equation (6) it is necessary to

determine the structural lags. This is done for each of the variables using Akaike information criterion.

As per Table 3 below, using the Index of industrial production as a measure of economic activity, it covers the required critical levels of F-statistic (5.26 is greater than the upper limits 4.00 and 4.48 at 90% and 95% probability) while using of GDP this condition is not met (2.36 is less than the upper limits 4.00 and 4.48 and did not even cover the lower limits 2.97 and 3.49 at 90% and 95% probability). Consistently, the final equation based on monthly data is tested for the presence of autocorrelation and conducted stability test (CUSUM and squared CUSUM), the results of which are set out in Appendix 2, Tables A.2.1., A.2.2. and Figure A.2.1. In the second stage of regression analysis is applied error correction model using the first lag of the residual obtained in the OLS regression to the levels of the variables (Appendix 2, Table P.2.2.).

F – statistic Wald test		Pesaran (2001) Critical value				
Index of industrial production (monthly data)	5.26	*Prob.*	*90%*	*90%*	*95%*	*95%*
		Order	*I(0)*	*I(1)*	*I(0)*	*I(1)*
GDP (quarterly data)	2.36	Critical value, *K = 3*	2.97	4.00	3.49	4.48

Table 3 - Results of the Wald test for the presence of long-run relationship between GDP, government spending and net taxes

Since the variables are in logarithmic form, we have to transform the relative changes to absolute changes, such as the definition of the traditional Keynesian multipliers. In order for the measured effect in absolute equivalent to be tested, the following equation has to be used

$$M = \frac{\Delta Y}{\Delta F} = \frac{\Delta lnY}{\Delta lnF} / \frac{\tilde{F}}{\tilde{Y}} \qquad (12),$$

where M is the value of a given multiplier, ΔY and ΔF are respectively the change in the final product and the fiscal variable, and ΔlnY and ΔlnF are their percentage changes. $\tilde{F}/\tilde{Y}$ are the average ratio between the fiscal variable and GDP on relevant period researched.

|	Elasticity	Average Y/F ratio	Long-run multiplier
μ	0.219	6.16	1.35
|μ_{tax}|	0.098	6.97	0.68
exo	1.282	-	-
	*ECM = - 0.307***		

Table 4 - Results of the measurement of long-run fiscal multipliers (2009 – 2014)
*Note .: ** reflects the level of statistical significance of 5%*

The analysis so far shows that using monthly data on the Index of industrial production long-term multiplier effect of government spending is higher than 1 (1.35), while the net taxes has a value close to 0.7. Table 4 illustrates this quantitative assessment provided that the average of the ratio of end product/fiscal variable values are taken between GDP and given fiscal variable for the period 2009 - 2014. The measured correction factor leads to the conclusion that the long-term effects between variables can be reached relatively quickly, which is a prerequisite for a limited net positive effect on aggregate supply. However, it should be noted that the index of industrial production is more volatile than GDP and monthly data themselves are more pronounced seasonal, which can cause overestimation of the multiplier effect and underestimated measurement the necessary period of adjustment to equilibrium.

4. Robustness check

Since ARDL approach does not provide the necessary evidence for accurately measuring the fiscal multipliers for quarterly data on GDP, following the methodological notes, we remove the trend from series by HP filter with $\lambda = 1600$. Thus, all data in the econometric model are transformed as I (0), allowing it to be included in the structural VAR model. The optimal number of lags in the model is defined by the Akaike criteria. That SVAR model has taken into account the assumptions referred to in paragraph 2 of this section, as received A and B matrices of structural factorization are shown in Appendix 2, Table A.2.4.
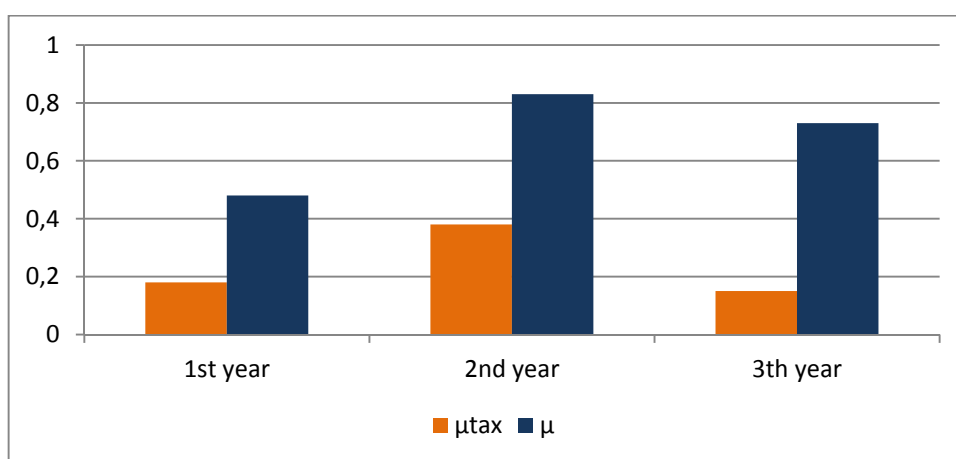
Figure 6 - Measurement of the cumulative multiplier effects on GDP for 12 quarters (3 years)

Source: own calculations
Note: since the impulse response reflecting the effect of 1 std, then in order to obtain the correct value of the multiplier have been made to the respective transformations.

The findings show that the impulse response of GDP to shocks in government spending and net taxes described have similar dynamics, but the multiplier effect in government spending has a strong and continuous magnitude. Multipliers reported for the first year are respectively 0.5 and 0.2 for the government expenditure and net taxes until the cumulative effect reaches maximum values around 0.8 and 0.4 in the medium term and then gradually subsides to neutralize. In both cases the peak of the cumulative effect reaches the second year, which shows that the sustainability of fiscal multipliers is not particularly significant. Ultimately, this confirms the findings from the previous approach, supporting the thesis that the implementation of government policy does not substantially influence in a positive direction on the long-term aggregate supply, and therefore more likely multiplier effect subsides relatively quickly in the time horizon.

CONCLUSION

Evidenced by the results obtained in Section III, the long-term effect of the change in government spending exceeds the negative effect of the change in net taxes during the prolonged economic recovery after the beginning of the recent global economic crisis. The upper bound of the measured spending multiplier values is somewhat higher compared than others calculus for Bulgaria, while the lower bound is considerably closer to the measurements of the IMF and the Bulgarian National Bank. Ultimately, the results can be logically explained by the choice of methodology and the larger number of observations after 2009, in line with macroeconomic theory effects of the economic crisis affecting the value of the multiplier. Regarding the value of the multiplier of net taxes, it can be reported that in similar studies (BNB, 2013) value is approximately two times smaller compared to the value of the multiplier of government spending.

Given the positive values of fiscal multipliers may be inferred that the adoption of fiscal expansion during the crisis has its arguments. The main conclusions concerning recommendations for the conduct of fiscal policy are related to the utilization of a greater part of the funds provided by EU, but mostly to increase particularly the effectiveness of government expenditure for the purpose of sustainable economic growth. In view of the demonstrated resilience of the multiplier effect in Bulgaria, this development gives grounds to assert that within the researched period 2009 – 2014,

there were no significant policies conducive to substantial long-term economic development.

Although in the available literature it can often encounter difficulty in unambiguous empirical assessment of the impact of different fiscal instruments to long-term economic growth, this is the direction to that the researches should be pursued in subsequent. In this regard, a key aspect in the analysis of long-term measures should be social security system in Bulgaria, which generates a significant proportion (and probably will generate a growing share in the future) of general government expenditure and plays a major role in shaping incentives for labor supply.

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Table A.1.1. - Definition of the variables

Variable	Description	Source
Government spending (G)	Wages and Salaries + Current maintenance + Capital expenditures, including EU funds	Minfin
Net taxes (T)	Tax revenue + Non-tax revenues - Social security contributions, incl. paid by the Budget - Social expenditures and grants- Subsidies	Minfin
Final product (1) (Y1)	Index of industrial production (monthly data)	NSI
Final product (2) (Y2)	GDP (quarterly data)	NSI

Appendix 2

Table A.2.1. – Statistically data on ARDL approach

Dependent Variable: D(Y)				
Method: Least Squares				
Sample (adjusted): 2009M03 2014M12				
Included observations: 70 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
Y(-1)	-0.273824	0.090165	-3.036924	0.0035
G(-1)	0.059919	0.028302	2.117085	0.0384
T(-1)	-0.026780	0.015964	-1.677590	0.0986
EXO(-1)	0.350970	0.163410	2.147788	0.0358
D(Y(-1))	-0.037556	0.125310	-0.299703	0.7654
D(T(-1))	-0.005678	0.012153	-0.467226	0.6420
D(G(-1))	-0.016734	0.025180	-0.664573	0.5089
D(EXO(-1))	-0.604951	0.349353	-1.731630	0.0885
C	-0.573476	0.659772	-0.869203	0.3882
DUMMY	-0.069597	0.020092	-3.463886	0.0010
R-squared	0.435209	Mean dependent var		0.001372
Adjusted R-squared	0.350490	S.D. dependent var		0.022798
S.E. of regression	0.018373	Akaike info criterion		-5.024302
Sum squared resid	0.020254	Schwarz criterion		-4.703088
Log likelihood	185.8506	Hannan-Quinn criter.		-4.896712
F-statistic	5.137101	Durbin-Watson stat		1.915706
Prob(F-statistic)	0.000037			

Table A.2.2. – Statistically data on Serial Correlation Test

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	0.432974	Prob. F(1,59)	0.5131
Obs*R-squared	0.509956	Prob. Chi-Square(1)	0.4752

Table A.2.3. – Statistically data on ARDL approach with error correction

Dependent Variable: D(Y)			
Method: Least Squares			
Sample (adjusted): 2009M03 2014M12			
Included observations: 70 after adjustments			
Variable	Coefficient	Std. Error	t-Statistic	Prob.
ECM(-1)	-0.306891	0.092665	-3.311823	0.0015
D(Y(-1))	-0.035948	0.130849	-0.274732	0.7844
D(T(-1))	-0.027664	0.009860	-2.805807	0.0067
D(G(-1))	-0.010432	0.022188	-0.470137	0.6399
D(EXO(-1))	-0.368486	0.349107	-1.055510	0.2952
C	0.002447	0.002326	1.051819	0.2969
DUMMY	-0.073579	0.020688	-3.556533	0.0007
R-squared	0.350224	Mean dependent var		0.001372
Adjusted R-squared	0.288341	S.D. dependent var		0.022798
S.E. of regression	0.019232	Akaike info criterion		-4.969845
Sum squared resid	0.023302	Schwarz criterion		-4.744996
Log likelihood	180.9446	Hannan-Quinn criter.		-4.880532
F-statistic	5.659418	Durbin-Watson stat		1.767630
Prob(F-statistic)	0.000095			

Figure A.2.1. – CUSUM test and CUSUM of squares test

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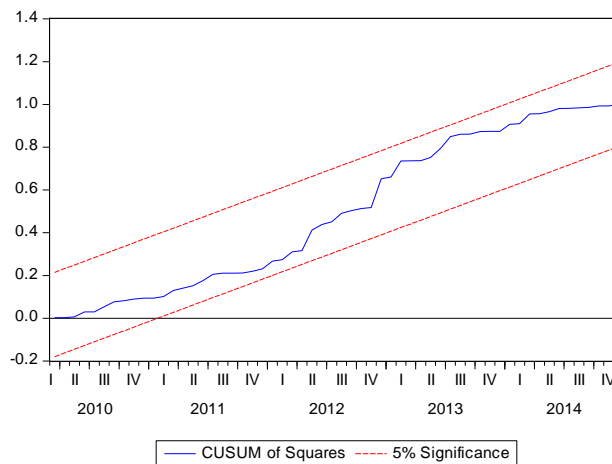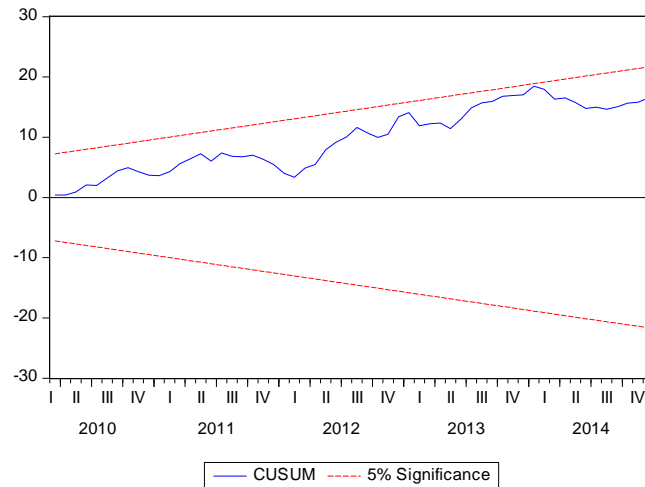
Table A.2.4. - Measurement of structural matrices in testing the SVAR model for the period 2009 - 2014 using GDP

Estimated A matrix:		
1.000000	0.000000	-1.100000
-0.081769	1.000000	0.000000
-0.085104	-0.081769	1.000000
Estimated B matrix:		
0.184539	0.098762	0.000000
0.000000	0.049028	0.000000
0.000000	0.000000	0.014575

Figure A.2.2. - Cumulative response effect of net taxes (T_resid) and government spending (G_resid) shocks to GDP

Accumulated Response to Cholesky One S.D. Innovations ± 2 S.E.

Accumulated Response of Y_RESID to T_RESID

Accumulated Response of Y_RESID to G_RESID