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Original Paper

Dynamic Analysis of Fiscal Policy in the United Kingdom

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Abstract

This paper studies the effects of fiscal stimuli on the real GDP of the United Kingdom for the period of 1997 through the first quarter of 2017. Structural vector autoregressive and vector error correction models are estimated. Impulse responses from both models provide support for the Keynesian view that fiscal stimuli are associated with rises in the real GDP. Variance decomposition analysis shows that over time, depending which model is considered; tax cuts impart a positive effect on the real GDP in the range of 5 to 20 percent. Government expenditure shocks account for 8 to 15 percent of variations in the real GDP based on the two models. The multipliers of tax cuts and government expenditures initially rise reaching a peak in the ninth quarter and decline to 1.60 and 1.74 in three years, respectively.

Keywords

Structural VAR, Impulse Responses, Variance Decomposition, Fiscal Policy Multipliers

1. Introduction

Researchers have examined the association of the government spending and taxes with various macroeconomic variables including private consumption, private investment, infrastructure, private savings, consumption, output level, among others.

Bailey (1971) argues that the government expenditures substitute private consumption and leaves the aggregate demand unchanged. On the other hand, Hall (1980) finds that transitory changes in government expenditures can alter the level of production. Barro (1981) shows empirical support that temporary increases in government purchases are associated with higher output growth than permanent ones. Baxter and King (1993) contradict the findings of both Hall (1980) and Barro (1981) and conclude that permanent changes rather than temporary government purchases are associated with larger output.

Barro (1974), Kochin (1974), Barro (1978), and Kormendi (1983) provide empirical support for the Richardian equivalence proposition. They conclude that the source of government expenditures, whether taxes or government debt, do not affect the aggregate demand. Such findings are rejected by empirical evidence put forth by Feldstein (1982).

Aschauer's (1985) explanation for such polar findings regarding the Richardian equivalence proposition is a possible misspecification bias that casts doubt on the robustness of the findings. His empirical evidence supports the joint hypothesis of rational expectations and Ricardian equivalence. He concludes that the government expenditures may be a poor substitute for private consumption. Hemming, Kell and Mahfouz (2002) offer a comprehensive review of research regarding the fiscal policy.

Other research papers present further conflicting conclusions regarding the fiscal policy and the economy. The neoclassical macroeconomists hold the view that exogenous rises in government expenditures financed by taxes, raise output and real interest rates. Aiyagari, Christiano and Eichenbaum (1992), Christiano and Eichenbaum (1992), Baxter and King (1993) and Burnside et al. (2004), among others, provide evidence to this effect. On the other hand, Phelan and Trejos (2000) and Ramey and Shapiro (1998), show that an exogenous increase in government purchases can lead to either a rise or a fall in real wages and output in various sectors of the economy. Several papers have shown that in the presence of oligopolistic market structures, imperfect competition, and economies of scale in modern economies, rises in the government expenditures may be associated with rising output as well as private consumption and wage rates (See Rotemberg & Woodford, 1992; and Devereux, Head, & Lapham, 1996). The opposing findings may be related to the time period, the available data, and the methodologies.

The past two decades has seen a surge in the application of vector autoregressive (VAR) and structural vector autoregressive models (SAVR) by many macroeconomic researchers to accommodate the dynamic and stochastic responses of the economy to various exogenous shocks. Seminal papers using SVARS and addressing monetary policy are Leeper et al. (1996), Christiano, Eichenbaum and Evans (1997) and Favero (2001). Among pioneering researchers that have investigated fiscal policy using this methodology are Fatas and Mihov (2001a, 2001b), Blanchard and Perotti (2002), Favero (2002), and Gali, Lopez-Salido and Valles (2005), Giordano et al. (2007), among others.

Giordano et al. (2007) employ a VAR to examine the effects of exogenous shocks to government purchases on the economy of Italy. They find that an exogenous one percent shock to government purchases results in a 0.6% rise in the GDP after three quarters and dies off in about eight quarters. Employment, private consumption, investment, and prices also show a positive response, some short-lived.

Blanchard and Perotti (2002) employ SVAR examining the post war quarterly US data. Their approach combines SVAR and event study approaches. Their SVAR identification strategy relies on incorporating institutional variables as well as some estimated elasticities outside of the SVAR system. Findings show that the government spending induces higher output, higher private consumption and crowds out the private investment. Oddly, both exports and imports respond negatively to positive shocks to the government expenditures. Rising taxes do the opposite. Their findings support some tenets of both the neoclassical and Keynesian theory.

This paper is inspired by Blanchard and Perotti (2002), albeit with more modest objectives. We investigate the response of the real GDP to fiscal policy shocks, i.e., shocks to government spending and taxes in the post war British economy. We choose the case of UK because of similarities in the government and the Central Bank approaches with the US. The British government and the Bank of England have experimented with expansionary and contractionary fiscal policies during this period.

The British economy enjoyed growth and a near full employment labor market in the early years following the WWII. Economists and policy makers credited Keynesian economic policies and the aggregate demand management for the favorable economic performance. However, similar to the US, 1970s was the era of stagflation in the UK. During this period, the monetarist view was that the expansionary fiscal policy was responsible for the high inflation and the crowding out of the private investments.

The deflationary fiscal policy in the early 1980s led to a deep recession and output fell below the full employment level. However, the government did not reverse course despite the advice of economists to the contrary. The 2009 financial crisis hit the UK economy and its financial sector hard. The real GDP plummeted by 6 percent. The UK government adopted an expansionary fiscal stance for a short time, with tax cuts accompanied by rising deficits. The economy began to recover. A new government in 2010 reversed the course on fiscal policy by reducing government expenditures. This policy was partially responsible for the double-digit recession and slow economic recovery.

Our findings for the UK economy are consistent with those of Blanchard and Perotti (2002) in the US. We show that both tax cuts and government expenditures result in increases in the GDP, consistent with the Keynesian view of the fiscal stimuli.

The paper is organized as follows. Section II explains the data and Methodology Empirical findings and discussion are the subject of Section III. Section IV offers a summary and the conclusions of the paper.

2. Data and Methodology

2.1 Data

Our study covers the period from the first quarter of 1997, through the first quarter of 2017. The data series are obtained from the International Monetary Fund's (IMF) International Financial Statistics. Model variables are government expenditures, net tax revenues and the GDP. To complete the data set, some quarterly observations were taken from the British Office of National Statistics. Quarterly net tax revenues are in billions of British pounds. The quarterly government expenditures are the total government purchases of goods and services in billions of pounds. The nominal seasonally adjusted GDP values are in billions of British pounds. All variables are converted to real measures using the GDP deflator.

2.1.1 Vector Autoregressive Formulation

The three-variable structural VAR estimated in this paper takes the following form:

$$\boldsymbol{A X_t} = \boldsymbol{\beta_0} + \sum_{i=1}^{s} \boldsymbol{\beta_i X_{t-i}} + \mathbf{u_t}\ , \quad (1)$$

Where A is a 3 x 3 square matrix

$$\mathbf{A} = \begin{bmatrix} 1 & a_1 & a_2 \\ a_3 & 1 & a_4 \\ a_5 & a_6 & 1 \end{bmatrix},$$

and **X** is the vector of model variables

$\mathbf{X}_t = (rg_t, rnt_t, rgdp_t)'$,

and vector u represents the vector of structural innovations or shocks, i.e.,

$\mathbf{u}_t = (u_t^{rg}, u_t^{nt}, u_t^{rgdp})'$.

Rg, rnt, and rgdp represent the real government expenditures, real net taxes, and the real GDP at time t, respectively. The vector of exogenous structural shocks is denoted by 3X1 vector $\mathbf{u}_t$ with elements that are uncorrelated across equations and with the lagged values of endogenous variables. Their covariance matrix is given by

$$\mathbf{\Sigma}_u = E(\mathbf{u}'_t\, \mathbf{u}_t)\,.$$

The off diagonal values of matrix **A** represent the contemporaneous relationship among the model stationary endogenous variables. $\boldsymbol{\beta}_0$ is a 3X1vector of intercepts. $\boldsymbol{\beta}_i$ is an 3X 3 coefficient matrix of lagged endogenous variables on the right- hand -side of equation (1). There are 3X3Xs (s is the lag order) parameters to be estimated in the matrix $\boldsymbol{\beta}_i$.

Multiplying both sides of the equation (8) by the matrix $\mathbf{A}^{-1}$ we arrive at the reduced form of the SVAR, i.e.,

$$\mathbf{X_t} = \mathbf{G}_0 + \sum_{i=1}^{s} \mathbf{G_i X_{t-i}} + \mathbf{e_t}\ ,$$

Where, $\mathbf{G}_0 = \mathbf{A}^{-1} * \boldsymbol{\beta}_0$, $\mathbf{G}i = \mathbf{A}^{-1} * \boldsymbol{\beta}$ and $\mathbf{e}_t = \mathbf{A}^{-1} * \mathbf{u}_t$. It should be noted that the elements of vector $\mathbf{e}_t$, which are referred to as forecast errors, are a linear function of the model structural shocks, i.e., elements of vector $\mathbf{u}_t$. Once a reduced form VAR is estimated, the structural shocks would have to be recovered in order to examine the effects of exogenous structural shocks to a model variable on the remaining variables. Thus, by multiplying the vector of forecast errors by matrix A, one recovers the vector of the structural shocks $\mathbf{u}_t$ as follows:

$$\begin{bmatrix} u_1 \\ u_2 \\ u_3 \end{bmatrix} = \begin{bmatrix} 1 & a_1 & a_2 \\ a_3 & 1 & a_4 \\ a_5 & a_6 & 1 \end{bmatrix} \begin{bmatrix} e_1 \\ e_2 \\ e_3 \end{bmatrix}.$$

The problem of identification arises because the number of equations derived from the reduced form estimation are not sufficient to solve for and obtain the coefficients of the structural model and to recover the structural shocks. Therefore, prior to estimating the reduced form parameters, some identification restrictions on the off diagonal elements of the matrix **A** in equation (1) are necessary. In this paper we follow the identification strategy suggested by Sims (1992), Bernanke (1986), and more recently applied by Blanchard and Perotti (2002) and Kilian and Park (2009), among others. This strategy calls for imposing restrictions on the contemporaneous relationships among the elements of matrix A.

It is reasonable to assume that the real GDP (RGDP) and the real net tax revenues do not contemporaneously influence the real government expenditures, thus, $a_1=a_2=0$. This assumption is based on the notion that government expenditure decisions lead real GDP and tax revenues due to institutional necessities, such as parliamentary approval, which may take months. Once these decisions are in place, the tax revenues and the RGPD in the same quarter do not influence the real government expenditures in that quarter. The assumption is further justified because governments are able to borrow by issuing bonds and expenditures on quarterly basis may not be constrained by the net tax revenues or the GDP.

The next constraint assumes that the real taxes are not related to the real government GDP in the same quarter, i.e., $a_4=0$. This assumption is based on the timing of tax collections. Personal and corporate income taxes are normally collected at a later quarter or at the end of the year.

The last row of matrix **A** does not contain any restrictions, implying that the real GDP is assumed to respond to both real government expenditures and real taxes in the same quarter. These conditions result in three restrictions, i.e., $(3^2-3)/2$, imposed on the elements of matrix **A.** Thus, the SVAR model becomes exactly identified and all the unknown elements of the lower triangular matrix **A,** can be recovered from the reduced form estimated coefficients.

SVARs are often used to analyze impulse responses and prediction error innovation accounting, i.e., variance decomposition. In order to obtain the impulse responses and perform the innovation accounting, the estimates of the reduced form coefficients and the covariance matrix of the forecast errors in the reduced form are utilized to retrieve the structural model coefficients and innovations. Based on the identification strategy above the structural shocks in equation (1), i.e., elements of vector $\mathbf{u}_t$ are fully recoverable from the residuals of the reduced form model.

Finally, the identified and estimated structural model in equation (8) may be written in an infinite moving average representation (wold representation) of the structural innovations as follows:

$$\mathbf{X}_t = \mathbf{\Omega} + \sum_{j=0}^{\infty} \mathbf{\Phi}_i \mathbf{u}_{t-j} \ , \tag{2}$$

where $\mathbf{\Omega}$ and $\mathbf{\Phi}$ are the vector of intercepts and the matrix of infinite structural shocks, respectively.

In equation (2) the elements of matrix $\mathbf{\Phi}$ can be used to generate the effects of the structural shocks (elements of vector $\mathbf{u}$) on the entire path of the endogenous variables, i.e, vector $\mathbf{X}_t$. The elements of matrix $\mathbf{\Phi}$ at lag 0 are the impact multipliers. For instance $\phi_{ij}(0)$ is the instantaneous impact of a structural shock or innovation of variable I on endogenous variable j. Similarly, $\phi_{ij}(t)$ are the one-period impact of shocks to variable i on variable j in time period t. In a similar way one can examine the forecast error variance by innovation accounting, i.e., variance decomposition. If a structural innovation of variable i explains none of the forecast error variance of endogenous variable x_j, then the series x_j is exogenous.

3. Empirical Findings

3.1 Summary Statistics

Panel A of Table 1 shows that only the real GDP is unequivocally nonstationary by the KPPS, and has a unit root according to ADF, PP tests. The remaining two variables are non-stationary by the KPPS test, but in one case the unit root test is rejected. Sims (1992) suggests that SVAR of nonstationary variables may be estimated and could provide valuable information. We follow this recommendation but include a trend as an exogenous variable in the reduced form VAR estimation. Figure 1 justifies our approach as it shows that all variables exhibit upward trend.

Table 1. Diagnostics and Summary 1974:1-2017:3

Panel A: Natural Logarithms of Real Values			
	Government Expenditure	Tax	GDP
ADF	-4.286[a]	-2.488	-1.214
PP	-3.636[a]	-6.140[a]	-1.494
KPPS	1.094	1.061	1.204
Panel B: Summary descriptive statistics for model variables. All variables are Natural logarithms of real values			
	Government Expenditure	Tax	GDP
Mean	4.299	4.648	5.938
Stand Dev	0.180	0.144	0.119
Skewness	-0.907	-0.611	-0.389
Kurtosis	-2.319	3.835	2.248
J-B	12.692[a]	7.301	3.953

Panel C: Johansen-Juselius Cointegration Test, unrestricted VAR lag order =7

r = The number of cointegrating vectors among the four variables

	λ_m	P-Value	λ_t	P-Value

r=0	28.668[a]	0.004	42.605[a]	0.001
r≤1	11.741	0.121	13.936[c]	0.084
r≤2	2.195	0.138	2.195	0.138

Notes. Order of lags in the VAR for cointegration test is 7, determined by the AIC, FPE, and likelihood ratio test (LR). Cointegration with unrestricted intercepts and no trends in the cointegrating VARs. P-values from MacKinnon-Haug-Michelis (1999) for both λ_m and λ_t reject no or one cointegrating vector. Maximum eigenvalue and traces tests suggest 1 cointegrating vectors at 5% level. Variables are natural logarithms of in real values.

[a], [b], and [c] , represent significance at .01, .05, and .10, respectively.

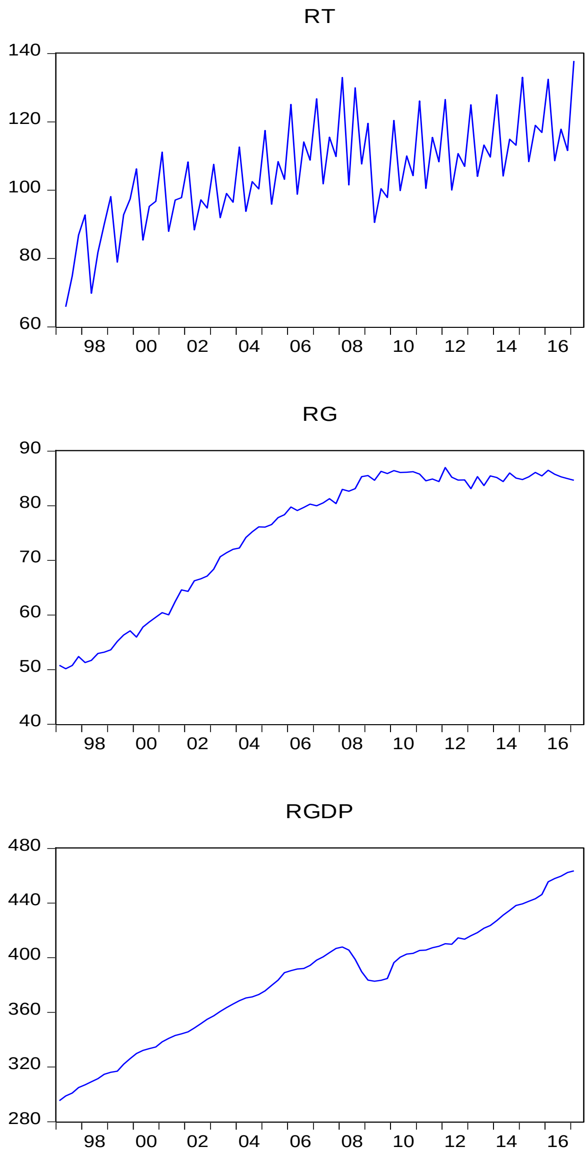

Figure 1. Real Tax Revenues, Real Government Expenditures, and Real GDP in Billions of Pounds, 1997.Q1 through 2017.Q1

Johansen-Juselius test of cointegration in Panel C shows that there may be at least one cointegrating vector among the three variables of the model. Thus, alternatively the dynamic interaction among the three variables may be analyzed in a vector error correction (VECM) framework. Impulse responses of both models are discussed. This approach allows us to examine the robustness of our empirical findings by comparing the findings from the two approaches.

3.2 Structural VAR Findings

We estimate the SVAR model in natural logarithm of real variables. To estimate the SVAR, first it is necessary to estimate its reduced form. To determine the lag order of the reduced form VAR, we examine various lag selection criteria. The Likelihood ration test, the final prediction error (FPE) and AIC point at seven lags. Therefore, we estimate the reduced form with this lag order. The reduced form VAR system is stationary as inverse roots of polynomials are all within the unit circle. Having estimated the reduced form VAR and given the exactly identifying restrictions, we retrieve all the coefficients of the SVAR and the structural shocks.

The contemporaneous SVAR coefficients of the real GDP are almost zero, indicating that the elasticities of the real GDP with respect to government expenditures and tax cuts in a given quarter are almost zero. This observation means that GDP responses to any tax cuts and government expenditures occur over several quarters. Impulse responses of the system to exogenous shocks form the moving average representation of the structural model are presented in Figures 2. The impulse response function is the time path of a given model variable following a shock to another. It shows the size of the impact of a shock as well as the rate at which the response tapers off. The point estimates and their two-standard error bands are shown by the solid and dotted lines in all cases.

Figure 2 shows that an exogenous positive shock to the government expenditures triggers an initial temporary negative response in real tax revenues, followed by an increase in real tax revenues for several months. The real GDP responds positively to positive innovations of the real government expenditures. This finding is consistent with the predictions of the Keynesian model. The cumulative response of the real tax revenues and the real GDP to positive innovations of the real government expenditures are positive and levels off in about two years. The cumulative effect is shown to be six times or more in both cases after three years. Figure 3 shows these cumulative effects and their ninety-five percent confidence band.

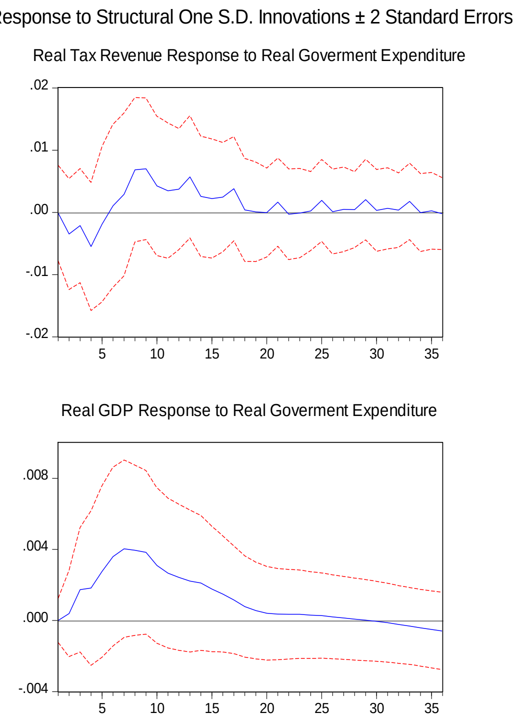

Figure 2. Responses of the Natural Logarithm of the Real Government Expenditure and the Real GDP to One Standard Deviation Shock to the Natural Logarithm of the Real Government Expenditures. Estimates and Two-Standard Deviation Confidence Band. SVAR Lag Order Is Seven. 1997:Q1-2017:Q1

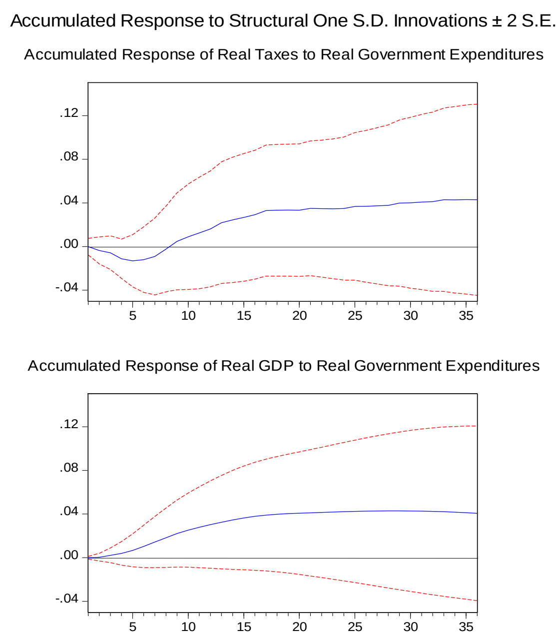

Figure 3. Cumulative Responses of the Natural Logarithm of the Real Government Expenditure and the Real GDP to One Standard Deviation Shock to the Natural Logarithm of Real Government Expenditures. Estimates and Two-Standard Deviation Confidence Band. SVAR Lag Order Is 7. 1997:Q1-2017:Q1

Figures 4 and 5 provide the impulse responses and cumulative impulse responses of the real government expenditures and the real GDP to negative one standard deviation innovations of real taxes and their ninety-five percent confidence band. In response to one standard deviation negative tax shock real government expenditures rise following an initial and temporary decline. The real GDP positively reacts to tax cuts, consistent with the predictions of the Keynesian model. Both the real GDP and real government expenditures exhibit a cumulative positive reaction to tax cuts pointing to the efficacy of tax cuts as an economic stimulus.

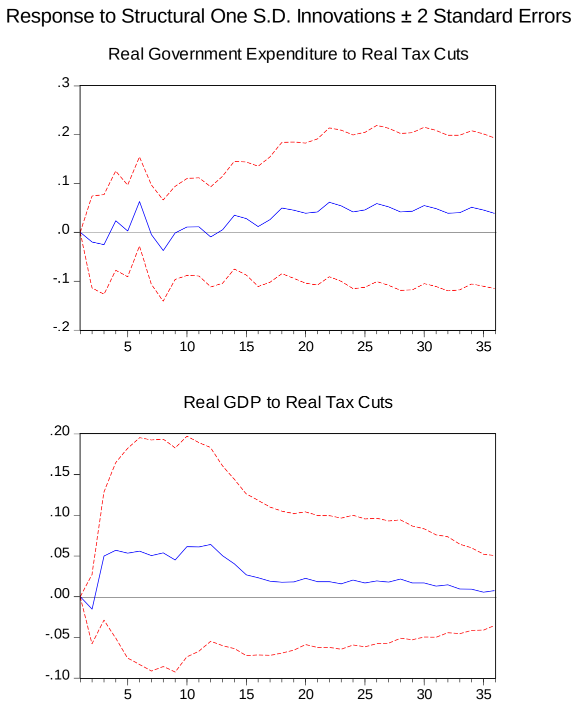

Figure 4. Responses of the Natural Logarithms of the Real Government Expenditures and the Real GDP to Negative One Standard Deviation Shock to Real Taxes. Estimates and Two-Standard Deviation Confidence Band. SVAR Lag Order Is Seven. 1997:Q1-2017:Q1

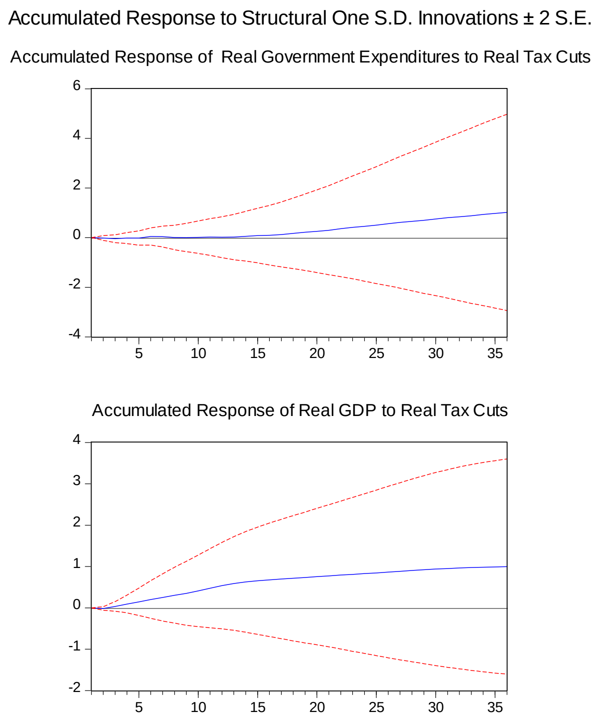

Figure 5. Cumulative Responses of the Natural Logarithms of the Real Government Expenditures and the Real GDP to One Standard Deviation Shock to Real Taxes. Estimates and Two-Standard Deviation Confidence Band. SVAR Lag Order Is Seven. 1997:Q1-2017:Q1

3.3 Robustness of the Findings

Table 1 shows that there may be one conitegrating vector that ensures the long-run equilibrium relationship among the model variables. We examine the robustness of the empirical results from SVAR by estimating the vector error correction model (VECM). This maybe particularly necessary because impulse responses from the SVAR model turned out statistically insignificant. However, responses to random shocks often are subject to large standard deviations.

The VAR lag orders for the VECM are set at six to accommodate error correction.

Impulse responses and the cumulative impulse responses of the real GDP and the real tax revenues to positive shocks to the real government expenditures are presented in Figures 6 and 7. The real tax revenues increase after a positive shock to the real government expenditures with a lag of four to five months. The cumulative effect on the real tax cuts is positive after an initial lag period.

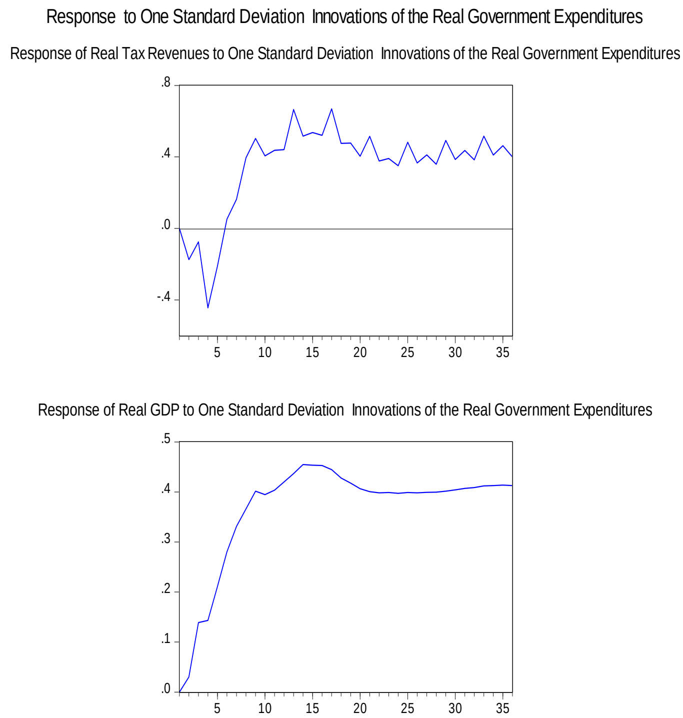

Figure 6. Responses of the natural logarithms of the real tax revenue and the real GDP to One Standard Deviation Shock to the Natural Logarithm of the Real Government Expenditure. VECM Lag Order Is Five 1997:Q1-2017:Q1

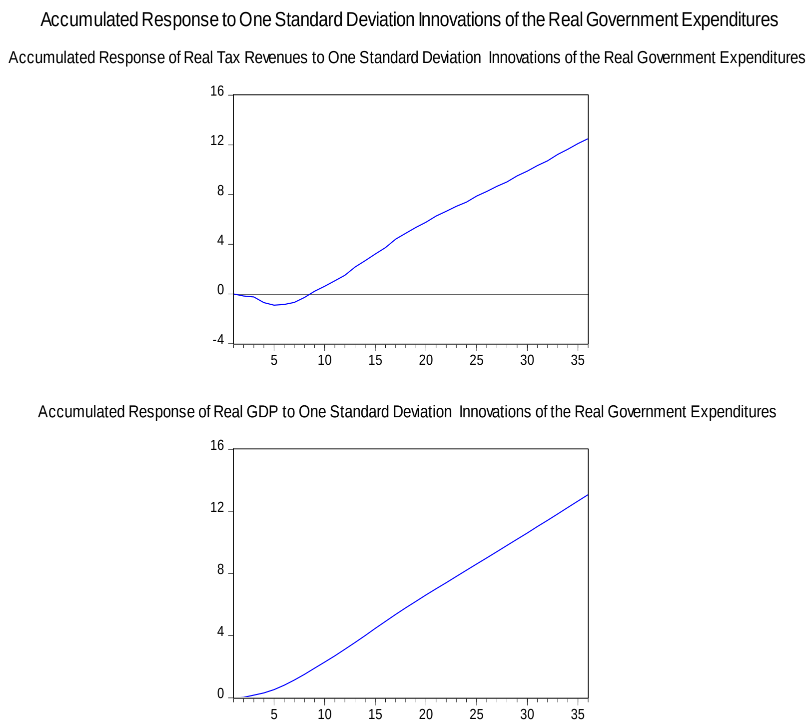

Figure 7. Cumulative Responses of the Natural Logarithms of the Real Tax Revenue and the Real GDP to One Standard Deviation Shock to the Natural Logarithm of the Real Government Expenditure. VECM Lag Order Is Five 1997:Q1-2017:Q1

The real GDP reacts positively to the increases in the real government expenditures, confirming that fiscal policy may be an effective economic stimulus. The positive cumulative response of the real GDP to a positive surprise rise in real government expenditures corroborates the findings of the SVAR model. This observation is consistent with the tenets of the Keynesian economics.

Figure 8 presents the impulse responses of the real government spending and the real GDP to real tax cuts from the VECM. The top panel shows that the real government expenditures respond negatively to real tax cuts. This is plausible as government budget constraint would indicate. The real GDP responds positively to tax cuts within one or two months, as supported by economic theory. The cumulative effects of tax cuts on the real government expenditures and the real GDP confirm that the real GDP benefits from tax cuts. However, tax cuts are expected to have a long-term negative effect on real government expenditures, as shown. These findings are presented in Figure 9.

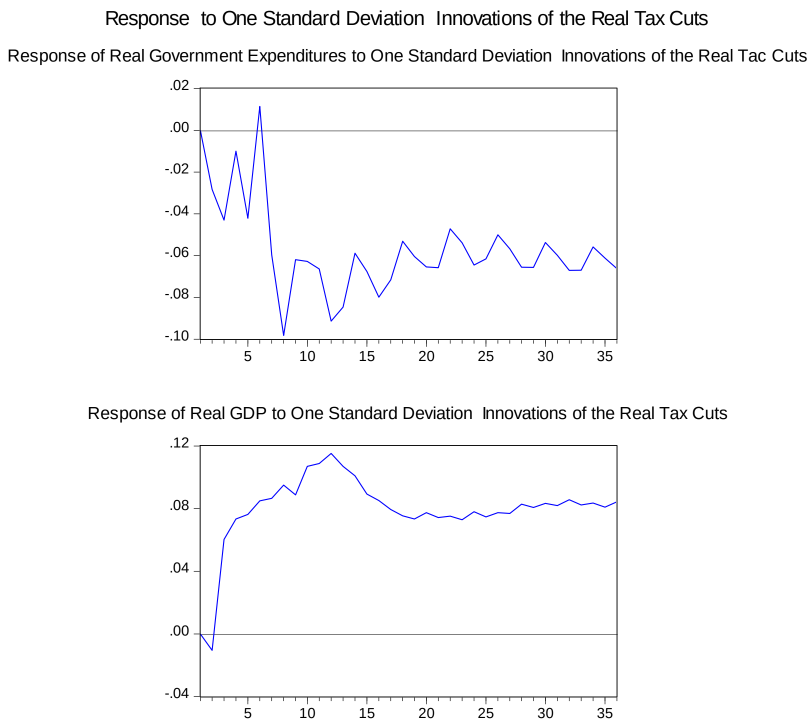

Figure 8. Responses of the Natural Logarithm of the Real Government Expenditures and real GDP to One Standard Deviation Shock to the Natural Logarithm of the Real Tax Cuts. VECM Lag Order Is Six. 1997:Q1-2017:Q1

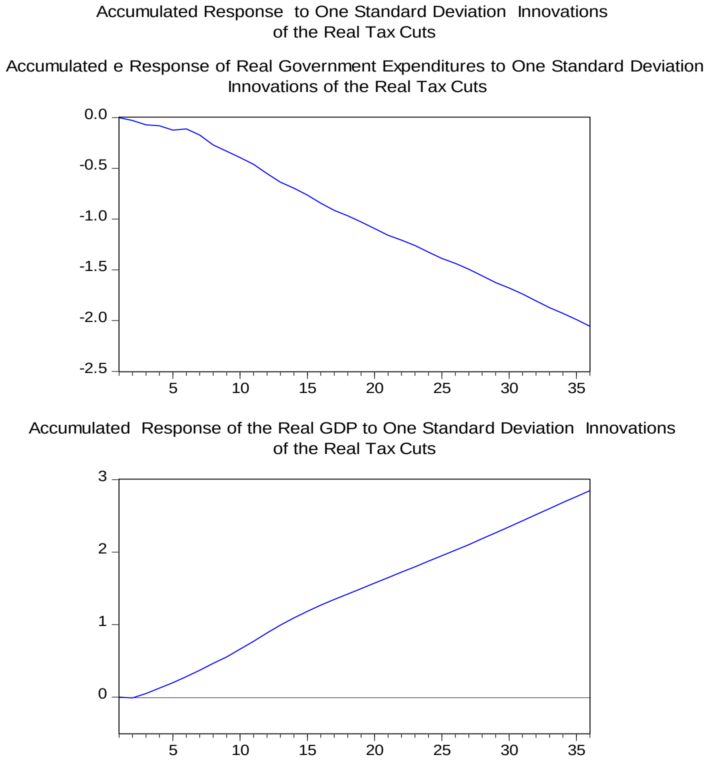

Figure 9. Cumulative Responses of the Natural Logarithm of the Real Government Expenditure and the Real GDP to One Standard Deviation Shock to the Natural Logarithm of the Real Tax Revenue. VECM Lag Order Is Six. 1997:Q1-2017:Q1

3.4 Variance Decomposition Analysis

Table 2 presents the decomposition of the forecast error of the real GDP explained by the SVAR variables. For instance, the one quarter ahead forecast error variance is mostly due to other shocks to the real GDP (99.99%) while negligible portions of the variance are accounted for by the real tax cuts and the real government expenditures.

Table 2. Percentage of Real GDP Forecast ErrorVariations Explained by Tax Revenues and Government Expenditures. 1997:Q1-2017:Q1.

Period	S.E.	Government Expenditure	Tax Cuts	Real GDP
1	0.011690	7.90E-06	0.002217	99.99778
2	0.012708	0.157931	0.296337	99.54573
3	0.013949	1.539445	1.369255	97.09130
4	0.014813	2.022703	1.905506	96.07179
5	0.015270	3.349349	2.134607	94.51604
6	0.016791	5.492237	2.484400	92.02336
7	0.017744	8.103330	2.784877	89.11179
8	0.018287	10.39591	3.162532	86.44156

9	0.019151	12.44280	3.391528	84.16567
10	0.019858	13.61604	3.940260	82.44370
11	0.020745	14.37107	4.460904	81.16803
12	0.021832	14.90145	5.016391	80.08216
18	0.028625	16.25709	5.586771	78.15614
24	0.034424	15.48694	5.585693	78.92737
36	0.040896	15.29709	5.836904	78.86601
Factorization: Structural				

However, in twelve quarters, only eighty percent of the variations in the real GDP are accounted for by other shocks to the real GDP. Roughly fifteen percent are due to government expenditures, while five percent are explained by tax cuts. These percentages stay relatively stable beyond twelve quarters, indicating that the effects of fiscal policy are almost entirely realized in three years. Table 3 offers the findings of the variance decomposition from the VECM. The two results are qualitatively similar. However, the real GDP responses to the fiscal policy stimuli continue beyond three years. According to impulse responses from the VECM in Table 3, in six years, roughly twenty percent of the variations in the real GDP are due to real taxes, while the real government expenditures account for around eight percent of the real GDP variations.

Table 3. Percentage of Real GDP Forecast ErrorVariations Explained by Tax Revenues and Government Expenditures. 1997:Q1-2017:Q1. Vector Error Correction Model

Period	S.E.	Taxes	Government Expenditure	Real GDP
1	0.012090	0.006712	0.109387	99.88390
2	0.013526	0.189641	0.031512	99.77885
3	0.015293	1.289345	2.319544	96.39111
4	0.016677	1.534304	3.374842	95.09085
5	0.017636	2.270197	3.917660	93.81214
6	0.019640	3.482257	4.590294	91.92745
7	0.021285	5.049284	5.255706	89.69501
8	0.022521	6.698555	6.005047	87.29640
9	0.023901	8.498430	6.499217	85.00235
10	0.024920	9.889166	7.291315	82.81952
11	0.025985	11.07400	7.952878	80.97312
12	0.027191	12.11921	8.577419	79.30337
18	0.032492	17.50191	9.189591	73.30850
24	0.037183	18.99294	8.782947	72.22411
36	0.045265	20.45366	8.690508	70.85583
Ordering: LRG LRT LRGDP				

3.5 Multiplier Analysis

Examining impact multipliers from the estimated SVAR and impulse responses, we find qualitative similarities between our impact multiplier estimates and those of Blanchard and Perotti (2002) who find small values for taxes and government spending. We compute multipliers as the ratio of the impact multipliers (the coefficients of matrix **Φ** in equation 2), divided by the standard deviation of the shocked variable). These modified multipliers show responses of the RGDP to one standard deviation shock to taxes or government expenditures in various quarters.

The multiplier of a shock to the real government expenditure on the real GDP rises from 0.12 in the first quarter to 0.57 in the fourth, 1.52 in the eighth and falls to 1.36 in the twelfth quarters.

The multiplier of a tax cut is 0.16 in the first quarter. The tax cut multipliers are 0.73, 1.96, and 1.74 for the fourth, eighth and twelfth quarters, respectively. Thus, responses in the real GDP to a tax cut shock, rise and reach a maximum of 2.05 in the ninth quarter and decline to 1.74 in three years.

The maximum government expenditure multiplier is 1.60 in the ninth quarter. Based on the comparison of multipliers, the conclusion is that the British economy appears to be more responsive to tax cuts than the government expenditures. This may be plausible as government expenditures as a percentage of the GDP for the sample data hovers in the range of eighteen to twenty percent, which is comparable to the US ratio. However, the ratio of tax revenues to the GDP is consistently above 22 percent and in many quarters in the range of 28 to 32 percent, compared to roughly 11 percent in the US. Therefore, corporations and individuals may believe that there is room for tax cuts. Tax cuts may provide a relief and much needed incentive to invest and innovate.

Tax cuts may also be interpreted as a sign of fiscal discipline and efficient allocation of revenue resources on the part of government, especially if taxes are perceived to be excessive. Corporate tax cuts may spur increased profitability and lead to increased private capital expenditures and future economic growth. However, in the US, Ragan and G.W. Bush era tax cuts did not produce such results.

4. Summary and Conclusions

This paper examines the effects of fiscal policy shocks in the UK for the period of 1997 through the first quarter of 2017. During this period the British economy had episodes of increased government expenditures and tax cuts. Our Structural VAR shows that tax cuts and government expenditures contribute to rises in the real GDP. Impulse responses from the VECM corroborate these conclusions. Findings of the paper are consistent with those of Blanchard and Perotti (2002). Variance decomposition analysis shows that based on the SVAR model, roughly fifteen percent of the variations of the real GDP are explained by government expenditures in three years compared with five percent for tax cuts. The VECM model indicates that tax cuts are more effective than the government expenditures, explaining around twenty percent of the changes in the real GDP, compared to eight percent due to government expenditures. Turning to multipliers, both tax cut and government expenditure multipliers initially rise reaching a peak in the ninth quarter and decline to 1.60 and 1.74 in three years.

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