The macroeconomic effects of fiscal consolidation policies in Greece

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Abstract

Purpose – This paper aims to investigate the effects of contractionary fiscal policy shocks on major Greek macroeconomic variables within a structural vector autoregression framework while accounting for debt dynamics.

Design/methodology/approach – The sign restriction approach is applied to identify a linear combination of government spending and government revenue shock simultaneously while accounting for debt dynamics. Additionally, output and unemployment responses to fiscal shocks under different scenarios concerning the amalgamation of austerity measures are considered.

Findings – The results indicate that a contractionary consumption policy shock, namely, a 1 per cent decrease in government consumption and a 1 per cent increase in indirect taxes, is preferred, as it produces a minor decrease in output and substantially decreases public debt, while a contractionary wage policy shock is suitable only when the government aims to sharply reduce public debt, as the consequences for the economy are harsh. A contractionary investment policy shock is not recommended, as it triggers a rise in unemployment and a fall in output, while the effect on the public debt is minor.

Practical implications – Policymakers should focus their efforts on reducing unproductive government consumption on the expenditure side. Concerning revenues, the reinforcement of tax administration is recommended to ensure that indirect taxes will be collected.

Originality/value – This paper contributes to the existing literature by providing a disaggregated analysis of the effects of fiscal policy actions in Greece by implementing several fiscal policy scenarios and accounting for the level of public debt. All scenarios are in the vein of the economic adjustment programs guidelines.

Keywords Taxation, Debt, SVAR, Macroeconomics, Public economics, Fiscal policy

Paper type Research paper

1. Introduction

There are many advantages to participating in a currency union, such as the Eurozone, but drawbacks also exist. The loss of an important policymaking instrument, i.e. monetary policy, denotes the regained attention of fiscal policy. Fiscal policy is the only tool that policymakers have to respond to idiosyncratic shocks to dampen business cycle fluctuations and reduce output volatility at a national level. It has been noted that the European Central Bank (ECB) is handicapped by the existence of structural rigidities among the member countries. As a result, monetary policy will face severe constraints in accentuating output misalignments (De Grauwe and Costa Storti, 2005).

The lack of fiscal policy coordination in Europe contributes to different rates of growth and unemployment among members of the Eurozone. A set of rules included in the Stability and Growth Pact, intending to control national authorities concerning public finances, failed to improve the economic performance of independent members because of being too

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restrictive and preventing the operation of automatic stabilizers (Collignon, 2007; Burdekin *et al.*, 2011). Greece confronted a severe sovereign debt crisis in 2009, which made the financial support provided by Eurozone member states and the International Monetary Fund in May 2010 essential. Since then, two economic adjustment programs (EAPs) were implemented in Greece until the end of 2013. Although these measures reduced the Greek Government's deficit, the consequences of fiscal consolidation were harsh, as output contraction reached 21.8 per cent and unemployment rate exceeded the European Commission's (2014) projections, reaching 27.5 per cent.

The impact of austerity measures on the economy and public debt has gained substantial attention in academic and policy circles over the past years. The focus of the literature has so far been on the effects of total government spending or total government revenue shocks. With the exception of few studies (Perotti, 2007; Auerbach and Gorodnichenko, 2012), there has been no disaggregation of which type spending cuts or tax hikes have been more or less effective at reducing public debt at lower output costs. Not explicitly taking into account fiscal multipliers[1] of different budget components may lead policymakers to miscalculate the necessary adjustment to bring down the debt ratio. Furthermore, most of the existing analyses focus on the effects of fiscal adjustments on output and neglect the effects on unemployment.

We contribute to the existing literature by providing a detailed analysis of the effects of fiscal policy actions in Greece by implementing various fiscal policy scenarios and accounting for the level of government debt. All scenarios are in the same vein of EAPs' guidelines, in an effort to apply a practical fiscal policy and evaluate its effectiveness in reducing public debt and preserving social cohesion. Specifically, four fiscal policy consolidation scenarios are exploited to assess the most effective austerity measures for debt reduction and to avoid further output contraction and increases in unemployment.

The remainder of the paper is organized as follows. Section 2 reviews the relevant theoretical and empirical literature on the effects of fiscal policy. Section 3 presents data information and discusses the structural vector autoregression (SVAR) econometric methodology in greater detail. In Section 4, we present the main empirical findings. Section 5 includes a brief summary of the results and some concluding remarks.

2. Literature review

2.1 Theoretical studies

There is no consensus regarding the impact of government spending cuts or tax hikes on fundamental macroeconomic variables. The outcome varies depending on the openness of the economy; the exchange rate regime; and the assumptions made about markets, individuals and prices. According to the Keynesian framework, in a world of rigid prices, aggregate demand determines output, consumption responds to current income and fiscal consolidation has a negative effect on growth (DeLong and Summers, 2012). In a Ricardian equivalence world, fiscal multipliers are zero, as consumers are forward-looking and fully aware of the government's intertemporal budget constraints (Barro, 1974).

A more recent strand of literature argues that fiscal multipliers can be negative, i.e. have non-Keynesian effects or contractionary fiscal expansion effects. The theories which explain this phenomenon introduced new concepts, such as the credibility of fiscal policy, debt sustainability and uncertainty. Blanchard's (1990) theoretical assertion shows that an immediate fiscal consolidation could increase households' total wealth by reducing the uncertainty of a more harsh adjustment later.

2.2 Empirical studies

As theoretical frameworks allow many possible outcomes, researchers have tried to shed light on the effects of fiscal policy shocks on the main macroeconomic variables; however, no broad consensus has been achieved. Although public expenditure increases or tax cuts generally show positive output multipliers (Fatas and Mihov, 2005; Marcellino, 2006; Mountford and Uhlig, 2009; Lozano and Rodriguez, 2011), the estimated size and duration of these effects vary considerably. Moreover, as researchers tried to explain the economic effects of fiscal consolidations, they faced non-Keynesian fiscal multipliers, i.e. positive output responses following expenditure cuts (Giavazzi and Pagano, 1990; Perotti, 2004; Ricci-Risquete and Ramajo, 2015).

Caldara and Kamps (2008) showed that all identification approaches used in the literature produced very similar results concerning government spending shocks, as gross domestic product (GDP), consumption and the real wage all significantly increased. Different results, however, derive from changes in taxation. Using the narrative approach to identify the timing and size of the changes in taxes, Romer and Romer (2007) found that an exogenous tax increase has a negative effect on output. Authors who investigate tax changes via other identification schemes (Blanchard and Perotti, 2002; Perotti, 2007) usually obtain a tax multiplier of around 1, while computed multipliers via a narrative approach are about 3. Mertens and Ravn (2014) strengthened the empirical evidence of high tax multipliers, as they estimated them around 2 on impact and up to 3 after six quarters. For developing countries in Asia, Jha *et al.* (2014) found that tax cuts have a greater counter-cyclical impact on output than government spending.

Another recent strand of literature investigates the effects of government spending on the labour market. As unemployment in Southern Europe countries has reached unprecedented rates, this issue is clearly of interest. Faia *et al.* (2013) studied various forms of fiscal stimuli in Europe and found that government spending multipliers are positive but small, while the size of the income tax cut multiplier depends on the persistence of the measure. Monacelli *et al.* (2010) provided evidence for the US labour market and showed that a 1 per cent of GDP increase in government spending produces output and unemployment multipliers of 1.2 and 1.5 after 1 year and 1.5 years, respectively.

The majority of the aforementioned studies ignored the fact that fiscal shocks provoke shifts in public debt, which governments are obliged to maintain at a specific level. This can trigger biased estimation of multipliers, as models fail to keep track of the debt dynamics that arise following a fiscal shock (Favero and Giavazzi, 2007). The consequence of omitting feedback from the debt level and failing to keep track of its path when estimating the impulse responses is a model that ignores the possibility that future taxes and spending interact with other macroeconomic variables, but not at the level of the public debt.

Ilzetzki *et al.* (2013) estimated the effects of fiscal policy for a large panel data set of developed and developing countries. Their research revealed that fiscal multipliers are lower in countries with relatively high debt levels. Hence, in countries with high debt levels, the fiscal stabilization policy becomes counterproductive and is harder to implement. Mayer *et al.* (2013) focused on the fiscal position related to the transmission of government spending shocks. They provided evidence that the allowance of positive levels of government debt in the steady state affected the size of fiscal multipliers, depending on the horizon at which the multiplier is evaluated. Specifically, they found that short-run multipliers differ substantially when high levels of debt are introduced in the steady state.

The accumulation of public debt in many economies has motivated research on the factors that contribute to a successful public debt reduction (Baldacci *et al.*, 2012) and on the effects of fiscal adjustment on output growth (Yang *et al.*, 2015). Boussard *et al.* (2013)

estimate the impact of consolidation on growth and find that with high levels of public debt and sizeable fiscal multipliers, debt ratios are likely to increase in the short term. The composition of fiscal shocks also matters. In general, multipliers are found to be higher for government expenditure shocks than for tax shocks (Coenen *et al.*, 2013). Gupta *et al.* (2005) assess the effects of fiscal consolidation and expenditure composition on economic growth and find that tilting the overall composition of public expenditure toward more productive uses and protecting capital expenditures are important for boosting growth. Anderson *et al.* (2014) suggest that fiscal authorities should use VAT taxes and transfers to achieve consolidation versus less growth-friendly instruments such as public investment and capital and labour taxes. Alesina *et al.* (2015) investigate further the empirical evidence of the importance of the composition of fiscal adjustments for the evaluation of their macroeconomic consequences and confirmed the differential effect of tax- and expenditure-based plans.

Fiscal multipliers' estimation in Greece is limited because of the lack of macroeconomic and fiscal data. Papageorgiou (2012) estimated the macroeconomic and welfare effects of changes in the tax-spending mix and debt consolidation policies. Output and welfare gains can be obtained from tax reforms that reduce the tax rate on labour income and increase consumption taxes, while both revenue- and expenditure-based debt consolidation policies have contractionary effects in economic activity. Tagkalakis (2014), building on Blanchard and Perotti (2002), examined the importance of credit for the transmission of fiscal policy shocks in Greece. A government expenditure shock contributes to a positive response in the output. This effect can be explained by the tightness of credit conditions in recent years. Athanasenas *et al.* (2014) found evidence supporting the fiscal synchronization hypothesis for the Greek economy, suggesting that the budget deficit could be reduced through government expenditures' reduction and contemporaneous and new tax controls.

The present paper assesses the effects of fiscal consolidation policies on economic growth, unemployment and public debt, with a particular focus on the mix of austerity measures undertaken. The achievement of debt reduction with the minimum output and employment losses is a key challenge now facing policymakers in many countries. Our results revealed that a policy based on government consumption cuts and indirect tax increases can efficiently affect the economy, as it produces a minor decrease in output and substantially decreases public debt.

3. Data and methodology

3.1 Data information

A new non-interpolated quarterly data set from 2000 to 2013-2014[2] is used in this study. Our benchmark model includes the following five variables:

(1) change in the log of real government spending (G), defined as the sum of government consumption and investment;

(2) change in the log of real government net revenues (T), defined as total current revenues minus current transfers[3];

(3) change in the log of real GDP (Y);

(4) change in the log of the number of unemployed (U); and

(5) change in the log of real government debt (D).

All variables are transformed in real terms using the GDP deflator. The vector autoregression (VAR) is fitted with one lag based on information criteria and no time trend is included. To account for seasonality, we have applied the X12 census filter.

GDP and debt-to-GDP ratios are plotted in Figure 1. During the period from 2000 to 2008, the increasing GDP sustained the debt-to-GDP ratio to around 100 per cent, but from 2009 to 2013, the significant decrease in GDP contributed to an enormous increase of 177 per cent in the debt-to-GDP ratio.

As a ratio to GDP, government spending increased from 21.4 per cent in 2000 to 26.76 per cent in 2009 and fell to 21.16 per cent in 2013 after the adoption of the measures proposed by the EAPs. Government net revenues increased from 22.04 per cent in 2000 to 24.67 per cent in 2002, and although GDP continued rising until 2008, they fell to 16.4 per cent. During that period, total current revenues fell by 4 per cent of the GDP, reflecting the tax relief that took place in Greece. Even though government net revenues fell to 14.23 per cent of GDP, the reduction during the period from 2009 to 2013 is attributed to the increased social transfers, as total current revenues increased by 3.8 per cent of the GDP. Fiscal consolidation measures adopted by the Greek Government because of the application of the EAPs led to a sharp increase in the unemployment rate, rising from 9.6 per cent in 2009 to 27.5 per cent in 2013 (Figure 2).

3.2 SVAR methodology

The basic form of a VAR model consists of a set of N endogenous variables $Y_t = (Y_{1t}, \ldots Y_{nt}, \ldots, Y_{Nt})$ for $n = 1, \ldots N$. The typical VAR model takes the following reduced form:

$$Y_t = a_0 + A(L)Y_{t-1} + e_t \quad (1)$$

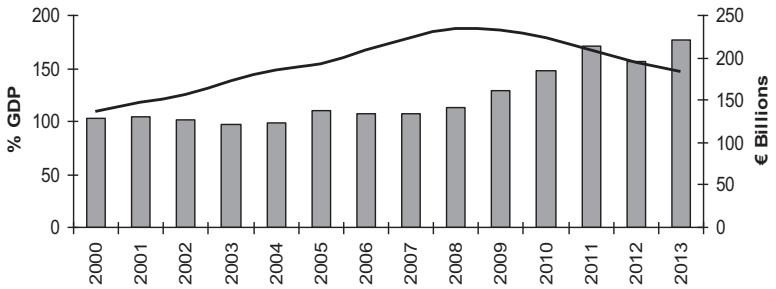

Figure 1.
The solid line displays the GDP in current prices measured in billion euros and the bar graph shows the debt-to-GDP ratio

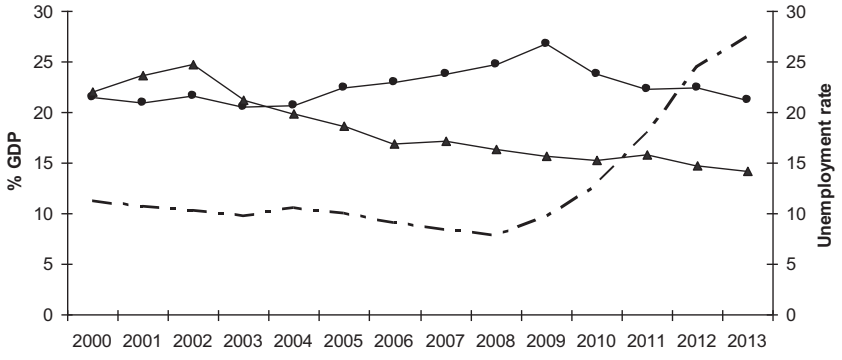

Figure 2.
The dashed line represents the unemployment rate, the round dot line stands for government spending and the line featuring triangles represents the government net revenues as a percentage of GDP

where a_0 is a constant vector, $Y_t = [G, T, Y, U, D]$ is the vector of endogenous variables, $A(L)$ represents the autoregressive lag order polynomial and e_t represents the vector of white-noise reduced-form innovations. One important characteristic of a VAR process is its correlated errors. Multiplying equation (1) by the matrix $A_0(n \times n)$, where n is the dimension of Y_t, results in the following form:

$$A_0 Y_t = A_0 a_0 + A_0 A(L) Y_{t-1} + B u_t \tag{2}$$

where u_t represents the uncorrelated structural error term with mean zero. The structural innovations can thus be represented by the following structural VAR model:

$$A_0 e_t = B u_t \tag{3}$$

It should be noticed that the reduced form of residuals can be retrieved from a SVAR model by $u_t = A_0^{-1} B e_t$, while its variance–covariance matrix can be retrieved by $\Sigma_u = A^{-1} B B^t A_t^{-1}$. The above model is often called an AB model, where the matrix A_0 defines the contemporaneous association between the variables. The orthogonality assumption of structural innovations implies that the variance–covariance matrix Σ_u is diagonal, and restrictions on the parameters of A_0 and B matrices must take place to achieve identification.

As equation (3) specifies the relationship between the reduced form and the structural errors, the matrix B is restricted to I_n, and thus, it can be written as $u_t = A_0 e_t$. The jth column of A represents the immediate impact on all variables of the jth innovation. The approach assumes that there are n fundamental shocks, which are mutually orthogonal and normalized to be of variance one. Therefore, $\Sigma_{cov} = E[u_t, u_t'] = AE[e_t, e_t']A' = AA'$, where equation Σ can be described as the covariance structure. The identification method here searches over the space of possible impulse vectors $A_t e^i$ to find those impulse responses that agree with the sign restrictions. The aim is to find an impulse vector α, where $\Re^n$, if there is some matrix A, such that $\Sigma_{cov} = AA'$, where $A = [\alpha_1 \ldots, \alpha_n]$ so that α is a column of A. As a result, α is an impulse vector if there is a n-dimensional vector α of unit length, so that $a = A'\alpha$ and hence $\Sigma_{cov} = AA' = \Sigma_{i=1}^{n} a_i, \alpha_i'$. The impulse response is calculated as $\Sigma_{cov} = AA' = \Sigma_{i=1}^{n} a_i e_i(k)$, where $e_i(k) \varepsilon \Re^n$ is the vector response at horizon k to the ith shock in the Cholesky decomposition of the Σ_{cov} (Uhlig, 2005).

We adopt the sign restriction approach to apply a more realistic fiscal policy, as government decisions about spending and taxes are mostly taken in conjunction and thus the identification of a single shock is inadequate to capture the effect of policy decisions. In particular, we examine the implementation of realistic fiscal policies, such as a contractionary baseline policy shock which combines the fiscal shocks in such a way that government spending falls by 1 per cent and government revenues rise by 1 per cent for four quarters. By denoting $r_{j,a}(k)$ as the response at horizon k of variable j to the impulse vector a, the above policy requires the following:

$$-0,01 = \sum_{j=0}^{k} (r_{GS,BGS}(k-j) BGS_j + r_{GS,BGR}(k-j) BGR_j \; for \; k = 0, \ldots K$$

$$0,01 = \sum_{j=0}^{k} (r_{GR,BGS}(k-j) BGS_j + r_{GR,BGR}(k-j) BGR_j \; for \; k = 0, \ldots K$$

where $k = 4$; GS and GR represent government spending and government revenue, respectively; and BGS and BGR represent the scale of standard basic government spending

and revenue shocks in period *j*, respectively. Similarly, a contractionary consumption policy shock is designed as a sequence of fiscal shocks, such that government consumption is reduced by 1 per cent and indirect taxes are raised by 1 per cent for one year.

3.3 Model specification

While all variables are stationary at a 5 per cent confidence level, the sign restriction methodology is robust to the non-stationarity issue and thus we do not impose any cointegrating long-run relationships among the variables. Hence, the approach is "agnostic", as no long-run restrictions are posed to the identification procedure. The confidence bands are drawn by taking draws from posterior distribution and identifying the shocks for each case. The bands are modelled as the 16th and 84th percentile quantities for the dynamic responses, which, if the distribution is normal, would correspond to a one-standard-deviation band (Sims and Zha, 1999).

In addition to a government spending shock and a tax shock, Mountford and Uhlig (2009) identified a business cycle shock and a monetary policy shock. In our application, we impose restrictions on only the fiscal variables for four quarters, ruling out short-term changes in government spending or government revenue variables that do not constitute part of a specific fiscal policy implementation. We omit the monetary policy shock because controlling for the monetary policy is not important when analyzing the consequences of a fiscal policy, as monetary policy shocks do not appear to have a large effect on real macroeconomic variables (Mountford and Uhlig, 2009; Wood, 2012)[4]. Moreover, we did not take into account the business cycle shock which attributes a positive correlation between output and revenue residuals entirely to the business cycle shock. This business cycle shock also rules out by construction of non-Keynesian effects of the fiscal policy (Giavazzi *et al.*, 2000) and might overstate the negative output effects of a tax shock (Caldara and Kamps, 2008)[5]. Therefore, we do not impose any restrictions on the macroeconomic variables and public debt and let the data reveal the impulse responses.

We extend the existing literature by applying several fiscal consolidation policy scenarios in an attempt to estimate the economic effects of individual expenditure and revenue items. While a large literature set (Alesina *et al.*, 2015; Corsetti *et al.*, 2012) has proved that expenditure-based fiscal adjustment are less costly in terms of output losses than tax-based adjustments, Greece is obliged to apply spending cuts and tax hikes all at once because of the implementation of EAPs. Therefore, we construct four fiscal policy scenarios, as depicted in Table I. The first scenario contemporaneously targets the reduction of government spending by 1 per cent for four periods and the increase in government net revenues by 1 per cent during the same time span to bring the fiscal deficit to a sustainable position[6]. The second scenario is defined as the reduction of government consumption and the increase in indirect

Policy	Gov. consumpt.	Gov. wage bill	Gov. spend.	Gov. invest.	Gov. net revenues	Income taxes	Indirect taxes	Capital taxes
Contractionary baseline policy			−		+			
Contractionary consumption policy	−						+	
Contractionary wage policy		−				+		
Contractionary investment policy				−				+

Table I.
Identifying sign restrictions

taxes by 1 per cent for four periods. The third scenario is the reduction of the government wage bill and the simultaneous increase of direct taxes by 1 per cent for four periods. In the third scenario, it is expected that lowering wages will increase competitiveness and preserve employment[7]. Finally, the fourth scenario is specified as a cut in government investment and a raise in capital taxes by 1 per cent for four periods.

From a theoretical point of view, government consumption and investment cuts will impact output depending on the level of government productivity in producing public goods and services. As expenditure cuts may imply reforms that take time to implement, taxes may help to speed up the fiscal consolidation. The main difference between direct and indirect taxes lies in their distortionary effect. Changes in indirect taxes affect the economy mainly through the price transmission channel, reducing the real value of households' wealth. On the other hand, an increase in direct taxes such as income taxes, changes the marginal rate of substitution between consumption and labour, reducing labour supply. While spending cuts may increase competitiveness, it is important to take into account the effects of disaggregated tax increases as they could offset the initial gains of lower spending.

4. Empirical findings

In Figures 3-6, we report the findings concerning the estimated responses of fiscal policy scenarios. The black solid line represents the median response of output/unemployment/debt to a 1 per cent shock to the government spending/revenue component. The top blue solid line represents the 84th percentile and the bottom blue solid line represents the 16th percentile, both of which are constructed using a Markov chain Monte Carlo (MCMC) algorithm based on 500 draws. Table II presents impact and cumulative output, unemployment and debt multipliers. Impact multipliers are computed by dividing the response of the variable in interest, normalized to the response of the corresponding endogenous fiscal component, by the sample mean of the GDP share of each fiscal component. The cumulative multiplier at horizon X is derived from the cumulative percentage change of the responding variable (e.g. GDP, unemployment, debt) after X quarters divided by the cumulative change of fiscal shocks expressed in percentage points of GDP at the same horizon.

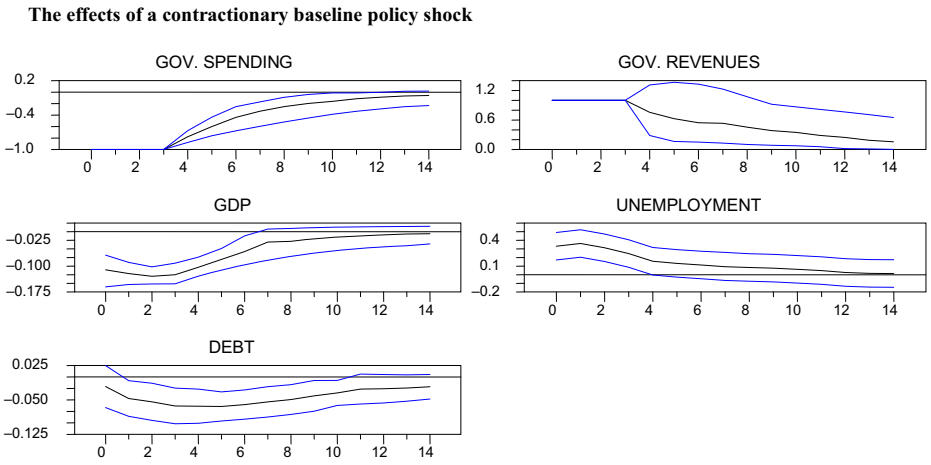

Figure 3. The black solid line represents the response of output/unemployment/debt to a negative 1 per cent shock to government spending and a positive 1 per cent shock to government net revenues. The top blue solid line represents the 84th percentile and the bottom blue solid line represents the 16th percentile

4.1 Contractionary baseline scenario

The application of the contractionary baseline policy, leads to a fall in output by 0.11 on impact and peaks in the fourth quarter after the shock. Unemployment instantly rises by 0.33 and peaks after one quarter. The effect of those variables is persistent, and in terms of output, it remains statistically significant for six quarters. Regarding unemployment, there is a steeper drop, which lasts for the first four quarters. The debt response is estimated at −0.02 on impact, but it is statistically insignificant, while afterwards and up until the tenth quarter, it remains negative and statistically significant. The cumulative multipliers of output and unemployment for the first year are −1.17 and 3.06, respectively, and two years after the shock they are −1.83 and 4.25, respectively (Table II, Panels A and B). The cumulative debt multiplier is −0.46 and −1.05 one and two years after the shock, respectively.

We should emphasize the Keynesian response of output in line with the results obtained from other studies (Perotti, 2004; Burnside *et al.* 1999; Blanchard and Perotti, 2002), as a government spending curtailment stagnates demand and increases unemployment, contrary

The effects of a contractionary consumption policy shock

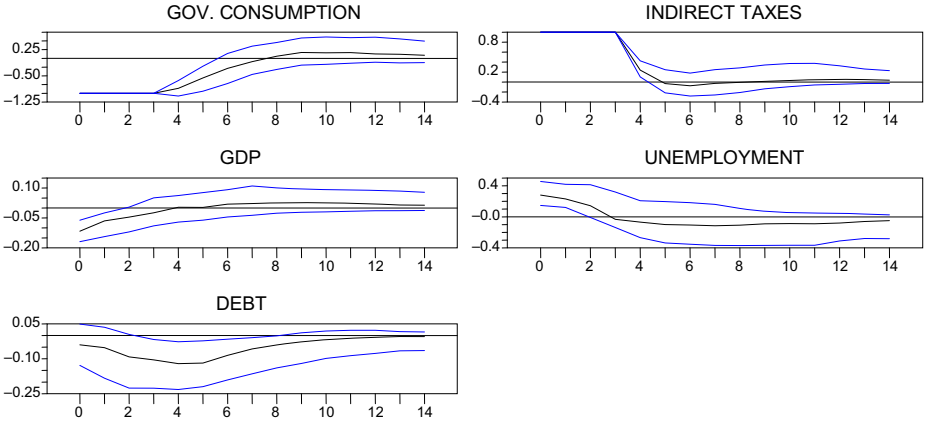

Figure 4.
The black solid line represents the response of output/unemployment/debt to a negative 1 per cent shock to government consumption and a positive 1 per cent shock to indirect taxes. The top blue solid line represents the 84th percentile and the bottom blue solid line represents the 16th percentile

The effects of a contractionary wage policy shock

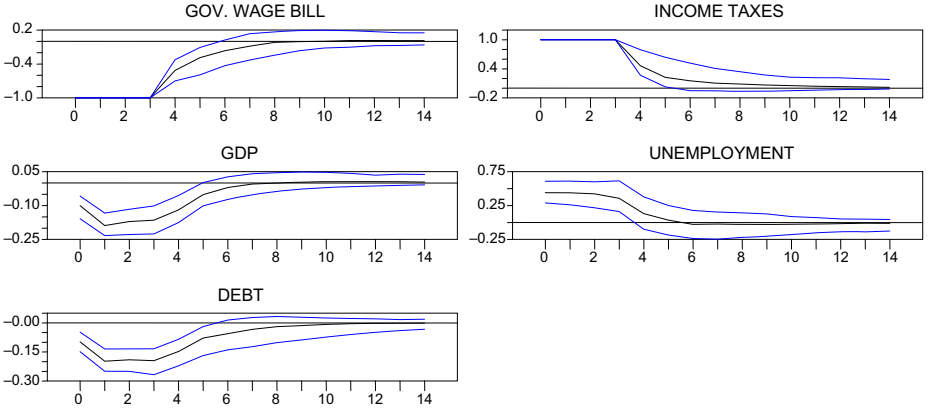

Figure 5.
The black solid line represents the response of output/unemployment/debt to a negative 1 per cent shock to the government wage bill and a positive 1 per cent shock to income taxes. The top blue solid line represents the 84th percentile and the bottom blue solid line represents the 16th percentile

to other studies that have identified output expansion (Alesina *et al.*, 2002). As far as the revenue side of the policy shock in the empirical literature, the results are mixed. Mountford and Uhlig (2009) found no significant results, while Perotti (2004) reported that the size and sign of output responses depend on the country and the period under investigation. While in other circumstances, a positive shock to taxes would increase government savings in the short term, thereby putting downward pressure on interest rates, our results suggest that this does not hold for Greece, as increased revenues are headed toward reduction of public debt and amplify the negative effects of the government spending cut.

4.2 Contractionary consumption policy scenario

The application of the contractionary consumption policy leads to a fall in output by 0.11 on impact and an instant increase in unemployment by 0.28 (Figure 4). The effect on those

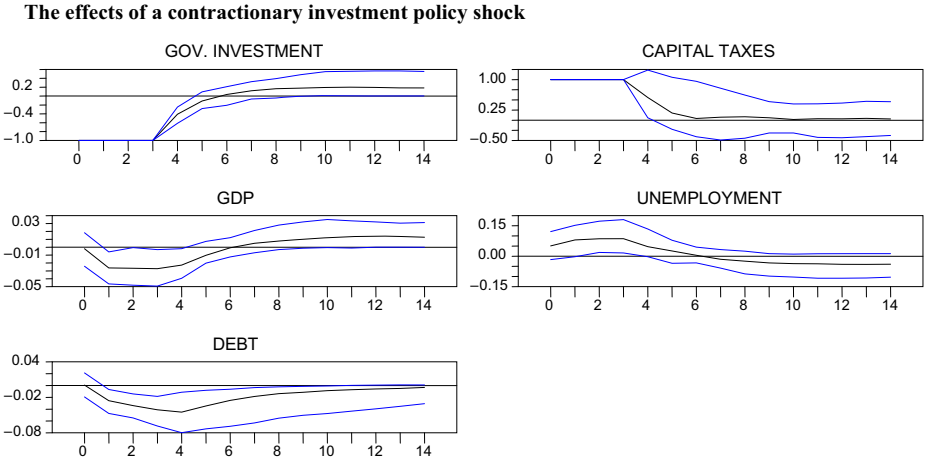

Figure 6.
The black solid line represents the response of output/unemployment/debt to a negative 1 per cent shock to government investment and a positive 1 per cent shock to capital taxes. The top blue solid line represents the 84th percentile and the bottom blue solid line represents the 16th percentile

Policy	Impact	Quarters 1st	4th	8th	12th
A. Cumulative output multipliers of fiscal policy scenarios					
Contr. base.	−0.26	−0.56	−1.17	−1.83	−2.03
Contr. cons.	−0.34	−0.56	−0.80	−0.68	−0.43
Contr. wage	−0.49	−1.38	−3.06	−4.04	−4.00
Contr. invest.	0.00	−0.31	−0.84	−1.16	−0.73
B. Cumulative unemployment multipliers of fiscal policy scenarios					
Contr. base.	0.80	1.68	3.06	4.25	4.55
Contr. cons.	0.87	1.58	2.08	1.80	1.21
Contr. wage	2.12	4.24	8.14	8.69	8.19
Contr. invest.	0.52	1.16	3.27	3.58	2.74
C. Cumulative debt multipliers of fiscal policy scenarios					
Contr. base.	−0.04	−0.17	−0.46	−1.05	−1.41
Contr. cons.	−0.12	−0.28	−0.96	−2.27	−2.83
Contr. wage	−0.44	−1.38	−3.35	−5.03	−5.13
Contr. invest.	0.00	−0.19	−0.87	−1.74	−2.18

Table II.
Cumulative multipliers of fiscal policy scenarios

variables fades away quickly. The cumulative output and unemployment multipliers are −0.80 and 2.08 four quarters after the shock and −0.68 and 1.80 the second year after the policy shock (Table II, Panel A and B). The debt response is estimated at −0.04 on impact, but it is statistically insignificant until the second quarter, after which it remains negative and statistically significant until the eighth quarter. The cumulative multiplier is −0.96 and −2.27 one and two years after the shock, respectively (Table II, Panel C).

The output and unemployment responses to a contractionary consumption shock are less persistent compared to the contractionary baseline shock, which is in line with Tagkalakis' (2013) results concerning the response of a government consumption shock. As mentioned before, government consumption constitutes the biggest part of the expenditure budget and has increased by 124 per cent during 2000-2009, and despite the reductions during 2010-2013, it remains 52 per cent above government consumption in 2000. There could be a reduction of unproductive expenses, such as social transfers, defense and pharmaceutical spending, while preserving basic social protection and national defense capacity. On the other hand, while the increase of indirect taxes may exert pressure on prices, due to the lower aggregate demand, to obtain their market share, firms at least partially absorb the cost of a higher consumption tax and thus output declines only in the first quarter of the policy shock. Papageorgiou (2012) also argued that in the case of Greece, the increase in the consumption tax rate is preferable to an increase in the tax rate on labour income.

4.3 Contractionary wage policy scenario

If the government follows the contractionary wage policy shock, the effects are more intense, as output falls by 0.11 on impact and the output contraction continues for five quarters (Figure 5). The reaction in unemployment shows nearly the opposite pattern, as it rises on impact by 0.43 and falls to almost zero after 1.5 years. This policy is the most effective concerning the reduction of public debt, as it falls by 0.44 on impact and by 3.35 after one year (Table II, Panel C). The effect remains statistically significant for almost five quarters. However, this comes with harsh consequences for growth and employment, as the output multiplier reaches −3.06 and the unemployment multiplier rises to 8.14 one year after the contractionary wage policy shock (Table II, Panels A and B).

Concerning the effects of that policy shock, while the reduction of public wages[8] might increase government efficiency, the decreased purchasing power of employees leads to a sharp reduction of aggregate demand and output responds immediately. Enterprises react to lower demand and reduce production, which provokes a discharge of redundant workers and contributes to the increase in unemployment. The reduction of wages in the private and public sectors is a prerequisite measure to improve Greek competitiveness through internal devaluation. However, the sharp reduction of public debt is attributed not only to wage reduction but also to high collectivity that income taxes exhibit, as there is no possibility for employees to avoid income taxes.

4.4 Contractionary investment policy scenario

Concerning the effects of a contractionary investment policy, the output remains unchanged on impact and unemployment rises by 0.05 and remains positive for two quarters. After 1.5 years, it turns negative, but the effect is not statistically significant. Debt remains stable on impact and falls statistically significantly from the first until the seventh quarter (Figure 6); however, the cumulative multiplier is smaller in all quarters compared to the other fiscal policy scenarios. Hence, the reduction of investments and the increase in taxes on capital leads to a significant increase in unemployment, as many businesses are closing due to heavy taxes and the complete lack of incentives results in increased unemployment. At the same time, this policy proves to be ineffective in

reducing public debt in a persistent manner. It is important to note that we did not take into account funding from the European Union (EU), as many public investment projects are co-financed largely by the EU. Therefore, a reduction of government investment would reduce proportionally the amount of money received from abroad, exerting more pressure on GDP and unemployment. The reduction of public investment should thus be avoided because of the adverse consequences for the economy. Baldacci *et al.* (2015) stated that the protection of public investment during the deficit reduction period is critical for medium-term growth.

4.5 Robustness checks

To assess the sensitivity of our results, we estimated our policy scenarios by including a time trend in the deterministic terms and by using a fourth-order lag polynomial instead of a first-order lag polynomial. However, our results were barely affected, as minor differences in point estimates are within the one-standard-deviation bandwidth of baseline estimates. It is also important to take into account structural breaks that might be present in our sample, such as the implementation of the EAPs or the debt reduction that took place in 2012. Regarding the EAPs, we include a dummy variable taking the value 1 from 2010-2012 onward and zero otherwise to control the fact that fiscal policy aimed at the reduction of public debt and that numerous reforms have been undertaken because of the application of the EAPs. While there are small differences, mainly in unemployment response, these also fall within the one-standard-deviation confidence bands of our baseline results and cannot be deemed as statistically significant. This is consistent with the idea that there are signs that the Greek economy is deteriorating and actions should be taken to reduce public debt well before the official implementation of the EAPs, as the spread of the 10-year sovereign bond yield between Greece and Germany began increasing from 2008 onward. Moreover, to test the stability of our results regarding the reduction of public debt, we have constrained the estimation to the sample until 2011-2014, but our baseline results remained quantitatively the same. This is in line with the notion that fiscal consolidation policy should be continued to achieve a budget surplus. Furthermore, the debt-to-GDP ratio remained at high levels, as the debt relief was small (Zettelmeyer *et al.*, 2013). Table III depicts the cumulative multipliers under different specifications for the fourth and the eighth quarters, respectively.

5. Conclusions

In response to the sovereign debt crisis in Greece, we implemented several fiscal consolidation scenarios in an effort to estimate the effects of the Greek Government's fiscal consolidation policy on major macroeconomic variables, while also taking into account government debt. Fiscal synchronization evidence implies that expenditure decisions are not made in isolation from revenue decisions. We exploited the sign restriction approach to apply a realistic fiscal policy, as the austerity measures adopted concerning expenditures and revenues are applied in conjunction.

The baseline scenario triggers a fall in output and an increase in unemployment. The existence of Keynesian effects of fiscal policy shocks in the Greek economy contradicts the results obtained for other economies, in which researchers observed non-Keynesian effects. This contradiction motivated us to apply several fiscal policy scenarios to reveal the effect of disaggregated government budget components and examine whether non-Keynesian effects exist in the Greek economy. Our results indicate that a contractionary consumption policy shock, namely, a 1 per cent decrease in government consumption and a 1 per cent increase in indirect taxes, is preferred, as it produces a minor decrease in output and a rise in unemployment and reduces public debt substantially, while the effect on public debt is not

Policy	4th quarter Time trend	4 lags	Dummy EAP	Since 2011:4	8th quarter Time trend	4 lags	Dummy EAP	Since 2011-2014
A. Cumulative output multipliers of fiscal policy scenarios								
Base.	−1.23	−1.04	−1.26	−1.09	−1.97	−1.77	−1.98	−1.80
Cons.	−0.88	−0.73	−0.74	−0.71	−0.71	−0.61	−0.62	−0.62
Wage	−3.41	−2.84	−2.92	−2.89	−4.28	−3.78	−3.94	−3.83
Invest.	−0.78	−0.88	−0.91	−0.86	−1.15	−1.24	−1.21	−1.07
B. Cumulative unemployment multipliers of fiscal policy scenarios								
Base.	3.16	2.83	2.93	2.90	4.41	3.94	4.87	4.05
Cons.	2.08	1.91	2.24	2.02	1.84	1.68	2.22	1.71
Wage	8.14	7.68	7.87	8.45	7.93	8.12	8.87	8.98
Invest.	3.27	3.44	3.18	3.32	3.71	3.88	3.91	3.37
C. Cumulative debt multipliers of fiscal policy scenarios								
Base.	−0.52	−0.43	−0.51	−0.48	−1.15	−0.96	−1.21	−1.18
Cons.	−1.02	−0.98	−1.19	−1.14	−2.38	−2.21	−2.34	−2.51
Wage	−3.12	−3.20	−3.14	−3.47	−4.76	−4.81	−5.42	−5.33
Invest.	−0.92	−1.01	−1.04	−0.87	−1.88	−2.02	−1.86	−2.11

Table III.
Cumulative multipliers of fiscal policy scenarios under alternative specifications

immediate and requires some time to start declining. The substantial increase of government consumption during the period 2000-2009, during which time unemployment remained almost the same, reveals that it is unproductive and therefore a reduction is necessary.

The second EAP stated that the reduction of wages will reinforce competitiveness, and thus we applied a contractionary wage policy shock, i.e. a 1 per cent decrease in public wages and a 1 per cent increase in income taxes. By analyzing the impulse response functions, we concluded that this policy is suitable only when the government aims at a sharp reduction of public debt. However, adopting this policy comes with harsh consequences for the economy and the employment rate and raises concerns about the sustainability of this fiscal policy scenario, as social cohesion is at risk because of high rates of unemployment. Finally, a contractionary investment policy shock – and more specifically, a 1 per cent decrease in government investment and a 1 per cent increase in capital taxes – is not recommended, as it triggers a rise in unemployment and a fall in output, while the effect on the public debt is minor.

The empirical results confirmed that the fiscal consolidation policy in Greece has no expansionary effects, although the size of multipliers differs substantially depending on the applied policy scenario. Better-designed and targeted tax and expenditure policies could hinder further increases in unemployment. Our analysis revealed that the composition of fiscal consolidation matters in terms of debt reduction, output contraction and unemployment. Policymakers should focus their efforts on the reduction of government consumption on the spending side, and revenues should be collected through indirect taxes. This requires strengthening of the tax enforcement mechanism to fight tax evasion, while cuts in government consumption contribute to a decrease in domestic prices and thus to competitiveness gains.

Notes

1. Fiscal multiplier is defined as the ratio between the change in output and an exogenous change in a given fiscal variable.
2. All data were obtained from OECD National Accounts Statistics, SNA 2008 (Detailed National Accounts, DOI: 10.1787/na-dna08-data-en) except public debt which is from Eurostat

[ei_nagt_q_r2.00b] and unemployment which is obtained from Hellenic Statistical Authority (publication/SJO01).

3. Transfers include all expenditure items except public consumption, public investment and interest payments. By subtracting current government transfers from government revenue, we do account for possible correlation between expenditures and revenues.
4. To check the robustness of our results to a conventional and non-conventional monetary policy shock we included to our model the three-month Euribor rate and the total assets of ECB, but the results remain within the one-standard-deviation bandwidth of baseline estimates
5. Following Caldara and Kamps (2008), we identified a business cycle shock by the requirement that the impulse responses of output and taxes are positive for four quarters following the shock, but the results remain within the one-standard-deviation bandwidth of baseline estimates confirming the Keynesian responses of output.
6. Expenditure cuts equivalent to 7 percent of GDP and taxes measures amount to 4 percent of GDP will be implemented in accordance with first EAP.
7. According to the first EAP, large cuts in public wages are inevitable and these consist of the abolition of Easter, Summer and Christmas bonuses to be replaced by a flat bonus.
8. Government wage bill increased by 66.4 per cent during 2000-2009, and from 2010-2013, the reduction is 27.8 per cent, although they remain 19.8 per cent above the year 2000.

References

Alesina, A., Ardagna, S., Perotti, R. and Schiantarelli, F. (2002), "Fiscal policy, profits, and investment", *American Economic Review*, Vol. 92 No. 3, pp. 571-589.

Alesina, A., Favero, C. and Giavazzi, F. (2015), "The output effect of fiscal consolidation plans", *Journal of International Economics*, Vol. 96 No. 1, pp. S19-S42.

Anderson, D., Hunt, B. and Snudden, S. (2014), "Fiscal consolidation in the euro area: how much pain can structural reforms ease?", *Journal of Policy Modeling*, Vol. 36 No. 5, pp. 785-799.

Athanasenas, A., Katrakilidis, C. and Trachanas, E. (2014), "Government spending and revenues in the Greek economy: evidence from nonlinear cointegration", *Empirica*, Vol. 41 No. 2, pp. 365-376.

Auerbach, A.J. and Gorodnichenko, Y. (2012), "Measuring the output responses to fiscal policy", *American Economic Journal: Economic Policy*, Vol. 4 No. 2, pp. 1-27.

Baldacci, E., Gupta, S. and Mulas-Granados, C. (2012), "Reassessing the fiscal mix for successful debt reduction", *Economic Policy*, Vol. 27 No. 71, pp. 365-406.

Baldacci, E., Gupta, S. and Mulas-Granados, C. (2015), "Debt reduction, fiscal adjustment, and growth in credit-constrained economies", *Journal of Applied Economics*, Vol. 18 No. 1, pp. 71-97.

Barro, R.J. (1974), "Are government bonds net wealth?", *The Journal of Political Economy*, Vol. 82 No. 6, pp. 1095-1117.

Blanchard, O. (1990), "Suggestions for a new set of fiscal indicators", OECD Economics Department Working Paper 79.

Blanchard, O. and Perotti, R. (2002), "An empirical characterization of the dynamic effects of changes in government spending and taxes on output", *Quarterly Journal of Economics*, Vol. 117 No. 4, pp. 1329-1368.

Blanchard, O.J. and Leigh, D. (2013), "Growth forecast errors and fiscal multipliers (No. w18779)", National Bureau of Economic Research.

Boussard, J., De Castro, F. and Salto, M. (2013), "Fiscal multipliers and public debt dynamics in consolidations", *Public Debt, Global Governance and Economic Dynamism*, Springer, Milano, pp. 167-211.

Burdekin, R.C., Banaian, K., Hallerberg, M. and Siklos, P.L. (2011), "Fiscal and monetary institutions and policies: onward and upward?", *Journal of Financial Economic Policy*, Vol. 3 No. 4, pp. 340-354.

Burnside, C., Eichenbaum, M. and Rebelo, S. (1999), "Hedging and financial fragility in fixed exchange rate regimes", NBER Working Paper 7143.

Caldara, D. and Kamps, C. (2008), "What are the effects of fiscal policy shocks? A VAR-based comparative analysis", European Central Bank, Working Paper 877.

Coenen, G., Straub, R. and Trabandt, M. (2013), "Gauging the effects of fiscal stimulus packages in the euro area", *Journal of Economic Dynamics and Control*, Vol. 37 No. 2, pp. 367-386.

Collignon, S. (2007), "The three sources of legitimacy for European fiscal policy", *International Political Science Review*, Vol. 28 No. 2, pp. 155-184.

Corsetti, G., Meier, A. and Müller, G.J. (2012), "Fiscal stimulus with spending reversals", *Review of Economics and Statistics*, Vol. 94 No. 4, pp. 878-895.

De Grauwe, P. and Costa Storti, C. (2005), "Is monetary policy in the Eurozone less effective than in the US?", CESifo Working Paper 1606.

DeLong, J.B. and Summers, L.H. (2012), "Fiscal policy in a depressed economy", *Brookings Papers on Economic Activity*, Vol. 1, pp. 233-297.

European Commission (2014), "The second economic adjustment programme for Greece- fourth review: April", Occasional Papers No. 192.

Faia, E., Lechthaler, W. and Merkl, C. (2013), "Fiscal stimulus and labor market policies in Europe", *Journal of Economic Dynamics and Control*, Vol. 37 No. 3, pp. 483-499.

Fatás, A. and Mihov, I. (2005), "Policy volatility, institutions and economic growth", CEPR Discussion Paper 5388.

Favero, C. and Giavazzi, F. (2007), "Debt and the effects of fiscal policy (No. w12822)", National Bureau of Economic Research.

Giavazzi, F. and Pagano, M. (1990), "Can severe fiscal contractions be expansionary? Tales of two small European countries", *NBER Macroeconomics Annual 1990,* MIT Press, Cambridge, Vol. 5, pp. 75-122.

Giavazzi, F., Jappelli, T. and Pagano, M. (2000), "Searching for non-linear effects of fiscal policy: evidence from industrial and developing countries", *European Economic Review*, Vol. 44 No. 7, pp. 1259-1289.

Gupta, S., Clements, B., Baldacci, E. and Mulas-Granados, C. (2005), "Fiscal policy, expenditure composition, and growth in low-income countries", *Journal of International Money and Finance*, Vol. 24 No. 3, pp. 441-463.

Ilzetzki, E., Mendoza, E.G. and Végh, C.A. (2013), "How big (small?) are fiscal multipliers?", *Journal of Monetary Economics*, Vol. 60 No. 2, pp. 239-254.

Jha, S., Mallick, S.K., Park, D. and Quising, P.F. (2014), "Effectiveness of countercyclical fiscal policy: evidence from developing Asia", *Journal of Macroeconomics*, Vol. 40, pp. 82-98.

Lozano, I. and Rodríguez, K. (2011), "Assessing the macroeconomic effects of fiscal policy in Colombia", *Journal of Financial Economic Policy*, Vol. 3 No. 3, pp. 206-228.

Marcellino, M. (2006), "Some stylized facts on non-systematic fiscal policy in the euro area", *Journal of Macroeconomics*, Vol. 28 No. 3, pp. 461-479.

Mayer, E., Rüth, S. and Scharler, J. (2013), "Government debt, inflation dynamics and the transmission of fiscal policy shocks", *Economic Modelling*, Vol. 33, pp. 762-771.

Mertens, K. and Ravn, M.O. (2014), "A reconciliation of SVAR and narrative estimates of tax multipliers", *Journal of Monetary Economics*, Vol. 68 No. 2, pp. 1-19.

Monacelli, T., Perotti, R. and Trigari, A. (2010), "Unemployment fiscal multipliers", *Journal of Monetary Economics*, Vol. 57 No. 5, pp. 531-553.

Mountford, A. and Uhlig, H. (2009), "What are the effects of fiscal policy shocks?", *Journal of Applied Econometrics*, Vol. 24 No. 1, pp. 960-992.

Papageorgiou, D. (2012), "Fiscal policy reforms in general equilibrium: the case of Greece", *Journal of Macroeconomics*, Vol. 34 No. 2, pp. 504-522.

Perotti, R. (2004), "Public investment: another (different) look", IGIER Working Paper 277.

Perotti, R. (2007), "In search of the transmission mechanism of fiscal policy", *NBER Macroeconomics Annual*, Vol. 22 No. 1, pp. 169-249.

Ricci-Risquete, A. and Ramajo, J. (2015), "The effects of fiscal policy on the Spanish economy: Keynesian or non-Keynesian behavior?", *Journal of Policy Modeling*, Vol. 37 No. 6, pp. 1019-1048.

Romer, C.D. and Romer, D.H. (2010), "The macroeconomic effects of tax changes: estimates based on a new measure of fiscal shocks", *American Economic Review*, Vol. 100 No. 3, pp. 763-801.

Sims, C.A. and Zha, T. (1999), "Error bands for impulse responses", *Econometrica*, Vol. 67 No. 5, pp. 1113-1155.

Tagkalakis, A.O. (2013), "The unemployment effects of fiscal policy: recent evidence from Greece", *IZA Journal of European Labor Studies*, Vol. 2 No. 1, pp. 1-32.

Tagkalakis, A.O. (2014), "Credit and the transmission of fiscal policy shocks: recent evidence from Greece", *Economics Letters*, Vol. 122 No. 2, pp. 263-267.

Uhlig, H. (2005), "What are the effects of monetary policy on output? Results from an agnostic identification procedure", *Journal of Monetary Economics*, Vol. 52 No. 2, pp. 381-419.

Wood, R. (2012), "Delivering economic stimulus, addressing rising public debt and avoiding inflation", *Journal of Financial Economic Policy*, Vol. 4 No. 1, pp. 4-24.

Yang, W., Fidrmuc, J. and Ghosh, S. (2015), "Macroeconomic effects of fiscal adjustment: a tale of two approaches", *Journal of International Money and Finance*, Vol. 57 No. 1, pp. 31-60.

Zettelmeyer, J., Trebesch, C. and Gulati, M. (2013), "The Greek debt restructuring: an autopsy", *Economic Policy*, Vol. 28 No. 75, pp. 513-563.

Further reading

Ali, S., Rabbi, F., Hayat, U. and Ali, N. (2013), "The composition of public expenditures and economic growth: evidence from Pakistan", *International Journal of Social Economics*, Vol. 40 No. 11, pp. 1010-1022.

Galí, J., López-Salido, J.D. and Vallés, J. (2007), "Understanding the effects of government spending on consumption", *Journal of European Economic Association*, Vol. 5, pp. 227-270.

Rafiq, M.S. and Mallick, S.K. (2008), "The effect of monetary policy on output in EMU3: a sign restriction approach", *Journal of Macroeconomics*, Vol. 30 No. 4, pp. 1756-1791.

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