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**Fiscal multipliers in Euro area  
peripheral countries: empirical evidence  
from a structural VAR model**

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## **Δημοσιονομικοί πολλαπλασιαστές στις χώρες της ευρώ-περιφέρειας: εμπειρική διερεύνηση μέσω ενός διαρθρωτικού VAR υποδείγματος**

Σωτήρης Παπαϊωάννου

### ΠΕΡΙΛΗΨΗ

Ο ρόλος της δημοσιονομικής πολιτικής και οι επιπτώσεις της στο παραγόμενο προϊόν είναι ένα από τα πιο αμφιλεγόμενα ζητήματα της σύγχρονης μακροοικονομικής έρευνας. Η σχετική θεωρητική βιβλιογραφία προβλέπει ότι η δημοσιονομική πολιτική μπορεί να επηρεάσει την οικονομική δραστηριότητα μέσω της στήριξης της συνολικής ζήτησης, σύμφωνα με την κεϋνσιανή οικονομική θεώρηση, ή να την παρεμποδίσει μέσω του παραγκωνισμού του ιδιωτικού τομέα, σύμφωνα με την νεοκλασική οικονομική αντίληψη.

Η συζήτηση σχετικά με τις επιδράσεις της δημοσιονομικής πολιτικής στο παραγόμενο προϊόν, καθώς και σε άλλες μακροοικονομικές μεταβλητές, έχει μετατοπιστεί προς μια νέα κατεύθυνση μετά την έλευση της χρηματοπιστωτικής κρίσης του 2007-2008, καθώς πολλές ανεπτυγμένες χώρες υιοθέτησαν μέτρα δημοσιονομικής επέκτασης προκειμένου να αντιμετωπιστούν οι αδυναμίες του χρηματοπιστωτικού τομέα και να αποκατασταθεί η συνολική εγχώρια ζήτηση. Ως αποτέλεσμα, η δημοσιονομική κατάσταση πολλών χωρών επιδεινώθηκε, οδηγώντας σε υψηλότερα δημοσιονομικά ελλείμματα και σε ταχεία συσσώρευση δημοσίου χρέους. Πιο πρόσφατα, η κατεύθυνση της δημοσιονομικής πολιτικής μετατοπίστηκε σε ένα πιο περιοριστικό καθεστώς, κυρίως στις οικονομίες της περιφέρειας της ευρώζωνης, ως απάντηση στην εμβάθυνση της κρίσης χρέους.

Η παρούσα εργασία προσπαθεί να συμβάλει στη σχετική βιβλιογραφία μέσω της ποσοτικοποίησης των επιπτώσεων της δημοσιονομικής πολιτικής στην οικονομική δραστηριότητα των χωρών της περιφέρειας της ζώνης του ευρώ. Προκειμένου να εντοπιστούν οι εξωγενείς διαταραχές στη δημοσιονομική πολιτική, εξειδικεύεται ένα διαρθρωτικό VAR οικονομετρικό υπόδειγμα, σύμφωνα με τη μεθοδολογία των Blanchard και Perotti, σε ένα σύνολο χρονολογικών σειρών τριμηνιαίας συχνότητας. Οι χώρες που εξετάζονται είναι η Ελλάδα, η Ιρλανδία, η Ιταλία, η Κύπρος, η Πορτογαλία και η Ισπανία, ενώ η χρονική περίοδος διερεύνησης εκτείνεται από το πρώτο τρίμηνο του 1995 έως και το τρίτο τρίμηνο του 2013.

Τα οικονομετρικά αποτελέσματα επιβεβαιώνουν ότι η επίπτωση στο παραγόμενο προϊόν, ύστερα από μια διαταραχή είτε στις δημόσιες δαπάνες ή στα καθαρά φορολογικά έσοδα, δεν είναι ομοιόμορφη σε όλες τις υπό εξέταση χώρες. Το μέγεθος της επίπτωσης των δημοσίων δαπανών είναι σχετικά υψηλό στην Ελλάδα, την Ιταλία και την Κύπρο, με το σωρευτικό πολλαπλασιαστή να είναι υψηλότερος της μονάδας. Η επίπτωση των δημοσίων δαπανών είναι επίσης θετική για την Ισπανία, αλλά είναι αρνητική για την Πορτογαλία και την Ιρλανδία. Η επίπτωση μιας διαταραχής στα καθαρά φορολογικά έσοδα είναι αρνητική ή κοντά στο μηδέν στις περισσότερες από τις υπό εξέταση χώρες.

**Fiscal multipliers in Euro area peripheral countries:  
empirical evidence from a structural VAR model**

**Abstract**

This paper studies the effects of fiscal policy on GDP across highly indebted countries of the Euro area periphery. By estimating a structural VAR econometric model for Cyprus, Greece, Ireland, Italy, Portugal and Spain during 1995:Q1-2013:Q3, this study shows that the output responses are not uniform following a fiscal shock. The magnitude of the cumulative multiplier after a government spending shock is very high in Cyprus, Greece and Italy. In most countries the output response after a shock in net taxes is negative or close to zero.

## **1. Introduction**

The role of fiscal policy and its effects on other macroeconomic variables is one of the most extensively discussed issues in the modern macroeconomics' literature. The relevant theoretical literature predicts that fiscal policy can influence output growth by supporting aggregate demand under a Keynesian manner, or can hamper growth through crowding out of the private sector, under neoclassical economic theory.

The existing empirical research that models the impact of fiscal variables on growth mostly utilizes multiple equation vector autoregression (VAR) models, as it allows for the dynamic feedback between endogenous variables in the econometric system. Empirical studies using VAR techniques find either that the government spending multiplier is greater than one or that it is well below unity. It seems that no consensus has yet emerged from empirically estimated VAR models regarding the response of output to fiscal shocks, with the magnitude of the response depending on several characteristics related to monetary policy, exchange rate regime, trade openness and level of government debt (Ilzetzki et al. 2013).

The debate on the effects of fiscal policy on output and other macroeconomic variables has moved to a new direction following the 2007-2008 financial crisis, as a lot of industrialized countries adopted fiscal stimulus measures to address weaknesses in the financial sector and restore aggregate demand. As a result, fiscal positions of many countries deteriorated, leading to higher fiscal deficits and rapid accumulation of government debt. More recently, the fiscal policy stance has shifted into a restrictive regime, as a response to the deepening sovereign debt crisis in euro area periphery economies.

Motivated by these considerations, this paper tries to contribute in the relevant literature by econometrically quantifying the impact of fiscal policy on economic



activity of countries in the Euro area periphery which are characterized by high debt to GDP ratios. Following the approach of Blanchard and Perotti (2002) a structural VAR econometric framework is set up to identify exogenous fiscal policy shocks. A quarterly time series dataset is employed for Cyprus, Greece, Italy, Ireland Portugal and Spain during the period 1995:Q1-2013:Q3.

The obtained econometric results confirm that responses of output after a shock in government spending or a shock in net taxes are not uniform across countries under examination. The magnitude of the output response after a shock in government spending is highly positive in Cyprus, Greece and Italy with the cumulative multiplier being higher than one. The response of output is also positive in Spain, but negative in Portugal and Ireland. The sign of the output response after a shock in taxes is negative or close to zero in most of the countries under consideration.

The paper proceeds as follows: section 2 presents the findings of the relevant theoretical and empirical literature. Section 3 introduces the econometric framework, while section 4 discusses the empirical results. Finally, section 5 concludes.

## **2. Theoretical predictions and related empirical literature**

Predictions of the existing theoretical literature are ambiguous as regards the impact of fiscal policy on output. General equilibrium new Keynesian models show that the government spending multiplier can be close or above one (Gali et al. 2007; Monacelli and Perotti 2008). In new Keynesian models, consumers do not face infinitely lived horizons and do not behave in a Ricardian fashion. Therefore, their consumption is a function of current disposable income and, thus, an increase in government spending financed by deficit and not tax increases leads to higher consumption and output.

On the other hand, standard real business cycle models are in sharp contrast to new Keynesian models in their predictions of the effects of government spending on output and consumption. Specifically, the size of the multiplier is less than one (Baxter and King 1993; Burnside et al. 2004; Ramey 2011), while consumption is expected to decline. The main reason for such a significant difference with new Keynesian models, is the implicit assumption of consumer behavior in real business cycle models featuring infinitely lived Ricardian households, whose consumption depends on an intertemporal budget constraint. In this way, an increase in government spending lowers the present value of income after taxes, which in turn generates negative wealth effects and decrease in consumption.

Several studies have tried to reconcile predictions of neoclassical models with observed evidence which were in favor of a raise in consumption after an increase in government spending. Gali et al. (2007) extended a standard new Keynesian model to allow for the co-existence of infinite horizon Ricardian consumers and ‘rule of thumb’ consumers, which do not save and do not borrow. They showed that an interaction of rule of thumb consumers with sticky prices and deficit financing of government spending can account for higher consumption when spending increases. In a similar way, Hall (2009) developed a dynamic general equilibrium model which has as main features the decline in markups of prices over costs when output raises and the elastic response of employment when demand increases. With these features the model delivers quite high multipliers and increase in consumption. Recently, Cogan et al. (2010) showed that government spending multipliers are much smaller in new Keynesian models than old Keynesian ones, with the estimated stimulus in GDP being one sixth of what is predicted in old Keynesian ones.

Most of the empirical evidence on the effectiveness of fiscal policy in raising output relies on VAR models. However, the existing empirical predictions are not uniform. A main reason that no consensus has yet emerged from empirically estimated VAR models arises from differences in the identification schemes. Blanchard and Perotti (2002) used a structural VAR framework for the US economy during the post war period and showed that positive government spending shocks are associated with higher output, with the size of the multiplier being close to one. Fatas and Mihov (2001) also showed that increases in government spending are expansionary with a multiplier greater than 1, which is mainly driven by increases in consumption. Similarly, Monacelli et al. (2010) estimated a VAR model to evaluate the effects of U.S. government spending on output and employment. Their results with respect to GDP were in favor of a multiplier which is larger than one.

Recently, Mountford and Uhlig (2009) used a sign restriction identification scheme within a structural VAR framework for the U.S. economy. They showed that output responds better to deficit financed tax cuts, while government spending has weak effects on output by crowding out private investment. On the other hand, Canova and Pappa (2007) examined the effects of fiscal policy in a monetary union, utilizing a sign restriction method in US states and EU countries. Among others, they showed that output responses after a deficit financed expenditure shock are higher than responses of output produced by deficit financed tax cuts.

A part of the literature has identified non Keynesian effects in periods of large fiscal consolidations with output rising as spending decreases. Giavazzi and Pagano (1990) have attributed this evidence to improvements in expectations of the private sector that governments plan to lower future taxation. Perotti (1999) also noted that

during the 1980s several countries implemented large deficit cuts due to large public debts, but the economies boomed rather than falling in recession.<sup>1</sup>

It seems, however, that the effects of fiscal policy have become weaker over time. Perotti (2005) using a structural VAR framework showed that the effects of fiscal policy on GDP have become substantially weaker over time in five major OECD countries, with the government spending multiplier being higher than 1 only in the US pre-1980 period. Similarly, Perotti (2007) found that the effect of government spending on U.S. consumption was positive and statistically significant in the 1960s and the 1970s but became insignificant in the 1980s and 1990s.

It seems that the magnitude of the effect of fiscal policy on output depends on country specific characteristics. Christiano et al. (2011) argue that the government spending multiplier can be very large in periods where the nominal interest rates are held constant and do not respond to spending increases. Ilzetzki et al. (2013) showed that the size of the multiplier is higher in industrial than in developed countries, in economies operating under predetermined rather than flexible exchange rate regimes and in relatively closed economies. They also showed that fiscal multipliers are negative in high debt countries.<sup>2</sup>

### **3. Econometric model**

A common approach to study the effects of fiscal policy on output is to use a standard VAR model. A drawback of this specification is that if covariance between error disturbances is not zero, then the common component of error innovations is wrongly attributed to the first variable entering the VAR, rendering the empirical estimates sensitive to the ordering of variables in the system. Instead of a standard VAR model,

a structural VAR approach is followed here to identify exogenous fiscal policy shocks and measure their impact.

We start with the following reduced form VAR:

$$Z_t = A(L)Z_{t-1} + U_t \quad (1)$$

where  $Z_t \equiv (g_t, t_t, y_t, p_t, r_t)$  is the vector of endogenous variables. This specification includes quarterly data on the logs of government spending ( $g_t$ ), defined as government consumption plus government investment, taxes net of government transfers ( $t_t$ ) and GDP ( $y_t$ ), with all three variables entering in real terms. It also includes a variable for the GDP deflator ( $p_t$ ), a variable for the interest rate paid for the 10-year government debt ( $r_t$ ), as well as a deterministic constant term. All variables are seasonally adjusted except the GDP deflator and the interest rate.  $A(L)$  is the autoregressive polynomial in the lag operator  $L$  and  $U_t \equiv (u_t^g, u_t^t, u_t^y, u_t^p, u_t^r)$  is the vector which contains the reduced form residuals.

Relying on Blanchard and Perotti (2002) and Perotti (2005), the reduced form residuals for government spending  $u_t^g$  and taxes  $u_t^t$  can be expressed as a linear function of: (a) automatic responses to movements in the macroeconomic variables of GDP, prices and interest rate, (b) discretionary response of fiscal policy to macroeconomic news and (c) random exogenous fiscal policy shocks ( $e_t^g, e_t^t$ ). The latter components are the structural shocks in government spending and taxes that we try to identify in order to measure responses of output. The reduced form residuals for government spending  $u_t^g$  and net taxes  $u_t^t$  can be represented as:

$$u_t^g = a_{g,y}u_t^y + a_{g,p}u_t^p + a_{g,r}u_t^r + \beta_{g,t}e_t^t + e_t^g \quad (2)$$

$$u_t^t = a_{t,y}u_t^y + a_{t,p}u_t^p + a_{t,r}u_t^r + \beta_{t,g}e_t^g + e_t^t \quad (3)$$

In order to recover structural residuals from the reduced form VAR, we need to have estimates for the  $a_{i,j}$ 's and  $\beta_{i,j}$ 's. The use of quarterly data allows us to set the contemporaneous response of discretionary fiscal policy to innovations in GDP, prices and interest rate equal to zero, since it takes more than a quarter to approve and implement new measures. Therefore, the  $a_{i,j}$ 's coefficients in equations (2) and (3) only reflect automatic responses of fiscal variables to movements in variables of GDP, prices and interest rate.

The output elasticity of government spending  $a_{g,y}$  is set equal to zero, as there is no evidence in favor of any substantial response of government spending to changes in GDP, within one quarter. Following Perotti (2005), the price elasticity of government spending  $a_{g,p}$  is set equal to 0.5, as several components of government spending are related to changes in prices (i.e. purchases of goods and services, wages). Also, given that the definitions of government spending and taxes do not contain interest rate payments, their interest rate elasticities are zero. The output elasticities of net taxes have been obtained from Veld et al. (2012).<sup>3</sup> Finally, the price elasticity of taxes has been constructed as the weighted average of the individual elasticities of four broad tax categories: indirect taxes, social security contributions and direct personal and corporate taxes.<sup>4</sup>

Once output and price elasticities have been obtained, the fiscal shocks can be expressed in the following way:

$$u_t^g - a_{g,y}u_t^y - a_{g,p}u_t^p - a_{g,r}u_t^r = \beta_{g,t}e_t^t + e_t^g \quad (4)$$

$$u_t^t - a_{t,y}u_t^y - a_{t,p}u_t^p - a_{t,r}u_t^r = \beta_{t,g}e_t^g + e_t^t \quad (5)$$

Since there is no a priori knowledge on whether decisions for spending are before decisions for taxes or the opposite, we have followed Blanchard and Perotti (2002) to adopt two alternative identification schemes, with the first one assuming

that spending decisions come first and taxes follow, so that  $\beta_{g,t} = 0$ . The second one assumes that tax decisions come first and government spending follows ( $\beta_{t,g} = 0$ ).

The reduced form residuals for GDP are a linear combination of fiscal variable shocks:

$$u_t^y = \gamma_{y,g} u_t^g + \gamma_{y,t} u_t^t + e_t^y \quad (6)$$

Accordingly, the reduced form residuals for price changes and interest rates are expressed as:

$$u_t^p = \gamma_{p,g} u_t^g + \gamma_{p,t} u_t^t + \gamma_{p,y} u_t^y + e_t^p \quad (7)$$

$$u_t^r = \gamma_{r,g} u_t^g + \gamma_{r,t} u_t^t + \gamma_{r,y} u_t^y + \gamma_{r,p} u_t^p + e_t^r \quad (8)$$

The final econometric specification can be written as:

$$AU_t = BV_t \quad (9)$$

where  $V_t \equiv (e_t^g, e_t^t, e_t^y, e_t^p, e_t^r)$  is the vector including orthogonal structural shocks,

$$\text{with: } A = \begin{bmatrix} 1 & 0 & 0 & -a_{g,p} & 0 \\ 0 & 1 & -a_{t,y} & -a_{t,p} & 0 \\ -\gamma_{y,g} & -\gamma_{y,t} & 1 & 0 & 0 \\ -\gamma_{p,g} & -\gamma_{p,t} & -\gamma_{p,y} & 1 & 0 \\ -\gamma_{r,g} & -\gamma_{r,t} & -\gamma_{r,y} & -\gamma_{r,p} & 1 \end{bmatrix} \text{ and } B = \begin{bmatrix} 1 & \beta_{g,t} & 0 & 0 & 0 \\ \beta_{t,g} & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix}$$

#### 4. Empirical results

The sample of the present analysis covers the period 1995:Q1–2013:Q3 for six euro area peripheral countries which are Cyprus, Greece, Italy, Ireland, Portugal and Spain. The data have been retrieved from the National Accounts' database of Eurostat as well as from the European Central Bank. We first estimate the reduced form VAR specification and then recover the structural parameters and shocks, which in turn are used to derive impulse responses of variables to fiscal shocks. For each individual country we estimate a separate VAR system. The number of lags for each VAR

system was set equal to 4, as no serial correlation did not exist in the residuals, the stability condition was satisfied and at least one of the information criteria was minimised.

After the estimation of the structural VAR's, a series of simulations was performed to trace the impact of fiscal shocks. The shocks were set equal to a positive one standard deviation and the impact of these shocks is illustrated with impulse response functions which are shown in Figures 1-6. Tables 1 and 2 display cumulative multipliers after a shock in government spending and after a shock in net taxes, respectively, for various time horizons. The cumulative fiscal multiplier is defined as the ratio of the cumulative change in output, divided by the median interest rate, over the magnitude of the change in the fiscal variable (either government spending or net taxes) in period  $t=1$ :

$$\text{cumulative fiscal multiplier} = \frac{\sum_{t=1}^n (\Delta(y_t) * (1+i)^{-1})}{\Delta(G_{t=1})} \quad (10)$$

where  $y$  is output and  $G$  is the fiscal variable.

Figure 1 displays the responses of endogenous variables after a shock in government spending in Cyprus. It seems that the spending shock is highly persistent and significant over time. The increase of government spending raises GDP, with the cumulative multiplier being equal to 0.10 four quarters after the shock, 0.47, eight quarters after the shock and 1.08 after twelve quarters (Table 1). As for the other endogenous variables included in the system, we do not observe a significant change in net taxes, or in prices, while there is a significant fall in interest rates. In the same figure, the response of GDP to the shock in net taxes is positive, with the cumulative multiplier reaching 0.29 four quarters after the shock. In Greece (Figure 2), a positive shock in government spending raises GDP, with the cumulative multiplier reaching



0.33 four quarters after the shock, 0.71 after eight quarters and 1.08 after twelve quarters (Table 1). A positive shock in net taxes lowers GDP, with the cumulative tax multiplier reaching -0.30 four quarters after the shock. In Ireland (Figure 3), the response of GDP after a shock in government spending is highly negative over the entire time horizon. The cumulative multiplier is equal to -0.16 four quarters after the shock, -0.65 after eight quarters and -1.26 after twelve quarters. We also observe a significant rise in the interest rate. The response of output after a positive tax shock is almost zero, while the interest rate falls.

In Italy (Figure 4), the response of GDP after a government spending shock is highly positive and peaks after six quarters. The size of the multiplier reaches 1.27 and 1.62, eight and twelve quarters after the shock, respectively. A positive tax shock lowers GDP, with the cumulative multiplier reaching -0.24 four quarters after the shock. In Portugal (Figure 5), the output response is almost zero one quarter after the government spending shock but becomes negative in the following quarters. The cumulative multiplier reaches -0.62 twelve quarters after the shock. A positive tax shock slightly raises GDP in the first four quarters, but then this effect becomes negative. The cumulative multiplier reaches 0.12 four quarters after the tax shock, but then becomes negative and equal to -0.10 and -0.07, after eight and twelve quarters, respectively. Finally, in Spain (Figure 6) the response of output is significantly positive and peaks eight quarters after the government spending shock. The cumulative multiplier reaches 0.73 and 0.71 after eight and twelve quarters, respectively. The response of GDP after a shock in net taxes is also positive and the respective multiplier is equal to 0.33 after four quarters.

In order to test the robustness of the obtained results to different assumptions, Tables 1 and 2 display fiscal multipliers after a) having included a dummy variable in

the VAR system which proxies for the period of the debt crisis and takes the values of one from the first quarter of 2009 onwards, b) having assumed a higher output elasticity of taxes c) having assumed a lower output elasticity of taxes and d) having adopted the alternative hypothesis that net taxes are ordered first in the identification scheme.<sup>5</sup> With few exceptions, the multipliers that have been obtained under different assumptions confirm the initial results as regards the response of output after a shock either in government spending or in net taxes. However, the magnitude of the multipliers differentiates in several countries, especially when including a dummy variable for the crisis or when ordering net taxes first in the identification scheme.

### *Discussion*

The obtained econometric results confirm that responses of output after a shock in government spending or a shock in taxes are not uniform across countries under examination. In particular, the effects of government spending are highly positive in Cyprus, Greece and Italy, with the value of the multiplier becoming higher than one. Also, the response of output is positive in Spain, but negative in Portugal and Ireland. Expectedly, in most of the countries under consideration the effect of a shock in taxes is negative.

The most meaningful explanations that can be offered to explain the variation of fiscal multipliers across countries are related to country specific effects. Such country characteristics include liquidity constraints of households and investors as well as response of interest rate after a rise in government spending. They also relate to the import propensity across countries and the sustainability of fiscal positions.<sup>6</sup>

Low or even negative responses of output after a shock in government spending indicate that households and firms do not respond with higher consumption

and higher investment. A possible explanation is related to negative wealth effects caused by expectations of households for higher future taxation. This is consistent with the Ricardian equivalence proposition stating that higher deficits today simply postpone future taxation. This proposition rests on the assumption that governments face an intertemporal budget constraint and cannot run deficits over time. It also rests on the assumption that economic agents recognize that and save more today in order to be able to pay higher taxes in the future.<sup>7</sup>

## **5. Conclusion**

The purpose of this study was to econometrically quantify the impact of fiscal policy on GDP of countries in the Euro area periphery, characterized by high debt to GDP ratios. A structural VAR econometric framework was set up to identify exogenous fiscal policy shocks. A quarterly time series dataset was used for Cyprus, Greece, Ireland, Italy, Portugal and Spain during the period 1995:Q1-2013:Q3. The econometric results showed that the size of the multiplier is not uniform across countries with the highest elasticity after a shock in government spending observed in Cyprus, Greece and Italy. In most of the countries under consideration the multiplier is negative after a shock in taxes.

Future research could investigate which factors are the most important for the variation of fiscal multipliers across countries and time, with a special focus given to responses of output during the recent economic crisis. Future research may also search which components of GDP are mostly affected by exogenous fiscal shocks, or identify which tax and spending components have the most influential effect on GDP.

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## Notes

1. Alesina and Ardagna (1998) argue that such non Keynesian effects in periods of large fiscal consolidations can hardly be interpreted as neoclassical ones since both output and consumption increase as government spending decreases.
2. Chung and Leeper (2007), as well as Favero and Giavazzi (2007), argued that overlooking the effects of debt dynamics when considering the influence of fiscal policy on growth leads to misspecified specifications and biased estimates.
3. The output elasticities of net taxes are equal to 1.14 for Cyprus, 1.07 for Greece, 1.14 for Ireland, 1.17 for Italy, 1.08 for Portugal and 1.09 for Spain.
4. The price elasticities of personal income taxes and social security contributions have been obtained from Van den Noord (2000). Also, following Perotti (2005), the price elasticities of indirect taxes and corporate taxes are set equal to zero. Accordingly, the price elasticity of total taxes is equal to 0.43 for Cyprus, 0.76 for Greece, 0.72 for Ireland, 0.68 for Italy, 0.60 for Portugal and 0.68 for Spain.
5. The advent of the crisis varies from country to country. However, for the sake of uniformity, we set the first quarter of 2009 as the milestone of the crisis.
6. Reinhart and Rogoff (2010) have shown that a negative relationship exists between debt and growth. Nickel and Tudyka (2013) showed across a panel of 17 European countries that expansionary fiscal policy has negative effects on output of countries with high debt to GDP ratios.
7. Some papers give empirical support to this theoretical proposition, with Alesina and Perotti (1997) and Alesina and Ardagna (2010) showing that fiscal adjustments that rely primarily on spending cuts may stimulate growth by restoring investors' confidence and raising future expected income of the private sector. This contradicts

the basic Keynesian predictions that raising taxes may have contractionary effects on output by lowering aggregate demand.

## Tables and figures

Table 1: Cumulative multipliers (government spending shock)

<i>Baseline VAR</i>					
	Q1	Q2	Q4	Q8	Q12
Cyprus	0.02	0.05	0.10	0.47	1.08
Greece	0.04	0.09	0.33	0.71	1.08
Ireland	-0.02	-0.04	-0.16	-0.65	-1.26
Italy	0.06	0.18	0.52	1.27	1.62
Portugal	0.03	-0.01	-0.05	-0.25	-0.62
Spain	0.02	0.07	0.20	0.73	0.71
<i>Dummy for crisis included</i>					
	Q1	Q2	Q4	Q8	Q12
Cyprus	0.03	0.07	0.17	0.65	1.31
Greece	0.03	0.08	0.28	0.59	1.11
Ireland	-0.02	-0.04	-0.16	-0.66	-1.22
Italy	0.04	0.11	0.32	1.01	1.33
Portugal	0.05	0.06	0.13	-0.07	-0.27
Spain	0.02	0.05	0.13	0.25	-0.02
<i>Lower output elasticity of taxes</i>					
	Q1	Q2	Q4	Q8	Q12
Cyprus	0.02	0.05	0.10	0.47	1.08
Greece	0.04	0.09	0.33	0.71	1.08
Ireland	-0.02	-0.04	-0.16	-0.65	-1.26
Italy	0.06	0.18	0.52	1.27	1.62
Portugal	0.03	-0.01	-0.05	-0.25	-0.62
Spain	0.02	0.07	0.20	0.73	0.71
<i>Higher output elasticity of taxes</i>					
	Q1	Q2	Q4	Q8	Q12
Cyprus	0.02	0.05	0.10	0.47	1.08
Greece	0.04	0.09	0.33	0.71	1.08
Ireland	-0.02	-0.04	-0.16	-0.65	-1.26
Italy	0.06	0.18	0.52	1.27	1.62
Portugal	0.03	-0.01	-0.05	-0.25	-0.62
Spain	0.02	0.07	0.20	0.73	0.71
<i>Ordering of net taxes first</i>					
	Q1	Q2	Q4	Q8	Q12
Cyprus	0.02	0.04	0.06	0.36	0.88
Greece	0.05	0.11	0.38	0.85	1.27
Ireland	-0.02	-0.03	-0.14	-0.59	-1.06
Italy	0.06	0.18	0.51	1.23	1.57
Portugal	0.03	0.00	-0.04	-0.26	-0.62
Spain	0.00	0.01	0.07	0.48	0.41



Table 2: Cumulative multipliers (tax shock)

<i>Baseline VAR</i>					
	Q1	Q2	Q4	Q8	Q12
Cyprus	0.02	0.08	0.29	0.85	1.45
Greece	-0.04	-0.10	-0.30	-0.80	-1.05
Ireland	-0.01	0.01	0.01	0.04	0.30
Italy	0.03	-0.04	-0.24	-0.60	-0.98
Portugal	0.03	0.06	0.12	-0.10	-0.07
Spain	0.06	0.14	0.33	0.54	0.68
<i>Dummy for crisis included</i>					
	Q1	Q2	Q4	Q8	Q12
Cyprus	0.01	0.05	0.22	0.56	1.06
Greece	-0.03	-0.09	-0.28	-0.92	-1.04
Ireland	-0.01	0.01	0.00	-0.03	0.10
Italy	0.04	0.03	0.09	0.41	0.43
Portugal	-0.01	-0.06	-0.18	-0.60	-0.79
Spain	0.06	0.12	0.21	0.04	0.01
<i>Lower output elasticity of taxes</i>					
	Q1	Q2	Q4	Q8	Q12
Cyprus	0.02	0.08	0.30	0.86	1.46
Greece	-0.03	-0.10	-0.29	-0.79	-1.03
Ireland	-0.01	0.01	0.01	0.04	0.31
Italy	0.04	-0.03	-0.21	-0.55	-0.92
Portugal	0.04	0.06	0.12	-0.10	-0.06
Spain	0.06	0.14	0.33	0.55	0.69
<i>Higher output elasticity of taxes</i>					
	Q1	Q2	Q4	Q8	Q12
Cyprus	0.02	0.07	0.29	0.85	1.44
Greece	-0.04	-0.11	-0.30	-0.82	-1.07
Ireland	-0.01	0.01	0.01	0.04	0.30
Italy	0.03	-0.05	-0.27	-0.64	-1.03
Portugal	0.03	0.06	0.11	-0.11	-0.07
Spain	0.06	0.14	0.33	0.53	0.67
<i>Ordering of net taxes first</i>					
	Q1	Q2	Q4	Q8	Q12
Cyprus	0.02	0.08	0.30	0.90	1.56
Greece	-0.03	-0.09	-0.25	-0.71	-0.90
Ireland	0.00	0.02	0.06	0.24	0.68
<b>Italy</b>	0.02	-0.07	-0.31	-0.77	-1.19
Portugal	0.03	0.06	0.12	-0.09	-0.04
Spain	0.07	0.15	0.38	0.75	0.87

Figure 1: Responses of endogenous variables (Cyprus)

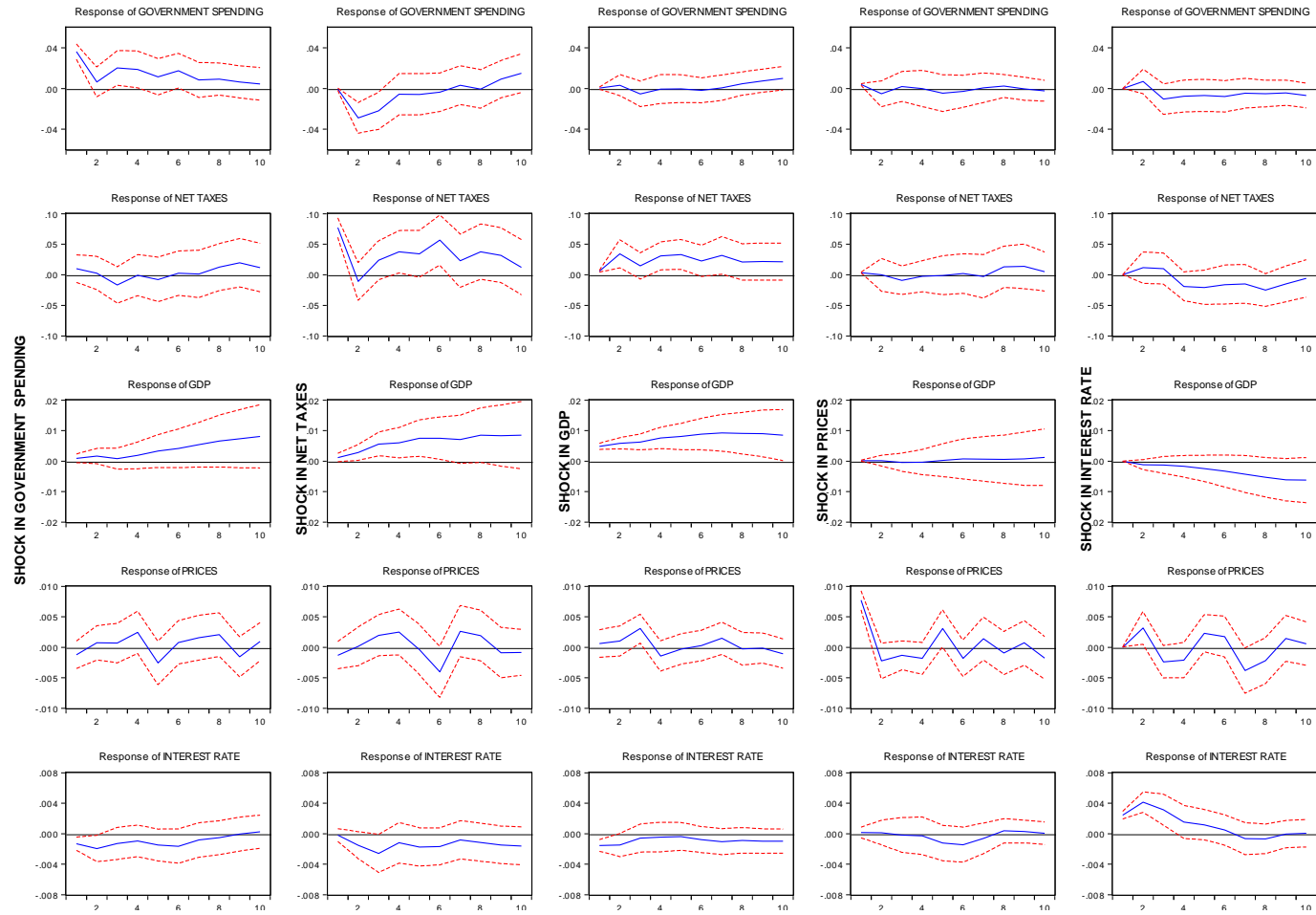


Figure 2: Responses of endogenous variables (Greece)

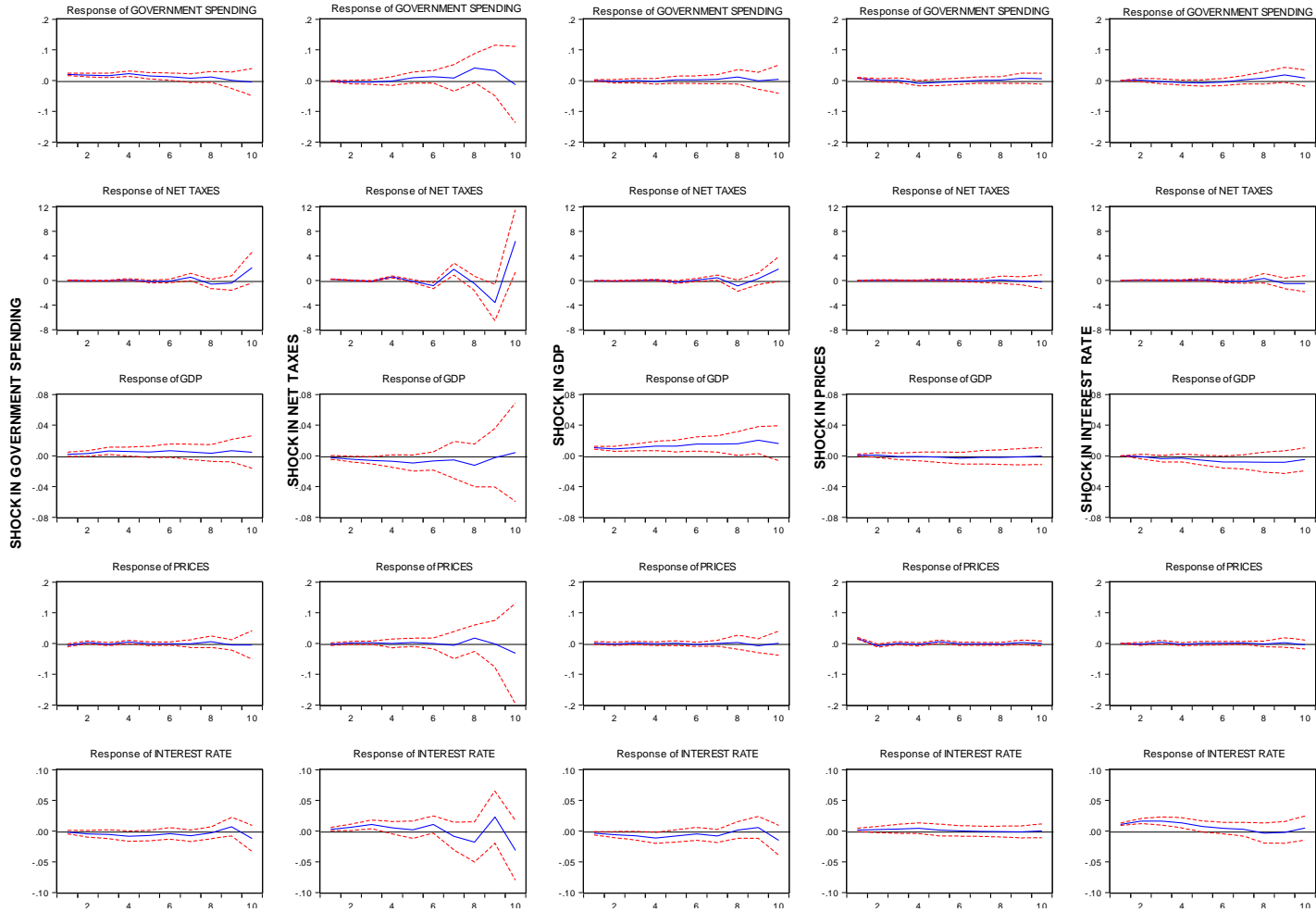


Figure 3: Responses of endogenous variables (Ireland)

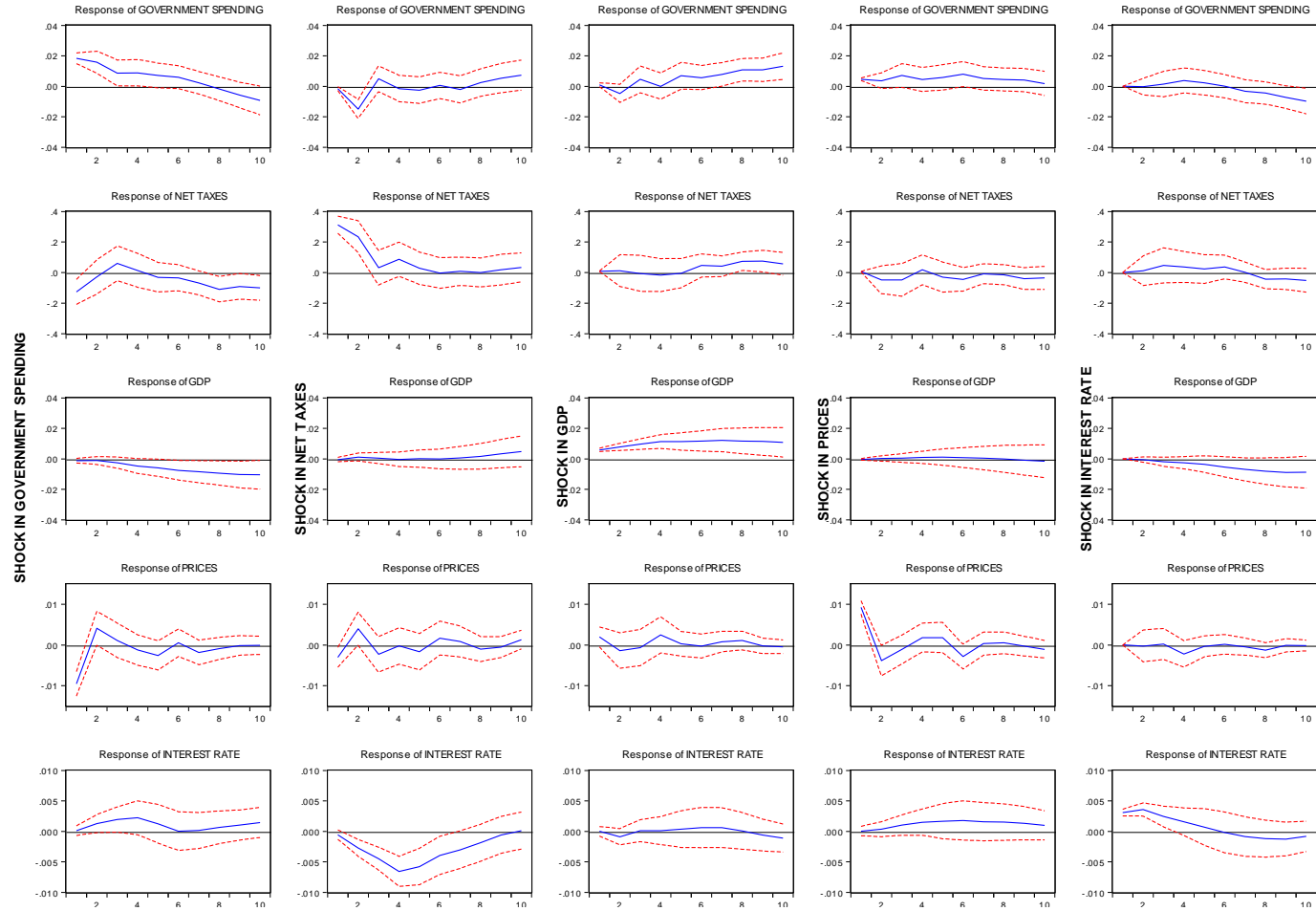


Figure 4: Responses of endogenous variables (Italy)

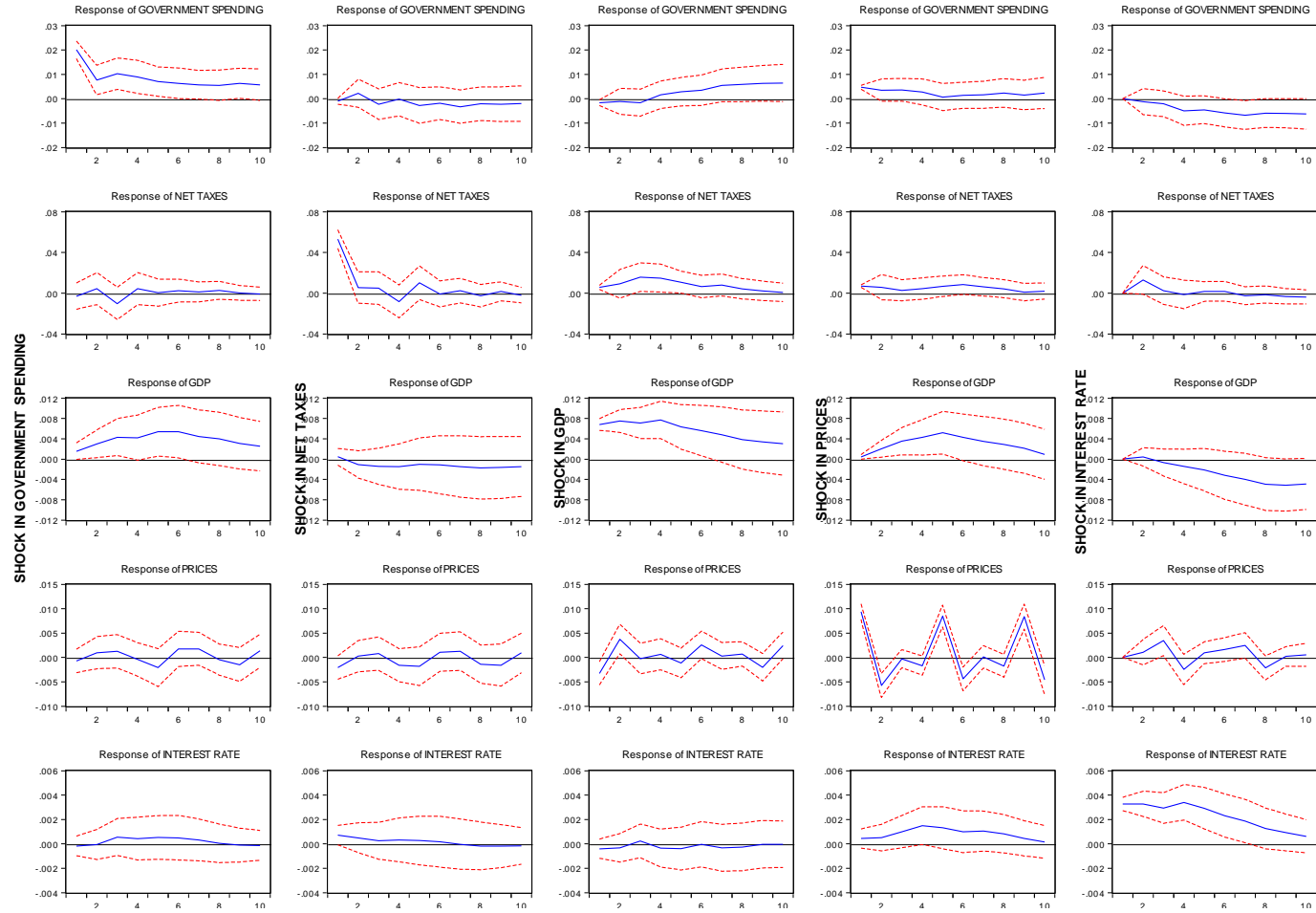


Figure 5: Responses of endogenous variables (Portugal)

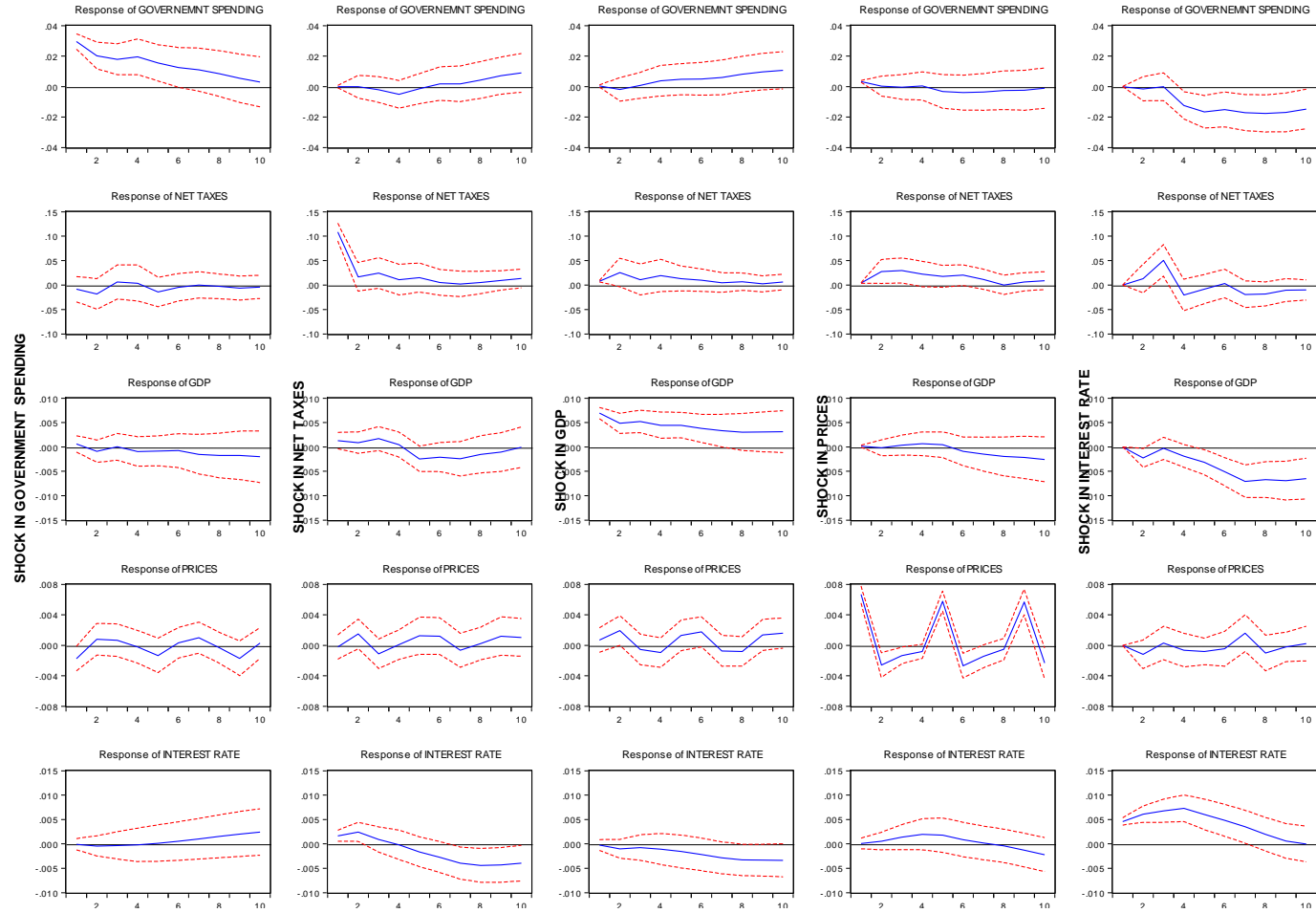
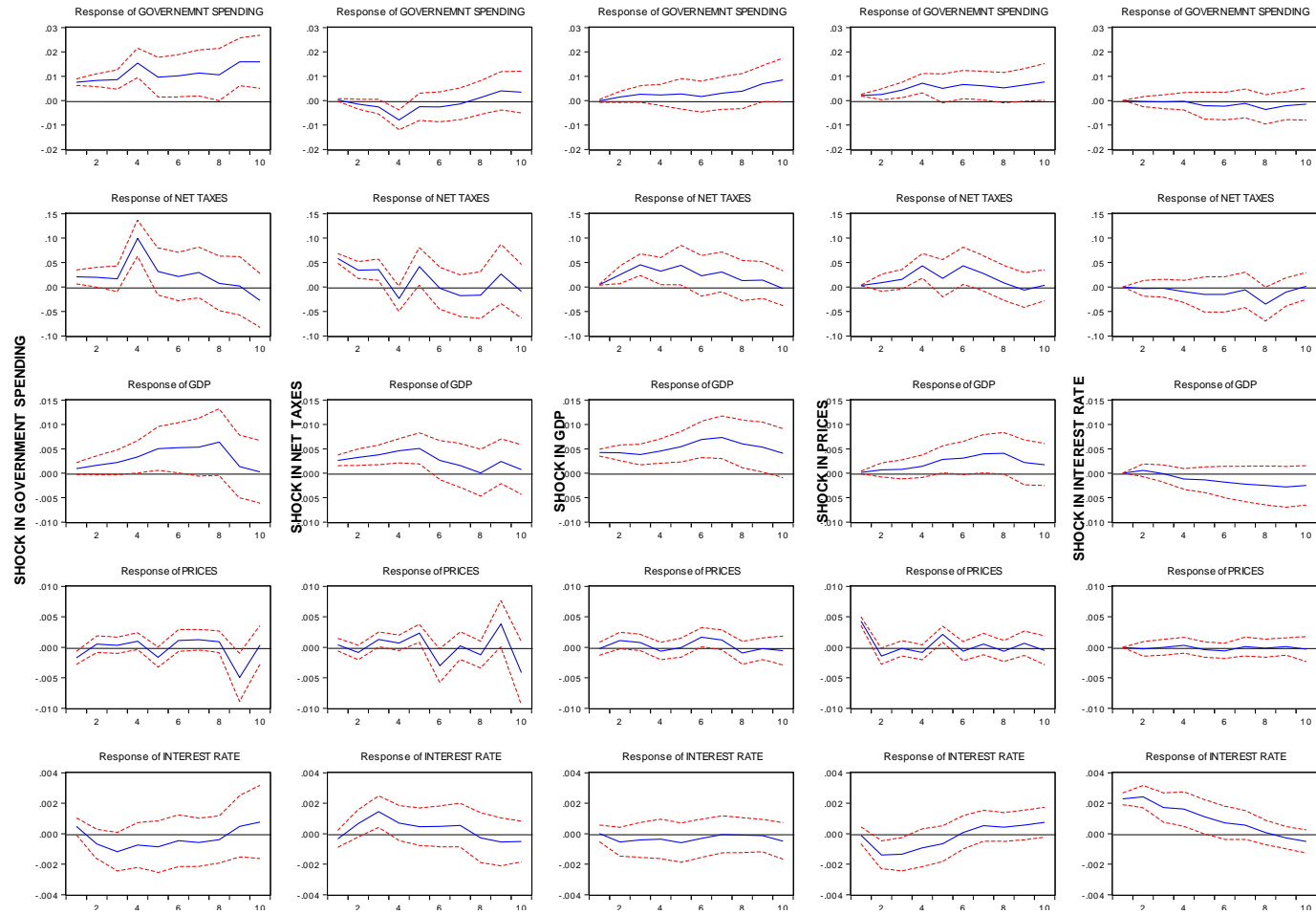


Figure 6: Responses of endogenous variables (Spain)



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