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Ph.D. Thesis

Expectations and Fiscal Policy: How Foresight Affects Policy Transmission

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Declaration

I certify that the thesis I have presented for examination for the Ph.D. degree of Roma Tre University is solely my own work other than where I have clearly indicated that it is the work of others (in which case the extent of any work carried out jointly by me and any other person is clearly identified in it - see Statement of conjoint work below).

Statement of conjoint work

I confirm that chapter 3 was jointly co-authored with Lilia Cavallari, Professor at the Department of Political Science of Roma Tre University. Each of us contributed equally to the creation, development and writing of the chapter.

Abstract

This thesis studies how expectations affect fiscal policy transmission. It revisits the empirical evidence on the domestic and cross-border effects of fiscal policy at the light of fiscal foresight.

Fiscal measures are the result of a complex decision process, entailing long lags between the moment when the decision is taken and when it is effectively implemented. It follows that fiscal policy can be easily anticipated, with agents modifying their actions when they receive signals about changes in policy, well before the actual implementation. This anticipation poses non-trivial challenges for the empirical analysis. It implies that economic variables may move well before the policy shocks estimated in macroeconomic models take place. Overlooking the effects of anticipation can be a major problem in VAR models. The parsimony required to conserve degrees of freedom makes the information carried by the few endogenous variables contained in the model much smaller than the information possessed by private agents. This leads to a problem of non-fundamentalness that might bias estimation results.

The predictability of fiscal actions is likely to influence their cross-border effects as well. National fiscal policies can affect other countries through a variety of potential channels. First, an increase in public spending could fall on foreign products, stimulating directly the foreign economy. Second, an expansionary policy could stimulate domestic economic activity, leading to more imports from other countries and thus helping to stimulate foreign activity as well. Third, if the fiscal expansion results in higher public debt, it could push long-term interest rates up in financial partners, crowding out private investment. Government's finances could even become unsustainable with the risk of a systemic crisis.

The innovative contribution of this thesis is to study fiscal spillovers and fiscal anticipation together. The aim is to estimate how national fiscal measures affect foreign economies through an approach that allows to solve the problem of non-fundamentalness in VAR analysis, while at the same time assessing the role of expectations for the international transmission of fiscal policy. The questions of interest that this analysis aims at answering are the following: are policy shocks estimated in standard fiscal VAR models really unanticipated? How does anticipation influence domestic and cross-border effects? What are the implications for real economic activity of a change in forecasts about policy actions? Should governments consider the implications of their claims and actions for the formation of expectations? Should national fiscal policies be coordinated at a supranational level? These questions have important policy implications that encouraged me to delve into these issues further and study them in depth.

The thesis comprises three chapters. The first chapter provides a survey of the VAR models used in the empirical literature. The second and third chapters assess from a

different perspective and with a different focus how the anticipation of future policy regimes changes the transmission of fiscal shocks.

The first chapter reviews how the econometric model adopted in this thesis -the vector autoregression (VAR) - has been used in the empirical literature on fiscal policy. First, it illustrates the basic characteristics of the VAR approach, describing the reasons behind its widespread use in applied macroeconomic research. Second, it analyzes the challenges that the VAR approach poses. Standard VAR models need to be identified in order to perform structural analysis, giving economic meaning to the shocks estimated in these systems. This chapter reviews the different approaches proposed in the literature to solve the problem, classifying them in four main categories. Standard VAR models are also low-dimensional models. The parsimony is imposed in order to conserve degrees of freedom and implies that VAR models can carry only a limited amount of information. The misalignment of the information space between private agents and econometricians may lead to a problem of non-fundamentalness, biasing the estimation of policy innovations. Discussing the solutions to this problem, I describe some innovative specifications of the basic approach which address this issue by taking advantage of the improvements in computing power and data availability (GVAR, FAVAR, Panel VAR). An ulterior limitation of standard VAR models is linearity. In this regard, this chapter outlines a further enhancement which allows for time-varying relationships among endogenous variable (TVC-VAR). Finally, the first chapter focuses on reviewing how VAR models have been used to study the international transmission of fiscal shocks, addressing the issue of cross-border effects.

The second chapter estimates the impact of expectations on fiscal spillovers. More precisely, the analysis studies how the anticipation of the future fiscal stance affects the international transmission of fiscal measures in the US. To address this challenge I use a set of two-country Bayesian VAR models. In each model, the US is the domestic economy, considering its leading role in the global economy. As foreign countries, I include Canada, France, Germany and UK because they represent the lion share of US foreign trade. The innovative feature of this contribution is to apply an identification strategy which differentiates an unanticipated or surprise shock from a foresight or news shock. The former represents a discretionary increase in government spending that was not foreseen by agents. The latter represents news received by agents which affect their expectations about prospective policy actions. The Philadelphia FED Survey of Professional Forecasters provides the data used to construct the indicators of fiscal forecast. This approach has a twofold advantage: it allows to address the problem of non-fundamentalness, as well as to assess the international repercussions of both surprise and foresight shocks. Results show the importance of expectations for the international transmission of US fiscal policies. A surprise fiscal stimulus has negligible cross-border effects when it is associated with expectations of spending reversals. Foresight shocks, on the contrary, are associated with expectations of increasing government spending and yield positive spillovers, despite no expansionary action is taken. The sign and magnitude

of these external effects are country sensitive, suggesting an active role of country-specific factors in affecting the international transmission of US fiscal policies. These findings provide novel evidence in support of the hypothesis that foresight alters fiscal policy effects on a national and international level.

The third chapter provides further evidence in support of the hypothesis that fiscal policy is largely anticipated and its effects depend on expectations. The analysis draws on two-country VAR models between major European economies and applies the same identification approach adopted in the second chapter, using this time the official forecasts of the European Commission to construct the indicators of fiscal forecast. Data refer to Italy, France and Germany over the period 1971-2011. This third contribution first documents the forecasting accuracy of the European Commission forecasts and shows that they help address the problem of non-fundamentalness in fiscal VAR models. Then, it identifies surprise and foresight shocks through a recursive ordering in which the realized policy does not react within the year to innovations in any other variable in the system. The expected policy, on the contrary, is allowed to react to innovations in the realized policy, reflecting the revision of expectations upon arrival of news. The findings show that an unanticipated fiscal stimulus leads to expectations of strong deficit reversals over the subsequent two to three years. This in turn depresses domestic and foreign activity over the same horizon. Foresight shocks, on the contrary, have positive effects on domestic activity. Differences in the responses to surprise and foresight shocks reflect the role of expectations. The evidence is consistent with a regime where deficit reversals are mainly based on taxation alone and suggests that the incentive to reform fiscal regimes in an uncoordinated way may be small, while incentives for opportunistic behavior may be strong.

Contents

Vector Autoregressive Models and Fiscal Policy: A Survey

Abstract

This paper provides a review of the vector autoregressive models used in the empirical literature on fiscal policy. It illustrates the basic characteristics and the development of the VAR approach, describing the different specifications and identification strategies proposed. Finally, it describes how VAR models have been used in studying the international transmission of fiscal shocks, addressing the issue of estimating cross-border effects.

JEL classification: C32, E62, F41

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1.1 Introduction

Over the last twenty five years the number of empirical studies investigating the transmission of fiscal policy has flourished. The common characteristic in the vast majority of these contributions is the use of vector autoregressive (VAR) models to characterize the economy. VAR models were first introduced in macroeconomics by the seminal paper of Sims (1980), as an alternative to large scale macroeconometric models. Being more flexible and producing results that are more easily interpretable than traditional large-scale macroeconometric models, the VAR methodology has gained widespread use in applied macroeconomic research. An additional advantage of the VAR approach is that, by being entirely data-driven, there is no need to build a structural model to describe the economy and the transmission mechanisms of economic policies. This allows to overcome the problem of structural model uncertainty.

The VAR methodology has been firstly applied in the empirical literature on monetary policy (see, among others, Leeper, Sims and Zha (1996), and Christiano, Eichenbaum and Evans (1999)). The first contribution using a VAR model for fiscal policy analysis is Ramey and Shapiro (1998). Since then, VAR has become the most used approach in the empirical literature on fiscal policy and the methodology has developed broadly, witnessing the flourishing of different specifications of the basic VAR approach, such as Panel VAR (PVAR) models, Factor-augmented VAR (FAVAR) models, Global VAR (GVAR) models, Time-varying coefficients VAR (TVC-VAR) models, just to name a few.

Comparing the results produced by contributions using VAR models in monetary and fiscal policy analysis, the heterogeneity in the empirical evidence about fiscal transmission is striking. Most macroeconomic models consent that an expansionary monetary policy is associated with a decrease in interest rates and a boost in output and inflation. The empirical evidence is largely consistent with this view. Conversely, there is no such consensus on the effects of fiscal policy. Despite sharing the same econometric approach, most contributions show conflicting results, producing an evidence that is not robust and remains inconclusive. Since empirical findings are crucial to choose among different theoretical models used in the policy making process, this lack of consensus has important practical implications. According to Caldara and Kamps (2006), this heterogeneity can be explained in the light of the different model specifications and identification strategies proposed in the literature.

This paper provides a survey of the vector autoregressive models applied in the literature on fiscal policy, analyzing two main aspects: the shock identification strategy and the model specification. Regarding the first aspect, I classify the different contributions in four main categories, according to the identification approach used: recursive, *à la* Blanchard and Perotti (2002), sign restrictions and event-approach[1]. Furthermore,

[1] I adopt the classification used by, among others, De Castro and Hernandez de Cos (2008), Caldara and Kamps (2006) and Halkos and Paizanos (2015).

I discuss the related issues of fiscal foresight and non-fundamentalness of VAR models. With regard to model specifications, I describe the main features of the developments of the VAR methodology proposed in the literature, showing how they address some of the structural problems affecting the standard approach. Finally, I review the empirical contributions that apply VAR models to study the international transmission of fiscal policy shocks, estimating their cross-border effects.

The remainder of the paper is structured as follows. Section 2 presents the basic features of the VAR approach. Section 3 describes the different identification strategies. Section 4 discusses model specifications. Section 5 reviews the empirical literature on fiscal spillovers. Section 6 concludes.

1.2 The VAR methodology

A Vector Autoregressive (VAR) model can be written in a reduced form[2] as follows:

$$Y_t = B(L)Y_{t-1} + \epsilon_t \tag{1}$$

where Y_t is the $(n \times 1)$ vector of covariance stationary endogenous variables, $B(L)$ are $(n \times n)$ polynomial matrices in the lag operator and ϵ_t is the $(n \times 1)$ vector of errors in the system, with variance-covariance matrix $E(\epsilon_t \epsilon_t') = \Sigma_\epsilon$, distributed as $\epsilon_t \sim (0, \Sigma_\epsilon)$.

Since a VAR process is always invertible, the process can be equally rewritten as:

$$(I_n - B(L))Y_t = \epsilon_t \tag{2}$$

The process is said to be stationary and stable if the roots of the polynomial $(I_n - B(L))$ lie outside the unit circle. The stability and stationarity of the process are necessary conditions to apply the Wold decomposition theorem, used for structural analysis. The theorem shows that a stationary and stable VAR process can be represented as a Vector Moving Average (VMA) process of infinite order as follows:

$$\begin{aligned} Y_t &= (I_n - B(L))^{-1}\epsilon_t \\ Y_t &= \sum_{j=0}^{\infty} B^j \epsilon_{t-j} \\ Y_t &= C(L)\epsilon_t \end{aligned} \tag{3}$$

[2]The reduced form of a system of equations expresses the endogenous variables as a function of their lags and exogenous variables (if any).

where $C_0 = I$; $C_1 = B$; $C_2 = B^2$ .... $C_n = B^n$. This implies that a stable and stationary VAR process admits a representation of the endogenous variables as a function of the system residuals[3]. Such result allows to obtain the impulse response functions, the main tool in structural analysis. They represent the mechanisms through which shocks spread over time. Referring to (3), the matrix C_j has the following interpretation:

$$\frac{\delta Y_t}{\delta \epsilon_{t-j}} = C_j$$

or, equally:

$$\frac{\delta Y_{t+j}}{\delta \epsilon_t} = C_j \tag{4}$$

This means that the coefficient in the row i, column k of C_j identifies the consequences of a unit increase in the k^{th} variable's innovation (residual) at date t on the value of the i^{th} endogenous variable at time $t + j$, holding all the other innovations at all dates constant [4]. The latter sentence poses a challenge, since it requires that variables' innovations are not correlated across time and across equations.

The general problem with model (3) is that it is not identified, meaning that there exist an infinite set of different values for the model parameters which all imply exactly the same probability distribution for the observed data. It follows that is not possible to infer the true value of the parameters from the sampling information in the data alone. Additional assumptions are needed, the so-called identifying restrictions.

Consequently, the reduced form of the model (3) is not suitable to study the transmission of shocks with economic meaning. The innovations contained in the vector ϵ_t have non zero cross-correlation, meaning that the variance-covariance matrix $E(\epsilon_t \epsilon_t') = \Sigma_\epsilon$ is not a diagonal matrix. This prevents any meaningful structural analysis. If the system is not identified and one gives a 1% shock to one of the endogenous variable, the system would be affected by shocks to other variables as well through the covariance relations.

Identifying the system implies choosing one particular representation of Y_t through the identifying restrictions. These restrictions orthogonalize the residuals (innovations), giving economic meaning to each structural shock as well. This means making the disturbances uncorrelated across time and across equations, transforming Σ_ϵ into a diagonal matrix. It is achieved by choosing any non-singular matrix Z, such that, for the basic matrix properties, (3) can be rewritten as:

$$Y_t = C(L) Z Z^{-1} \epsilon_t \tag{5}$$

[3] In a VAR system, the estimated residuals represent the 1-step ahead forecast error and are defined as innovations as well (Lutkepohl (2011)).

[4] The stationarity of the process guarantees that $\lim_{j \to \infty} \frac{\delta Y_{t+j}}{\delta \epsilon_t} = 0$.

Since $ZZ^{-1} = I$, (5) is equal to (3). Setting $\beta = BZ$ and $\eta_t = Z^{-1}\epsilon_t$ allows to rewrite (5) as:

$$Y_t = \sum_{j=0}^{\infty} \beta^j \eta_{t-j} \tag{6}$$

The new structural innovations η_t are linear combinations of the system residuals. They are white noise with variance-covariance matrix $cov(\eta_t) = (Z^{-1})\Sigma(Z^{-1})'$. The idea is to choose a matrix Z such that $cov(\eta_t)$ is a diagonal matrix. In this way, the new innovations are orthogonal, allowing structural analysis[5]. When one endogenous variable is shocked, all the other innovations remain unchanged, permitting to study the reaction of all the variables to a singular structural shock. The matrix Z has n^2 elements that need to be pinned down by the identifying restrictions. A total of n(n+1)/2 restrictions are implied by orthonormality, so n(n-1)/2 parameters need to be fixed. The idea is to use economic theory, deriving restrictions on the effects of some shocks on particular variables.

The identification strategy adopted is crucial in VAR analysis. The matrix Z transforms a data-driven model, the unrestricted VAR, into a model where the economic theory enters through the restrictions imposed on the relationships among the variables, the structural VAR (SVAR). The identifying restrictions proposed in the literature are manifold and the choices operated by different authors contribute to explain the heterogeneity in the empirical evidence. In the following section I discuss in details the main options adopted in the literature.

1.3 Identification strategies

I classify the fiscal VAR models into four groups, according to the structural shock identification strategy used[6]. The first group includes studies which apply the so-called recursive approach, based on the Cholesky decomposition. The second group comprises contributions which follow the approach proposed by the seminal paper of Blanchard and Perotti (2002), relying on a two-step procedure based on institutional information. The third group consists of contributions which use sign restrictions, as proposed by Mountford and Uhlig (2009). The fourth group comprehends studies that apply the event-study approach or narrative approach proposed by Ramey and Shapiro (1998).

[5]Besides making shocks uncorrelated, Z should be chosen to give each shock economic meaning.

[6]Perotti (2005) classifies the SVAR literature into three groups. De Castro and Hernandez de Cos (2008) add an additional group of the literature, which includes contributions applying an approach *à la* Blanchard and Perotti (2002). The same classification is used by many other contributions, including Caldara and Kamps (2006) and Halkos and Paizanos (2015).

1.3.1 Recursive approach

The recursive approach is based on specific assumptions concerning the slugginesh of fiscal variables and it implies a causal ordering of the endogenous variables. Hence, the order of the equations included in the system is crucial and should rely on viable and testable assumptions.

This approach applies the Cholesky decomposition, firstly introduced by Sims (1980). Referring to the model (5), the matrix Z is restricted to be a lower triangular matrix, defining the short-run relations between the endogenous variables according to their order. The variable ordered first is affected contemporaneously only by its own shock, while the variable ordered second is affected by its own shock and by the shock of the variable ordered first. This way, each variable in the system is affected contemporaneously by its own structural shock and by the structural shocks of all the variables ordered before, but it does not depend simultaneously on the variables ordered afterwards. Thus, applying a recursive approach eventually means establishing an order of endogeneity among the variables included in the VAR model.

More in details, referring to (5), this approach works as follow:

$$AY_t = C(L)ZZ^{-1}A\epsilon_t \tag{7}$$

where A is the n-dimensional identity matrix [A=I_n] used to orthogonalize the residuals. Z is set to be a lower triangular matrix, imposing a recursive scheme among variables with clear economic implications. The relationship between reduced-form VAR disturbances ϵ_t and structural residuals η_t is given by:

$$\begin{aligned} \eta_t &= Z^{-1}A\epsilon_t \\ Z\eta_t &= A\epsilon_t \end{aligned} \tag{8}$$

Taking as an illustrative example a VAR model with three endogenous variables, the system (8) would be as follows:

$$\begin{bmatrix} 1 & 0 & 0 \\ a_{2,1} & 1 & 0 \\ a_{3,1} & a_{3,2} & 1 \end{bmatrix} \begin{bmatrix} \eta_1 \\ \eta_2 \\ \eta_3 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} \epsilon_1 \\ \epsilon_2 \\ \epsilon_3 \end{bmatrix} \tag{9}$$

It is worth noticing that, after the initial period,the endogenous variables of the model can interact freely without any restrictions.

This methodology has been used by Fatás and Mihov (2001) to study the effects of a shock to government spending in the US[7]. In their baseline VAR specification, the vector of endogenous variables is Y_t=($G_t, X_t, GDP_t, PGDP_t, Tax_t, Rbill_t$), where G_t

[7]The recursive approach is used by many other contributions studying the effects of fiscal policy in different countries or regions. Among them, just to name a few, Mirdala (2009) applies it to analyze

is government spending, X_t is either consumption or investment, GDP_t is the Gross Domestic Product, $PGDP_t$ is the GDP deflator, Tax_t is the level of federal taxation and $Rbill_t$ is the averaged quarterly 3-month T-bill rate. Considering the recursive approach, this order means that public expenditure does not react contemporaneously to changes in any other variable while its shocks affect immediately all the other variables in the system. Taxes reacts contemporaneously to changes in output, albeit this captures mostly the reaction of the automatic response, not the discretionary one. This approach is based on the idea that fiscal policy has an implementation lag, needing time to be designed and approved. Applying this identification strategy, Fatás and Mihov (2001) find evidence of a fiscal multiplier greater than 1. This means that a 1% unanticipated increase in government spending stimulates a more than proportional boost in GDP, together with an increase in private consumption. The effects on investments is negligible.

1.3.2 Two-step procedure *à la* Blanchard and Perotti (2002)

In their seminal paper, Blanchard and Perotti (2002) propose a procedure to identify fiscal policy shocks based on institutional information about tax and transfer systems, as well as their timing, so as to identify the automatic response of taxes and government spending to economic activity. The procedure follows two steps: in the first step, institutional information are used to isolate the automatic responses of government expenditure and taxes to the business cycle. In the second step, the elasticities of government revenue and expenditure to GDP estimated in the first step allow the identification of the fiscal policy shocks.

Blanchard and Perotti (2002) apply this approach to assess the effects of government expenditure and government revenues shocks in the US. Their baseline specification includes three endogenous variables: Y=$[T_t, G_t, X_t]$, where T_t is taxes, G_t is federal government spending and X_t is Gross Domestic Product, all in real and per capita terms. They model the relationship between reduced form residuals and structural shocks as follows:

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the effects of fiscal measures in European transition economies (Czech Republic, Hungary, Poland, Slovak Republic, Bulgaria and Romania) over the period 2000-2008. Fiscal shocks are found to have small, though significant, effects on output. De Castro (2006) obtains similar results by applying the recursive approach to a fiscal VAR model for Spain. Hur (2007) finds that fiscal policy plays a very moderate contribution in the economic stabilization of Korea, with very small effects that quickly phase out. Afonso and Sousa (2012) apply the recursive approach to a Bayesian SVAR model for US, UK, Germany and Italy while Boiciuc (2015) apply the same approach to a VAR model for the Romanian economy. Both contributions find evidence of low impact of fiscal measures. Marattin and Salotti (2010) apply an identification strategy based on the Cholesky decomposition to a VAR analysis on UK economy. Their results show that the response to a government spending shock depends on the public expenditure composition. Nickel and Tudyka (2014) use a recursive identification approach in a Panel VAR analysis for seventeen European countries over the period 1970 - 2010. They obtain evidence of non-linear responses to fiscal expansionary measures that depend crucially on the degree of public indebtedness.

$$
\begin{aligned}
t_t &= a_1 x_t + a_2 e_t^g + e_t^t \\
g_t &= b_1 x_t + b_2 e_t^t + e_t^g \\
x_t &= c_1 x_t + c_2 g_t + e_t^x
\end{aligned} \tag{10}
$$

where t_t, g_t and x_t are the system residuals while e_t^t, e_t^g and e_t^x are the mutually uncorrelated structural shocks to be recovered. The first step of their identification strategy allows to construct the parameters a_1 and b_1, relying on institutional information. Since in the second step Blanchard and Perotti set b_1=0 and, alternatively, b_2=0 or a_2=0, it can be concluded that this identification strategy has a structure similar to the recursive approach. Caldara and Kamps (2006) demonstrate that there are only minor differences between the impulse responses generated by the two approaches if the order of the variables in the recursive approach is well selected, both for government expenditure and government revenues. As a matter of fact, most contributions do not differentiate between these two approaches.

The impulse responses produced in Blanchard and Perotti (2002) show that output respond positively to government spending, and so do private consumption and real wages. In most cases though the multipliers are small, often close to one. Private investment responds negatively to both increases in government expenditure and taxes.

The approach proposed by Blanchard and Perotti (2002) has been widely used by many empirical contributions in fiscal analysis[8]. Perotti (2005) applies the same identification strategy to estimate the effects of fiscal policy in five OECD countries: Australia, Canada, West Germany, United Kingdom and United States. He finds that expansionary measures have positive but not persistent effects on the GDP, in line with Blanchard and Perotti (2002). De Arcangelis and Lamartina (2003) take this identification approach one step further, proposing an empirical test to discriminate between policy regimes as well. They obtain empirical findings in agreement with the previous ones, outlining positive output responses to both shocks on government spending and taxation, with multipliers lower than 1. The results obtained by Galí, López-Salido and Valls (2007) are similar, showing a boost in output and consumption in response to a government spending shock. The latter is identified by assuming that government purchases are not affected contemporaneously by the innovations in the other variables contained in the VAR. Ilzetzki, Mendoza and Vegh (2013) apply an identification procedure *à la* Blanchard and Perotti (2002) to a panel quarterly data set of 44 countries, showing that the impact of government expenditure policies depends crucially on country-specific characteristics, such as international trade openness, exchange rate regime and public indebtedness. Fiscal multipliers associated to an increase in public spending are found to be positive, except

[8] A list of contributions using an identification strategy *à la* Blanchard and Perotti (2002) includes, among others, de Castro and Hernández de Cos (2008), Biau and Girard (2005), Giordano et al. (2007), Monacelli and Perotti (2008), Lozano and Rodríguez (2009), Baxa (2010), Heppke-Falk et al. (2010), Cimadomo and Benassy-Quere (2012), Muir and Weber (2013), Benetrix and Lane (2013).

for countries with high level of public debt. Multipliers are bigger in developed countries and closed economies, while they are close to zero in countries operating under flexible exchange rates. Corsetti, Meier and Muller (2012) employ the Blanchard and Perotti (2002) approach in a two-stage strategy. In a first step, they estimate a fiscal policy rule to obtain estimates of spending shocks. In a second step, they use contemporaneous and lagged values of the estimated policy shocks to trace the dynamic effects of government expenditure on the macroeconomic variables of interest, assessing the role of different economic environments in shaping fiscal transmission as well. Their results are in line with previous findings, showing a positive but contained output response to an in increase in government spending, coupled with crowding-out of investment and net exports. They also confirm that the multiplier is bigger for countries under a peg and with low public debt, while it can reach a size up to two during financial crisis.

1.3.3 Sign restrictions

Sign restrictions were firstly introduced by Faust (1998) and Uhlig (2005) to study the effect of monetary policy. They were applied to fiscal policy analysis by Mountford and Uhlig (2009) and Canova and Pappa (2007)[9] among many others[10]. This method identifies policy shocks by imposing sign restrictions directly on the impulse responses but, differently from the recursive approach, it does not impose linear restrictions on the contemporaneous relations between reduced-form and structural disturbances.

Mountford and Uhlig (2009) apply this approach to examine the effects of fiscal policy on economic activity in the US. Their model contains 10 variables: GDP, total government spending, total government revenues, interest rate, adjusted reserves, pro-

[9]For a more detailed description of the contribution by Canova and Pappa (2007), see Section 5.

[10]For a more comprehensive review of sign restrictions in Structural Vector Autoregressive models, see Fry and Pagan (2011). Sign restrictions have been widely used in fiscal VAR models. A non-exhaustive list comprises, among others, Dungey and Fry (2009) who combine sign restrictions with the recursive approach and with an identification approach based on the long-run cointegration relationship between endogenous variables. They apply this composite strategy to jointly identifying the effects of both fiscal and monetary policy shocks in New Zealand. The results show that the influence of fiscal policy on output has been substantial, often outweighing the contribution of monetary policy. Enders, Müller and Scholl (2011) derive restrictions on the sign of several impulse responses from a two-country general equilibrium model, finding that the real exchange rate and the terms of trade depreciate in response to expansionary government spending policies in the US. Iiboshi and Iwata (2015) apply to a TVC-VAR model for the US the enhanced sign restrictions identification approach based on the algorithm proposed by Arias, Rubio-Ramirez and Waggoner (2014). They obtain evidence of negative fiscal multipliers during the Great Moderation that changed positively after the Great Recession. Similar results are obtained by Candelon and Lieb (2013). They use a multivariate Threshold VAR (TVAR) identified via sign restrictions. They find that fiscal policy has a stronger impact in times of economic stress than in times of expansion, and that direct spending policies are more efficient than tax-cut policies in stabilizing the economy in the short-run. Bermperoglu, Pappa and Vella (2013) apply sign restrictions to a SVAR model to identify austerity measures in the US, Canada, Japan, and the UK. According to their results, government vacancy cuts are associated with the highest output losses and the lowest gains in terms of deficit reductions, while government wage cuts are the least destructive device for cutting the budget.

Table 1: Sign Restrictions in Mountford and Uhlig (2009)

	Government Revenues	Government Spending	GDP, Consumption, Investments	Interest Rate	Adjusted Reserves	Prices
Non-Fiscal Shocks						
Business Cycle	+		+			
Monetary Policy				+	-	-
Fiscal Policy Shocks						
Deficit Spending Shock		+				
Revenue Shock	+					
Balanced Budget Spending Shock	+	+				

The table reports the sign restrictions imposed in the structural shock identification strategy applied by Mountford and Uhlig (2009). All of them are set to be in place for 4 quarters (from q0 to q3).

ducer price index of crude materials (PPIC), GDP deflator, private consumption, private non-residential investment and real wages, all at a quarterly frequency from 1955 to 2000.

They identify three different fiscal policy shocks: a revenue shock, where revenues and deficits change but expenditures are left unchanged, a deficit spending shock, where government spending increases but government revenues remain constant, and a balanced budget spending shock, where an increase in government spending is tax-financed. First though they identify a business cycle shock and a monetary policy shock. Then they impose orthogonality between both of them and fiscal policy shocks, in order to distinguish unanticipated fiscal shocks from the automatic responses of fiscal variables to business cycle movements and monetary measures. As shown in Table 1, the busyness cycle shock is identified by imposing four positive sign restrictions on GDP, private consumption, private non-residential investment and total government revenue. These and all the other restrictions are applied for four quarters, from quarter 0 when the shock takes place to quarter 3. The contractionary monetary policy shock is identified by imposing positive positive sign restrictions on interest rates, and negative sign restrictions on adjusted reserves, GDP deflator and PPIC[11]. Finally, unanticipated fiscal shocks are identified. The unanticipated government revenue shock is identified imposing positive sign restrictions on the response of total government revenue, requiring government expenditure to remain unchanged. The deficit spending shock is identified as an increase in government spending, leaving government revenues unchanged. In the identification of the balanced budget fiscal shock, Mountford and Uhlig impose a positive sign on the responses of government revenue and expenditure as well.

It is worth noticing that this identification strategy does not impose any sign restriction on the responses of GDP, private consumption, and private non-residential investment to fiscal policy shocks and that the unanticipated fiscal shocks are not required to be orthogonal. Nonetheless, some applications of this approach could present a major problem. Depending to the sign restrictions imposed, they could rule out by assumption

[11]The monetary policy shock and the business cycle shock are set to be orthogonal.

phenomena such as the expansionary fiscal contractions that have recently dominated the policy and academic debate.

Mountford and Uhlig (2009) find that a surprise deficit-financed tax cut is the best fiscal solution to stimulate the economy, while an unanticipated deficit-financed government spending shock stimulates the economy only weakly. Interestingly, despite the increase in government spending does not produce a rise in interest rates, it crowds-out investments anyway.

1.3.4 Narrative approach

The narrative approach is also known as fiscal dummy variable approach. It was introduced for the first time by Ramey and Shapiro (1998) and further developed by Edelberg, Eichenbaum and Fisher (1999) and Burnside, Eichenbaum and Fisher (2004)[12]. All these contributions analyze the effects of large increases in military spending in the United States, considering defense expenditure as proxy of government spending. The idea behind this approach is that public expenditure increases associated with wars and military build-ups are not related to the state of the economy and thus can be considered really exogenous.

Ramey ad Shapiro (1998) isolated three exogenous events that led to large military build-ups: the Korean war, the Vietnam war and the Carter-Reagan build-up. They use them as exogenous regressors in a univariate autoregressive model. Their database comprises data at a quarterly frequency from 1947-q1 to 1996-q4. They reach the conclusion that an increase in military expenditure stimulates output while having a negative effect on real wages and consumption, consistently with the Neoclassical framework.

Edelberg, Eichenbaum and Fisher (1999) extend this approach to a VAR model, changing the basic VAR setting (32) by adding a dummy variable term as follows:

$$Y_t = B(L)Y_{t-1} + \gamma(L)D_t + \epsilon_t \tag{11}$$

where D_t takes the value 1 if t =[1950-q3 (Korea); 1965-q1(Vietnam); 1980-q1(Regan)]. Otherwise, for all the remaining dates, the variable takes the value 0. They obtain results that are consistent with Ramey and Shapiro (1998): in response to an exogenous increase in US government purchase, output and employment rise while real wages and consumption fall.

The version of the dummy variable approach proposed by Edelberg, Eichenbaum and Fisher (1999) imposes strong constraints: the shape and size of the responses of the endogenous variables to the three military build-ups are the same in the different episodes. Burnside, Eichenbaum and Fisher (2004) propose a less stringent version of

[12]A list of contributions using this approach comprehends, among others, Romer and Romer (2010), Favero and Giavazzi (2010), Devries et al. (2011), Favero and Giavazzi (2012), Mertens and Ravn (2014), Alesina, Favero and Giavazzi (forthcoming).

this approach, allowing each episode to have an impact with different intensity, although the shape of the responses is still assumed to be the same. The model (11) changes as follows:

$$Y_t = B(L)Y_{t-1} + \sum_{i=1}^{3} \gamma(L)\theta_i D_{it} + \epsilon_t \tag{12}$$

where θ_i are scalars with θ_1 normalized to unity. The parameters θ_2 and θ_3 measure the intensity of the second and third Ramey-Shapiro episodes relative to the first, allowing the intensity of each episode to vary. Burnside, Eichenbaum and Fisher (2004) apply (12) to investigate the nature of US fiscal policy and its effects in the aftermath of 9/11. They find that the conduct of fiscal policy after 9/11 was unusual and that the large exogenous increase in deficit that followed the terrorist attack due to military expenditures and tax cuts affected the economy differently from what happened in the Ramey and Shapiro (1998) episodes.

The advantage of this approach is that the identification of a structural form is not needed. On the other hand, other substantial fiscal shocks can occur around the same time of military build-ups, biasing the identification.

1.3.5 Fiscal foresight and non-fundamentalness

The identification of fiscal shocks presents an ulterior challenge: how to identify shocks that are "truly unanticipated". It is amply recognized that fiscal policy can be anticipated to a large extent because of the existence of legislative and implementation lags. Economic agents receive news and signals about future changes in fiscal policy well before these changes take place. As a consequence, agents anticipate future measures, acting according to their expectations and causing macroeconomic variable to move before the policy shocks are recorded in the data. This issue, known as fiscal foresight, can lead to a problem of nun-fundamentalness, firstly brought to attention by Hansen and Sargent (1980).

In a SVAR model the structural shocks are identified as linear combinations of the estimated residuals of an unrestricted VAR. These residuals, defined as innovations because they are the 1-step ahead forecast errors, represent a change in the variable of interest that could not be anticipated. Fundamentalness requires any linear combination of the residuals to be uncorrelated with available information. If this condition is not satisfied, the VAR model is misspecified, lacking sufficient information to identify structural shocks. This problem typically arises when agents' information space is larger than the econometrician's one, and the few variables included in the VAR model may not convey sufficient information for the identification of the structural shocks.

On an econometric ground, a misspecified VAR model implies that the endogenous variables have a non-fundamental structural moving average representation. Since structural shocks are identified by rotating the VAR innovations, this requires the MA rep-

resentation to be invertible. The necessary condition for invertibility is that no root of the determinant of the matrix of the MA representation lies inside the unit circle. Otherwise, VAR estimation will not allow to recover the structural shocks. Albeit non-fundamentalness may arise in monetary VAR models as well, it is a major concern especially for fiscal policy models, given the predictable nature of fiscal measures due to implementation lags[13].

The origin of the debate about non-fundamentalness of VAR models can be traced back to Lippi and Reichlin (1993). They suggest the possible existence of non-fundamental representations in a comment to the VAR model proposed by Blanchard and Quah (1989). More recently the contributions addressing this problem have flourished[14]. Among the most influential, Leeper, Walker and Yang (2008) document that fiscal foresight is intrinsic to the tax policy process and then study its econometric implications. They show that foresight produces equilibrium time series with a non-invertible moving average component in estimated VARs, misaligning the agents' and the econometrician's information sets. This imply the impossibility to extract any economically meaningful shocks from estimated residuals. They reach the conclusion that non-invertibility is likely to be endemic to the VAR model on fiscal policy.

Evidence of non-fundamentalness is provided by Ramey (2011) as well. She shows that government spending shocks estimated with a standard closed economy VAR are predicted by the forecasts from the Survey of Professional Forecasters. The same forecasts, provided by the Philadelphia FED, are a key tool in the identification strategy proposed by Forni and Gambetti (2014). Their approach intends to overcome the non-fundamentalness issue by distinguishing between a surprise shock and a foresight shock. This distinction allows to clean the fiscal shock from its anticipated component, solving the non-fundamentalness problem. Furthermore, it allows to study the transmission of a foresight shock, assessing how a change in the agents' expectations affect macroeconomic variables such as GDP, interest rate and exchange rate.

1.4 VAR specifications

The growing popularity of VAR models in applied economic research has fostered the development of different specifications of the standard approach, in the attempt to further refine this method by taking advantage of the growing data availability.

[13] For a complete review of non–fundamentalness in structural econometric models see Alessi, Barigozzi and Capasso (2011).

[14] A non-exhaustive list of studies addressing the issue of fiscal policy anticipation includes, among others, Mertens and Ravn (2010), Forni and Gambetti (2010), Tenhofen and Wolff (2010), Perotti (2011), Ricco and Ellahie (2012), Leeper, Richter and Walker (2012), Ricco (2015).

1.4.1 Global VAR models

Global VAR (GVAR) models were originally proposed by Pesaran et al. (2004). They are multivariate, multi-country time series models. Their structure is based on VAR models of individual countries and makes them a good tool to study inter-country linkages. In a basic unrestricted VAR model with k endogenous variables covering N countries, the number of unknown parameters is too large to be estimated. This imposes a more parsimonious model specification. Global VAR models address this problem with a multi-stage approach. In the first step, small-scale individual country specific VAR models are estimated conditional on the other countries considered. These models are represented as augmented VAR models, denoted as VARX. Together with domestic variables, the system comprises weighted cross-section averages of foreign variables which are treated as weakly exogenous. In the second step, individual country VARX models are aggregated in a consistent and cohesive manner into a larger Global VAR model and solved simultaneously[15].

Consider a panel of N cross-section units (i=1, 2,...,N), each featuring k_i endogenous variables observed during the time periods t = 1, 2,..., T. Let $Y_{i,t}$ denote a $(k_i \times 1)$ vector of variables specific to each cross-section unit i in time t, and let $Y_t = (Y_{1,t}'; Y_{2,t}';...; Y_{N,t}')$ denote a $(k \times 1)$[16] vector of all the variables in the panel. Each country specific VARX model can be represented as follows:

$$Y_{i,t} = \sum_{l=1}^{p_i} B_{i,l} Y_{i,t-l} + A_{i,0} Y_{i,t}^* + \sum_{l=1}^{q_i} A_{i,l} Y_{i,t-l}^* + \epsilon_{i,t} \tag{13}$$

where $Y_{i,t}^*$ is the $(k^* \times 1)$ vector of country-specific cross-section averages of foreign variables; $B_{i,l}$ and $A_{i,l}$ are matrices of unknown coefficients and and $\epsilon_{i,t}$ is the $(k_i \times 1)$ vector of errors in the system. Each country specific model expresses the domestic endogenous variables as function of their lagged values and cross-section averages of foreign variables (treated as weakly exogenous). It is worth noticing that (13) allows for cointegration both amongst domestic variables as well as foreign variables, for this reason it can be equivalently written in the form of Vector Error Correction (VEC) model[17]. The second step of the GVAR approach consists of stacking estimated country models to form one large Global VAR model as follows:

$$G_0 Y_t = \sum_{l=1}^{p} G_l Y_{t-l} + \epsilon_t \tag{14}$$

where $G_l = (Z_{1,l}W_1; Z_{2,l}W_2;...; Z_{N,l}W_N)'$, with $Z_{i,l}=(B_{i,l},A_{i,l})$ and $W_i=(E_i',U_i)$. E_i is the

[15]For a more detailed description of GVAR models see Chudik and Pesaran (2014).

[16]Note that $k = (k_1 \times N)$.

[17]Vector Error Correction (VEC) models are multivariate time series models which allow to deal with cointegrated variables (see, among others, Johansen (1988) and (1991)).

$(k \times k_i)$ selection matrix which select $Y_{i,t}$, so that $Y_{i,t} = E_i Y_t$. U_i is the $(k \times k)$ matrix of country-specific weights.

Caporale and Girardi (2013)[18] apply this approach to a panel of ten European countries (Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, the Netherlands, Portugal and Spain) to study the dynamic effects of fiscal imbalances in a given EMU member state on the borrowing costs of other euro-zone partners. They use quarterly seasonally adjusted series over the sample period 1999:1-2010:4. For each country specific VEC model, the vector of endogenous variables includes nominal long-term rates, real output, the expected inflation rate and the debt/GDP ratio. The vector of country-specific foreign variables comprises the same variables referring to the rest of the euro area, together with the 3-month Euribor rate, which is treated as a global variable in the GVAR. By applying this approach, they find that euro denominated government yields are strongly linked with each other. This results highlight the existence of negative externalities imposed by fiscal imbalances (above all in peripheral countries) and provide support to the need for fiscal discipline in the euro area.

1.4.2 Factor-augmented VAR models

An alternative solution to the problem of limited information contained in parsimonious structural VARs is given by combining them with the factor analysis for large datasets. Standard low-dimensional VAR models, in order to conserve degrees of freedom, usually employ six to eight variables. This small number of variables is unlikely to span the information set used by economic agents or by the financial market participants. The inadequate information set typically used in VAR systems creates two main problems, which can both be addressed by Factor-augmented VAR (FAVAR) models. First, to the extent that private sector agents have information not reflected in the VAR system, the estimation of policy innovations is likely to be contaminated. Second, standard models allow researchers to obtain impulse responses only for the variables included in the system, which generally constitute only a small subset of the variables of interest. Advances in econometrics and statistics provide a solution to the dimensionality problem of VAR models: combining factor analysis with a VAR framework allows to overcome the deficiency of information affecting standard VAR models. Factors are statistical instruments to shrink the dimensionality of a large dataset and exploit all the available information about its co-variations. Augmenting VAR models with a small number of factors permits to enhance considerably the information set, without increasing greatly the dimensionality of the model.

Let Y_t be an $(n \times 1)$ vector of observable economic variables. Following the standard approach, a VAR model can be estimated using data contained in Y_t alone. However, additional economic information, not fully captured by the variables included in Y_t , may

[18]For more applications of GVAR models to fiscal analysis see, for instance, Favero (2012), Ricci-Risquete and Ramajo-Hernández (2015), Dragomirescu-Gaina and Dionisis (2015).

be relevant to modeling the dynamics of these series. Let us suppose that this additional information can be summarized by an $(k \times 1)$ vector of unobserved factors, F_t. Let us assume that the joint dynamics of (F_t, Y_t) can be modeled as follows:

$$\begin{bmatrix} F_t \\ Y_t \end{bmatrix} = A(L) \begin{bmatrix} F_{t-1} \\ Y_{t-1} \end{bmatrix} + \epsilon_t \tag{15}$$

Where $A(L)$ is a polynomial matrix in the lag operator and ϵ_t is the vector of errors. (15) is a VAR in (F_t, Y_t). If the terms of $A(L)$ that relate Y_t to F_{t-1} are all zero, (15) reduces to a standard VAR; otherwise, it is a factor-augmented vector autoregression (FAVAR). The problem with (15) is that it cannot be estimated directly because the factors are unobservable. If we interpret the factors as representing forces that potentially affect many economic variables, we may infer something about them from observations on a variety of economic time series[19].

This approach was firstly introduced in monetary policy analysis (see, among others, Bernanke, Boivin and Eliasz (2005)). Pashourtidou, Savva and Syrichas (2014) recently applied this approach to estimate the dynamic effects of fiscal consolidation policies on key macroeconomic variables in Cyprus[20]. They propose two different specifications: the first one uses total general government expenditure and revenues, while the second employs government surplus/deficit (as a percentage of GDP). Each specification includes real output and CPI as well. They use seasonally adjusted quarterly data over the period 1995:1-2013:2. The factors are estimated from two different blocks of data: one set of factors is extracted from a dataset of domestic series and the other one from a group of foreign and international variables. In this FAVAR model domestic factors are ordered after the observable variables and are followed by the international factors. Thus, fiscal variables are ordered first, followed by GDP, CPI, domestic and foreign factors. This order assumes that output, prices and other aspects of domestic and foreign economy respond contemporaneously to fiscal shocks, while fiscal variables react with some lag to changes in the economy. The results show that fiscal retrenchment efforts in Cyprus, in the form of either government expenditure reductions or government revenue increases, lead to a fall in GDP driven by the negative responses of investment, private consumption and employment. As a result of the contractionary effects of austerity measures, inflation decelerates. Fiscal tightening based on expenditure reduction results in a larger contraction in output than consolidation through an equivalent revenue rise, especially in the medium term.

[19] For a detailed explanation of FAVAR models in applied economic analysis see Bernanke, Boivin and Eliasz (2005).

[20] Other contributions applying FAVAR models to study fiscal policy are, among others, Fry and Zheng (2012), Claeys and Vašíček (2014), Fragetta and Gasteiger (2014), Dell'Erba and Sola (2016).

1.4.3 Panel VAR models

The application of the VAR approach to panel datasets represent a further solution to the problem of limited information carried by standard VAR models. Taking advantage of the growing availability of data, this approach allows to exploit the cross-country comparison much further. Panel VARs are built with the same logic of standard VARs but, by adding a cross-sectional dimension, they are a much more powerful tool for addressing a wide range of policy-oriented questions, above all at an international level[21].

As in standard VAR models, in Panel VARs all variables are assumed to be endogenous and interdependent. The main difference is the cross sectional dimension of the representation. Let Υ_t be a $(k \times N)$ vector that is the stacked version of $Y_{i,t}$, the vector of k endogenous variables for each unit i = 1,2,...,N; such that $\Upsilon_t = (Y'_{1,t}, Y_{2,t}', ..., Y_{N,t})'$. The sub-index i is generic and indicates each individual unit composing the cross-section of the panel sample. These units could be countries, sectors, markets or combinations of them. Then a panel VAR can be represented as follows:

$$Y_{i,t} = B(L)\Upsilon_{t-1} + \epsilon_{i,t} \tag{16}$$

Confronting (16) with (32), it is clear that in the panel specification the lags of all endogenous variables of all units enter the model for unit i, denoting the dynamic interdependencies among the components of the panel. Moreover, $\epsilon_{i,t}$ are generally correlated across the different i, denoting static interdependencies.

Panel VAR models have been widely used in the study of fiscal transmission[22], above all to study cross-border effects. Beetsma and Giuliodori (2011) propose a panel VAR approach to study the consequences of unexpected changes in government expenditure for domestic and foreign activity. Their sample includes annual time series for fourteen EU countries over the period 1970–2004 (Austria, Belgium, Denmark, Finland, France, Ireland, Italy, Germany, Greece, the Netherlands, Portugal, Spain, Sweden and the United Kingdom). For each country, the sample comprises five endogenous variables: government purchases, cyclically-adjusted net taxes, output, the long-run nominal interest rate and the real effective exchange rate. All the variables are real and in natural logarithms (except for the long-run interest rate). The identification strategy is based on a lower-triangular Cholesky decomposition according to this particular ordering, meaning that government purchases are not contemporaneously affected by changes in the other endogenous variables. The results obtained with this approach are consistent with the neo-Keynesian framework. An increase in government expenditure boosts output (with a multiplier exceeding unity on average) and consumption and investment, while it reduces

[21] For a complete survey of Panel VAR models in applied economic research see Canova and Ciccarelli (2013).

[22] See, among others, Beetsma, Giuliodori and Klaassen (2006),Nickel and Vansteenkiste (2008), Gonzalez-Garcia, Lemus and Mrkaic (2013), Silva, Carvalho and Ribeiro (2013), Attinasi and Metelli (2016).

the public balance and the trade balance. The latter effect is determined by the real appreciation of the exchange rate which follows an expansionary fiscal policy, caused by the rise of the long-term interest rate (with some lag). The positive output response is smaller for more open economies, confirming the existence of spillovers (mainly via the trade channel).

1.4.4 Time-varying coefficients VAR models

Another issue affecting basic linear VAR models, beside the parsimony of the model, is the impossibility of allowing relationships among variables to change over time. The solution to this problem is represented by time-varying coefficients VAR (TVC-VAR) models. TVC VARs are a generalization of standard VAR models in which the coefficients are allowed to change over time. More in details:

$$Y_t = B_{1,t}Y_{t-1} + B_{2,t}Y_{t-2} + ... + B_{p,t}Y_{t-p} + \epsilon_t \tag{17}$$

Let $B_t = [B_{1,t},\ B_{2,t},...,\ B_{p,t}]$, and $\beta_t = \text{vec}(B_t)$. To get reasonable estimates of the coefficients from the limited amount of data available, stochastic constraints are imposed. More specifically, the time variation of the coefficients in β_t is usually assumed to follow independent random walks:

$$\beta_t = \beta_{t-1} + U_t \tag{18}$$

Where $U_t \sim (0, \Sigma_U)$. TVC VAR models have been used extensively to study the dynamic changes of the size of fiscal multipliers[23]. Auerbach and Gorodnichenko (2012,b), among many others[24], propose a regime-switching structural VAR model, permitting fiscal policy effects to vary over the busyness cycle. They use this approach to study the effect of fiscal measures in the US. Exactly as in Blanchard and Perotti (2002), they use quarterly data to estimate a VAR system in which the vector of endogenous variables comprises, in this order, log of real government purchases, log of real government receipts of direct and indirect taxes (net of transfers to businesses and individuals) and log real gross domestic product. While the structural shock identification strategy follows Blanchard and Perotti (2002), the innovative feature of this approach is that it allows for differences in the propagation of structural shocks on two different levels. The first one is contemporaneous, via differences in the disturbances' covariance matrices. The second is dynamic, via differences in the VAR estimated coefficients over time. To solve the non-linear system

[23] TVC VAR models were firstly applied in monetary policy analysis by Cogley and Sargent (2005) and Primiceri (2005).

[24] A non-exhaustive list of the contributions using TVC VAR models to analyze how fiscal transmission changes over time includes: Kirchner, Cimadomo and Hauptmeier (2010), Franta, Libich and Stehlik (2012), Coutinho and Silva (2014), Arin, Koray and Spagnolo (2015), Berg (2015), Caggiano et al. (2015).

that this approach implies they use Monte Carlo Markov Chain methods. Thanks to the regime switching feature of this model, Auerbach and Gorodnichenko (2011) find large differences in the size of spending multipliers in recessions and expansions, with fiscal policy being considerably more effective in recessions.

Cimadomo and D'Agostino (2015) take the time-varying coefficients VAR approach one step further, combining it with the use of mixed frequency time series[25]. They apply this approach to estimate the macroeconomic effects of government spending policies in Italy. The inclusion of both annual and quarterly series for government spending allows them to enhance their information set by considerably extend the period covered in their analysis. For European countries, quarterly time series for most fiscal variables are available only since 1999, while annual time series have been generally available since the 1980s. The results suggest that government spending shocks tend to have positive effects on output in Italy over the period 1988Q4-2013Q3. The fiscal multiplier, generally maximized at the one year horizon, follows a U-shape over the sample considered: it peaks at around 1.5 at the beginning of the sample, it then stabilizes between 0.8 and 0.9 from the mid-1990s to the late 2000s, before rising again to above unity during of the recent crisis.

1.5 International transmission of fiscal policy and VAR models

VAR models have been extensively used to study the international transmission of fiscal policy, assessing the cross-border effects of fiscal measures.

Beetsma and Giuliodori (2005) apply the VAR approach to estimate fiscal policy spillovers in Europe that propagate via the trade channel. Their baseline specification includes consumer price inflation, real government spending, real GDP, real net taxes, the money market rate and the real effective exchange rate. All these variables are at a quarterly frequency over the period 1970 – 1998. They employ an identification strategy based on Cholesky decomposition, assuming that real government spending is not contemporaneously affected by changes in real activity, as in Blanchard and Perotti (2002) and Fatas and Mihov (2001). They find that fiscal expansions in Germany, France and Italy lead to significant increases in imports from various European countries and this effect is slightly strengthened for members of the monetary union.

Fiscal policy cross-border effects via trade channel in Europe are studied by Beetsma, Giuliodori and Klaassen(2006) as well. They employ a panel VAR approach, with government spending, net taxes and GDP as endogenous variables, combining it with a panel bilateral trade model. With the former they identify the fiscal shocks, with the latter they assess the effects of changes in domestic output on foreign exports. Their findings document the existence of significant spillovers. On average, a fiscal stimulus of a 1 % of GDP in Germany produces a 0.23 % rise in foreign GDP within two years if the stimulus is carried out through an increase in public expenditure, while the external

[25]For an exhaustive survey of the mixed-frequency literature see Foroni and Marcellino (2013).

effect reduces to 0.06 % on average when if the expansion is realized with a tax cut.

Hebous and Zimmermann (2013) estimate output spillovers of fiscal shocks in the euro area as well but applying a GVAR approach. They compare the output response to a domestic fiscal shock with the response to foreign fiscal shock, represented as a weighted average of the fiscal shocks across all member countries. Their estimates show that the impact of an area-wide fiscal shock on the output of a given member country tends to be positive and larger than the impact of a domestic shock, stressing the importance of coordinated fiscal actions in the euro area.

The existence of fiscal spillovers is confirmed by Bénassy-Quéré and Cimadomo (2006), who find positive cross-border effects from Germany in neighboring and smaller countries. In contrast with Beetsma, Giuliodori and Klaassen(2006), this contribution finds that tax policies have a larger multiplier and a more persistent effect than spending policies. They obtain this evidence by estimating a Factor-augmented VAR model (FAVAR). Germany, the domestic country, is restricted to be contemporaneously unaffected by the foreign variables while German shocks can affect foreign economies.

Canova and Pappa (2007) use a VAR model to study fiscal spillovers within a monetary union, assessing the effect of regional expenditure and revenue shocks on the price differentials in the monetary union. They focus on the US states as well as on nine EMU member countries. For the US states the sample comprises annual data over the period 1969 - 1995 while for EMU members quarterly series from 1997:1 to 2003:3. They run separate Bayesian VAR systems for each unit, constructing the average response of these estimates. They use sign restrictions on the dynamics of deficits and output to identify two types of structural expenditure shock. Their findings show that on average an expansionary fiscal policy produces positive price differential responses in both monetary unions, but, in a number of units, price differential responses to the same policy are negative. They explain the latter effects with the existence of sizable spillover effects.

More recently, Auerbach and Gorodnichenko (2013) applied a regime switching approach to study fiscal spillovers among OECD countries. In this contributions, the authors enhance the identification strategy to address the fiscal foresight issue as well. They remove predictable innovations in government spending by controlling for information contained not only in the lags of macroeconomic variables but also in professional forecasts. They do not apply a VAR model tough, but they run a series of regressions for different countries and different time horizons, using semi-annual time series for the estimation. The results document that cross-country spillovers have an important impact but this varies greatly over the business cycle. The cross-border effects are high when the affected country is in recession while are modest when it is in expansions. Furthermore, they reach their peak when both recipient and source countries are in recession.

1.6 Conclusions

Since they were first introduced in macroeconomics by Sims (1980), vector autoregressive models have become the most used analytical tool to trace the effects of economic policies. The popularity of the VAR approach is due to its flexibility and simplicity, but it presents some challenges as well. This paper has reviewed the (VAR) models used in fiscal policy analysis, showing how the contributions in the literature have addressed those challenges. First of all, the innovations or shocks estimated in these systems have no economic meaning and standard VAR models need to be identified. This paper describes the four main identification approaches proposed in the literature: recursive, *à la* Blanchard and Perotti (2002), sign restrictions and event-approach. Secondly, standard VAR models are typically low-dimensional models. The parsimony is imposed in order to conserve degrees of freedom. This implies that VAR models can carry only a limited amount of information. Moreover, basic VAR models are linear, preventing relations among endogenous variables to change over time. In response to these problems, contributions in the literature have proposed enhanced specifications of the standard VAR model. Global VAR (GVAR) models, Factor-augmented VAR (FAVAR) models and Panel VAR models represent solutions to enlarge the information set spanned by VAR systems and to address the problem of non-fundamentalness as well. Time-Varying Coefficients VAR (TCV-VAR) models and Regime-Switching VAR (RS VAR) models enhance the analytical power of the VAR approach by allowing the relations among variables to change over time or different regimes.

VAR models have therefore witnessed a remarkable development in the last twenty years. This evolution has enhanced their performances, allowing them to take advantage of improvements in data collection and computing power. Nonetheless, some old problems remain unsolved. The striking heterogeneity in the empirical evidence about fiscal transmission produced by VAR models demonstrates that further improvements are needed. This lack of consensus is particularly costly from a policy making point of view and needs to be addressed.

References

[1] Afonso, A. and Sousa, R. M. (2012), *The macroeconomic effects of fiscal policy*, Applied Economics, Vol. 44(34), pp 4439-4454.

[2] Alesina, A. and Ardagna, S. (2010), *Large Changes in Fiscal Policy: Taxes versus Spending*, NBER Chapters, in: Tax Policy and the Economy, Vol. 24, pp 35-68.

[3] Alesina, A., Favero, C. and Giavazzi, F.(2014), *The Output Effect of Fiscal Consolidations*, forthcoming in Journal of International Economics.

[4] Alessi, L., Barigozzi M. and Capasso M. (2011), *Non–fundamentalness in structural econometric models: A review*, International Statistical Review, Vol. 79(1), pp 16–47.

[5] Arias, J. E., Rubio-Ramirez, J. F. and Waggoner, D. F. (2014), *Inference Based on SVARs Identified with Sign and Zero Restrictions: Theory and Applications*, Board of Governors of the Federal Reserve System International Finance Discussion Papers, No. 1100.

[6] Arin, K. P., Koray, F. and Spagnolo, N. (2015), *Fiscal multipliers in good times and bad times*, Journal of Macroeconomics, Vol. 44(C), pp 303-311.

[7] Attinasi, M. G. and Metelli, L. (2016). *Is fiscal consolidation self-defeating? A Panel-VAR analysis for the Euro area countries*, European Central Bank Working Paper Series, No. 1883.

[8] Auerbach, A. J. and Gorodnichenko, Y. (2012,a), *Fiscal Multipliers in Recession and Expansion*, NBER Chapters, in: Fiscal Policy after the Financial Crisis, pp 63-98.

[9] Auerbach, A. J. and Gorodnichenko, Y. (2012,b), *Measuring the Output Responses to Fiscal Policy*, American Economic Journal – Economic Policy, Vol. 4(2), pp 1–27.

[10] Auerbach, A. J. and Gorodnichenko, Y. (2013), *Output Spillovers from Fiscal Policy*, American Economic Review, Vol. 103(3), pp 141-146.

[11] Baxa, J. (2010),*What the Data Say about the Effects of Fiscal Policy in the Czech Republic?*, Mathematical Methods in Economics, pp 24-29.

[12] Beetsma, R. and Giuliodori, M. (2005), *What are the Trade Spill-Overs from Fiscal Shocks in Europe? An Empirical Analysis*, De Economist, Vol. 153(2), pp 167-197.

[13] Beetsma, R. and Giuliadori, M. (2011), *The effects of government purchase shocks: Review and estimates for the EU*, Economic Journal, No. 121(550), pp F4-F32.

[14] Beetsma, R., Giuliodori, M. and Klaassen, F. (2006), *Trade Spillovers of Fiscal Policy in the European Union: A Panel Analysis*, Economic Policy, Vol. 21(48), pp 639-687.

[15] Benetrix, A. S. and Lane, P. R. (2013), *Fiscal Shocks and the Real Exchange Rate,*International Journal of Central Banking, Vol. 9(3), pp 1-32.

[16] Berg, O. (2015), *Time Varying Fiscal Multipliers in Germany*, Review of Economics, Vol. 66(1), pp 13-46.

[17] Bermperoglu, D., Pappa, E. and Vella, E. (2013), *Spending-based austerity measures and their effects on output and unemployment*, CEPR Discussion Papers, No. 9383.

[18] Bernanke, B., Boivin, J. and Eliasz, P. S. (2005), *Measuring the effects of monetary policy: A factor-augmented vector autoregressive (FAVAR) approach*, Quarterly Journal of Economics, No. 120(1), pp 387-422.

[19] Biau, O. and Girard, E. (2005), *Politique budgétaire et dynamique économique en France. L'approche var structurel*, Revue économique, Vol. (3), pp 755-764.

[20] Bjørnland, H. C. (2000), *VAR models in Macroeconomic Research*, Documents 2000/14 Statistics Norway.

[21] Blanchard, O. J. and Quah, D. (1989), *The Dynamic Effects of Aggregate Demand and Supply Disturbances*, American Economic Review ,Vol. 79(4), pp 655-73.

[22] Blanchard, O.J. and Perotti, R. (2002), *An Empirical Characterization of the Dynamic Effects of Changes in Government Spending and Taxes on Output*, The Quarterly Journal of Economics, Vol. 117(4), pp 1329-1368.

[23] Boiciuc, I. (2015), *The effects of fiscal policy shocks in Romania. A SVAR Approach*, Procedia Economics and Finance, Vol. 32, pp 1131 – 1139.

[24] Boussard, J., de Castro, F. and Salto, M. (2012), *Fiscal Multipliers and Public Debt Dynamics in Consolidations*, Economic Papers 460 (July), Directorate General Economic and Monetary Affairs (DG ECFIN), European Commission.

[25] Burnside, C., Eichenbaum, M. and Fisher, J.D.M. (2004), *Fiscal shocks and their consequences*, Journal of Economic Theory, Vol. 115(1), pp 89-117.

[26] Caggiano, G., Castelnuovo, E., Colombo, V. and Nodari, G. (2015), *Estimating Fiscal Multipliers: News From a Nonlinear World*, Economic Journal, Vol. 0(584), pp 746-776.

[27] Caldara, D. and Kamps, C. (2006), *What Do We Know About the Effects of Fiscal Policy Shocks? A Comparative Analysis*, Computing in Economics and Finance 2006, No. 257.

[28] Candelon, B. and Lieb, L. (2013), *Fiscal policy in good and bad times*, Journal of Economic Dynamics and Control, Vol. 37(12), pp 2679-2694.

[29] Canova, F. and Pappa, E. (2007), *Price Differentials in Monetary Unions: The Role of Fiscal Shocks*, Economic Journal, Vol. 117(520), pp 713-737.

[30] Canzoneri, M., Collard, F., Dellas, H. and Diba, B. (2015), *Fiscal Multipliers in Recessions*, forthcoming in Economic Journal.

[31] Caporale, G. M. and Girardi, A. (2013), *Fiscal Spillovers in the euro area*, Journal of International Money and Finance, Vol. 38(C), pp 84.e1-84.e16.

[32] Chinn, M. (2013), *Fiscal Multipliers*, contribution to the New Palgrave Dictionary of Economics.

[33] Christiano, L. J., Eichenbaum, M. and Evans, C. L. (1999), *Monetary Policy Shocks: What Have We Learned and to What End?*, in Handbook of Macroeconomics, Elsevier, Vol. 1, pp 65-148.

[34] Chudik, A. and Pesaran, M. H. (2014), *Theory and Practice of GVAR Modeling*, Cambridge Working Papers in Economics 1408.

[35] Cimadomo, J. and Benassy-Quere, A. (2012), *Changing patterns of fiscal policy multipliers in Germany, the UK and the US*, Journal of Macroeconomics, Vol. 34(3), pp 845-873.

[36] Cimadomo, J. and D'Agostino, A. (2015), *Combining time-variation and mixed-frequencies: an analysis of government spending multipliers in Italy*, European Central Bank Working Paper Series, No. 1856.

[37] Claeys, P. and Vašíček, B. (2014), *Measuring bilateral spillover and testing contagion on sovereign bond markets in Europe*, Journal of Banking and Finance, Vol. 46(C), pp 151-165.

[38] Cogley, T. and Sargent, T.J. (2005), *Drift and Volatilities: Monetary Policies and Outcomes in the Post WWII U.S*, Review of Economic Dynamics, Vol. 8(2), pp 262-302.

[39] Corsetti, G., Meier, A. and Muller, G. (2010), *Cross-Border Spillovers from Fiscal Stimulus*, International Journal of Central Banking, Vol. 6(1), pp 5-37.

[40] Corsetti, G., Meier, A. and Muller, G. (2012), *What determines government spending multipliers?*, Economic Policy, Vol. 27(72), pp 521-565.

[41] Coutinho, P. M. and Silva, L.A. (2014), *Time-varying fiscal policy in the US*, Studies in Nonlinear Dynamics and Econometrics, Vol. 18(2)

[42] De Arcangelis, G. and Lamartina, S. (2003), *Identifying Fiscal Shocks and Policy Regimes in Some OECD Countries*, European Central Bank Working Paper, No. 281.

[43] de Castro, F. (2006), *The macroeconomic effects of fiscal policy in Spain*, Applied Economics, Vol. 38(8), pp 913-924.

[44] de Castro, F. and Hernández de Cos, P. (2008), *The economic effects of fiscal policy: The case of Spain*, Journal of Macroeconomics, Vol. 30(3), pp. 1005-1028.

[45] Dell'Erba, S. and Sola, S. (2016), *Does fiscal policy affect interest rates? Evidence from a factor-augmented panel*, The B.E. Journal of Macroeconomics, No. 2194-611.

[46] Devries, P., Guajardo, J., Leigh, D. and Pescatori, A. (2011), *A New Action-Based Dataset of Fiscal Consolidation*, IMF Working Papers, No. 11/128.

[47] Dragomirescu-Gaina, C. and Dionisis, P. (2015), *Strategic interactions of fiscal policies in Europe: A global VAR perspective*, Journal of International Money and Finance, Vol. 59(C), pp 49-76.

[48] Dungey, M. and Fry, R. (2009), *The identification of fiscal and monetary policy in a structural VAR*, Economic Modelling, Vol. 26(6), pp 1147-1160.

[49] Edelberg, W., Eichenbaum, M. and Fisher, J.D.M. (1999), *Understanding the Effects of a Shock to Government Purchases*, Review of Economic Dynamics, Vol. 2(1), pp 166-206.

[50] Eichenbaum, M. and Fisher, J.D.M. (2005), *Fiscal Policy in the Aftermath of 9/11*, Journal of Money, Credit and Banking, Vol. 37(1), pp 1-22.

[51] Enders, Z., Müller, G. J. and Scholl, A. (2011), *How do fiscal and technology shocks affect real exchange rates?: New evidence for the United States*, Journal of International Economics, Vol. 83(1), pp 53-69.

[52] Fatas, A. and Mihov, I. (2001), *The Effects of Fiscal Policy on Consumption and Employment: Theory and Evidence*, CEPR Discussion Papers, No. 2760.

[53] Faust, J. (1998), *The robustness of identified VAR conclusions about money*, International Finance Discussion Papers, No. 610.

[54] Favero, C. (2002), *How do European Monetary and Fiscal Authorities Behave?*, CEPR Discussion paper, No. 3426.

[55] Favero, C. (2012), *Modelling and Forecasting Yield Differentials in the euro area. A non-linear Global VAR model*,IGIER Working Papers 431.

[56] Favero, C. and Giavazzi, F. (2010), *Reconciling VAR-based and Narrative Measures of the Tax-Multiplier*, CEPR Discussion Papers 7769.

[57] Favero, C. and Giavazzi, F. (2012), *Measuring Tax Multipliers: The Narrative Method in Fiscal VARs*, American Economic Journal: Economic Policy, Vol. 4(2), pp 69-94.

[58] Forni, M. and Gambetti, L. (2010), *Fiscal Foresight and the Effects of Government Spending*, Barcelona Graduate School of Economics Working Papers, No 460.

[59] Forni, M. and Gambetti, L. (2014), *Government Spending Shocks in Open Economy VARs*, CEPR Discussion Papers, No. 10115.

[60] Foroni, C. and Marcellino, M. (2013), *A survey of econometric methods for mixed-frequency data*, European University Institute Economics Working Papers, No. ECO2013/02.

[61] Fragetta, M. and Gasteiger, E. (2014), *Fiscal Foresight, Limited Information and the Effects of Government Spending Shocks*, Oxford Bulletin of Economics and Statistics, Vol. 76(5), pp 667-692.

[62] Franta, M., Libich, J. and Stehlik, P. (2012), *Tracking Monetary-Fiscal Interactions Across Time and Space*, Czech National Bank Working Papers, No. 2012/06.

[63] Fry, R. and Pagan, A. (2011), *Sign Restrictions in Structural Vector Autoregressions: A Critical Review*, Journal of Economic Literature, Vol. 49(4), pp 938-60.

[64] Fry, R. and Zheng, J. (2012), *How Do Monetary and Fiscal Policy Shocks Explain US Macroeconomic Fluctuations? A FAVAR Approach*, Centre for Applied Macroeconomic Analysis, Australian National University, mimeo.

[65] Galí J., López-Salido, J. D. and Valls, J. (2007), *Understanding the effects of government spending on consumption*, Journal of the European Economic Association, Vol. 5(1), pp 227–270.

[66] Giordano, R., Momigliano, S., Neri, S., and Perotti, R. (2007), *The effects of fiscal policy in Italy: Evidence from a VAR model*, European Journal of Political Economy, Vol. 23(3), pp 707-733.

[67] Gonzalez-Garcia, J., Lemus, A. and Mrkaic, M. (2013), *Fiscal Multipliers in the ECCU*, IMF working papers, No. 13/117.

[68] Guajardo, J., Leigh, D. and Pescatori, A. (2014), *Expansionary Austerity? International Evidences*, Journal of the European Economic Association, Vol. 12(4), pp 949-968.

[69] Halkos, G. and Paizanos, E. (2015), *Fiscal policy and economic performance: A review of the theoretical and empirical literature*, MPRA Paper 67737.

[70] Hansen, L. P. and Sargent, T. J. (1980), *Formulating and estimating dynamic linear rational expectations models*, Journal of Economic Dynamics and Control, Vol. 2, pp 7–46.

[71] Hebous, S. and Zimmermann, T. (2013), *Estimating the effects of coordinated fiscal actions in the euro area*, European Economic Review, Vol. 58(C), pp 110-121.

[72] Heppke-Falk, K. H., Tenhofen, J. and Wolff, G. B. (2010), *The Macroeconomic Effects of Exogenous Fiscal Policy Shocks in Germany: A Disaggregated SVAR Analysis*, Journal of Economics and Statistics, Vol. 230(3), pp 328-355.

[73] Hur, S. K. (2007), *Measuring the Effectiveness of Fiscal Policy in Korea*, NBER Chapters, in: Ito, T. and Rose, A. K. (2007), *Fiscal Policy and Management in East Asia*, NBER-EASE, Vol. 16, NBER Books.

[74] Iiboshi, H. and Iwata, Y. (2015), *Time-varying Fiscal Multipliers Identified with Sign and Zero Restrictions: A Bayesian Approach to TVP-VAR-SV model*, Mimeo.

[75] Ilzetzki, E. O., Mendoza, E. and Vegh, C. (2013), *How big (small?) are fiscal multipliers?*, Journal of Monetary Economics, Vol. 60(2), pp 239-254.

[76] Johansen, S. (1988), *Statistical Analysis of Cointegration Vectors*, Journal of Economic Dynamics and Control, Vol. 12(2-3), pp 231-254.

[77] Johansen, S. (1991), *Estimation and Hypothesis Testing of Cointegration Vectors in Gaussian Vector Autoregressive Models*, Econometrica, No. 59(6), pp 1151-1180.

[78] Kim, S. and Roubini, N. (2008), *Twin deficit or twin divergence? Fiscal policy, current account, and real exchange rate in the U.S*, Journal of International Economics, Vol. 74(2), pp 362-383.

[79] Kirchner, M., Cimadomo, J. and Hauptmeier, S. (2010), *Transmission of government spending shocks in the euro area: Time variation and driving forces*, European Central Bank Working Paper Series 1219.

[80] Leeper, E. M., Richter, A. W. and Walker T. B. (2012), *Quantitative Effects of Fiscal Foresight*, American Economic Journal: Economic Policy, Vol. 4(2), pp 115-144.

[81] Leeper, E. M., Sims, C.A. and Zha T. (1996), *What Does Monetary Policy Do?*, Brookings Papers on Economic Activity, Vol. 27(2), pp 1-78.

[82] Leeper, E. M., Walker, T.B. and Yang, S.S. (2008),*Fiscal Foresight: Analytics and Econometrics*, NBER Working Paper No. 14028.

[83] Lippi, M. and Reichlin, L.(1994), *VAR analysis, nonfundamental representations, Blaschke matrices*, Journal of Econometrics, Vol. 63(1), pp 307–325.

[84] Lozano, I. and Rodríguez, K. (2009), *Assessing the Macroeconomic Effects of Fiscal Policy in Colombia*, Borradores de Economia, No. 552.

[85] Lutkepohl, H. (2011), *Vector Autoregressive Models*, Economics Working Papers ECO2011/30, European University Institute.

[86] Lutkepohl, H. (2014), *Structural Vector Autoregressive Analysis in a Data Rich Environment: A Survey*, Discussion Papers of DIW Berlin, No. 1351.

[87] Marattin, L. and Salotti, S. (2010), *The Response of Private Consumption to Different Public Spending Categories: VAR Evidence from UK*, EcoMod2010.

[88] Mertens, K. and Ravn, M. O. (2010), *Measuring the Impact of Fiscal Policy in the Face of Anticipation: A Structural VAR Approach*, Economic Journal, Vol. 120(544), pp 393-413.

[89] Mertens, K. and Ravn, M. O. (2014), *A reconciliation of SVAR and narrative estimates of tax multipliers*, Journal of Monetary Economics, Vol. 68(S), pp S1-S19.

[90] Mirdala, R. (2009), *Effects Of Fiscal Policy Shocks In The European Transition Economies*, Journal of Applied Research in Finance Bi-Annually, Vol. 0(2), pp 141-157.

[91] Monacelli, T. and Perotti, R. (2008), *Openness and the Sectoral Effects of Fiscal Policy*, Journal of the European Economic Association, Vol. 6(2-3), pp 395-403.

[92] Monacelli, T. and Perotti, R. (2010), *Fiscal Policy, the Real Exchange Rate and Traded Goods*, Economic Journal, Vol. 120(544), pp 437-461.

[93] Mountford, A. and Uhlig, H. (2009), *What are the effects of fiscal policy shocks?*, Journal of Applied Econometrics, Vol. 24(6), pp 960-992.

[94] Muir, D. and Weber, A. (2013), *Fiscal Multipliers in Bulgaria; Low But Still Relevant*, IMF Working Papers 13/49.

[95] Nickel, C. and Tudyka, A. (2014), *Fiscal Stimulus in Times of High Debt: Reconsidering Multipliers and Twin Deficits*, Journal of money credit and banking, Vol. 46(7), pp 1313-1344.

[96] Nickel, C. and Vansteenkiste, I. (2008), *Fiscal policies, the current account and Ricardian equivalence*, European Central Bank Working Paper Series 0935.

[97] Pashourtidou, N., Savva, C. S. and Syrichas, N. (2014), *The Effects of Fiscal Consolidation on Macroeconomic Indicators in Cyprus*, Cyprus Economic Policy Review, Vol. 8(1), pp 93-119.

[98] Perotti, R. (2005), *Estimating the effects of fiscal policy in OECD countries*, Proceedings, Federal Reserve Bank of San Francisco.

[99] Perotti, R. (2011), *Expectations and Fiscal Policy: An Empirical Investigation*, IGIER working paper, No. 429.

[100] Pesaran, M. H., Schuermann, T. and Weiner, S. M. (2004), *Modelling regional interdependencies using a global error-correcting macroeconometric model*, Journal of Business and Economics Statistics, Vol. 22, pp 129-162.

[101] Primiceri, G.E. (2005), *Time Varying Structural Vector Autoregressions and Monetary Policy*, Review of Economic Studies, Vol. 72(3), pp 821-852.

[102] Ramey, V.A. (2011a), *Identifying Government Spending Shocks: It's All in the Timing*, The Quarterly Journal of Economics, Vol. 126(1), pp 1-50.

[103] Ramey, V.A. (2011b), *Can Government Purchases Stimulate the Economy?*, Journal of Economic Literature, Vol. 49(3), pp 673-85.

[104] Ramey, V.A. and Shapiro, M.D. (1998), *Costly Capital Reallocation and the Effects of Government Spending*, Carnegie-Rochester Conference Series on Public Policy, Vol. 48, pp 145.

[105] Ricci-Risquete, A. and Ramajo-Hernández, J. (2015), *Macroeconomic effects of fiscal policy in the European Union: a GVAR model*, Empirical Economics, Vol. 48(4), pp 1587-1617.

[106] Ricco, G. (2015), *A new identification of fiscal shocks based on the information flow*, European Central Bank Working Paper Series, No. 1813.

[107] Ricco, G. and Ellahie, A. (2012), *Government Spending Reloaded: Fundamentalness and Heterogeneity in Fiscal SVARs*, MPRA Paper, No. 42105.

[108] 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(3), pp 763-801.

[109] Silva, R., Carvalho, V.M. and Ribeiro, A. P. (2013), *How large are fiscal multipliers? A panel-data VAR approach for the Euro area*, FEP Working Papers, No. 500

[110] Sims, C. (1980), *Macroeconomics and Reality*, Econometrica, Vol. 48(1), pp 1-48.

[111] Tenhofen, J. and Wolff, G. B. (2010), *Does anticipation of government spending matter? The role of (non-)defense spending*, Bonn Econ Discussion Papers 12/2010.

[112] Uhlig, H. (2005), *What are the effects of monetary policy on output? Results from an agnostic identification procedure*, Journal of Monetary Economics, Vol. 52(2), pp 381-419.

[113] Yang, S.S. (2008), *Quantifying tax effects under policy foresight*, Journal of Monetary Economics, Vol. 52(8), pp 1557-1568.

Fiscal policy spillovers: do expectations have cross-border effects?

Abstract

This paper estimates the cross-border effects of U.S. fiscal shocks within a two-country Bayesian VAR framework. Using an identification strategy which differentiates between foresight and surprise shocks, it traces spillovers on four main U.S. trade partners. I find that expectations significantly affect the international transmission of U.S. fiscal policy. An unanticipated fiscal stimulus leads to expectations of spending reversals, thereby lowering long term interest rates and depreciating the national currency. This kind of shock has no cross-border effects. The anticipation of an increase in government spending, on the contrary, raises long term interest rates, appreciates the U.S. dollar and boosts foreign activity. These findings provide novel evidence in support of the hypothesis that foresight alters fiscal policy effects on a national and international level.

JEL Classification: C32, E62, F42
Keywords: Fiscal foresight, fiscal spillovers, structural VARs, fiscal policy

2.1 Introduction

With the global financial crisis of 2008 turning into a global recession, many countries used fiscal stimulus packages to counteract its negative consequences. This has sparked a renewed interest in assessing the macroeconomic effects of discretionary fiscal policy. Empirical evidence about these effects is abundant but far from clear-cut. Recent studies, including Alesina and Ardagna (2010), show that fiscal consolidations can lead to a permanent increase in output. Others, such as in 't Veld (2013), explain how austerity measures can have self-defeating effects, lowering output and worsening public debt positions for a long time.

Beyond these divergences, recent contributions have succeeded in gathering consensus on three main aspects of fiscal policy: the variable size of multipliers, the importance of cross-border effects and the predictability of fiscal measures. It is by now well-understood that fiscal multipliers vary with business cycles (Corsetti et al. (2012)) and they are higher in recessions (Auerbach and Gorodnichenko (2012)). In general, empirical evidence shows that the size of the multiplier depends on a number of factors, including the state of public finances, the stance of monetary policy, the presence of a financial crisis and the exchange rate regime (Chinn (2013)).

Yang (2008) and Leeper, Walker, and Yang (2008) demonstrate that fiscal policy can be easily anticipated because of legislative and implementation lags, leading to fiscal foresight. Agents modify their actions when they receive signals about changes in policy, anticipating the effects of fiscal measures before the time when they are implemented. This implies that economic variables may move well before shocks take place. This can create a problem of non-fundamentalness in VAR models (Lippi and Reichlin (1994), Leeper et al. (2012)). Fundamentalness requires that the estimated residuals are not correlated with available information, so that they can not be predicted. If this condition is not satisfied, the fundamental moving average representation does not exist, implying that the VAR model is misspecified and shocks can not be identified. While there is widespread consensus on the predictability of fiscal policy and the need to take this into account in empirical models, the approaches proposed in the literature to address the problem are manifold. Ramey and Shapiro (1998) use military build-ups to identify variations in government spending that are really exogenous and not anticipated. Ramey (2011) shows that both professional forecasts and the Ramey-Shapiro (1998) narrative identification approach Granger-cause the VAR shocks. She constructs two new measures of government spending shocks to overcome the problem: the first is based on a richer narrative evidence than the one proposed by Ramey-Shapiro (1998) and the second is based on the Survey of Professional Forecasters. Forni and Gambetti (2014) draw their identification procedure on the latter indicator, using the Survey of Professional Forecasters to clean fiscal shocks from their anticipated component and to study the effects of a change in expectations. Auerbach and Gorodnichenko (2015) use daily data on U.S. government spending to identify fiscal shocks which have fundamental representations. The idea is that high frequency data help address the problem of the

predictability of fiscal variables.

Regarding the international transmission of fiscal shocks, Auerbach and Gorodnichenko (2015) document large cross-country effects during recessions using a regime switching VAR model where transitions across recessions and expansions are smooth. Faccini, Mumtaz and Surico (2016) show that expansionary fiscal policies in U.S. have a negligible effect on foreign output, although cross-border effects slightly increase in more recent times, following the 2008 financial crisis.

None of these studies assess the impact of expectations on spillovers, despite economic theory suggests that fiscal foresight can affect variables such as exchange rates and long term interest rates. Corsetti, Meier and Muller (2010), employing a two-country business cycle model, show that expansionary fiscal measures can have positive output spillovers only if associated with credible spending reversals, highlighting the importance of expectations about future fiscal regimes. Bearing this in mind, this paper aims at revisiting the empirical evidence on fiscal spillovers in the light of fiscal foresight. The analysis verifies how the anticipation of the future fiscal stance affects the international transmission of fiscal measures. To address this challenge I use a set of two-country VAR(4) models[26]. In each model, the U.S. is the domestic economy, considering its leading role in the global economy. As foreign countries, I include Canada, France, Germany and UK because they represent the lion share of U.S. foreign trade[27].

The baseline VAR comprises eight endogenous variables representing indicators of realized and expected fiscal policy in the U.S. (Government spending and its forecasts), economic activity in both countries (U.S. and foreign country GDPs) and transmission channels (foreign net exports, the long term nominal interest rate spread and the exchange rate). The innovative feature of this contribution is to apply an identification strategy which differentiates an unanticipated or surprise shock from a foresight or news shock (following Forni and Gambetti (2014)). The former is the shock identified in most VAR models; it represents a discretionary increase in government spending that was not foreseen by agents. The latter represents news received by agents which affect their expectations about prospective policy actions. The Philadelphia FED Survey of Professional Forecasters provides the data used to construct the indicators of fiscal forecast. This approach has twofold advantages: it allows to address the problem of non-fundamentalness, as well as to assess the international repercussions of both surprise and foresight shocks.

Results show the importance of expectations for the international transmission of U.S. fiscal policies. A surprise fiscal stimulus, if associated with expectations of spending reversals, has negligible cross-border effects. Foresight shocks, on the contrary, are associated with expectations of increasing government spending and yield positive spillovers,

[26] For a more detailed description of VAR models as tools to assess the macroeconomic effects of fiscal policy see, among others, Blanchard and Perotti (2002), Fatas and Mihov (2001), Caldara and Kamps (2006).

[27] China, Mexico and Japan have been excluded due to problems with the availability of data.

despite no expansionary fiscal action is taken. The sign and magnitude of these external effects are country sensitive, with some countries (France and Canada) more responsive than others (Germany and U.K.). This might suggest an active role of country-specific factors in affecting the international transmission of U.S. fiscal policies. The final external effects may well depend on the structural characteristics of the foreign economy, such as the institutional framework, the structure of the international asset market, the dimension and international trade flows (Ciccarelli et al. (2012)).

Regarding the transmission channel, the results in this paper confirm the puzzling response of the exchange rate to an expansionary fiscal measure, as documented by Kim and Roubini (2008). In contrast with the predictions of the Mundell and Fleming model, an unexpected increase in government expenditure triggers a depreciation of the domestic currency. My findings suggest that the cause of this depreciation may well be the expectations of spending reversals associated with positive surprise shocks. When an unexpected increase in government spending takes place, agents anticipate that expenditure cuts will materialize in the future. This causes an immediate reduction of long term interest rates which provokes a depreciation of the domestic currency. On the contrary, the anticipation of a future rise in government spending - the foresight shock - leads to an increase in long term interest rates (through the expectation of higher future interest rates), resulting in an appreciation of the national currency.

The remainder of the paper is organized as follows. Section 2 outlines the econometric approach and the identification procedure. Section 3 illustrates and discusses final results. Section 4 concludes.

2.2 Econometric Approach

The analysis studies how surprise and foresight shocks affect economic activity in the country where fiscal policy is implemented, the U.S., and in its major trade partners (Canada, France, Germany, UK). For this purpose I propose a two-country VAR model which includes variables that are expressions of the fiscal stance in the U.S. (both implemented and anticipated), the economic activity in both countries and commercial and financial transmission channels.

2.2.1 Data

The dataset comprises quarterly time series for the period 1981:q3 - 2013:q4. The use of the Philadelphia FED Survey of Professional Forecasters for the fiscal foresight variable imposes the starting date.

Real Government Consumption Expenditure and Gross Investment is chain quantity index from the Bureau of Economic Analysis (BEA)[28]. U.S. GDP is from the BEA, the

[28]The choice of the quantity index is due to the lack of a series in 2009 chained U.S. dollars which

GDP series for Canada, France and UK are from the OECD StatExtract database while the one for Germany is from the German National Statistical Office. All these series are in millions of national currency. The U.S. Federal Surplus is Federal receipts minus Federal expenditure over GDP and all the three series are from the BEA. Net exports are differences between exports and imports of goods and services, which are chained volume series in millions of euros from the OECD StatExtract, except Germany whose series of net exports in euros is from the Bundesbank database. Long term spreads are constructed as the U.S. 10-Year Treasury Constant Maturity Rate (source: Board of Governors FED) minus the other country 10 year bond rate (source: OECD - MEI). Exchange rates are the quantity of foreign currency per U.S. dollar and are from the Board of Governors FED database. I use natural logarithms of levels for Real Government Consumption Expenditure, GDPs and exchange rates. All variables in logs are multiplied by 100 to express the impulse response functions as percentage rates of variation.

Forecasts are from the Survey of Professional Forecasters, the oldest quarterly survey of macroeconomic forecasts in the United States. It was formerly conducted by the American Statistical Association (ASA) and the National Bureau of Economic Research (NBER). Now it has been taken over by the Federal Reserve Bank of Philadelphia. I use the annualized percent change of the mean responses for the Federal Government Consumption Expenditure and Gross investment (level series is subject to several changes of the base year). These forecasts are constructed by first computing the mean of the responses for the level of the variable, and then the rate of growth of this mean. When the survey is conducted in quarter t, the forecasters make their projections on the basis of historical observations dated $t-1$ and earlier[29].

More information about data (sources, codes, unit of measures and descriptive statistics) are in the appendix.

2.2.2 The VAR model

Consider the following VAR model:

$$Y_t = B(L)Y_{t-1} + \epsilon_t \tag{19}$$

where Y_t is the vector $n \times 1$ of endogenous variables, $B(L)$ are polynomial matrices $n \times n$ in the lag operator and ϵ_t is a vector $n \times 1$ of *iid* errors.

The baseline specification includes eight endogenous variables:

$$Y_t = [Forecast_t^{US} \quad G_t^{US} \quad Y_t^{US} \quad Sur_t^{US} \quad Y_t^i \quad nX_t^i \quad Spread_t^i \quad ex_t^i]' \tag{20}$$

The super-script US indicates U.S. variables while the super-script i refers to the other country considered in the model (i=Can, Fra, Ger, UK).

was available for the entire time span considered in the analysis.

[29]For more detailed information about the Survey, visit the Philadelphia FED website.

Real Federal Government consumption (G_t^{US}) describes the fiscal stance adopted in the U.S.. U.S. (Y_t^{US}) and foreign (Y_t^i) real Gross Domestic Products are indicators of real economic activity. U.S. public surplus (Sur_t^{US}) allows to control for variations in public revenues. Net exports/GDP (nX_t^i) and long term spread ($Spread_t^i$) represent, respectively, the commercial and financial transmission channel. The exchange rate (ex_t^i) is included to control for changes in currencies value which affect international trade flows.

Many contributions (see, among others, Beetsma and Giuliodori (2005) and Beetsma et al. (2006)) have studied the international transmission of fiscal shocks within a similar structural VAR framework. However, these studies have not addressed the problem of non-fundamentalness, nor they have assessed the role of fiscal foresight. Adding forecasts of real Federal Government consumption ($Forecast_t^{US}$) as an endogenous variable allows to address both issues. Controlling for expectations helps to realign the econometrician's information set with the agents'one, helping to estimate government spending shocks which have fundamental moving average representations. At the same time, including a forecast indicator permits to study the international repercussions of a change in expectations as well.

To identify the foresight shock I adopt a twofold approach as in Forni e Gambetti (2014), based on two indicators. The first one can be described as a narrative approach (Ramey (2011)). It identifies the news shock as the difference between the forecast of government spending at *t+1* made at t and the one made at *t-1*. The difference between the two reflects the new information received by forecasters at time t, hence the news shock.

This identification assumes that government expenditure growth (g_t) can be modeled as follows:

$$g_t = \alpha(L)\epsilon_t + \beta(L)\eta_t + \delta(L)\xi_t \tag{21}$$

where:

$\alpha(L) = \sum_{k=0}^{\infty} \alpha_k L^k$
$\beta(L) = \sum_{k=0}^{\infty} \beta_k L^k$
$\delta(L) = \sum_{k=0}^{\infty} \delta_k L^k$

are all impulse response functions in the lag operator L and ϵ_t is the foresight shock, η_t the surprise shock and ξ_t can be thought of as a non-policy shock that reflects endogeneity, such as, for example, automatic stabilization over the cycle.

The foresight shock does not affect g_t contemporaneously, thus its response function reacts with some delay $s > 0$, with $\alpha_k = 0$ for all $k < s$. As in Blanchard and Perotti (2002), I assume the non-policy shock has no contemporaneous effect on g_t too, i.e. $\delta_0 = 0$. Only surprise shocks have an immediate effect on public expenditure ($\beta_0 \neq 0$).

It is worth stressing that in the Survey of Professional Forecasters the forecast of g_t

made at time t, a nowcast, is different from the realized g_t ($E_t(g_t) \neq g_t$). Forecasters observe the surprise shock and the non-policy shock with a one-period delay, i.e. $E_t(\eta_t) = 0$ while $E_t(\eta_{t-1}) = \eta_{t-1}$. The anticipated shock is the only one observed at time t.

Considering this, equation (3) can be rewritten as follows:

$$E_t(g_{t+h}) = \sum_{k=h}^{\infty} \alpha_k \epsilon_{t+h-k} + \sum_{k=h+1}^{\infty} \beta_k \eta_{t+h-k} + \sum_{k=h+1}^{\infty} \delta_k \xi_{t+h-k} \tag{22}$$

$$E_{t-1}(g_{t+h}) = \sum_{k=h+1}^{\infty} \alpha_k \epsilon_{t+h-k} + \sum_{k=h+2}^{\infty} \beta_k \eta_{t+h-k} + \sum_{k=h+2}^{\infty} \delta_k \xi_{t+h-k} \tag{23}$$

The revision of the h-steps ahead forecast is given by:

$$E_t(g_{t+h}) - E_{t-1}(g_{t+h}) = \alpha_h \epsilon_t + \beta_{h+1} \eta_{t-1} + \delta_{h+1} \xi_{t-1} \tag{24}$$

Since the anticipated shock does not affect g_t contemporaneously ($\alpha_0 = 0$), the revision for $h = 0$ is equal to:

$$E_t(g_t) - E_{t-1}(g_t) = \beta_1 \eta_{t-1} + \delta_1 \xi_{t-1} \tag{25}$$

The non-policy shock does not affect g_t contemporaneously either, hence:

$$E_t(g_t) - E_{t-1}(g_t) = \beta_0 \eta_t \tag{26}$$

Equations (7) and (8) do not contain the foresight shock because the one-step-ahead revision can not be used to capture the anticipated shock since it affects only medium and long run expectations. On the contrary, taking into account several revisions of expectations of public spending growth and summing them over time (for four quarters in this analysis, i.e. $h = 3$) provides useful information about the foresight shock.

$$\sum_{h=1}^{3} (E_t g_{t+h} - E_{t-1} g_{t+h}) = \sum_{h=1}^{3} \alpha_h \epsilon_t + \sum_{h=2}^{4} \beta_h \eta_{t-1} + \sum_{h=2}^{4} \delta_h \xi_{t-1} \tag{27}$$

It is worth noticing that equation (9) contains also terms in η_{t-1} and ξ_{t-1} but, as showed in Forni and Gambetti (2014), cleaning it from these terms does not change the result.

The alternative approach to identify the foresight shock, that can be defined as a *cumulative* approach, is based on a different foresight indicator. It follows from the premise that taking into account forecasts for h>1 constitutes a better proxy of what agents really expect:

$$Cumulated_t = \sum_{t=1}^{4} Forecast_t \tag{28}$$

Model (1) is estimated using each forecast indicator in turn: narrative (9) and cumulative (10). Each model includes four lags, according to the standard information criteria[30].

The identification of structural shocks follows Fatas and Mihov (2001) and Blanchard and Perotti (2002), using a recursive mechanism *à la* Cholesky. Government expenditure is ordered first, implying it is not affected contemporaneously by structural shocks of the other endogenous variables while the opposite is true. This reflects the lagged response of fiscal policy to changes in the economy due to legislative and implementation lags. On the contrary, all the other variables react contemporaneously to government spending shocks. Following this logic, the forecast variable is ordered second. A shock in government spending changes agents' expectations immediately, while a shock in the expectations does not translate into a contemporaneous change of policy. For robustness purposes I tried to order the forecast variable both as first or as second and the order does not affect the outcome (as confirmed in Forni and Gambetti (2014)).

I use a Bayesian approach with diffuse prior in view of the high number of parameters to be estimated. The impulse response functions are constructed as the average of the posterior distribution over 500 draws. Changing the number of draws does not alter the results.

2.3 Results

The presentation is organized by type of shock, considering first the effects of a surprise shock, as represented by a unit variance unexpected rise in government expenditure, and then the effect of a foresight shock, as given by a unit variance rise in the expectations about government spending. In all figures, shaded areas in dark grey and light grey represent, respectively, 68% and 90% confidence intervals.

2.3.1 Surprise Shock

Consider a fiscal expansion in the U.S.. Figures 1 and 2 show that an unanticipated rise in government expenditure triggers a positive response of U.S. GDP on impact and a negative response of U.S. federal surplus. While the deterioration of the surplus is persistent, the boost in output lasts just one quarter. A possible reason for this short-lasting effect is the expectation that a spending reversal will take place in the future, as displayed by Figures 1(b) and 2(b). As the figures show, the surprise shock is associated with a negative and persistent response of both foresight indicators, implying that agents expect public expenditure cuts to happen in the future after the unexpected expansionary fiscal measure. This, in turn, leads to expectations of future lower interest rates (Figure 5, panels c,g,k,o) that may encourage agents to postpone their consumption and investment

[30]Results do not change if models include 3 lags.

decisions, crowding out two components of aggregate demand[31].

Regarding cross-border effects, Figure 5 shows that the response of foreign output is negligible in all countries. Corsetti et al. (2010), using a two-country business cycle model, obtain positive output spillovers in response to expansionary fiscal measures associated with expectations of spending reversals. According to their model, the fall in domestic nominal long term interest rates stimulates domestic aggregate demand enough to overcome the negative effect on the foreign economy exports, due to the real appreciation of its currency. The boost in domestic demand leads to an improvement in the trade balance of the foreign country that, together with lower long term interest rates, yields a positive effect on foreign output.

The empirical evidence presented in figure 5 supports only partially these findings. Panels (c,g,k and o) confirm that an expansionary policy, not foreseen by agents and associated with expectations of spending reversals, causes domestic nominal long term interest rates to fall. This, in turn, triggers a depreciation of the U.S. dollar, as shown in Figure 5 (d, h, l and p). The response of the exchange rate is in contrast with the Mundell and Fleming model which predicts an appreciation of the domestic currency following a fiscal stimulus. My findings are in line with Kim and Roubini (2008) who document a real exchange rate depreciation as well.

The explanations of the puzzling response can be found in the expectations of spending reversals which lower domestic long term interest rates. Albeit these responses provide empirical confirmation to the findings of Corsetti et al. (2010), they do not produce positive output spillovers as in their contribution. The reason behind this divergence may well be the response of the current account. Corsetti et al. (2010) find an improvement in the trade balance of the foreign country, panels (f) and (n) show instead a persistent contraction of Canadian[32] and French net exports following a U.S. unexpected expansionary measure. The trade balance of Germany and U.K. have a negligible response to the same shock (panels (b) and (j)). According to these findings, the depreciation of the U.S. dollar *vis-à-vis* the foreign currency, caused by agents' expectations, is they key element in determining the deterioration of the foreign current account and, consequently, the absence of any positive output response.

2.3.2 Foresight Shock

Results change substantially when it comes to analyzing the responses to a positive foresight shock. In this case, realized government spending does not move at $t = 0$, as shown in Figure 3 and 4 (panels (b) and (c)). What changes is the way in which agents foresee the future. According to the news or signals they receive, they forecast an increase in government spending and start shaping their behaviors accordingly. This

[31] Forni and Gambetti (2014) show that a persistent decline in consumption actually takes place one quarter after the unanticipated fiscal stimulus.

[32] U.S. imports account for almost 80% of Canadian exports.

affects real variables both on a national and international level (as displayed in Figures 3, 4, 6 and 7).

Figures 3 and 6 show the IRFs when the forecast indicator is constructed according to the narrative approach (9), Figures 4 and 7 report the results under the cumulative approach (10). It is worth stressing that results are robust, so using one foresight indicator or the other does not alter them substantially.

Regarding domestic effects, Figure 3(c) and 4(c) show a positive response of U.S. GDP to an expansionary foresight shock albeit on impact the effect is null. The prediction of an increase in public expenditure lead agents to expect a higher level of interest rates in the future. This, in turn, translates into an immediate increase of domestic long term interest rates (Figures 6 and 7, panels c, g, k and o). The rise in long term interests rates leads to an appreciation of the U.S. dollar (Figure 6 and 7, panels d, h, l and p). A comparison between Figure 5 on the one hand, and Figure 6 and 7 on the other hand, suggests that expected policies, rather than realized policies, are the main driving force of the dynamics of long term interest rates and exchange rates.

Focusing on the international effects, Figures 6 and 7 show that the expectation of a fiscal stimulus in the U.S. have an impact on partner economies, differently from unexpected expansionary policies which have only minor consequences abroad. Figure 6(e) and 6(m) display a boost in Canadian and French output following a news shock. The response is fairly persistent in both countries and robust to the narrative and cumulative approach. Output spillovers are barely significant in either Germany or U.K., confirming the minor responsiveness found after a surprise shock (Figure 6 and 7, panels a and i). U.K. output declines on impact but it is reversed after 2 quarters (Figure 6(a)). This effect is negligible under the cumulative approach.

Confronting the reactions of the four U.S. trade partners, it is worth noticing that outputs respond differently, despite the interest rate and the exchange rate dynamics are very similar. This may suggest an active role of country-specific factors in affecting the international transmission of U.S. fiscal policies. As discussed in Ciccarelli et al. (2012), the reaction of each economy may depend on some structural characteristics such as the institutional framework, the structure of the international asset market and international trade flows, just to name a few.

My results provide novel evidence in support of the hypothesis that expectations play a crucial role for the domestic and international transmission of fiscal policy. According to the traditional Mundell and Fleming model, a fiscal expansion is associated with a rise in long term interest rates and a consequent appreciation of the domestic currency. This, in turn, produces positive spillovers in partner economies through a stimulus of their net exports. Beetsma and Giuliodori (2005) and Beetsma et al. (2006) provide empirical support to this hypothesis, estimating sizable trade spillovers in response to expansionary fiscal policies in Europe. Beetsma and Giuliodori (2005) find that a fiscal stimulus in Germany, France and Italy lead to significant increases in imports from a number of European countries, providing a boost for foreign outputs. Beetsma et al.

(2006) confirm these results.

The evidence produced by this analysis is in sharp contrast with those previous findings. A fiscal expansion in the U.S. worsens the foreign current account and triggers a contraction of foreign output. The reason behind this divergence may be that these previous contributions do not differentiate between surprise and foresight shock, identifying a fiscal shock that is a combination of both. My findings demonstrate that ignoring the role of foresight for fiscal policy transmission can be misleading. The anticipation of cuts in public expenditure associated with fiscal stimuli causes a reduction of domestic interest rates. This leads to a depreciation of the U.S. dollar and to a consequent deterioration of foreign countries trade balance. On the contrary, the anticipation of a fiscal expansion produces dynamics that are similar to the ones described by previous contributions. It is important to notice that in this case no fiscal action is taken. Hence, the expectation of a future increase in government spending rather than its practical implementation raises domestic interest rates. Consequently it produces a real appreciation of the national currency (the U.S. dollar), having a positive economic impact on the foreign country. It is worth stressing two more points highlighted by my results: the appreciation of the U.S. dollar does not produce a boost for foreign exports and output spillovers are country sensitive (Figure 6 and 7). These findings indicates that the anticipation of future policy regimes can affect greatly the transmission of fiscal shocks, highlighting the importance of expectations and foresight for fiscal policy effectiveness.

2.4 Conclusions

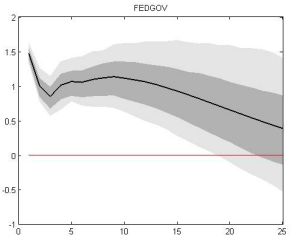
This paper has analyzed the role of expectations for the international transmission of fiscal policy. Using an identification strategy which distinguishes between surprise and foresight shocks in two-country Bayesian VAR models, I traced the effects of each shock in turn on 4 main U.S. trade partners (UK, Germany, Canada and France).

Results show negligible output spillovers in response to an unanticipated fiscal stimulus because of expectations of spending reversals. On the contrary, the anticipation of an expansionary measure produces positive effects on foreign economic activity despite no policy action is taken.

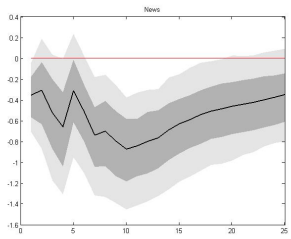
This evidence has non-negligible policy implications. First of all, it confirms the existence of cross-border effects, in line with Beetsma and Giuliodori (2011), Caporale and Girardi (2013) and Auerbach and Gorodnichenko (2013). This provides support to the theory that a coordinated approach to fiscal policy on an international base could be beneficial (Benes et al. (2013)). After the 2008 crisis, policy cooperation was strengthened. However, to really improve fiscal policy effectiveness on a global level, a proper coordination which goes beyond the 'house in order' approach is necessary.

Secondly, the findings of this analysis highlight the importance of foresight for policy transmission. This suggest that fiscal policy is effective as long as it influences expectations, reviving the debate on the credibility of policy institutions as a necessary pre-

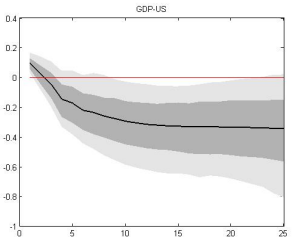
requisite for optimal policy (Kydland and Prescott (1977)). Governments can enhance the effectiveness of their fiscal actions only if they succeed in shaping agents' forecasts according to their needs.



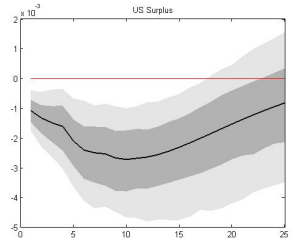
(a) Government Spending



(b) Foresight

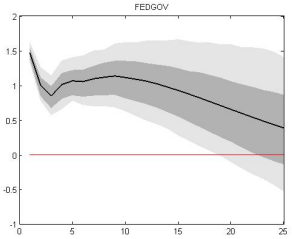


(c) US GDP

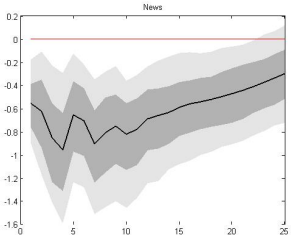


(d) US Surplus

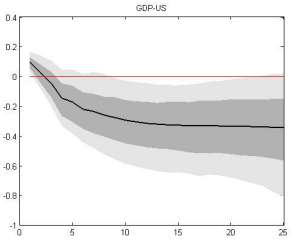
Figure 1: IRFs of domestic variables to a U.S. surprise Government spending shock - Narrative approach



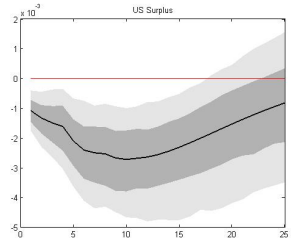
(a) Government Spending



(b) Foresight

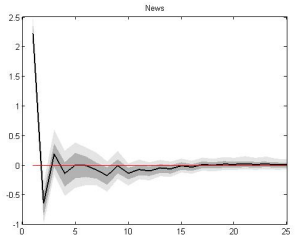


(c) US GDP

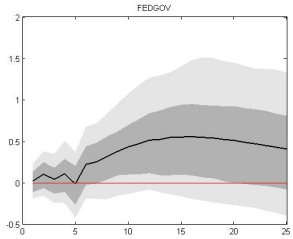


(d) US Surplus

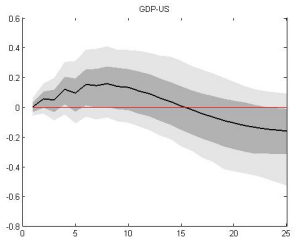
Figure 2: IRFs of domestic variables to a U.S. surprise Government spending shock - Cumulative approach



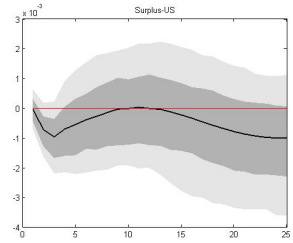
(a) Foresight



(b) Government Spending

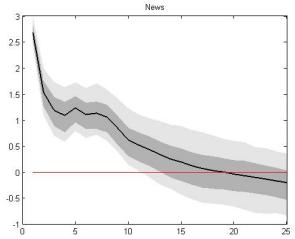


(c) US GDP

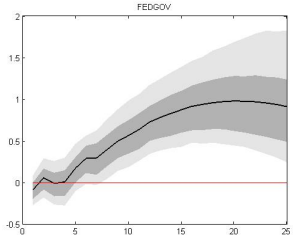


(d) US Surplus

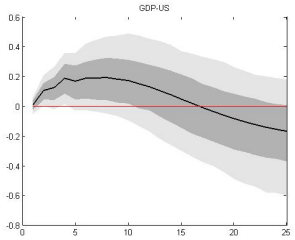
Figure 3: IRFs of domestic variables to a U.S. Government spending foresight shock - Narrative approach



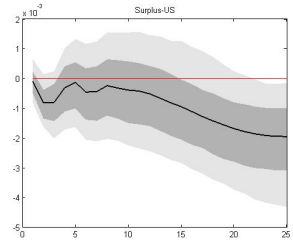
(a) Foresight



(b) Government Spending

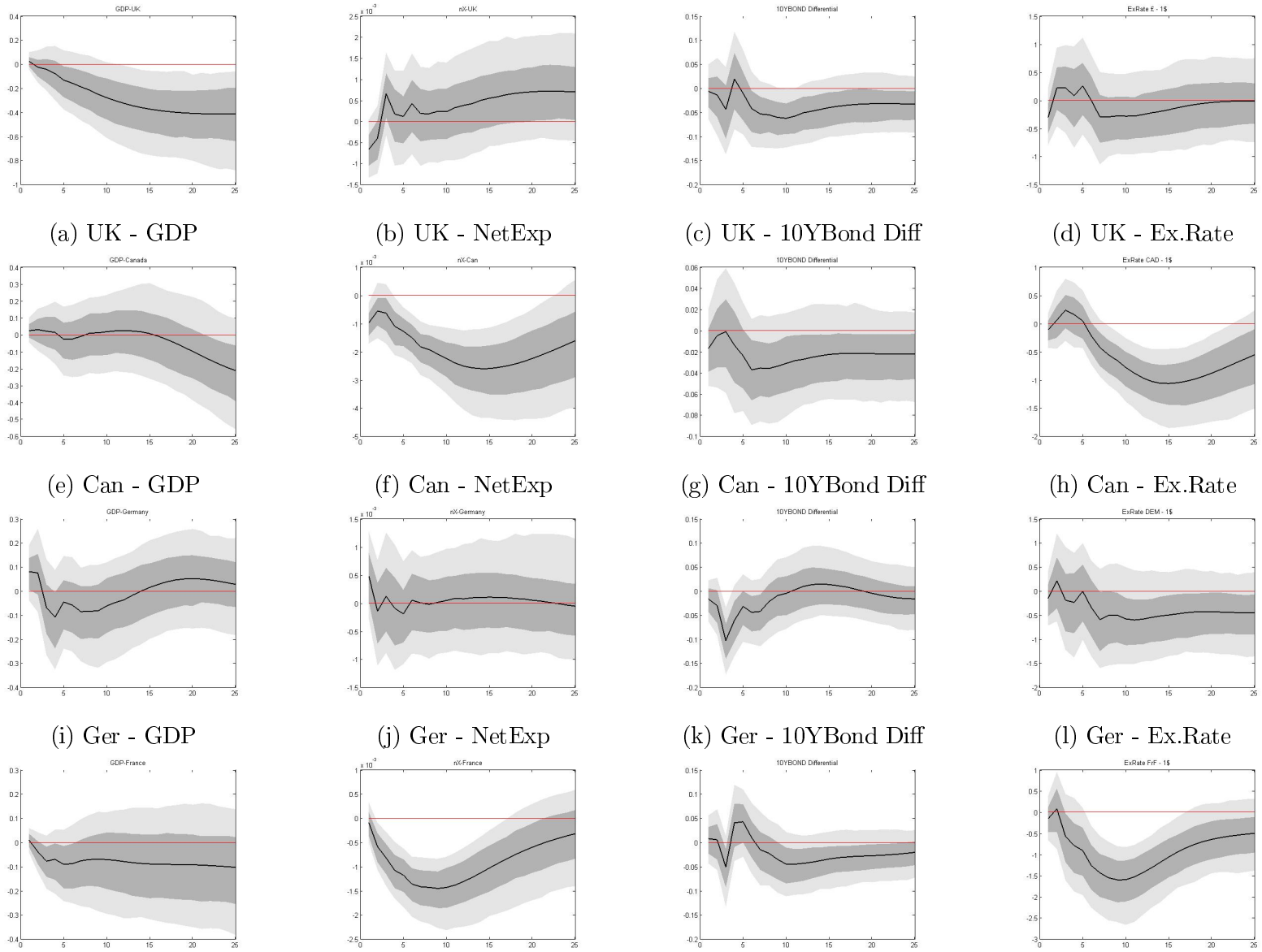


(c) US GDP



(d) US Surplus

Figure 4: IRFs of domestic variables to a U.S. Government spending foresight shock - Cumulative approach



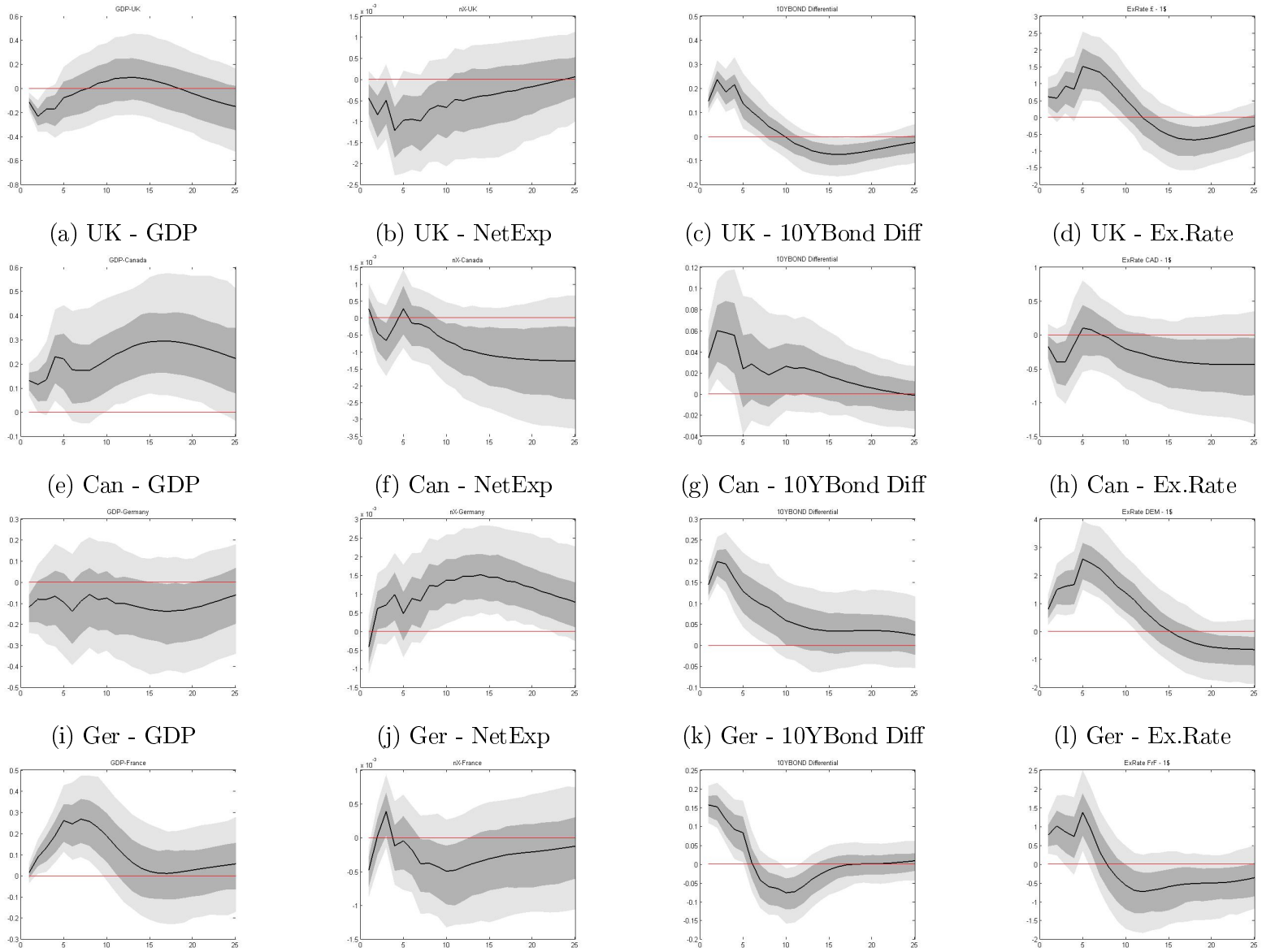
(a) UK - GDP (b) UK - NetExp (c) UK - 10YBond Diff (d) UK - Ex.Rate

(e) Can - GDP (f) Can - NetExp (g) Can - 10YBond Diff (h) Can - Ex.Rate

(i) Ger - GDP (j) Ger - NetExp (k) Ger - 10YBond Diff (l) Ger - Ex.Rate

(m) Fra - GDP (n) Fra - NetExp (o) Fra - 10YBond Diff (p) Fra - Ex.Rate

Figure 5: IRFs to a U.S. surprise Government spending shock



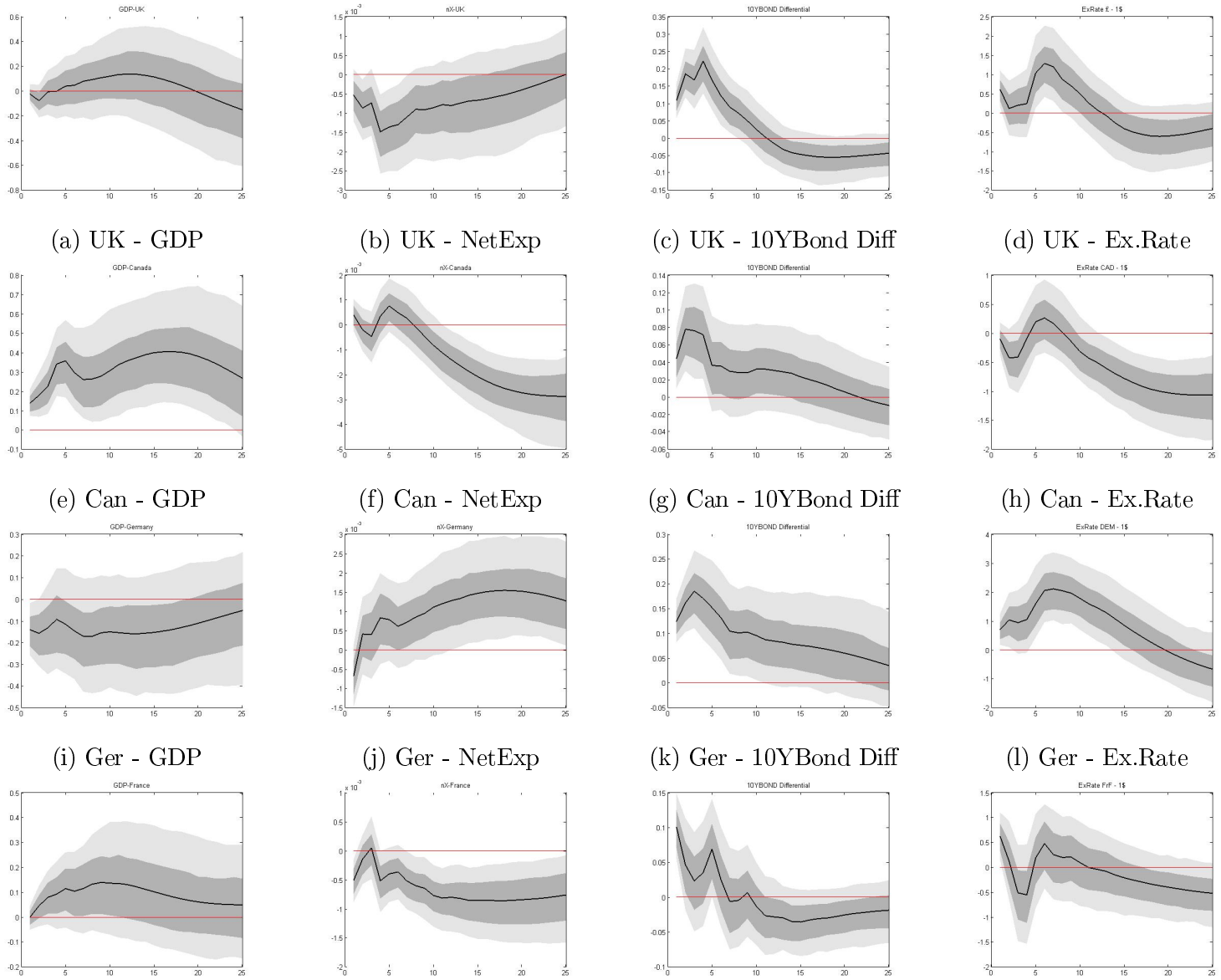
(a) UK - GDP (b) UK - NetExp (c) UK - 10YBond Diff (d) UK - Ex.Rate

(e) Can - GDP (f) Can - NetExp (g) Can - 10YBond Diff (h) Can - Ex.Rate

(i) Ger - GDP (j) Ger - NetExp (k) Ger - 10YBond Diff (l) Ger - Ex.Rate

(m) Fra - GDP (n) Fra - NetExp (o) Fra - 10YBond Diff (p) Fra - Ex.Rate

Figure 6: IRFs to a U.S. Government spending foresight shock - Narrative approach



(a) UK - GDP (b) UK - NetExp (c) UK - 10YBond Diff (d) UK - Ex.Rate

(e) Can - GDP (f) Can - NetExp (g) Can - 10YBond Diff (h) Can - Ex.Rate

(i) Ger - GDP (j) Ger - NetExp (k) Ger - 10YBond Diff (l) Ger - Ex.Rate

(m) Fra - GDP (n) Fra - NetExp (o) Fra - 10YBond Diff (p) Fra - Ex.Rate

Figure 7: IRFs to a U.S. Government spending foresight shock - Cumulative approach

References

[1] Alesina, A. and Ardagna, S. (2010), *Large Changes in Fiscal Policy: Taxes versus Spending*, NBER Chapters, in: Tax Policy and the Economy, Vol. 24, pp 35-68.

[2] Auerbach, A. J. and Gorodnichenko, Y. (2015), *Effects of Fiscal Shocks in a Globalized World*, NBER Working Papers 21100 (forthcoming in IMF Economic Review).

[3] Auerbach, A. J. and Gorodnichenko, Y. (2012), *Fiscal Multipliers in Recession and Expansion*, NBER Chapters, in: Fiscal Policy after the Financial Crisis, pp 63-98.

[4] Auerbach, A. J. and Gorodnichenko, Y. (2013), *Output Spillovers from Fiscal Policy*, American Economic Review, Vol. 103(3), pp 141-146.

[5] Beetsma, R. and Giuliodori, M. (2005), *What are the Trade Spill-Overs from Fiscal Shocks in Europe? An Empirical Analysis*, De Economist, Vol. 153(2), pp 167-197.

[6] Beetsma, R. and Giuliadori, M. (2011), *The effects of government purchase shocks: Review and estimates for the EU*, Economic Journal, No. 121(550), pp F4-F32.

[7] Beetsma, R., Giuliodori, M. and Klaassen, F. (2006), *Trade Spillovers of Fiscal Policy in the European Union: A Panel Analysis*, Economic Policy, Vol. 21(48), pp 639-687.

[8] Benes, J., Kumhof, M., Laxton, D., Muir, D. and S. Mursula (2013), *The Benefits of International Policy Coordination Revisited*, IMF Working Paper, No. 13/262.

[9] Blanchard, O.J. and Perotti, R. (2002), *An Empirical Characterization of the Dynamic Effects of Changes in Government Spending and Taxes on Output*, The Quarterly Journal of Economics, Vol. 117(4), pp 1329-1368.

[10] Boussard, J., de Castro, F. and Salto, M. (2012), *Fiscal Multipliers and Public Debt Dynamics in Consolidations*, Economic Papers 460 (July), Directorate General Economic and Monetary Affairs (DG ECFIN), European Commission.

[11] Caggiano, G., Castelnuovo, E., Colombo, V. and Nodari, G. (2015), *Estimating Fiscal Multipliers: News From a Nonlinear World*, Economic Journal, Vol. 0(584), pp 746-776.

[12] Caldara, D. and Kamps, C. (2006), *What Do We Know About the Effects of Fiscal Policy Shocks? A Comparative Analysis*, Computing in Economics and Finance 2006, No. 257.

[13] Canzoneri, M., Collard, F., Dellas, H. and Diba, B. (2015), *Fiscal Multipliers in Recessions*, forthcoming in Economic Journal.

[14] Caporale, G. M. and Girardi, A. (2013), *Fiscal Spillovers in the euro area*, Journal of International Money and Finance, Vol. 38(C), pp 84.e1-84.e16.

[15] Chinn, M. (2013), *Fiscal Multipliers*, contribution to the New Palgrave Dictionary of Economics.

[16] Ciccarelli, M., Ortega, E. and Valderrama, M. T. (2012), *Heterogeneity and cross-country spillovers in macroeconomic-financial linkages*, European Central Bank Working Paper Series, No. 1498.

[17] Cimadomo, J. and D'Agostino, A. (2015), *Combining time-variation and mixed-frequencies: an analysis of government spending multipliers in Italy*, European Central Bank Working Paper Series, No. 1856.

[18] Cogan, J., Cwik, T., Taylor J. and Wieland, G. (2010), *New Keynesian versus Old Keynesian Government Spending Multiplier*, Journal of Economic Dynamics and Control, Vol. 34(3), pp 281-295.

[19] Corsetti, G., Meier, A. and Muller, G. (2010), *Cross-Border Spillovers from Fiscal Stimulus*, International Journal of Central Banking, Vol. 6(1), pp 5-37.

[20] Corsetti, G., Meier, A. and Muller, G. (2012), *What determines government spending multipliers?*, Economic Policy, Vol. 27(72), pp 521-565.

[21] De Arcangelis, G. and Lamartina, S. (2003), *Identifying Fiscal Shocks and Policy Regimes in Some OECD Countries*, European Central Bank Working Paper, No. 281.

[22] Dornbusch, R. (1976), *Expectations and exchange rates dynamics*, Journal of Political Economy 84, pp 1161-1176.

[23] Faccini, R., Mumtaz, H. and Surico, P. (2016), *Testing for International Fiscal Spillovers*, Journal of International Economics, Vol. 99, pp 31–45.

[24] Fatas, A. and Mihov, I. (2001), *The Effects of Fiscal Policy on Consumption and Employment: Theory and Evidence*, CEPR Discussion Papers, No. 2760.

[25] Forni, M. and Gambetti, L. (2014), *Government Spending Shocks in Open Economy VARs*, CEPR Discussion Papers, No. 10115.

[26] Guajardo, J., Leigh, D. and Pescatori, A. (2014), *Expansionary Austerity? International Evidences*, Journal of the European Economic Association, Vol. 12(4), pp 949-968.

[27] Kim, S. and Roubini, N. (2008), *Twin deficit or twin divergence? Fiscal policy, current account, and real exchange rate in the U.S*, Journal of International Economics, Vol. 74(2), pp 362-383.

[28] Kydland, F. and Prescott, E. (1977), *Rules Rather Than Discretion: The Inconsistency of Optimal Plans*, Journal of Political Economy, Vol. 85(3), pp 473-91.

[29] Leeper, E. M., Richter, A. W. and Walker T. B. (2012), *Quantitative Effects of Fiscal Foresight*, American Economic Journal: Economic Policy, Vol. 4(2), pp 115-144.

[30] Leeper, E. M., Walker, T.B. and Yang, S.S. (2008),*Fiscal Foresight: Analytics and Econometrics*, NBER Working Paper No. 14028.

[31] Lippi, M. and Reichlin, L.(1994), *VAR analysis, nonfundamental representations, Blaschke matrices*, Journal of Econometrics, Vol. 63(1), pp 307–325.

[32] Monacelli, T. and Perotti, R. (2010), *Fiscal Policy, the Real Exchange Rate and Traded Goods*, Economic Journal, Vol. 120(544), pp 437-461.

[33] Mundell, R. A. (1962), *The Appropriate Use of Monetary and Fiscal Policy for Internal and External Stability*, IMF Staff Papers, Vol. 9(1), pp 70-79.

[34] Mundell, R. A. (1963), *Capital mobility and stabilization policy under fixed and flexible exchange rates*, Canadian Journal of Economic and Political Science, No. 29 (4), pp 475–485.

[35] Perotti, R. (2011), *Expectations and Fiscal Policy: An Empirical Investigation*, IGIER working paper, No. 429.

[36] Ramey, V.A. (2011), *Identifying Government Spending Shocks: It's All in the Timing*, The Quarterly Journal of Economics, Vol. 126(1), pp 1-50.

[37] Ramey, V.A. and Shapiro, M.D. (1998), *Costly Capital Reallocation and the Effects of Government Spending*, Carnegie-Rochester Conference Series on Public Policy, Vol. 48, pp 145.

[38] Uhlig, H. (2005), *What are the effects of monetary policy on output? Results from an agnostic identification procedure*, Journal of Monetary Economics, Vol. 52(2), pp 381-419.

[39] in 't Veld, J. (2013), *Fiscal consolidations and spillovers in the Euro area periphery and core*, European Economy - Economic Papers 506, Directorate General Economic and Monetary Affairs (DG ECFIN), European Commission.

[40] Woodford, M. (2011),*Simple Analytics of the Government Expenditure Multiplier*, American Economic Journal: Macroeconomics, Vol. 3(1), pp 1-35.

[41] Yang, S.S. (2008), *Quantifying tax effects under policy foresight*, Journal of Monetary Economics, Vol. 52(8), pp 1557-1568.

2.5 Appendix

2.5.1 Data

The complete list of all the time series used is as follow:

Variable	Name	Source	Unit of Measure
US Gov. Spending	Real Government consumption expenditure and gross investment	BEA - B823RA3	Chain-type Quantity index (2009=100)
US Fiscal Foresight	Real federal government consumption and expenditure and gross investment (Forecast)	Survey of Professional Forecasters (Phil FED)	Annualized percent change of mean responses
GDP US	Real Gross Domestic Product USA	BEA - A191RX1	Billions of Chained 2009 dollars
US Federal Surplus	(Federal Receipts [W018RC1] - Federal Expenditure[W019RC1]) / GDP	BEA	Billions of dollars
GDP UK	Total Gross Domestic Product for the United Kingdom in Constant Prices	OECD - NAEXKP01GBQ652S	Chained 2000 National Currency Units
GDP Canada	Total Gross Domestic Product for Canada in Constant Prices	OECD - NAEXKP01CAQ189S	National Currency Units
GDP Germany	Real Gross Domestic Product Germany	German National Statistical Office	Billions of Euro
GDP France	Total Gross Domestic Product for France in Constant Prices	OECD - NAEXKP01FRQ189S	National Currency Units
Net Exp US	Net Exports of Goods and Services USA	BEA - A019RC1	Billions of dollars
Exp UK	Exports of Goods and Services UK - chained volume	OECD	Millions of national currency
Imp UK	Imports of Goods and Services UK - chained volume	OECD	Millions of national currency
Exp Canada	Exports of Goods and Services Canada - chained volume	OECD	Millions of national currency
Imp Canada	Imports of Goods and Services Canada - chained volume	OECD	Millions of national currency
Net Exp Germay	Net Exports of Goods and Services Germany	Bundesbank	Thousand of hypotetically Euros
Exp France	Exports of Goods and Services France - chained volume	OECD	Millions of national currency
Imp France	Imports of Goods and Services France - chained volume	OECD	Millions of national currency
Int. Rate US	10-Year Treasury Constant Maturity Rate	Board of Governors FED - GS10	% per annum
Int. Rate UK	Long Term Interest Rates	OECD - MEI	% per annum
Int. Rate Canada	Long Term Interest Rates	OECD - MEI	% per annum
Int. Rate Germay	Long Term Interest Rates	OECD - MEI	% per annum
Int. Rate France	Long Term Interest Rates	OECD - MEI	% per annum
Ex. Rate £-$	U.S. / U.K. Foreign Exchange Rate	Board of Governors FED - DEXUSUK	British pounds to 1 US dollar
Ex. Rate CAD - $	Canada / U.S. Foreign Exchange Rate	Board of Governors FED - EXCAUS	Canadian dollars to 1 US dollar
Ex. Rate DEM - $	Germany / U.S. Foreign Exchange Rate	Board of Governors FED - EXGEUS	Deutschmarks to 1 US dollar
Ex. Rate FrF - $	France / U.S. Foreign Exchange Rate	Board of Governors FED - EXFRUS	French francs to 1 US dollar

Tables below report main descriptive statistics[33]:

Statistics	G_USA	News	Narr	S_USA	Y_USA
Max	465,90047	31,19497	9,703182	0,013797	1658,449
Min	399,9411	-11,1745	-8,53762	-0,10962	1568,238
Mean	432,79429	4,913467	0,343807	-0,03315	1620,026
Median	430,28547	5,401155	0,347965	-0,02809	1622,74
Variance	274,76863	86,72054	6,799006	0,000748	751,1145
SD	16,576147	9,312386	2,60749	0,027347	27,40647
Skewness	0,3792402	0,507965	0,25992	-1,14267	-0,29365
Kurtosis	-0,649079	-0,33237	2,664746	1,301616	-1,21328

[33]The Kurtosis is the excess Kurtosis.

Statistics	Y_UK	Y_Can	Y_GER	Y_Fra	nX_UK	nX _Can
Max	1288,102	1296,688	1339,537	1302,804	0,027855	0,100326
Min	1205,153	1215,323	1282,968	1247,274	-0,04311	-0,03274
Mean	1253,608	1259,34	1315,739	1279,838	-0,00826	0,040926
Median	1256,532	1257,883	1318,909	1279,773	-0,00966	0,04388
Variance	686,8874	599,6646	290,7282	320,6153	0,000384	0,001133
SD	26,20854	24,48805	17,05075	17,90573	0,019592	0,033656
Skewness	-0,285	-0,09086	-0,49125	-0,28417	-0,0172	-0,4625
Kurtosis	-1,25967	-1,32129	-0,96197	-1,24778	-1,16981	-0,3946

Statistics	nX_Fra	nX_Ger	i_UK	i_Can	i_Ger	i_Fra
Max	0,024168	0,083678	1,93	0,65	5,03	1,34
Min	-0,03301	-0,0013	-3,72667	-2,46333	-1,35333	-5,00333333
Mean	-0,00171	0,039926	-0,70154	-0,56446	0,923615	-0,47923077
Median	-0,00069	0,034239	-0,49	-0,34333	0,465	-0,32666667
Variance	0,000159	0,000506	1,038489	0,53868	2,035144	1,221934976
SD	0,012599	0,022504	1,019063	0,733948	1,426585	1,105411677
Skewness	-0,2712	0,302581	-0,63645	-0,42892	1,267213	-1,17960296
Kurtosis	-0,6695	-1,20114	0,660043	-0,87118	0,931292	2,430318995

Statistics	UK_US_ExRate	Can_US_ExRate	Ger_US_ExRate	France_US_ExRate
Max	-11,0019645	46,66229211	118,0837229	229,8396332
Min	-71,50065149	-3,303985408	22,45122143	143,4627278
Mean	-48,48311659	22,66871302	56,94961125	176,179756
Median	-47,39333898	22,52988991	51,67081731	173,3776715
Variance	109,71239	170,7609578	444,2711647	315,0143733
SD	10,47436824	13,06755363	21,07774098	17,74864427
Skewness	0,218953768	-0,215131254	0,93489679	0,821008488
Kurtosis	0,818193919	-0,78634971	0,188656742	0,341290504

Foresight and the macroeconomic impact of fiscal policy: evidence for France, Germany and Italy

Abstract

This paper provides evidence in support of the hypothesis that fiscal policy is largely anticipated and its effects depend on expectations. Based on a 2-country Bayesian VAR model between major European economies, we find that an unanticipated fiscal stimulus leads to expectations of strong deficit reversals. This in turn depresses domestic and foreign activity. Foresight shocks, on the contrary, have positive effects on domestic activity. Differences in the responses to surprise and foresight shocks reflect the role of expectations. The evidence in our study is consistent with a regime where deficit reversals are mainly based on taxation alone.

JEL classification: E62, F45, H62

Keywords: fiscal policy; VAR model; fiscal spillovers; fiscal multiplier

3.1 Introduction

Evidence about the macroeconomic impact of fiscal policy is abundant yet controversial. Estimates of the government spending multiplier range from 0.5 to 2.5 in the United States depending on the estimation approach.[34] Moreover, they vary considerably over time and across countries. It is by now well-understood that fiscal multipliers are higher in recessions (Auerbach and Gorodnichenko (2012)) and depend on such a large set of circumstances, including the exchange rate regime, trade openness, financial development, financial health and the state of public finances, that the notion of multiplier itself is put into question.[35] Results are mixed when it comes to evaluating the international effects of fiscal policy. In the euro area, Caporale and Girardi (2013) document a significant impact of fiscal imbalances in a given EMU country on the borrowing costs faced by its EMU partners. Higher interest rates crowd-out private expenditure and reduce the efficacy of debt-financed fiscal expansions. Canova et al. (2013), on the contrary, document limited and even perverse effects on long-term yields. In their panel, most of the action comes through the trade channel: a fiscal expansion in one country leads to higher imports and has positive output spillovers in partner economies. [36]

On the methodological ground, the fact that fiscal policy can be anticipated to a large extent poses a non-trivial identification problem. Fiscal variables are the result of a complex decision process, entailing long lags between the moment when the decision is taken and when it is effectively implemented. In the absence of a proper account of predictability, these variables may not convey sufficient information for identifying structural shocks, a problem known as "non-fundamentalness". Clearly, estimated responses may be misleading and very far from the true ones whenever fiscal shocks are not properly identified. In the words of Ramey (2011a), identifying fiscal shocks is all in the timing.

In this paper, we revisit the effects of fiscal policy on both domestic and foreign activity at the light of fiscal foresight. For this purpose, we use the official forecasts of the European Commission to identify surprise and foresight shocks. The former are unpredictable changes in the policy that is actually in place and capture innovations within a given policy regime. The latter are unpredictable changes in policy forecasts and reflect revision of expectations about future policy actions, namely regime shifts. The analysis draws on two-country VAR models between major European economies that include measures of both realized and expected policy together with country-specific

[34] The Congressional Budget Office (2012) provides a detailed survey. See also Reichling and Wahlen (2012) and Ramey (2011b).

[35] Empirical explorations into the determinants of government spending multipliers include, among others, Auerbach and Gorodnichenko (2013), Corsetti et al. (2012), Ilzetzki et al. (2013), Christiano et al. (2011), Caldara and Kamps (2012), Erceg and Linde (2012), Leeper et al. (2011), and Woodford (2009). See also Caggiano et al. (2015), Guajardo et al. (2011).

[36] Previous studies documenting positive output spillovers from fiscal expansion in the EMU include, among others, Beetsma and Giuliodori (2004) and Beetsma et al. (2006).

GDP, bilateral exports and long-term interest rate differentials. The fiscal stance is captured by the government balance (ratio to GDP) from the European Commission Forecasts. Data refer to Italy, France and Germany over the period 1971-2011. Fiscal shocks are identified as in Forni and Gambetti (2014) through a recursive ordering in which the realized policy does not react within the year to innovations in any other variable in the system. The expected policy, on the contrary, is allowed to react to innovations in the realized policy, reflecting the revision of expectations upon arrival of news.

We provide evidence in support of the hypothesis that fiscal policy is largely anticipated and its effects depend on expectations about future policy actions. We first document the forecasting accuracy of the European Commission Forecasts and show that they help address the problem of non-fundamentalness in the identification of fiscal shocks. Then, we estimate the effects of surprise and foresight shocks. An unanticipated fiscal stimulus (the surprise shock) is found to generate expectations of strong deficit reversals over the subsequent two to three years and to depress domestic and foreign activity over the same horizon. This is consistent with a regime where deficit reversals are mainly based on taxation alone. A different picture emerges when the fiscal stimulus is engineered through a change in expectations. An anticipated fiscal expansion (the foresight shock) has positive effects on domestic activity.

The paper is organized as follows. Section 2 verifies the forecast accuracy of the European Commission Forecasts and assesses their implications for the identification of fiscal shocks. Section 3 presents the econometric approach and section 4 discusses the results. Section 5 concludes.

3.2 Fiscal foresight

It is amply recognized that fiscal policy can be anticipated to a large extent. Yet, empirical evidence documenting fiscal foresight with time series data is scarce. Most contributions focus on government spending in the United States, including Ramey (2011a), Perotti (2011) and Forni and Gambetti (2014) among others. Using the Survey of Professional Forecasters, these studies suggest that the forecasts of government spending provide useful information about the prospective developments not only of government spending itself but also of private consumption and output growth.[37] Ignoring this information can cause serious estimation bias.

In this section, we will assess the extent to which publicly available forecasts of the government balance in Italy, France and Germany provide information about future policy developments and their role for the indentification of structural shocks. For this purpose, we use the European Commission Forecasts, ECF henceforth. The ECF report, for each year over the period 1971-2011, the forecast of the government balance (ratio to

[37] In Europe, see Gonzales et al. (2012).

GDP), d_t, made at the beginning of the period for the current and the subsequent period, $f_t(d_t)$ and $f_t(d_{t+1})$, respectively. Forecasts are released in the spring and autumn of each year. From the original data, we derive the cumulated forecast:

$$F_t = f_t(d_t) + f_t(d_{t+1}) \tag{29}$$

the forecast error:

$$Fe_t = f_t(d_t) - d_t \tag{30}$$

and the forecast news:

$$Fn_t = f_t(d_t) - f_{t-1}(d_t) \tag{31}$$

Each of the indicators above reflects a different aspect of the forecasting process. The cumulated forecast captures the expected change in the government balance between t and t+1. Using information over a two-year horizon, it may perform better in terms of accuracy compared to the simple forecasts $f_t(d_t)$ and $f_t(d_{t+1})$. The forecast error provides information about the accuracy of the EC forecasts. The forecast news conveys the new information that becomes available at each time t.

As a preliminary step, we evaluate the forecasting accuracy of the European Commission Forecasts as compared to standard time series models. The target is the realized government balance-to-GDP ratio (see below for a complete description of the data) over the period 1971-2011. The time series models we use are univariate autoregressive models with maximum order 2. The initial sample date is 1971 and the parameters are estimated with a rolling windows of 16 years. Forecast accuracy is measured by the mean square forecast error, MSFE, normalized by the variance of the target. The MSFE is the fraction of unpredictable variance: the lower the MSFE the higher the degree of foresight. Results are reported in Table 1.

The forecasts of the European Commission appear more accurate compared to the best performing autoregressive model. The MSFE of the ECF is lower than in any time series model and the difference is significant at the 5 percent level according to the Diebold-Mariano test (Diebold and Mariano (1995)). These findings are in line with previous studies documenting the forecast accuracy of the ECF (Gonzales et al. (2012)). They suggests that the forecasts of the European Commission convey useful information for predicting the government balance.

It is well-known that omitting information can cause serious estimation bias (Forni and Reichlin (1998)). In VAR models, overlooking the effect of anticipated policies may lead to a non-fundamental structural MA representation (Leeper et al. (2013)). Because fiscal variables react with a delay to innovations in any other variable in the system, they may not provide sufficient information to identify structural shocks. As a consequence, the VAR results can be misleading and the estimated responses very far from the true ones (Ramey (2011a)). A similar problem occurs in monetary models that do not consider

Table 2: Forecast Accuracy

GERMANY	Log-likelihood	MSE	MSFE
ARMA (1,1)	-42,96501	1,95490	4,09730
ARMA (1,2)	-43,42423	1,96620	1,98760
ARMA (2,1)	-42,37214	1,85030	3,24460
ARMA (2,2)	-42,36907	1,85110	3,27830
EU Commission Forecast (1996-2011)			1,021875
FRANCE	Log-likelihood	MSE	MSFE
ARMA (1,1)	-50,69220	3,77270	3,63410
ARMA (1,2)	-47,48858	3,24900	9,10010
ARMA (2,1)	-50,48945	3,70650	3,59000
ARMA (2,2)	-47,15581	3,23110	8,23130
EU Commission Forecast (1996-2011)			0,29938
ITALY	Log-likelihood	MSE	MSFE
ARMA (1,1)	-38,31310	1,31620	1,48700
ARMA (1,2)	-38,29995	1,31620	1,49400
ARMA (2,1)	-38,28995	1,31560	1,50030
ARMA (2,2)	-38,28959	1,31540	1,49940
EU Commission Forecast (1996-2011)			0,33875

The table reports the log-likelihood and the mean square error, MSE, of the regression in row together with the mean square forecast error, MSFE, of the deficit forecast from ARMA models and from the European Commission Forecasts. Data cover the period 1996-2011.

variables in the information set of central banks. Energy prices, for instance, provide useful information about future inflation and omitting them can cause a price puzzle, i.e. a positive response of inflation to an increase in the policy rate.

We verify the existence of a fundamental MA representation using the orthogonality test proposed by Forni and Gambetti (2014). The test is based on a simple rational: fundamentalness requires that any linear combination of the estimated residuals is not correlated with the past realizations of available information. If the condition is not satisfied, a fundamental MA representation does not exist and the VAR model is misspecified, in the sense that it does not include sufficient information to identify structural shocks. The testing procedure is the following: first, estimate a VAR model and identify the shocks of interest; second, regress these shocks on the past values of variables that reflect available information and perform an F-test for the significance of the regression. Our regressors include the EC forecasts and the indicators (29), (30) and (31).

As it will be clear soon, we focus on deficit shocks (the econometric model is described below). These are identified as the first shock in a Cholesky decomposition of the VAR(2) including, in this order, the government deficit (ratio to GDP) and GDP of each country, taken one at a time, together with GDP, net bilateral exports (ratio to GDP) and long-term interest rate differentials for each partner economy considered in turn. The model is estimated separately for each country pair over the period 1971-2011.[38] The estimated deficit shocks are then used to perform the orthogonality test. They are regressed on five sets of regressors, including the series reported by the ECF and the indicators (29), (30) and (31), considered one at a time. The sixth regression contains all of these series together. The first five regressions contain up to 2 lags of the regressors so as to capture information far in the past. For efficiency reasons, the sixth regression contains only contemporaneous regressors. Results are shown in Table 2. The table reports the p-values of the F-test for the six sets of regressors, in rows, and for all country pairs, in columns. Orthogonality is clearly rejected in the regressions using all available forecasts, All, and in the regressions using forecast errors, FE_t. It is not rejected in most of the remaining cases. We conclude that non-fundamentalness cannot be excluded in our VAR model.

3.3 The econometric approach

In this section we analyze the macroeconomic effects of fiscal stimulus, as measured by an increase in the government deficit-to-GDP ratio, in France, Germany, and Italy. Our analysis is focused on unexpected variations in government deficits, i.e. surprise shocks, as compared to unexpected variations in deficit forecasts, i.e. foresight shocks. We consider surprise and foresight shocks in each of these countries in turn and estimate

[38] The impulse responses together with 68% and 90% confidence intervals are available upon request.

Table 3: Fundamentalness test

Regressors	**Germany - Italy**	**Germany - France**
Nowcast	0,004	0,007
1 Year Ahead	0,445	0,586
Cumulated (1)	0,064	0,096
Forecast Error (2)	0,019	0
News (3)	0,242	0,147
ALL	0	0
Regressors	**Italy - Germany**	**Italy - France**
Nowcast	0,418	0,276
1 Year Ahead	0,701	0,862
Cumulated (1)	0,458	0,513
Forecast Error (2)	0	0
News (3)	0,48	0,374
ALL	0	0
Regressors	**France - Germany**	**France - Italy**
Nowcast	0,273	0,145
1 Year Ahead	0,883	0,946
Cumulated (1)	0,848	0,684
Forecast Error (2)	0	0
News (3)	0,556	0,345
ALL	0	0

The table reports the p-values of the F-test for each set of regressors (in rows) and for different samples (in columns). The first five regressions contain up to two lags for each regressor while the sixth regression contains one lag for each regressor.

their effects on domestic and foreign activity as well as on interest rate differentials and bilateral exports.

Our main interest relates to the role of forecasts for the domestic and cross-border transmission of shocks: how are domestic and foreign output affected by a fiscal stimulus that may be reversed in the future? How are they affected by a change in expectations about future policy actions? How effective is a fiscal stimulus that will take place in the future?

The notion that the effects of fiscal stimulus depend on expectations about future policy actions is well-known at least since Barro (1974). He showed that for a given pattern of government expenditure, how that spending is financed has no consequences for aggregate demand. The argument is based on the fact that agents smooth consumption over their whole lifetime. Consider, for instance, a debt-financed increase in government spending today that will be completely offset by higher (future) taxation alone. The prospective of lower disposable income in the future provides an incentive for agents to contract their current expenditures, so as to smooth consumption over time. As a consequence, the real interest rate raises and expectations of higher taxes completely crowd-out private expenditure. In a regime where both government spending and taxes automatically adjust so as to consolidate public debt over time, Corsetti et al. (2011) show that fiscal stimulus might in principle crowd-in private expenditure. In such a regime, the initial increase in the government deficit triggers a subsequent reversal of spending cuts or tax hikes that leads the deficit below trend for a while. Interest rates may even fall, boosting private spending. The extent to which expectations about future policy actions affect the impact of fiscal stimulus is ultimately an empirical matter. In what follows, we propose a methodology to shed some light on the question.

3.3.1 Data

We use annual data for Germany, Italy and France over the period 1971-2011, where the frequency reflects availability of foresight data. Table 3 in Appendix A reports key information on the original series and data transformations.

Macroeconomic data are from the OECD StatExtract database. They comprise GDP - measured at constant prices with base year 2010 - and the consumer price index, CPI. Bilateral imports and exports - denominated in US dollars at current prices - are from the UN Comtrade database. They are expressed in euros using the euro-dollar exchange rate from Eurostat and deflated with the CPI. Finally, the series of the government balance (ratio to GDP) - both realizations and forecasts - are from the European Commission. We have multiplied the original series by -1 so that positive values represent government deficits.

3.3.2 The model

Consider the VAR model given by:

$$Y_t = B(L)Y_{t-1} + \epsilon_t \tag{32}$$

where Y_t is the $(n \times 1)$ vector of endogenous variables, $B(L)$ are $(n \times n)$ matrix polynomials in the lag operator and ϵ_t is the $(n \times 1)$ vector of errors in the system. The vector of endogenous comprises the government deficit (ratio to GDP), one of the forecast indicators (29), (30) and (31) and real GDP for each country $i = 1, .., 3$ considered in turn together with real GDP, net bilateral exports (ratio to GDP), nx, and the interest rate differential on 10-year government bonds, *spread*, for each country $j = 1, .., 3$,with $j \neq i$ considered in turn:

$$Y_t = [d_{i,t} \quad F_{i,t}/Fe_{i,t}/Fn_{i,t} \quad GDP_{i,t} \quad GDP_{j,t} \quad nx_{j,t} \quad spread_{j,t}]' \tag{33}$$

The model is estimated separately for each country pair. All variables except interest differentials are HP filtered with a smoothing parameter $\lambda = 6.5$ as is usual in business cycle studies.[39] Cyclical adjustment is amply used in fiscal studies (see van der Noord (2000) and In 't Veld et al. (2013)). Typically, the cyclical component of a fiscal variable is meant to capture discretionary policy, which is largely unpredictable, while the trend component reflects predictable movements due to the functioning of automatic stabilizers.

Given the scope of the study, which is focused on the macroeconomic impact of fiscal stimulus at home and abroad, we have included also variables that capture the main channels of international transmission. Net bilateral exports represent trade spillovers: a fiscal expansion in one country is expected to spread its effects abroad through an increase in imports from the trading partners, so that bilateral exports from country j to country i increase after a fiscal expansion in country i. Interest differentials capture spillovers through the financial channel. The effect of a fiscal expansion on the spread is a priori ambiguous. A fiscal expansion may induce an upward correction of the risk premium required on government bonds, especially in highly indebted countries. This implies an increase (decrease) in the spread of countries that are more (less) exposed to sovereign risk.

Identification of fiscal shocks is achieved by assuming a contemporaneous recursive ordering where exogenous variables are ordered as given in the definition of Y_t. Zero contemporaneous restrictions are popular in fiscal studies (see Fatas and Mihov (2001) and Blanchard and Perotti (2002)). They are based on the premise that fiscal policy involves a decision process characterized by long and variable lags between the time when a decision is made and when it is actually implemented. As a consequence, fiscal variables react with a lag of at least one period to innovations in any other variable in the system. Specifically, we assume that the government deficit does not react within the year to innovations in any other variable in the system. To identify foresight shocks,

[39] Using non-cyclically adjusted variables is inconsequential for the analysis. The impulse responses of non-cyclically adjusted variables are available upon request.

we assume further that innovations to deficits can have a contemporaneous impact on the foresight indicator while innovations to the foresight indicator have no impact on the deficit realized within the year. The assumption reflects the incentive to revise forecasts upon arrival of "news" about the realized deficit.

To gain further insight on our identification strategy, consider the Wold representation of the government deficit:

$$d_t = \alpha(L)\epsilon_t + \beta(L)\eta_t + \delta(L)\xi_t$$

where $\alpha(L) = \sum_{k=0}^{\infty} \alpha_k L^k$, $\beta(L) = \sum_{k=0}^{\infty} \beta_k L^k$, and $\delta(L) = \sum_{k=0}^{\infty} \delta_k L^k$ are impulse response functions in the lag operator L, ϵ_t is the foresight shock, η_t is the surprise shock and ξ_t is a non-policy shock reflecting endogenous variations, for instance because of the functioning of automatic stabilizers. By definition of news, the deficit reacts with some delay s to ϵ_t, implying $\alpha_k = 0$ for $k < s$. The non-policy shock also affects the deficit with delay (as in Blanchard and Perotti (2002)). The surprise shock is, on the contrary, characterized by $\beta_0 \neq 0$. In this setup, the surprise shock reflects unanticipated changes in the government deficit, i.e. deviations of the deficit from the expected path within a given policy regime. The foresight shock, by contrast, reflects changes in expectations about the future policy regime (see Appendix C for a plot of foresight shocks).

The model (32) is estimated with Bayesian methods with diffuse priors.

3.4 Results

The presentation is organized by type of shock. For each country pair, we first consider the effects of a "surprise shock" as represented by a one percent rise in the realized deficit. Then, we consider a "foresight shock" as given by a one percent rise in the expected deficit as measured by (29), (30) or (31). For brevity, we report the impulse responses only for the model with the forecast error indicator. We have checked that using cumulated forecasts or forecast news is inconsequential for the analysis (Appendix B contains the impulse responses with (30) or (31)). In all Figures, impulse response functions are percent deviation from trend while shaded areas in dark grey and light grey represent, respectively, 68% and 90% confidence intervals.[40]

Consider a fiscal expansion in Germany (Figure 1). Panels 1a and 1b refer to the country pair Germany-Italy, while panels 1c and 1d refer to Germany-France. A non-anticipated rise in the German deficit, namely a surprise shock, has negative effects on economic activity both within and across German borders (Figures 1a and 1c). The response of German output is negative on impact in both samples, although it is barely significant in the sample Germany-Italy. Output returns to trend in about two years. Interestingly, the surprise expansion triggers expectations of substantial deficit reversals over the next two years: the forecast indicator falls on impact by approximately 0.5 percent below trend in both samples and turns slightly positive only after 2 years. Overall,

[40] Impulse responses are averages of the posterior distributions with 500 replications.

these findings suggest that the effects of a surprise expansion today are completely offset by expectations of a deficit reversal in the near future.

A different picture emerges with foresight shocks (Figures 1b and 1d). A positive shock to forecasts, i.e. an anticipated fiscal expansion, boosts output at home. The response of German output is positive on impact, reaches a peak of almost 0.8 percent after two years and then gradually returns to trend. The effect is quite persistent (about 4 years in the sample Germany-Italy and 3 years in the sample Germany-France). The multiplier - calculated as the cumulative increase in GDP - is above unity, precisely 1.4 percent in the sample Germany-Italy and 1 percent in Germany-France, in line with evidence about government spending multipliers cited above. It is worth stressing that the shock has a positive impact on domestic activity despite the deficit may actually fall below trend for a while.

Differently from surprise shocks, which imply sizable spillovers in the partner economies, the foresight shock has only minor consequences abroad. The response of GDP in either France or Italy is barely significant as are interest differentials. Bilateral exports increase as expected.

We have estimated the model for all of the other country pairs, considering a fiscal expansion in Italy (Figure 2) and a fiscal expansion in France (Figure 3).

Qualitatively, the responses are similar to those documented for a German expansion. Unanticipated fiscal expansions have negative output effects within and across borders (Figures 2a and 2c refer to a surprise shock in Italy; Figures 3a and 3c to a surprise shock in France). A surprise expansion in Italy (France) leads to a cumulated fall in domestic output as large as 0.7 percent (1.4 percent) over a 3 year horizon. Output spillovers are negative in all country pairs. As before, the shock leads to large deficit reversals: the expected deficit falls by 1 percent (0.5 percent) on impact in Italy (France) and is expected to stay below trend for about 3 years in both countries.

Turning to foresight shocks, domestic output increases in all samples, except France-Italy (Figure 3d). Interestingly, the effect is independent of the dynamics of the realized deficit: the deficit moves in accord with expectations in the sample Italy-Germany, it moves in contrast with expectations in the sample France-Italy and barely reacts in all other cases. We stress that foresight shocks are much more effective within than across borders. As with a German fiscal expansion, output spillovers seem to occur mainly in response to surprise shocks.

Why are responses to surprise and forecast shocks so different? The reason is the effect on expectations. The surprise shock implies a deviation of the deficit from the expected path. Given the policy regime in place, the shock triggers expectations of deficit reversals. Agents form their expectations on the base of what they consider a credible fiscal regime. If they, for instance, believe that an increase in the government deficit today will lead to higher taxes in the future, then any unexpected fiscal stimulus will be completely offset by anticipated tax hikes. If, on the other side, agents believe that also spending cuts can be engineered to consolidate public debt, then expectations of

a deficit reversal might have positive effects on aggregate demand and economic activity. The question of what type of fiscal regime is embodied in expectations is ultimately empirical. The evidence above is consistent with a regime where debt consolidation is mainly based on taxation.

The foresight shock, on the other side, implies a change in expectations, i.e. a regime shift that induces agents to revise their expectations. The fact that the foresight shock has positive effects on economic activity strengthens our argument that surprise shocks reflect a regime of tax-based debt consolidation. It is worth stressing that expectations seem to behave similarly in all countries despite ample heterogeneity in national fiscal regimes.

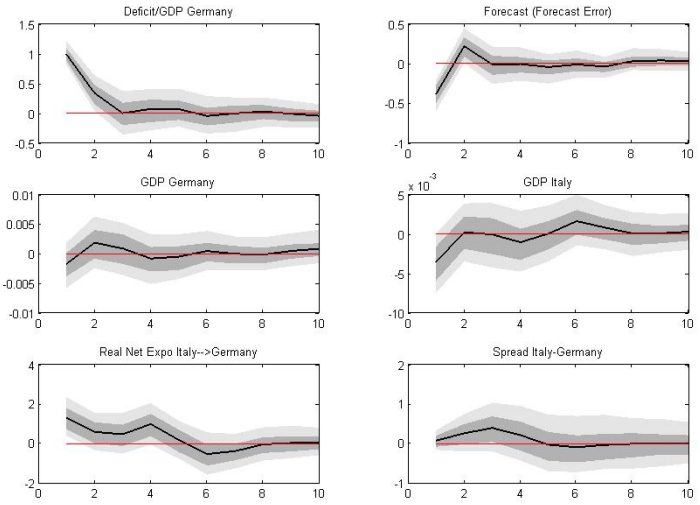
3.5 Conclusions

This paper has provided evidence in support of the hypothesis that fiscal policy is largely anticipated and its effects depend on expectations about future policy actions. Using the European Commission Forecasts of the government balance in France, Germany and Italy over the period 1971-2011, we have first assessed the forecast accuracy of the ECF in comparison to standard autoregressive models. Then, we have documented non-fundamentalness in the VAR model including, in this order, the government deficit (ratio to GDP) and GDP of the three countries taken one at a time, together with GDP, bilateral exports (ratio to GDP) and long-term interest rate differentials in each of the two partner economies considered in turn. The VAR model is estimated with Bayesian methods separately for each country pair. Finally, we have estimated a VAR model including, in addition to the variables above, one of three alternative forecast indicators: the cumulated forecast, the forecast error and the forecast news. Drawing on a recursive scheme, we have identified a surprise shock, i.e. an unanticipated deviation of the deficit from the expected path, and a foresight shock, i.e. a change in the expected deficit path.

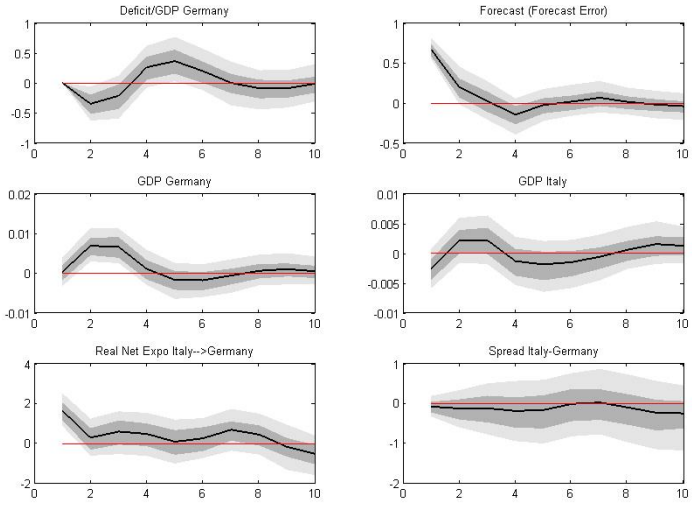
We find that unanticipated fiscal stimulus generates expectations of strong deficit reversals over the next two to three years, depending on the country pair, and this depresses domestic and foreign activity over the same horizon. These dynamics are consistent with a regime where deficit reversals are mainly based on taxation and crowd-out private expenditure. A regime shift that leads agents to anticipate a (credible) fiscal expansion, on the contrary, has positive effects on domestic activity. Differences in the responses to surprise and foresight shocks reflect the role of expectations about the policy regime that will prevail in the future. Our results suggest that fiscal stimulus is ineffective as long as the current regime is expected to be in place also in the future.

The evidence in this paper has non-negligible policy implications. First, it supports the idea that fiscal stimulus is effective as long as it triggers expectations of deficit reversals which are not entirely tax-driven. Remarkably, this would require a credible regime shift for all countries in our sample. Second, it suggests that the incentive to reform fiscal regimes in an uncoordinated way may be small. On the one side, the incentives for

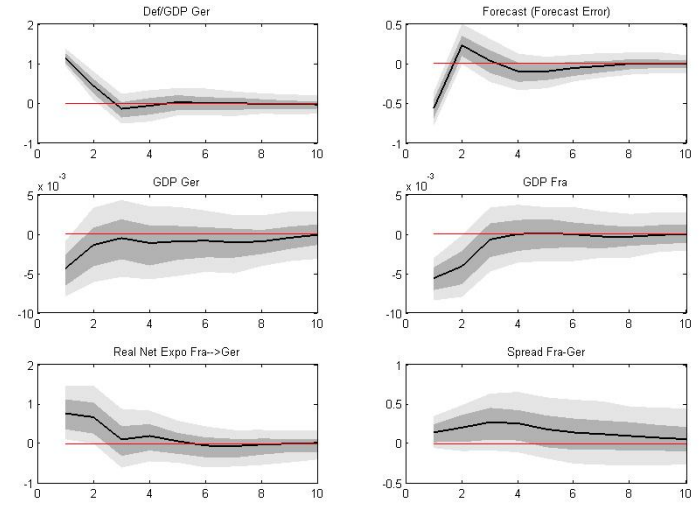
opportunistic behavior may be strong. Negative output spillovers in response to surprise shocks imply, in fact, that the adverse effects of deficit reversals can be partly shifted abroad. On the other side, changes in expectations have only minor consequences for foreign activity.



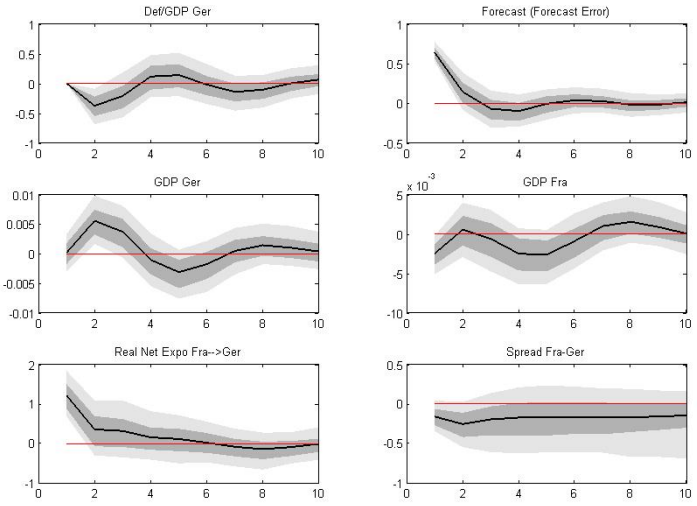
(a) IRF to a 1% rise in Deficit. Germany - Italy



(b) IRF to a 1% rise in Foresight Deficit. Germany - Italy

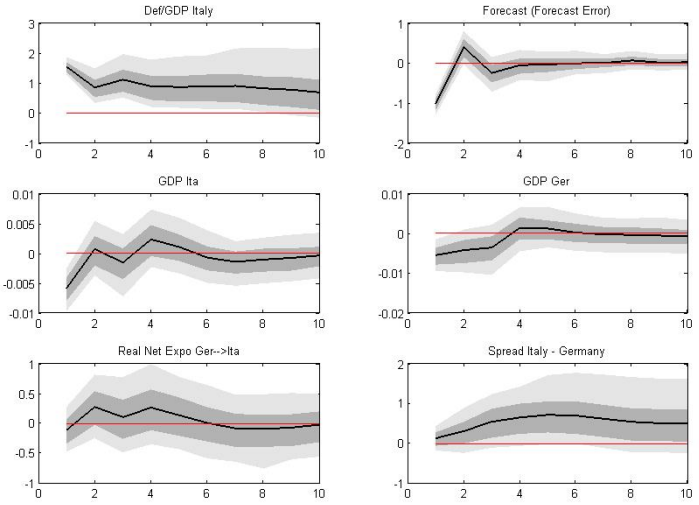


(c) IRF to a 1% rise in Deficit. Germany - France

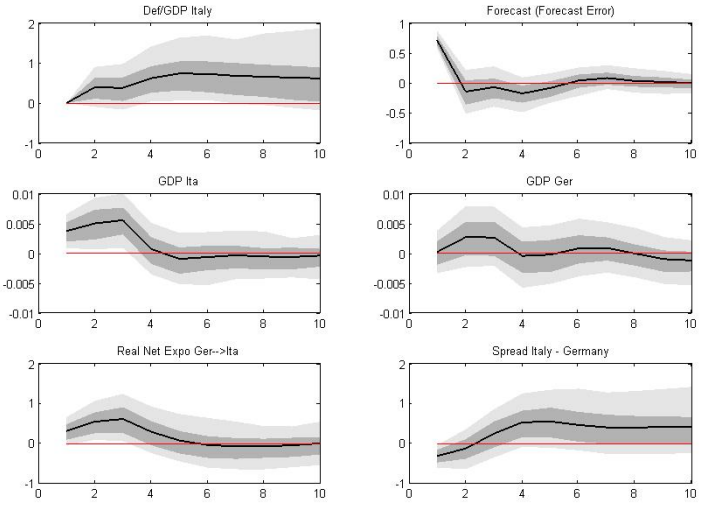


(d) IRF to a 1% rise in Foresight Deficit. Germany - France

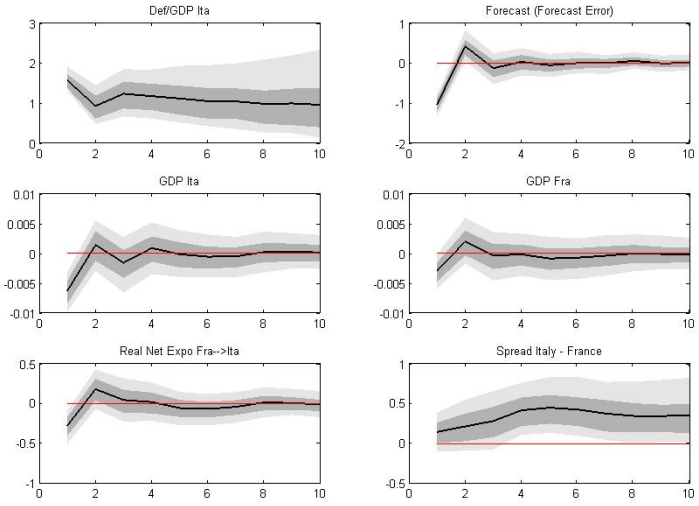
Figure 8: Domestic and cross-border effects of a fiscal expansion in Germany



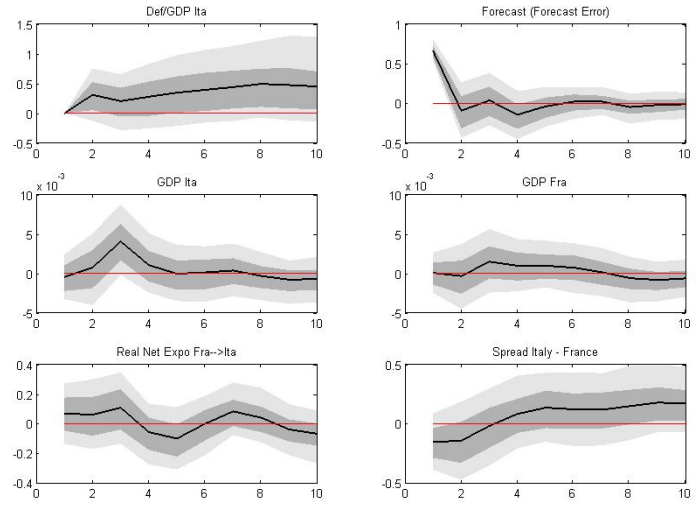
(a) IRF to a 1% rise in Deficit. Italy - Germany



(b) IRF to a 1% rise in Foresight Deficit. Italy - Germany

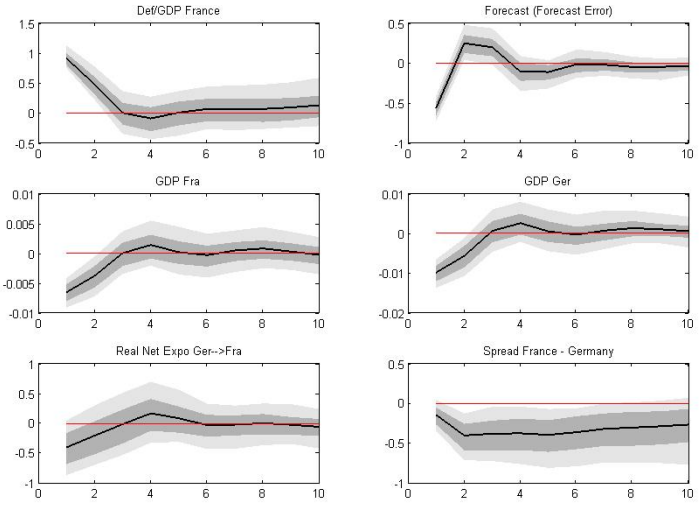


(c) IRF to a 1% rise in Deficit. Italy - France

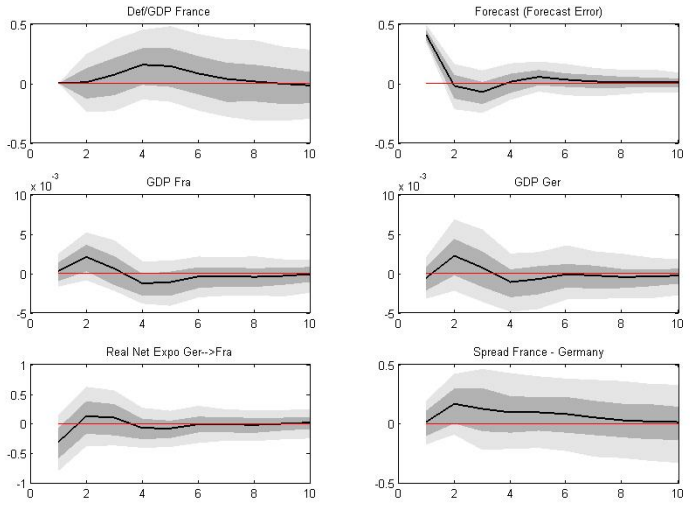


(d) IRF to a 1% rise in Foresight Deficit. Italy - France

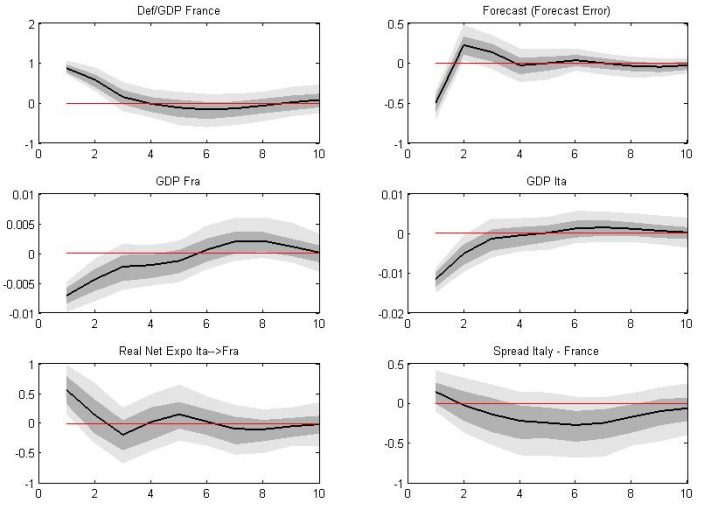
Figure 9: Domestic and cross-border effects of a fiscal expansion in Italy



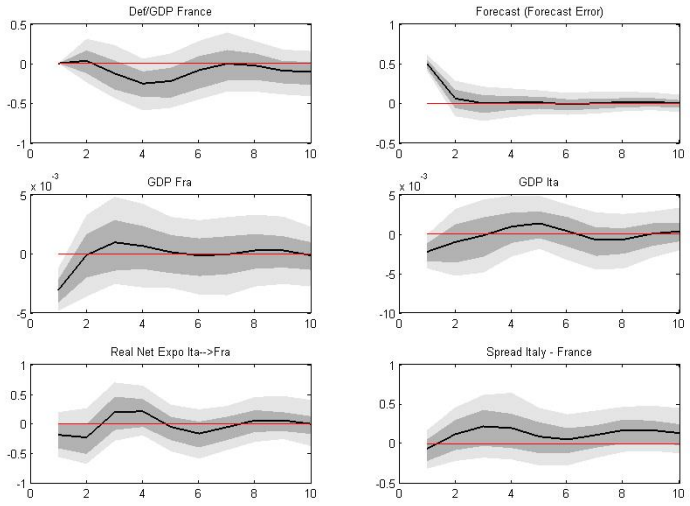
(a) IRF to a 1% rise in Deficit. France - Germany



(b) IRF to a 1% rise in Foresight Deficit. France - Germany



(c) IRF to a 1% rise in Deficit. France - Italy



(d) IRF to a 1% rise in Foresight Deficit. France - Italy

Figure 10: Domestic and cross-border effects of a fiscal expansion in France

References

[1] Alesina, A. and Ardagna, S. (2010), *Large Changes in Fiscal Policy: Taxes versus Spending*, NBER Chapters: Tax Policy and the Economy, Vol. 24, pp 35-68

[2] Alesina, A., Barbiero, O., Favero, C., Giavazzi, F. and Paradisi, M. (2015), *Austerity in 2009-2013*, NBER Working Papers No. 20827

[3] Auerbach, A. J. and Gorodnichenko, Y. (2012), *Fiscal Multipliers in Recession and Expansion*, NBER Chapters: Fiscal Policy after the Financial Crisis, pp 63-98

[4] Auerbach, A. J. and Gorodnichenko, Y. (2013), *Output Spillovers from Fiscal Policy*, American Economic Review, Vol. 103 (May), pp 141-46

[5] Beetsma, R. and Giuliodori, M. (2004), *What are the Spillovers from Fiscal Shocks in Europe? An Empirical Analysis*, ECB Working Paper No. 325

[6] Beetsma, R., Giuliodori, M. and Klaassen, F. (2006), *Trade Spillovers of Fiscal Policy in the European Union: A Panel Analysis*, Economic Policy, Vol. 21(48), pp 639-687

[7] Bernanke, B. S. (2012), *Some Reflections on the Crisis and the Policy Response*, Remarks at the Conference on Rethinking Finance: Perspectives on the Crisis

[8] Blanchard, O.J. and Perotti R. (2002), *An Empirical Characterization of the Dynamic Effects of Changes in Government Spending and Taxes on Output*, The Quarterly Journal of Economics, Vol. 117(4), pp 1329-1368

[9] Boussard, J., de Castro, F. and Salto, M. (2012), *Fiscal Multipliers and Public Debt Dynamics in Consolidations*, Economic Papers 460 (July), Directorate General Economic and Monetary Affairs (DG ECFIN), European Commission

[10] Burnside, C. and Meshcheryakova, Y. (2004), *Cyclical Adjustment of the Budget Surplus: Concepts And Measurement Issues*, Fiscal Sustainability in Theory and Practice: A Handbook, pp. 113-132, World Bank

[11] Caggiano, G., Castelnuovo, E., Colombo, V. and Nodari, G. (2015), *Estimating Fiscal Multipliers: News From a Nonlinear World*, Economic Journal, Vol. 0(584), pp 746-776.

[12] Caporale, G.M. and Girardi, A. (2013), *Fiscal Spillovers in the euro area*, Journal of International Money and Finance, Vol. 38(C)

[13] Canzoneri, M., Collard, F., Dellas, H. and Diba, B. (2015), *Fiscal Multipliers in Recessions*, CEPR Discussion Papers 10353

[14] Chinn, M. (2013), *Fiscal Multipliers*, contribution to the New Palgrave Dictionary of Economics

[15] Cogan, J., Cwik, T., Taylor J. and Wieland, G. (2010), *New Keynesian versus Old Keynesian Government Spending Multiplier*, Journal of Economic Dynamics and Control, Vol. 34(3), pp 281-295

[16] Corsetti, G., Meier, A. and Muller, G. (2010), *Cross-Border Spillovers from Fiscal Stimulus*, International Journal of Central Banking, Vol. 6(1), pp 5-37

[17] Corsetti, G., Meier, A. and Muller, G. (2012), *What determines government spending multipliers?*, Economic Policy, Vol. 27(72), pp 521-565

[18] D'Agostino, A. and Cimadomo, J. (2013), *Combining time-variation and mixed-frequencies: an analysis of government spending multipliers in Italy*, Working Paper Series 1856, European Central Bank

[19] De Arcangelis, G. and Lamartina, S. (2004), *Fiscal shocks and policy regimes in some OECD countries*, Monetary Policy, Fiscal Policies and Labour Market, Cambridge University Press.

[20] Devries, P., Guajardo J., Leigh D. and Pescatori, A. (2011), *A New Action-Based Dataset of Fiscal Consolidation*, IMF Working Papers 11/128, International Monetary Fund

[21] Dornbusch, R. (1976), *Expectations and exchange rates dynamics*, Journal of Political Economy 84, pp 1161-1176

[22] Faccini, R., Mumtaz, H. and Surico, P. (2012), *Testing for International Fiscal Spillovers*, LBS manuscript

[23] Fatas A. and Mihov I. (2001), *The Effects of Fiscal Policy on Consumption and Employment: Theory and Evidence*, CEPR Discussion Papers No 2760

[24] Forni, M. and Gambetti, L. (2014), *Government Spending Shocks in Open Economy VARs*, CEPR Discussion Papers 10115

[25] Gonzalez Cabanillas, L. and Terzi, A. (2012), *The accuracy of the European Commission's forecasts re-examined*, European Commission Economic Paper No. 476

[26] Grossman, E. and Woll, C. (2014), *Saving the Banks: The Political Economy of Bailouts*, Comparative Political Studies, Vol. 47, No. 4, pp 574-600

[27] Guajardo, J., Leigh, D. and Pescatori, A. (2011), *Expansionary Austerity: New International Evidences*, Journal of the European Economic Association 12, pp 949-968

[28] Ilzetzki, E. O., Mendoza, E., and Vegh, C. (2013). How big (small?) are fiscal multipliers?, Journal of Monetary Economics, Vol. 60(2), pp 239-254

[29] Kydland, F. and Prescott, E. (1977), *Rules Rather Than Discretion: The Inconsistency of Optimal Plans*, Journal of Political Economy, Vol. 85(3), pp 473-91

[30] Kim, S. and Roubini N. (2008), *Twin deficit or twin divergence? Fiscal policy, current account, and real exchange rate in the U.S*, Journal of International Economics 74(2), pp 362-383

[31] Leeper, E.M., A. W. Richter, and Walker T. B. (2012), *Quantitative Effects of Fiscal Foresight*, American Economic Journal: Economic Policy, Vol. 4(2), pp 115-144

[32] Leeper, E.M., Walker, T.B. and Yang, S.S. (2008),*Fiscal Foresight: Analytics and Econometrics*, NBER Working Paper No. 14028

[33] Mirdala R. (2009), *Effects Of Fiscal Policy Shocks In The European Transition Economies*, Journal of Applied Research in Finance Bi-Annually, Vol. 0(2), pp 141-157

[34] Monacelli, T. and Perotti, R. (2010), *Fiscal Policy, the Real Exchange Rate and Traded Goods*, Economic Journal, Vol. 120(544), pp 437-461

[35] Ostrup, F., Oxelheim L. and Wihlborg C. (2009), *Origins and Resolution of Financial Crises: Lessons from the Current and Northern European Crises*, Asian Economic Papers, Vol. 8(3), pp 178-220

[36] Perotti, R. (2011), *Expectations and Fiscal Policy: An Empirical Investigation*, IGIER working paper No 429

[37] Ramey, V.A. (2011a), *Identifying Government Spending Shocks: It's All in the Timing*, The Quarterly Journal of Economics, Vol. 126(1), pp 1-50

[38] Ramey, V.A. (2011b), *Can Government Purchases Stimulate the Economy?*, Journal of Economic Literature , Vol. 49(3), pp 673-85

[39] Reichlin, L. (2014), *Monetary Policy and Banks in the Euro Area: The Tale of Two Crises*, Journal of Macroeconomics, Vol. 39, pp 387-400

[40] Rodriguez, C. and Carrasco, C.A. (2014), *ECB Policy Responses between 2007 and 2014: a chronological analysis and a money quantity assessment of their effects*, Working papers 65, Financialisation, Economy, Society and Sustainable Development (FESSUD) Project

[41] Uhlig, H. (2006), *What are the effects of monetary policy on output? Results from an agnostic identification procedure*, Journal of Monetary Economics, Vol. 52(2), pp 381-419

[42] van der Noord, P. (2000), *The Size and Role of Automatic Fiscal Stabilizers in the 1990s and Beyond*, OECD Economics Department Working Papers, No. 230

[43] in 't Veld, J. (2013), *Fiscal consolidations and spillovers in the Euro area periphery and core*, European Economy - Economic Papers 506, Directorate General Economic and Monetary Affairs (DG ECFIN), European Commission

[44] in 't Veld, J., Larch, M. and Vandeweyer, M. (2013), *Automatic Fiscal Stabilisers: What They Are and What They Do*, Open Economies Review, Vol. 24(1), pp 147-163

[45] Woodfrod, M. (2011),*Simple Analytics of the Government Expenditure Multiplier*, American Economic Journal: Macroeconomics, Vol. 3(1), pp 1-35

[46] Yang, S.S. (2008), *Quantifying tax effects under policy foresight*, Journal of Monetary Economics 52(8), pp 1557-1568

3.6 Appendix A

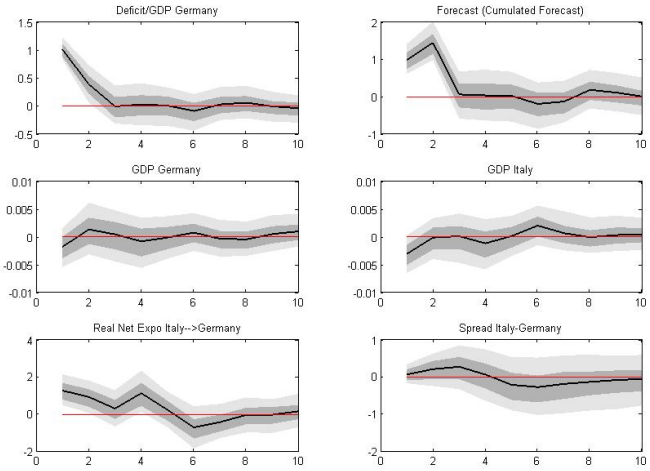
Table 4: Data

Series	Source	Unit of measure	
Gov. Balance/GDP	EU Commission*	%	**
Gov. Balance/GDP Forecast	EU Commission*	%	**
Real GDP (B1_GA)	OECD StatExtract	Millions of Euros - 2010 Base Year (VOB)	**
Bilateral Exports	WITS UN ComTrade	Dollars	**
Bilateral Imports	WITS UN ComTrade	Dollars	**
CPI - All Items	OECD StatExtract	2010 = 100	
Euro - Dollar Exchange Rate (ert_bil_eur_a)	Eurostat	1 € = — $	
Gov. Bonds Interest Rates	IMF	%	

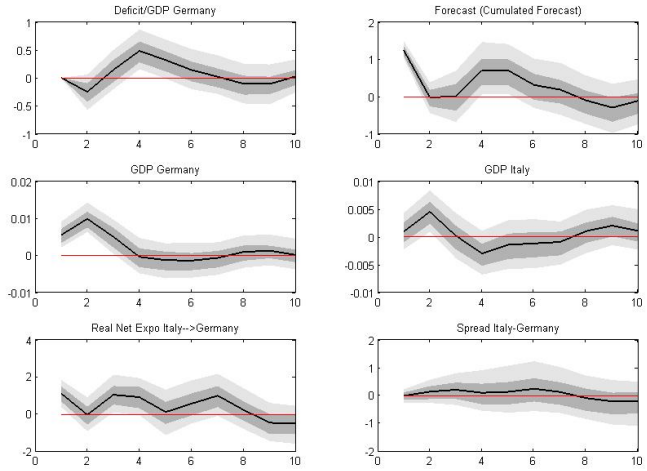
* See Gonzalez Cabanillas, L. and Terzi, A. (2012)
** HP fitered with a smoothing parameter $\lambda = 6.5$

3.7 Appendix B

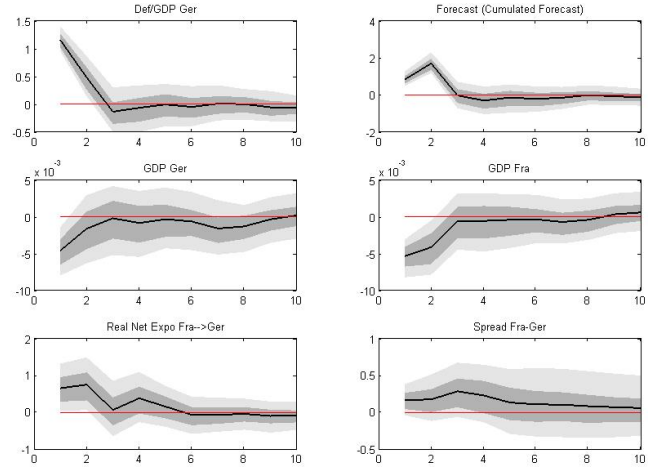
3.7.1 Model with cumulated forecasts



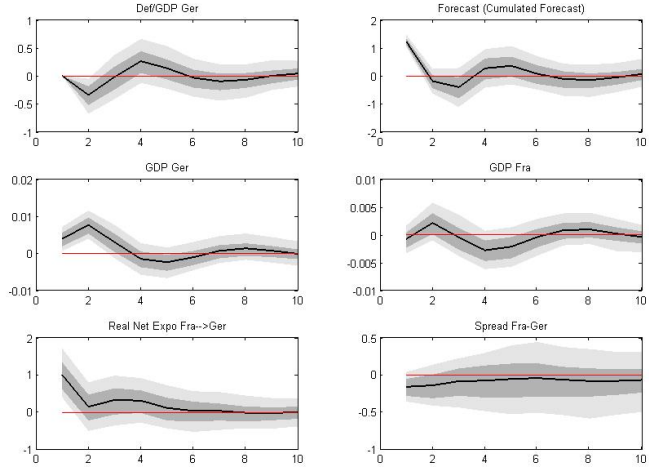
(a) IRF to a 1% rise in Deficit. Germany - Italy



(b) IRF to a 1% rise in Foresight Deficit. Germany - Italy

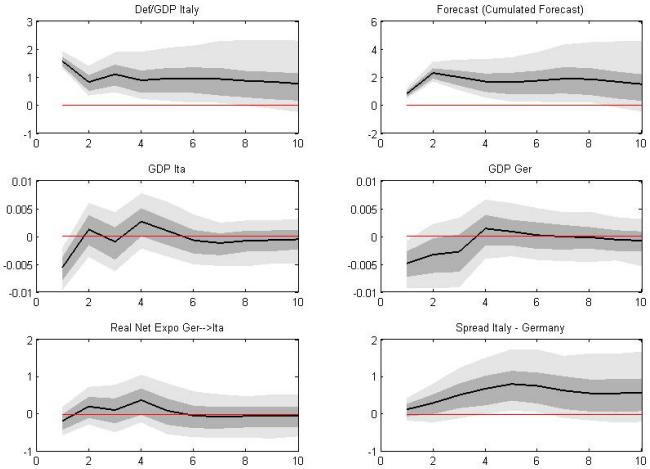


(c) IRF to a 1% rise in Deficit. Germany - France



(d) IRF to a 1% rise in Foresight Deficit. Germany - France

Figure 11: Domestic and cross-border effects of a fiscal expansion in Germany



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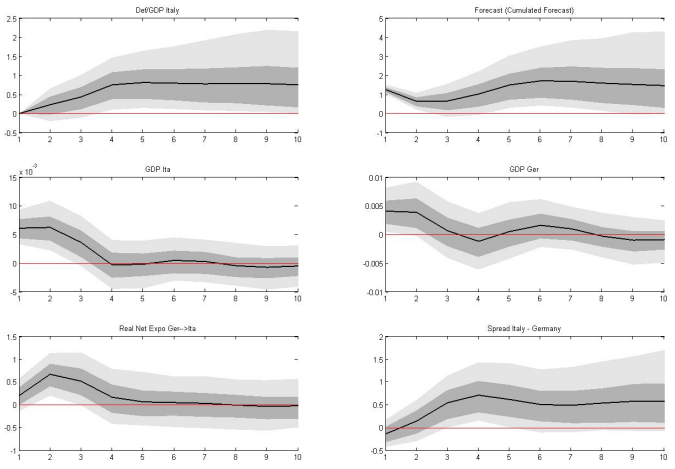

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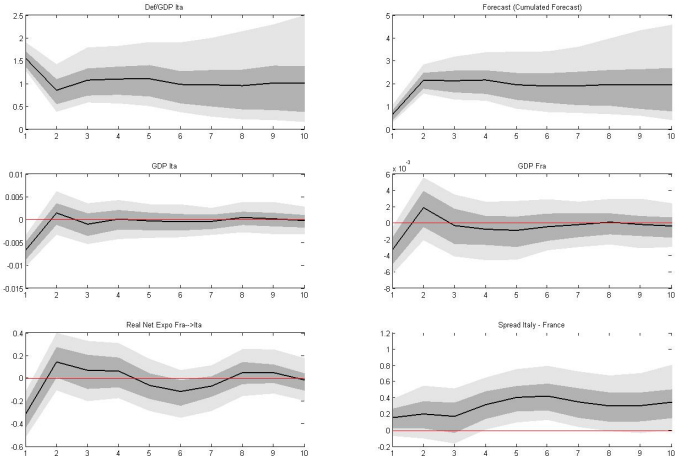

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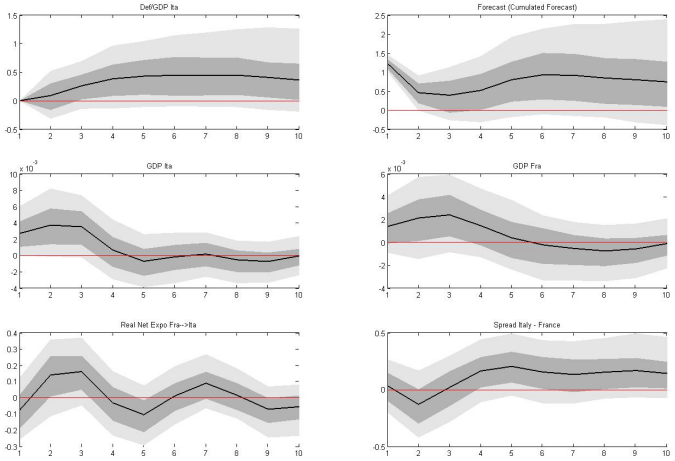
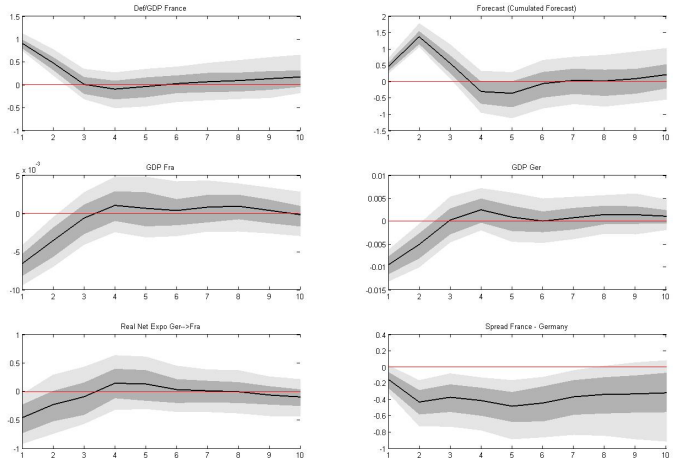


(d) IRF to a 1% rise in Foresight Deficit. Italy - France

Figure 12: Domestic and cross-border effects of a fiscal expansion in Italy



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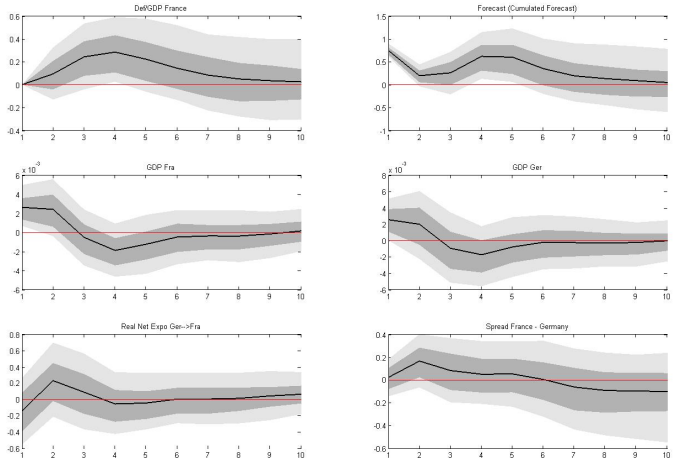
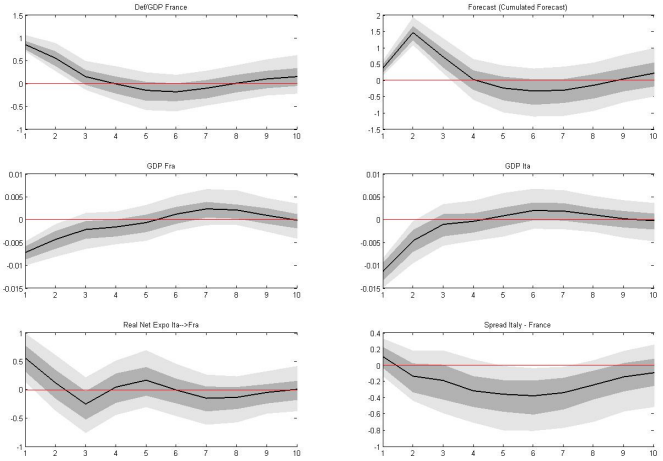
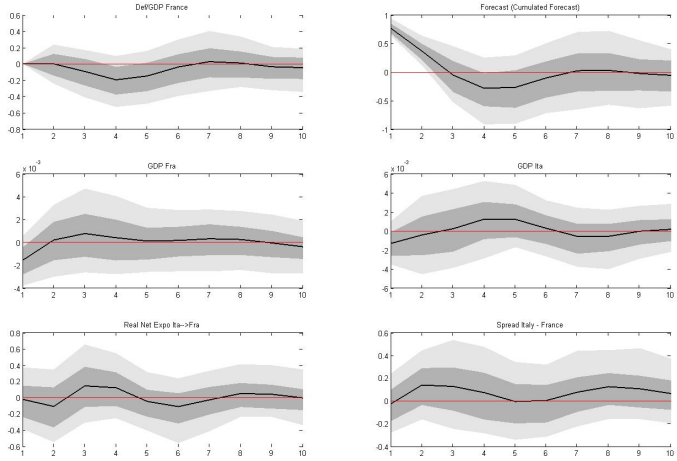


(b) IRF to a 1% rise in Foresight Deficit. France - Germany



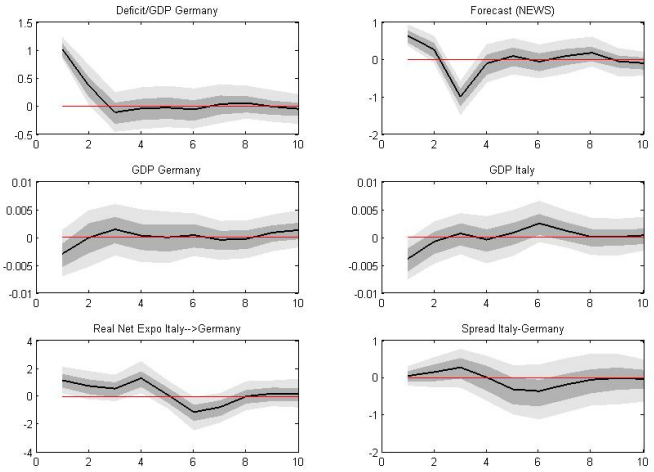
(c) IRF to a 1% rise in Deficit. France - Italy



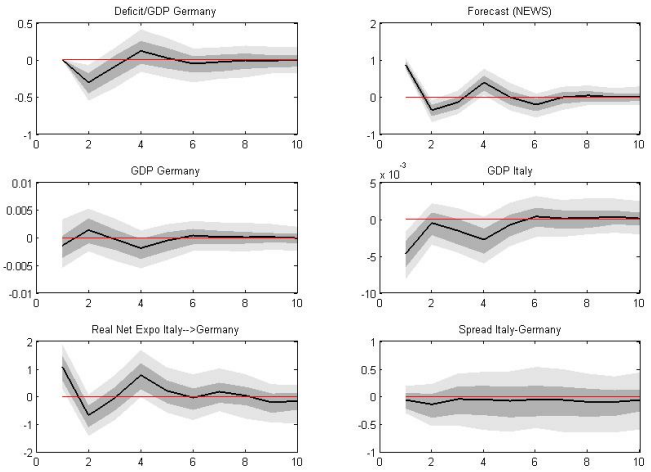
(d) IRF to a 1% rise in Foresight Deficit. France - Italy

Figure 13: Domestic and cross-border effects of a fiscal expansion in France

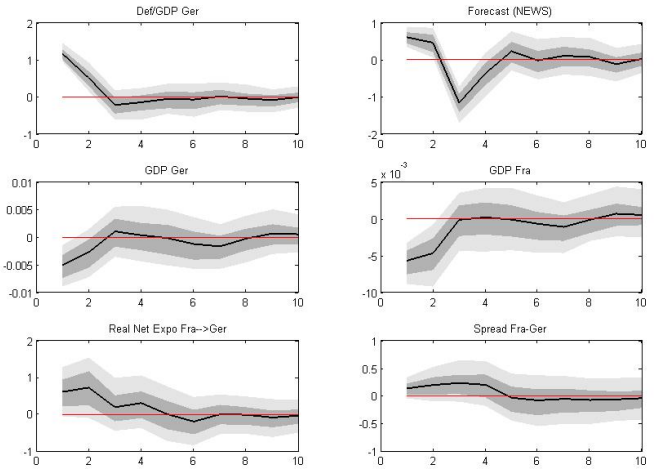
3.7.2 Model with forecast news



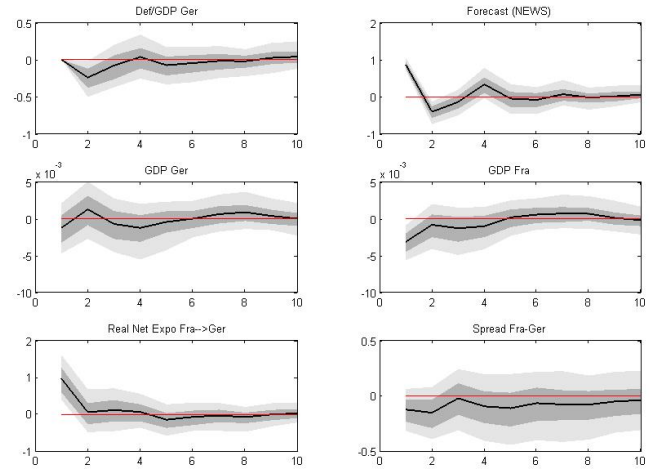
(a) IRF to a 1% rise in Deficit. Germany - Italy



(b) IRF to a 1% rise in Foresight Deficit. Germany - Italy

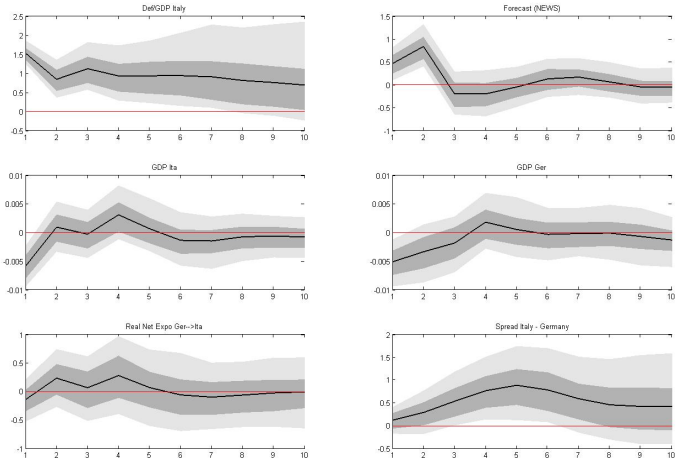


(c) IRF to a 1% rise in Deficit. Germany - France

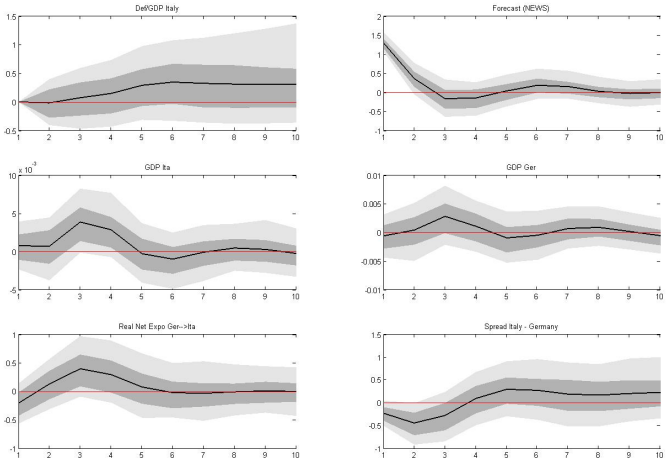


(d) IRF to a 1% rise in Foresight Deficit. Germany - France

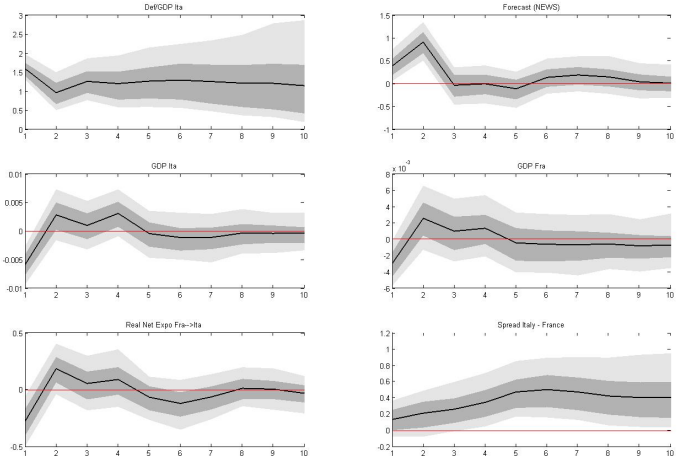
Figure 14: Domestic and cross-border effects of a fiscal expansion in Germany



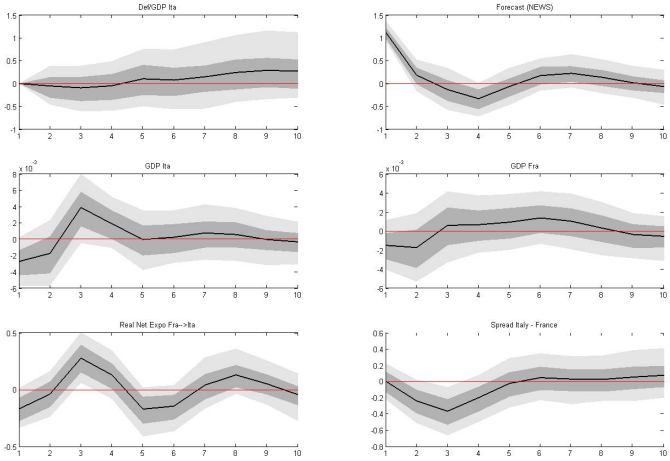
(a) IRF to a 1% rise in Deficit. Italy - Germany



(b) IRF to a 1% rise in Foresight Deficit. Italy - Germany

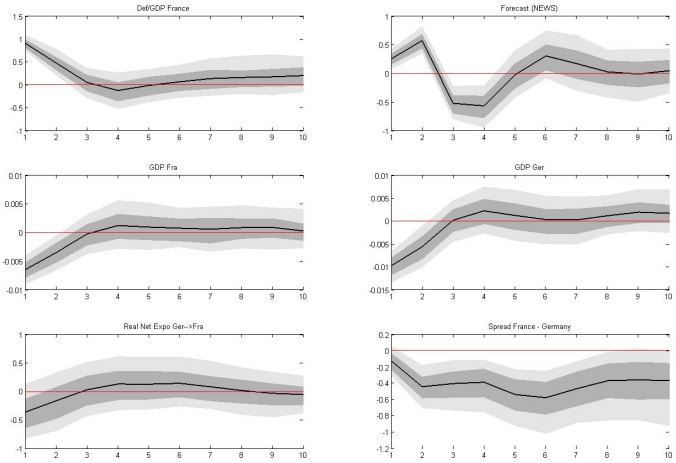


(c) IRF to a 1% rise in Deficit. Italy - France

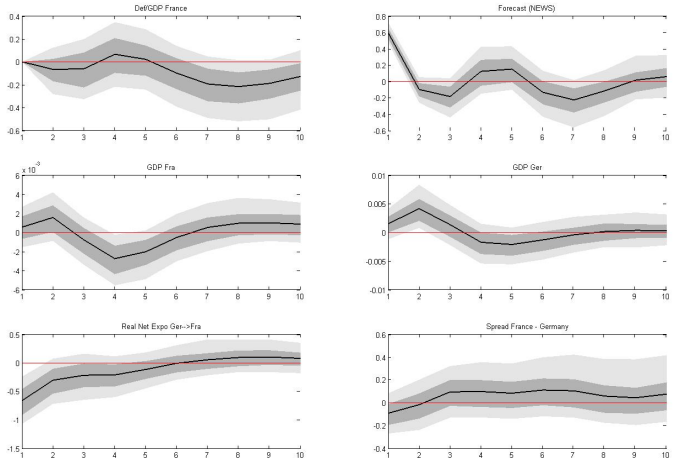


(d) IRF to a 1% rise in Foresight Deficit. Italy - France

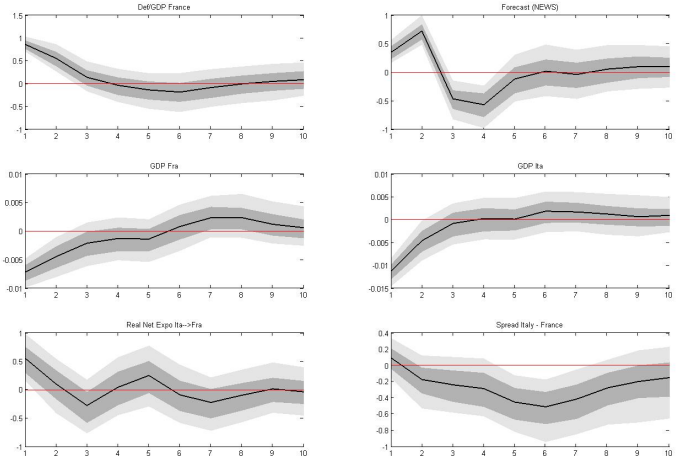
Figure 15: Domestic and cross-border effects of a fiscal expansion in Italy



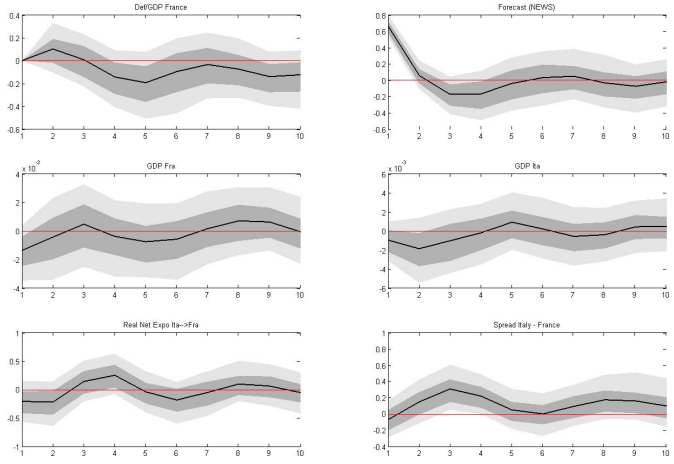
(a) IRF to a 1% rise in Deficit. France - Germany



(b) IRF to a 1% rise in Foresight Deficit. France - Germany



(c) IRF to a 1% rise in Deficit. France - Italy



(d) IRF to a 1% rise in Foresight Deficit. France - Italy

Figure 16: Domestic and cross-border effects of a fiscal expansion in France

3.8 Appendix C

Consider foresight shocks. Figures 10 to 15 plot for each country pair the foresight shocks obtained from the model with cumulated forecasts, with forecast errors or with forecast news. The red shaded areas represent period of sizable fiscal consolidations, defined as deficit reductions above 0.5 of GDP as in Devries et al. (2011). Positive (negative) values reflect a revision upward (downward) of the deficit forecast.

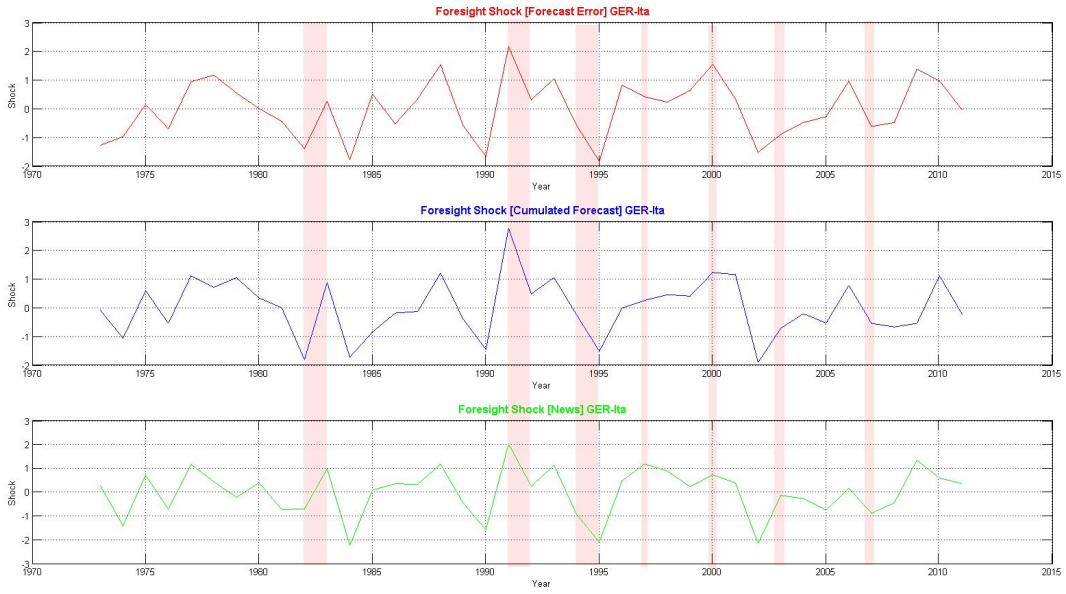


Figure 17: Foresight Shocks. Germany - Italy

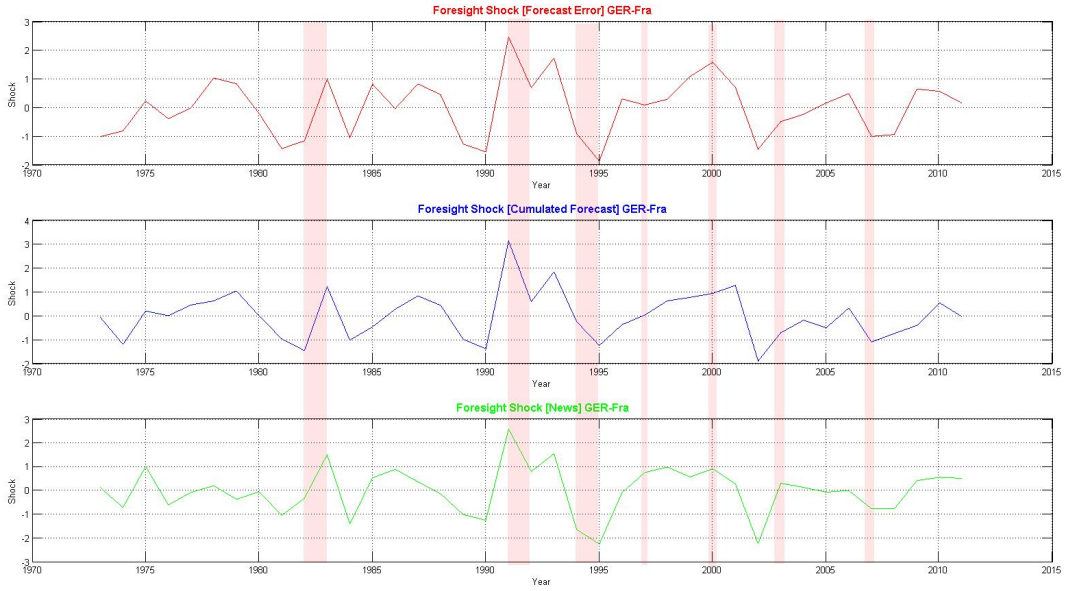


Figure 18: Foresight Shocks. Germany - France

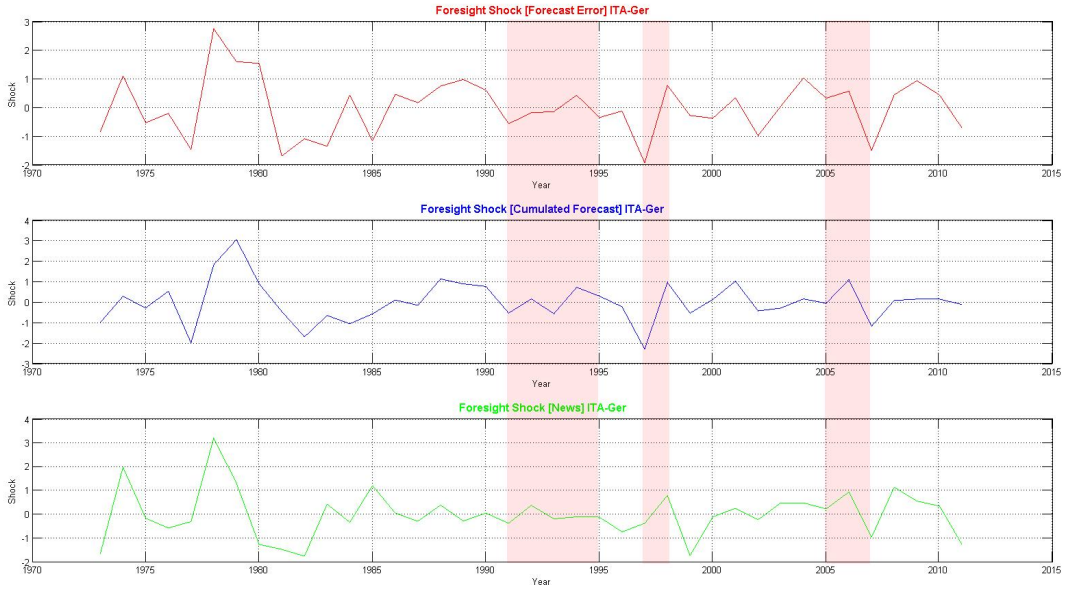


Figure 19: Foresight Shocks. Italy - Germany

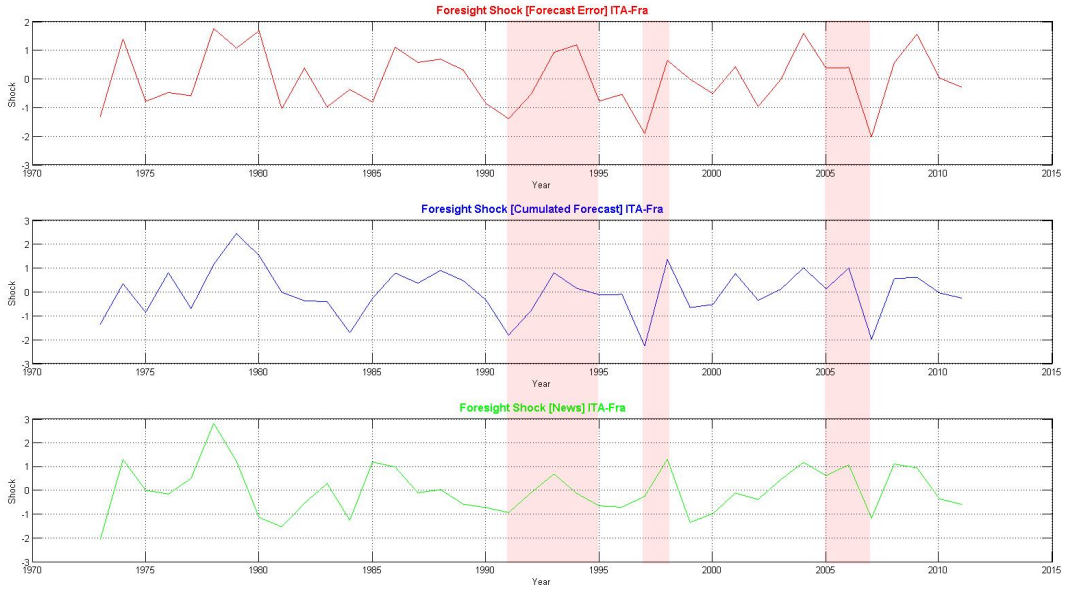


Figure 20: Foresight Shocks. Italy - France

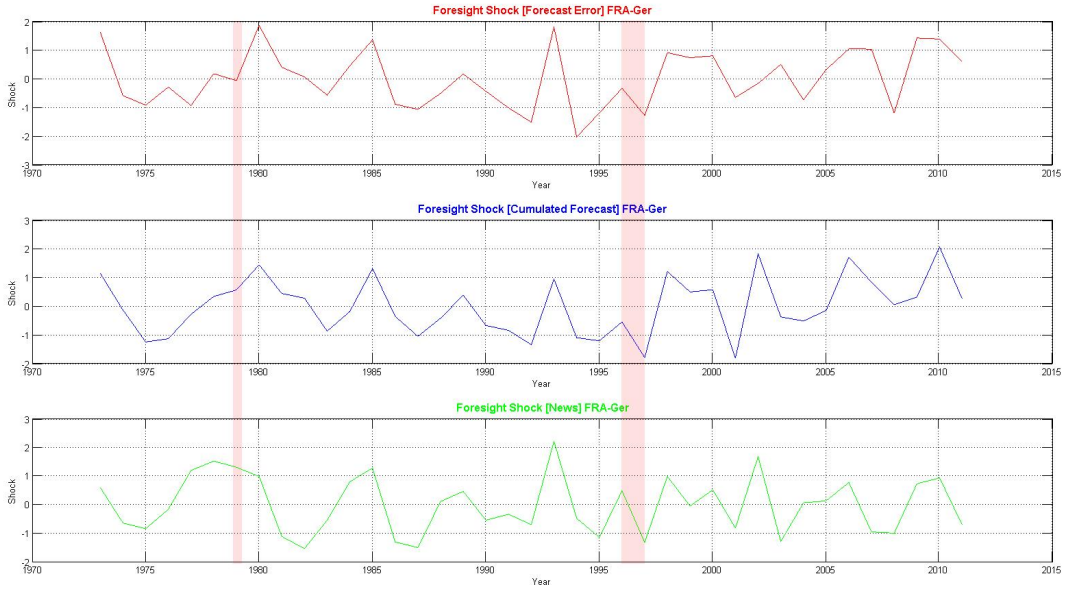


Figure 21: Foresight Shocks. France - Germany

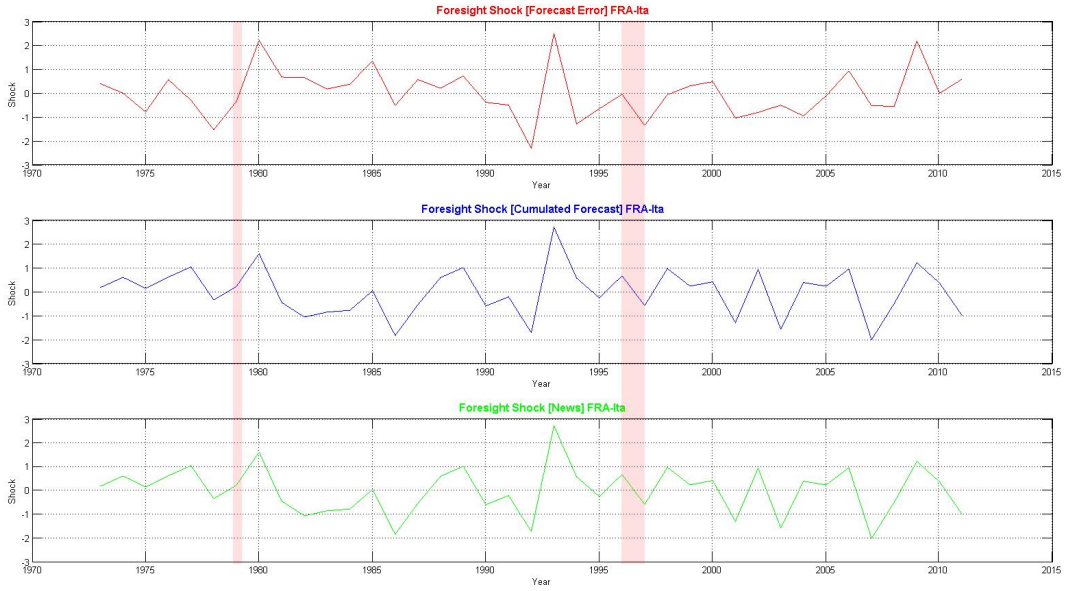


Figure 22: Foresight Shocks. France - Italy

All of the shocks are very similar. Despite capturing different aspects of the forecasting process, they all convey information related to changes in the government balance. They display negative spikes in correspondence to major episodes of fiscal retrenchment, as expected. In most of the cases, troughs are well before the start of consolidations, reflecting the extent of fiscal anticipation. Positive spikes occur immediately before or after consolidation episodes, capturing expectation rallies. A notable exception is the fiscal retrenchment of 1992-95 in Italy, where expectations are almost flat. Overall, the evidence reinforces the results in Section 2 showing that the European Commission forecasts do provide useful information for fiscal foresight.

Conclusions

The thesis has examined how the anticipation of future policy regimes influence the effects of discretionary fiscal actions on a national and international level. The analysis draws on the VAR approach with an identification scheme that allows to estimate the effects of truly unanticipated fiscal measures as well as changes in expectations about future policies. The results obtained provide support to the hypothesis that foresight affects significantly the response of domestic and foreign economies to fiscal policy. More in details:

Chapter 2 tells us that a fiscal stimulus in the US produces a temporary boost in domestic output and has no effects on foreign economies as long as it is associated with expectations of spending reversals. Conversely, the anticipation of an expansionary policy has positive effects on both domestic and foreign output, despite no fiscal measure is taken.

Chapter 3 tells us that expectations about future policy actions influence the transmission of fiscal policy in Europe. Expansionary policies associated with previsions of strong expenditure retrenchments over the subsequent two to three years depress domestic and foreign activity over the same period. Forecasts of expansionary deficit-financed measures, on the contrary, have positive effects on domestic output.

The evidence provided in this thesis has non-negligible policy implications. First, it shows that the effects of fiscal policy depend strongly on how agents foresee future policy actions. Second, it highlights that fiscal policy is effective as long as it succeeds in steering expectations. This revives the debate on the credibility of policy institutions as a necessary prerequisite for optimal policy. Third, it confirms the existence of fiscal cross-border effects, providing support to the theory that a coordinated approach to fiscal policy on an international base could be beneficial. In this regard, it also suggests that the incentive to reform fiscal regimes in an uncoordinated way may be small. On the one side, the incentives for opportunistic behavior may be strong.

The thesis can be extended further in a number of directions. For example, the proposed VAR analysis can be applied to a panel dataset, exploiting the cross-country dimension much further through the analysis of dynamic and static interdependencies. Another direction for extension of this research concerns the possibility to allow for regime-dependent responses. Strong recessions or persistent periods of steady economic growth can influence the way agents formulate forecasts, changing the effects that these forecasts have on fiscal policy transmission.

References

[1] Afonso, A. and Sousa, R. M. (2012), *The macroeconomic effects of fiscal policy*, Applied Economics, Vol. 44(34), pp 4439-4454.

[2] Alesina, A. and Ardagna, S. (2010), *Large Changes in Fiscal Policy: Taxes versus Spending*, NBER Chapters, in: Tax Policy and the Economy, Vol. 24, pp 35-68.

[3] Alesina, A., Favero, C. and Giavazzi, F.(2014), *The Output Effect of Fiscal Consolidations*, forthcoming in Journal of International Economics.

[4] Alessi, L., Barigozzi M. and Capasso M. (2011), *Non–fundamentalness in structural econometric models: A review*, International Statistical Review, Vol. 79(1), pp 16–47.

[5] Arias, J. E., Rubio-Ramirez, J. F. and Waggoner, D. F. (2014), *Inference Based on SVARs Identified with Sign and Zero Restrictions: Theory and Applications*, Board of Governors of the Federal Reserve System International Finance Discussion Papers, No. 1100.

[6] Arin, K. P., Koray, F. and Spagnolo, N. (2015), *Fiscal multipliers in good times and bad times*, Journal of Macroeconomics, Vol. 44(C), pp 303-311.

[7] Attinasi, M. G. and Metelli, L. (2016). *Is fiscal consolidation self-defeating? A Panel-VAR analysis for the Euro area countries*, European Central Bank Working Paper Series, No. 1883.

[8] Auerbach, A. J. and Gorodnichenko, Y. (2012,a), *Fiscal Multipliers in Recession and Expansion*, NBER Chapters, in: Fiscal Policy after the Financial Crisis, pp 63-98.

[9] Auerbach, A. J. and Gorodnichenko, Y. (2012,b), *Measuring the Output Responses to Fiscal Policy*, American Economic Journal – Economic Policy, Vol. 4(2), pp 1–27.

[10] Auerbach, A. J. and Gorodnichenko, Y. (2013), *Output Spillovers from Fiscal Policy*, American Economic Review, Vol. 103(3), pp 141-146.

[11] Auerbach, A. J. and Gorodnichenko, Y. (2015), *Effects of Fiscal Shocks in a Globalized World*, NBER Working Papers 21100 (forthcoming in IMF Economic Review).

[12] Baxa, J. (2010),*What the Data Say about the Effects of Fiscal Policy in the Czech Republic?*, Mathematical Methods in Economics, pp 24-29.

[13] Beetsma, R. and Giuliodori, M. (2005), *What are the Trade Spill-Overs from Fiscal Shocks in Europe? An Empirical Analysis*, De Economist, Vol. 153(2), pp 167-197.

[14] Beetsma, R. and Giuliadori, M. (2011), *The effects of government purchase shocks: Review and estimates for the EU*, Economic Journal, No. 121(550), pp F4-F32.

[15] Beetsma, R., Giuliodori, M. and Klaassen, F. (2006), *Trade Spillovers of Fiscal Policy in the European Union: A Panel Analysis*, Economic Policy, Vol. 21(48), pp 639-687.

[16] Benes, J., Kumhof, M., Laxton, D., Muir, D. and S. Mursula (2013), *The Benefits of International Policy Coordination Revisited*, IMF Working Paper, No. 13/262.

[17] Benetrix, A. S. and Lane, P. R. (2013), *Fiscal Shocks and the Real Exchange Rate*,International Journal of Central Banking, Vol. 9(3), pp 1-32.

[18] Berg, O. (2015), *Time Varying Fiscal Multipliers in Germany*, Review of Economics, Vol. 66(1), pp 13-46.

[19] Bermperoglu, D., Pappa, E. and Vella, E. (2013), *Spending-based austerity measures and their effects on output and unemployment*, CEPR Discussion Papers, No. 9383.

[20] Bernanke, B. (2012), *Some Reflections on the Crisis and the Policy Response*, Remarks at the Conference on Rethinking Finance: Perspectives on the Crisis.

[21] Bernanke, B., Boivin, J. and Eliasz, P. S. (2005), *Measuring the effects of monetary policy: A factor-augmented vector autoregressive (FAVAR) approach*, Quarterly Journal of Economics, No. 120(1), pp 387-422.

[22] Biau, O. and Girard, E. (2005), *Politique budgétaire et dynamique économique en France. L'approche var structurel*, Revue économique, Vol. (3), pp 755-764.

[23] Bjørnland, H. C. (2000), *VAR models in Macroeconomic Research*, Documents 2000/14 Statistics Norway.

[24] Blanchard, O. J. and Quah, D. (1989), *The Dynamic Effects of Aggregate Demand and Supply Disturbances*, American Economic Review ,Vol. 79(4), pp 655-73.

[25] Blanchard, O.J. and Perotti, R. (2002), *An Empirical Characterization of the Dynamic Effects of Changes in Government Spending and Taxes on Output*, The Quarterly Journal of Economics, Vol. 117(4), pp 1329-1368.

[26] Boiciuc, I. (2015), *The effects of fiscal policy shocks in Romania. A SVAR Approach*, Procedia Economics and Finance, Vol. 32, pp 1131 – 1139.

[27] Boussard, J., de Castro, F. and Salto, M. (2012), *Fiscal Multipliers and Public Debt Dynamics in Consolidations*, Economic Papers 460 (July), Directorate General Economic and Monetary Affairs (DG ECFIN), European Commission.

[28] Burnside, C., Eichenbaum, M. and Fisher, J.D.M. (2004), *Fiscal shocks and their consequences*, Journal of Economic Theory, Vol. 115(1), pp 89-117.

[29] Burnside, C. and Meshcheryakova, Y. (2004), *Cyclical Adjustment of the Budget Surplus: Concepts And Measurement Issues*, Fiscal Sustainability in Theory and Practice: A Handbook, pp. 113-132, World Bank.

[30] Caggiano, G., Castelnuovo, E., Colombo, V. and Nodari, G. (2015), *Estimating Fiscal Multipliers: News From a Nonlinear World*, Economic Journal, Vol. 0(584), pp 746-776.

[31] Caldara, D. and Kamps, C. (2006), *What Do We Know About the Effects of Fiscal Policy Shocks? A Comparative Analysis*, Computing in Economics and Finance 2006, No. 257.

[32] Candelon, B. and Lieb, L. (2013), *Fiscal policy in good and bad times*, Journal of Economic Dynamics and Control, Vol. 37(12), pp 2679-2694.

[33] Canova, F. and Pappa, E. (2007), *Price Differentials in Monetary Unions: The Role of Fiscal Shocks*, Economic Journal, Vol. 117(520), pp 713-737.

[34] Canzoneri, M., Collard, F., Dellas, H. and Diba, B. (2015), *Fiscal Multipliers in Recessions*, forthcoming in Economic Journal.

[35] Caporale, G. M. and Girardi, A. (2013), *Fiscal Spillovers in the euro area*, Journal of International Money and Finance, Vol. 38(C), pp 84.e1-84.e16.

[36] Chinn, M. (2013), *Fiscal Multipliers*, contribution to the New Palgrave Dictionary of Economics.

[37] Christiano, L. J., Eichenbaum, M. and Evans, C. L. (1999), *Monetary Policy Shocks: What Have We Learned and to What End?*, in Handbook of Macroeconomics, Elsevier, Vol. 1, pp 65-148.

[38] Chudik, A. and Pesaran, M. H. (2014), *Theory and Practice of GVAR Modeling*, Cambridge Working Papers in Economics 1408.

[39] Ciccarelli, M., Ortega, E. and Valderrama, M. T. (2012), *Heterogeneity and cross-country spillovers in macroeconomic-financial linkages*, European Central Bank Working Paper Series, No. 1498.

[40] Cimadomo, J. and Benassy-Quere, A. (2012), *Changing patterns of fiscal policy multipliers in Germany, the UK and the US*, Journal of Macroeconomics, Vol. 34(3), pp 845-873.

[41] Cimadomo, J. and D'Agostino, A. (2015), *Combining time-variation and mixed-frequencies: an analysis of government spending multipliers in Italy*, European Central Bank Working Paper Series, No. 1856.

[42] Claeys, P. and Vašíček, B. (2014), *Measuring bilateral spillover and testing contagion on sovereign bond markets in Europe*, Journal of Banking and Finance, Vol. 46(C), pp 151-165.

[43] Cogan, J., Cwik, T., Taylor J. and Wieland, G. (2010), *New Keynesian versus Old Keynesian Government Spending Multiplier*, Journal of Economic Dynamics and Control, Vol. 34(3), pp 281-295.

[44] Cogley, T. and Sargent, T.J. (2005), *Drift and Volatilities: Monetary Policies and Outcomes in the Post WWII U.S*, Review of Economic Dynamics, Vol. 8(2), pp 262-302.

[45] Corsetti, G., Meier, A. and Muller, G. (2010), *Cross-Border Spillovers from Fiscal Stimulus*, International Journal of Central Banking, Vol. 6(1), pp 5-37.

[46] Corsetti, G., Meier, A. and Muller, G. (2012), *What determines government spending multipliers?*, Economic Policy, Vol. 27(72), pp 521-565.

[47] Coutinho, P. M. and Silva, L.A. (2014), *Time-varying fiscal policy in the US*, Studies in Nonlinear Dynamics and Econometrics, Vol. 18(2)

[48] De Arcangelis, G. and Lamartina, S. (2003), *Identifying Fiscal Shocks and Policy Regimes in Some OECD Countries*, European Central Bank Working Paper, No. 281.

[49] de Castro, F. (2006), *The macroeconomic effects of fiscal policy in Spain*, Applied Economics, Vol. 38(8), pp 913-924.

[50] de Castro, F. and Hernández de Cos, P. (2008), *The economic effects of fiscal policy: The case of Spain*, Journal of Macroeconomics, Vol. 30(3), pp. 1005-1028.

[51] Dell'Erba, S. and Sola, S. (2016), *Does fiscal policy affect interest rates? Evidence from a factor-augmented panel*, The B.E. Journal of Macroeconomics, No. 2194-611.

[52] Devries, P., Guajardo, J., Leigh, D. and Pescatori, A. (2011), *A New Action-Based Dataset of Fiscal Consolidation*, IMF Working Papers, No. 11/128.

[53] Dornbusch, R. (1976), *Expectations and exchange rates dynamics*, Journal of Political Economy 84, pp 1161-1176.

[54] Dragomirescu-Gaina, C. and Dionisis, P. (2015), *Strategic interactions of fiscal policies in Europe: A global VAR perspective*, Journal of International Money and Finance, Vol. 59(C), pp 49-76.

[55] Dungey, M. and Fry, R. (2009), *The identification of fiscal and monetary policy in a structural VAR*, Economic Modelling, Vol. 26(6), pp 1147-1160.

[56] Edelberg, W., Eichenbaum, M. and Fisher, J.D.M. (1999), *Understanding the Effects of a Shock to Government Purchases*, Review of Economic Dynamics, Vol. 2(1), pp 166-206.

[57] Eichenbaum, M. and Fisher, J.D.M. (2005), *Fiscal Policy in the Aftermath of 9/11*, Journal of Money, Credit and Banking, Vol. 37(1), pp 1-22.

[58] Enders, Z., Müller, G. J. and Scholl, A. (2011), *How do fiscal and technology shocks affect real exchange rates?: New evidence for the United States*, Journal of International Economics, Vol. 83(1), pp 53-69.

[59] Faccini, R., Mumtaz, H. and Surico, P. (2016), *Testing for International Fiscal Spillovers*, Journal of International Economics, Vol. 99, pp 31–45.

[60] Fatas, A. and Mihov, I. (2001), *The Effects of Fiscal Policy on Consumption and Employment: Theory and Evidence*, CEPR Discussion Papers, No. 2760.

[61] Faust, J. (1998), *The robustness of identified VAR conclusions about money*, International Finance Discussion Papers, No. 610.

[62] Favero, C. (2002), *How do European Monetary and Fiscal Authorities Behave?*, CEPR Discussion paper, No. 3426.

[63] Favero, C. (2012), *Modelling and Forecasting Yield Differentials in the euro area. A non-linear Global VAR model*,IGIER Working Papers 431.

[64] Favero, C. and Giavazzi, F. (2010), *Reconciling VAR-based and Narrative Measures of the Tax-Multiplier*, CEPR Discussion Papers 7769.

[65] Favero, C. and Giavazzi, F. (2012), *Measuring Tax Multipliers: The Narrative Method in Fiscal VARs*, American Economic Journal: Economic Policy, Vol. 4(2), pp 69-94.

[66] Forni, M. and Gambetti, L. (2010), *Fiscal Foresight and the Effects of Government Spending*, Barcelona Graduate School of Economics Working Papers, No 460.

[67] Forni, M. and Gambetti, L. (2014), *Government Spending Shocks in Open Economy VARs*, CEPR Discussion Papers, No. 10115.

[68] Foroni, C. and Marcellino, M. (2013), *A survey of econometric methods for mixed-frequency data*, European University Institute Economics Working Papers, No. ECO2013/02.

[69] Fragetta, M. and Gasteiger, E. (2014), *Fiscal Foresight, Limited Information and the Effects of Government Spending Shocks*, Oxford Bulletin of Economics and Statistics, Vol. 76(5), pp 667-692.

[70] Franta, M., Libich, J. and Stehlik, P. (2012), *Tracking Monetary-Fiscal Interactions Across Time and Space*, Czech National Bank Working Papers, No. 2012/06.

[71] Fry, R. and Pagan, A. (2011), *Sign Restrictions in Structural Vector Autoregressions: A Critical Review*, Journal of Economic Literature, Vol. 49(4), pp 938-60.

[72] Fry, R. and Zheng, J. (2012), *How Do Monetary and Fiscal Policy Shocks Explain US Macroeconomic Fluctuations? A FAVAR Approach*, Centre for Applied Macroeconomic Analysis, Australian National University, mimeo.

[73] Galí J., López-Salido, J. D. and Valls, J. (2007), *Understanding the effects of government spending on consumption*, Journal of the European Economic Association, Vol. 5(1), pp 227–270.

[74] Giordano, R., Momigliano, S., Neri, S., and Perotti, R. (2007), *The effects of fiscal policy in Italy: Evidence from a VAR model*, European Journal of Political Economy, Vol. 23(3), pp 707-733.

[75] Gonzalez Cabanillas, L. and Terzi, A. (2012), *The accuracy of the European Commission's forecasts re-examined*, European Commission Economic Paper, No. 476.

[76] Gonzalez-Garcia, J., Lemus, A. and Mrkaic, M. (2013), *Fiscal Multipliers in the ECCU*, IMF working papers, No. 13/117.

[77] Grossman, E. and Woll, C. (2014), *Saving the Banks: The Political Economy of Bailouts*, Comparative Political Studies, Vol. 47(4), pp 574-600.

[78] Guajardo, J., Leigh, D. and Pescatori, A. (2014), *Expansionary Austerity? International Evidences*, Journal of the European Economic Association, Vol. 12(4), pp 949-968.

[79] Halkos, G. and Paizanos, E. (2015), *Fiscal policy and economic performance: A review of the theoretical and empirical literature*, MPRA Paper 67737.

[80] Hansen, L. P. and Sargent, T. J. (1980), *Formulating and estimating dynamic linear rational expectations models*, Journal of Economic Dynamics and Control, Vol. 2, pp 7–46.

[81] Hebous, S. and Zimmermann, T. (2013), *Estimating the effects of coordinated fiscal actions in the euro area*, European Economic Review, Vol. 58(C), pp 110-121.

[82] Heppke-Falk, K. H., Tenhofen, J. and Wolff, G. B. (2010), *The Macroeconomic Effects of Exogenous Fiscal Policy Shocks in Germany: A Disaggregated SVAR Analysis*, Journal of Economics and Statistics, Vol. 230(3), pp 328-355.

[83] Hur, S. K. (2007), *Measuring the Effectiveness of Fiscal Policy in Korea*, NBER Chapters, in: Ito, T. and Rose, A. K. (2007), *Fiscal Policy and Management in East Asia*, NBER-EASE, Vol. 16, NBER Books.

[84] Iiboshi, H. and Iwata, Y. (2015), *Time-varying Fiscal Multipliers Identified with Sign and Zero Restrictions: A Bayesian Approach to TVP-VAR-SV model*, Mimeo.

[85] Ilzetzki, E. O., Mendoza, E. and Vegh, C. (2013), *How big (small?) are fiscal multipliers?*, Journal of Monetary Economics, Vol. 60(2), pp 239-254.

[86] Johansen, S. (1988), *Statistical Analysis of Cointegration Vectors*, Journal of Economic Dynamics and Control, Vol. 12(2-3), pp 231-254.

[87] Johansen, S. (1991), *Estimation and Hypothesis Testing of Cointegration Vectors in Gaussian Vector Autoregressive Models*, Econometrica, No. 59(6), pp 1151-1180.

[88] Kim, S. and Roubini, N. (2008), *Twin deficit or twin divergence? Fiscal policy, current account, and real exchange rate in the U.S*, Journal of International Economics, Vol. 74(2), pp 362-383.

[89] Kirchner, M., Cimadomo, J. and Hauptmeier, S. (2010), *Transmission of government spending shocks in the euro area: Time variation and driving forces*, European Central Bank Working Paper Series 1219.

[90] Kydland, F. and Prescott, E. (1977), *Rules Rather Than Discretion: The Inconsistency of Optimal Plans*, Journal of Political Economy, Vol. 85(3), pp 473-91.

[91] Leeper, E. M., Richter, A. W. and Walker T. B. (2012), *Quantitative Effects of Fiscal Foresight*, American Economic Journal: Economic Policy, Vol. 4(2), pp 115-144.

[92] Leeper, E. M., Sims, C.A. and Zha T. (1996), *What Does Monetary Policy Do?*, Brookings Papers on Economic Activity, Vol. 27(2), pp 1-78.

[93] Leeper, E. M., Walker, T.B. and Yang, S.S. (2008),*Fiscal Foresight: Analytics and Econometrics*, NBER Working Paper No. 14028.

[94] Lippi, M. and Reichlin, L.(1994), *VAR analysis, nonfundamental representations, Blaschke matrices*, Journal of Econometrics, Vol. 63(1), pp 307–325.

[95] Lozano, I. and Rodríguez, K. (2009), *Assessing the Macroeconomic Effects of Fiscal Policy in Colombia*, Borradores de Economia, No. 552.

[96] Lutkepohl, H. (2011), *Vector Autoregressive Models*, Economics Working Papers ECO2011/30, European University Institute.

[97] Lutkepohl, H. (2014), *Structural Vector Autoregressive Analysis in a Data Rich Environment: A Survey*, Discussion Papers of DIW Berlin, No. 1351.

[98] Marattin, L. and Salotti, S. (2010), *The Response of Private Consumption to Different Public Spending Categories: VAR Evidence from UK*, EcoMod2010.

[99] Mertens, K. and Ravn, M. O. (2010), *Measuring the Impact of Fiscal Policy in the Face of Anticipation: A Structural VAR Approach*, Economic Journal, Vol. 120(544), pp 393-413.

[100] Mertens, K. and Ravn, M. O. (2014), *A reconciliation of SVAR and narrative estimates of tax multipliers*, Journal of Monetary Economics, Vol. 68(S), pp S1-S19.

[101] Mirdala, R. (2009), *Effects Of Fiscal Policy Shocks In The European Transition Economies*, Journal of Applied Research in Finance Bi-Annually, Vol. 0(2), pp 141-157.

[102] Monacelli, T. and Perotti, R. (2008), *Openness and the Sectoral Effects of Fiscal Policy*, Journal of the European Economic Association, Vol. 6(2-3), pp 395-403.

[103] Monacelli, T. and Perotti, R. (2010), *Fiscal Policy, the Real Exchange Rate and Traded Goods*, Economic Journal, Vol. 120(544), pp 437-461.

[104] Mountford, A. and Uhlig, H. (2009), *What are the effects of fiscal policy shocks?*, Journal of Applied Econometrics, Vol. 24(6), pp 960-992.

[105] Muir, D. and Weber, A. (2013), *Fiscal Multipliers in Bulgaria; Low But Still Relevant*, IMF Working Papers 13/49.

[106] Mundell, R. A. (1962), *The Appropriate Use of Monetary and Fiscal Policy for Internal and External Stability*, IMF Staff Papers, Vol. 9(1), pp 70-79.

[107] Mundell, R. A. (1963), *Capital mobility and stabilization policy under fixed and flexible exchange rates*, Canadian Journal of Economic and Political Science, No. 29 (4), pp 475–485.

[108] Nickel, C. and Tudyka, A. (2014), *Fiscal Stimulus in Times of High Debt: Reconsidering Multipliers and Twin Deficits*, Journal of money credit and banking, Vol. 46(7), pp 1313-1344.

[109] Nickel, C. and Vansteenkiste, I. (2008), *Fiscal policies, the current account and Ricardian equivalence*, European Central Bank Working Paper Series 0935.

[110] Ostrup, F., Oxelheim, L. and Wihlborg, C. (2009), *Origins and Resolution of Financial Crises: Lessons from the Current and Northern European Crises*, Asian Economic Papers, Vol. 8(3), pp 178-220.

[111] Pashourtidou, N., Savva, C. S. and Syrichas, N. (2014), *The Effects of Fiscal Consolidation on Macroeconomic Indicators in Cyprus*, Cyprus Economic Policy Review, Vol. 8(1), pp 93-119.

[112] Perotti, R. (2005), *Estimating the effects of fiscal policy in OECD countries*, Proceedings, Federal Reserve Bank of San Francisco.

[113] Perotti, R. (2011), *Expectations and Fiscal Policy: An Empirical Investigation*, IGIER working paper, No. 429.

[114] Pesaran, M. H., Schuermann, T. and Weiner, S. M. (2004), *Modelling regional interdependencies using a global error-correcting macroeconometric model*, Journal of Business and Economics Statistics, Vol. 22, pp 129-162.

[115] Primiceri, G.E. (2005), *Time Varying Structural Vector Autoregressions and Monetary Policy*, Review of Economic Studies, Vol. 72(3), pp 821-852.

[116] Ramey, V.A. (2011a), *Identifying Government Spending Shocks: It's All in the Timing*, The Quarterly Journal of Economics, Vol. 126(1), pp 1-50.

[117] Ramey, V.A. (2011b), *Can Government Purchases Stimulate the Economy?*, Journal of Economic Literature, Vol. 49(3), pp 673-85.

[118] Ramey, V.A. and Shapiro, M.D. (1998), *Costly Capital Reallocation and the Effects of Government Spending*, Carnegie-Rochester Conference Series on Public Policy, Vol. 48, pp 145.

[119] Reichlin, L. (2014), *Monetary Policy and Banks in the Euro Area: The Tale of Two Crises*, Journal of Macroeconomics, Vol. 39, pp 387-400.

[120] Ricci-Risquete, A. and Ramajo-Hernández, J. (2015), *Macroeconomic effects of fiscal policy in the European Union: a GVAR model*, Empirical Economics, Vol. 48(4), pp 1587-1617.

[121] Ricco, G. (2015), *A new identification of fiscal shocks based on the information flow*, European Central Bank Working Paper Series, No. 1813.

[122] Ricco, G. and Ellahie, A. (2012), *Government Spending Reloaded: Fundamentalness and Heterogeneity in Fiscal SVARs*, MPRA Paper, No. 42105.

[123] Rodriguez, C. and Carrasco, C.A. (2014), *ECB Policy Responses between 2007 and 2014: a chronological analysis and a money quantity assessment of their effects*, Working papers 65, Financialisation, Economy, Society and Sustainable Development (FESSUD) Project.

[124] 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(3), pp 763-801.

[125] Silva, R., Carvalho, V.M. and Ribeiro, A. P. (2013), *How large are fiscal multipliers? A panel-data VAR approach for the Euro area*, FEP Working Papers, No. 500

[126] Sims, C. (1980), *Macroeconomics and Reality*, Econometrica, Vol. 48(1), pp 1-48.

[127] Tenhofen, J. and Wolff, G. B. (2010), *Does anticipation of government spending matter? The role of (non-)defense spending*, Bonn Econ Discussion Papers 12/2010.

[128] Uhlig, H. (2005), *What are the effects of monetary policy on output? Results from an agnostic identification procedure*, Journal of Monetary Economics, Vol. 52(2), pp 381-419.

[129] van der Noord, P. (2000), *The Size and Role of Automatic Fiscal Stabilizers in the 1990s and Beyond*, OECD Economics Department Working Papers, No. 230.

[130] in 't Veld, J. (2013), *Fiscal consolidations and spillovers in the Euro area periphery and core*, European Economy - Economic Papers 506, Directorate General Economic and Monetary Affairs (DG ECFIN), European Commission.

[131] in 't Veld, J., Larch, M. and Vandeweyer, M. (2013), *Automatic Fiscal Stabilisers: What They Are and What They Do*, Open Economies Review, Vol. 24(1), pp 147-163.

[132] Woodford, M. (2011),*Simple Analytics of the Government Expenditure Multiplier*, American Economic Journal: Macroeconomics, Vol. 3(1), pp 1-35.

[133] Yang, S.S. (2008), *Quantifying tax effects under policy foresight*, Journal of Monetary Economics, Vol. 52(8), pp 1557-1568.