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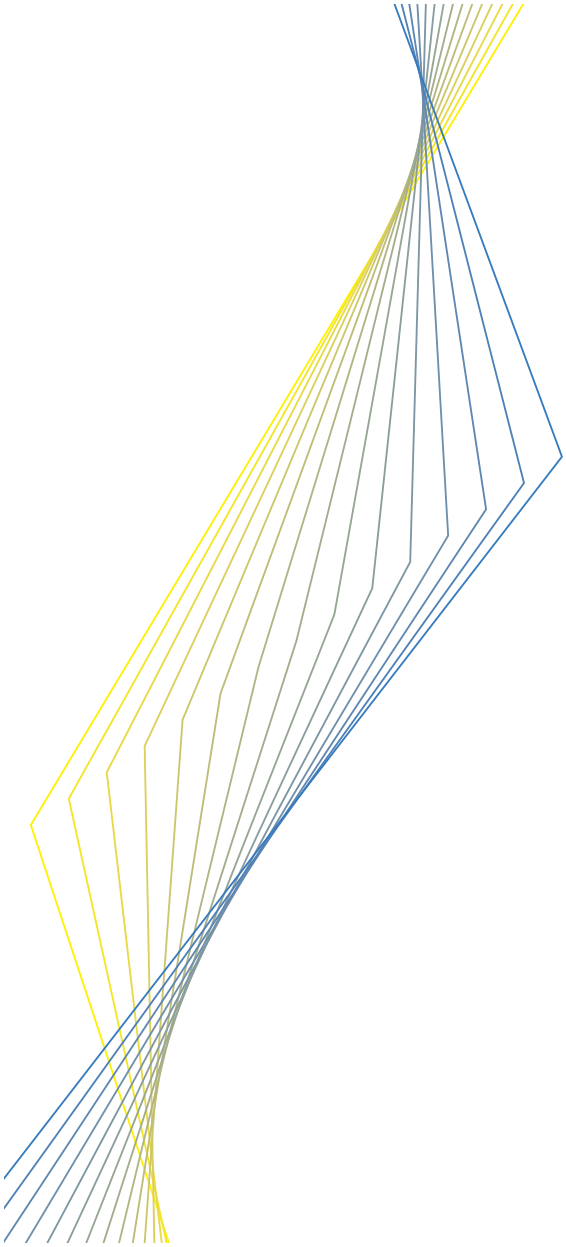

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BY GIUSEPPE DE ARCANGELIS[2] AND SERENA LAMARTINA[3]

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1 We would like to thank Carlo Favero, Jurgen von Hagen, Chris Kamps, Ludger Schuknecht, Carmine Trecroci and two anonymous referees for their useful comments, as well as the participants of the section on Fiscal Policy at the European Economic Association Meetings held in Lausanne, 28 August–1 September 2001, the participants of the conference "EMU Macroeconomics Institutions" held in Milan-Bicocca, 20–22 September 2001, and the Fiscal Policies Division at the ECB for useful discussions. The views expressed in this work are those of the authors and do not necessarily reflect those of the institutions to which they belong. The authors are fully responsible for any errors and omissions. This paper can be downloaded without charge from http://www.ecb.int or from the Social Science Research Network electronic library at http://ssrn.com/abstract_id=487422.

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ISSN 1561-0810 (print)

ISSN 1725-2806 (online)

Contents

Abstract

The aim of this paper is twofold. First, for West Germany, France, Italy and US, we econometrically select within a SVAR model some *fiscal policy regimes*, i.e. a "set of rules" for the implementation of fiscal policies. Second, we identify the fiscal policy shocks related to different categories of expenditure and taxation, and simulate their effects on economic activity. Empirical evidence shows that in the selected European countries fiscal decisions mainly target government expenditure while a clear-cut distinction between spending and taxation regimes is not found in the US. Both shocks on government spending and taxation generate keynesian responses of output, although fiscal multipliers are quite low (output reacts by 0.1 percent quarterly on average at most to a 1 percentage change in the expenditure or revenue ratio). In Italy, the US and France, the strongest effect on output is produced by shocks on government expenditure on wages and transfers.

Keywords: SVAR, Fiscal Policy.
JEL Classification Codes: E62, H30

Non-technical summary

The paper empirically analyses the effects of different fiscal shocks on economic activity in the last four decades. The introduction of fiscal rules at European level and the empirical findings of non-keynesian effects of some fiscal consolidation episodes have recently revived the interest in the study of fiscal policy decisions and of the elements that determine their economic impact. The literature on non-keynesian effects of fiscal policy has emphasised the relevance of the composition of the adjustments. Cross-country studies revealed that fiscal consolidations implemented via spending cuts – in particular in public wages and transfers - are on average more effective in producing positive macroeconomic effects than consolidations implemented via tax increases. However, the issue of non-keynesian effects is not uncontroversial as it is argued that these effects often occur under specific circumstances of initial public finances and under specific macroeconomic conditions.

This paper further investigates the role of different kinds of expenditure and revenue shocks in affecting economic activity in four OECD countries (West Germany, France, Italy and US). It adopts an approach which differs from that of cross-country studies as fiscal policy innovations are identified and their effects on economic activity are simulated within a structural vector autoregression model that describes the decision process of the fiscal policy-maker. Different possible ways of conducting fiscal policy are in the paper defined as 'fiscal policy regimes': each regime targets a different budgetary category, allowing the other fiscal variables to adapt to a change in the targeted variable. The budget balance is disaggregated in government spending in wages and transfers, residual spending and taxation. An empirical test is proposed to discriminate amongst fiscal regimes targeting at these variables. Empirical evidence suggests that, while in the selected European countries fiscal regimes target government expenditure, a clear-cut distinction between spending and taxation regimes is not found in the US. The simulation analysis shows that fiscal shocks, both on revenues and expenditure, produce the standard keynesian results on output: on average, a decrease in public expenditure lowers output and a decrease in taxation leads to an expansion. In contrast with some cross-country evidence, shocks which increase government spending on wages and transfers have in most cases the strongest positive effect on output. However, supporting the existing empirical literature, the size of multipliers in no cases is large or long lasting.

1 Introduction

The setting of new institutional frameworks at European level for fiscal policy making and the empirical evidence of non standard (non-keynesian) effects of some fiscal consolidation episodes have revived the interest in the study of fiscal policy. In Europe, the Maastricht Treaty and the Stability and Growth Pact, by imposing budgetary limits, represent the most important reference for the implementation of policy actions since the 1990s. Similarly, in the last decade fiscal policy decisions in the US have been led by the budgetary rules imposed after the increasing budget deficits in the 1980s.[1]

In this context some questions can be raised: how do fiscal consolidations affect economic activity? Is fiscal policy relevant for business cycle fluctuations? Moreover, the imposition of quantitative limits on budget deficits raise the question: when keeping deficits within bounds, do governments prefer to tighten public expenditure or to increase taxes? In the past, were fiscal policy decisions more "expenditure-led" or "taxation-led"?

In this paper we deal with such issues from an empirical perspective. Our main objective is twofold. First, we empirically select the "fiscal policy regimes", namely the rules according to which fiscal policy actions were decided (whether taxation decisions preceded expenditure decisions or vice-versa). Second, for the selected fiscal policy regimes, we identify fiscal policy shocks and estimate both their effects on output and their relevance for business cycle fluctuations.

In our analysis we disaggregate the budget balance in expenditure and taxation and focus on a specific type of expenditure: government wages and transfers. This allows to test a particular policy regime where the authorities target this kind of government spending and let taxation and other expenditure decisions follow.

The recent literature on non-keynesian effects of fiscal policy has highlighted the importance of targeting expenditure on wages and transfers. In cross-country studies Alesina and Perotti (1995, 1997) showed that a relevant element in determining non-keynesian effects is the *type of adjustment:* namely, whether the fiscal consolidation is implemented by cutting public expenditure rather than increasing taxes. Moreover, they argued that the macroeconomic effects of the cuts in public expenditure differ, depending on whether they affect public wages and transfers rather than other types of expenditure.

The role of such expenditure is studied within a framework which is different from that of the literature on non-keynesian effects. Instead of focusing on case studies or single consolidation episodes, we analyse long time series making use of vector autoregressions models. This kind of analysis can be considered as complementary to the other to the extent to which it still allows to focus on the role of different fiscal innovations, but it is carried out over a whole sample period rather than over few consolidation episodes.

The work is inspired by the recent empirical literature on monetary policy, which uses Structural Vector Autoregression (SVAR) models here conveniently adapted to

[1] The two laws approved by the Congress (the Budget Enforcement Act in 1990 and the Omnibus Budget Reconciliation in 1993), aiming at putting the high budget spending under control, resulted in several years of consecutive budgetary surpluses.

the different characteristics of fiscal policy.[2] Similar studies are performed by Blanchard and Perotti (2002) and Perotti (2002) for the US and other OECD countries. Our work, however, takes this approach one step further by proposing an empirical test which allows to discriminate between policy regimes, and by considering a more detailed disaggregation of budgetary items.[3]

Our findings show a difference in the implementation of policy actions between the European countries in our sample (West Germany, France and Italy) and the US. Data suggest that, while in the European countries fiscal regimes target government expenditure, a clear-cut distinction between expenditure and taxation regimes is not found for the US. This is in line with previous findings for the US. The simulation analysis shows that both kind of fiscal shocks produce keynesian results: on average, a decrease in public expenditure decreases output and a decrease in taxation leads to an expansion. In contrast with some cross-country evidence, positive shocks in government spending on wages and transfers have in most cases the strongest supportive effect on output. However, in line with existing literature, the size of multipliers in no cases is large or long-lasting.

The paper is structured as follows. Section 2 presents some stylised facts on fiscal variables relevant for our analysis in the sample period considered. Section 3 reviews the most recent empirical literature on fiscal policy, while Section 4 provides an explanation of the concepts of "shock" and "regime" that are widely used in this paper. The core of the paper is Section 5, which presents the empirical model. Estimation and simulation results are reported in Section 6 and Section 7 concludes.

2 Stylised Facts

The role of fiscal policy has been changing over the last decades in all the industrialized countries. In the 1960s fiscal policy played an important role as a stabilisation tool. However, the rapid increase of public deficits and debts during the 1980s made clear the need to bring public finances back towards a sustainable path. Official constraints on both deficit/GDP and debt/GDP ratios were imposed in Europe first with the Maastricht Treaty and afterwards with the Stability and Growth Pact. Similarly, in the US, following a period of increasing budget deficits in the 1980s, the government imposed some budgetary rules, which effectively contributed to reduce fiscal imbalances in the 1990s and led to protracted surpluses in the recent past.

This paper focuses its empirical analysis on the composition of fiscal adjustments analysing in particular the role of different components of total government expenditure in determining fiscal policy making. Total government expenditure has been disaggregated in government expenditure on wages and transfers and residual spending.[4]

[2]The SVAR methodology has been only recently applied to fiscal policy (see Section 3), whereas it is widely used for monetary policy. One of the main reasons is the unavailability of reliable fiscal data at high frequency for long periods of time and for many countries. Like Favero (2002) and Marcellino (2002), for the empirical application of this paper we use the OECD database in order to have homogeneous data across countries.

[3]A similar approach to test monetary regimes has been adopted by Bernanke and Mihov (1998).

[4]The residual expenditure is a relevant budgetary item, as it includes interest payments on

In all the countries considered, government spending on wages and transfers represents a sizeable share of total spending. The highest percentage in the sample period of our analysis is recorded in Italy, with an average of 70 per cent over the period. In West Germany[5] and France this share is around 66 per cent, whereas in the United States the percentage lowers to 59 per cent.

A picture of the increasing weight on economic activity of such expenditure for all countries over time is given by Fig. 1. The figure shows that public wages and transfers as a percentage of GDP have been rising since the 1960s in all the countries. While in Europe this share increased from about 23-24 per cent of GDP in the 1960s up to 30-35 percent in the 1990s, in the US it increased gradually and slightly over time from 15-16 per cent of GDP to over 20 per cent in the same period.

Fig. 2 shows that the increase in spending was accompanied by an upward trend in the revenue-to-GDP ratio. In all countries the revenue ratio has been rising monotonically in the last four decades, although with different intensity. In Europe the largest increases was in West Germany during the 1970s and in France and Italy during the 1980s, with the share of revenues on GDP being well above 40 per cent in all countries. In the US the increase over the period was more gradual and the revenue ratio has never been higher than 30 per cent.

The observed co-movement of revenues and expenditure raises some questions: does such an increase in government expenditure on wages and transfers correspond to a fiscal regime where decisions on those expenses preceded every other decision? Did the increase in expenditure lead to an increase in taxation, or did the decisions on taxes precede the decisions on spending?

3 Related Empirical Literature

While there is a broad consensus in the literature on the effects of monetary policy on economic activity, there is more uncertainty about the effects of fiscal policy decisions. According to the standard keynesian models, cuts in public expenditure or increases in taxes dampen aggregate demand directly and indirectly via a decrease in disposable income and private consumption. Neo-classical models justify smaller multipliers within the standard keynesian theory by allowing a more complex interaction of aggregate demand with real and money markets. Recently, new theoretical approaches have even supported the idea that fiscal consolidations may have *positive* effects on economic activity by acting through the confidence channel when they credibly interrupt upward trends in public debt. Empirical evidence does not provide a unique answer to this issue by showing that non-keynesian effects may take place under well defined circumstances.

The empirical investigation of the macroeconomic effects of fiscal shocks on output has mainly developed around two lines of research which make use of two different methodological tools.

The first one, known as the *"ex-post approach"*, analyses single consolidation episodes. By comparing the macroeconomic performance and the fiscal situation

the public debt, which have been (and still are for some highly-indebted European countries) a considerable percentage of total government spending.

[5]The data for West Germany cover the period up to the unification.

Figure 1: Weight of Government Expenditure on Wages and Transfers (as percentage of GDP) in some OECD Countries

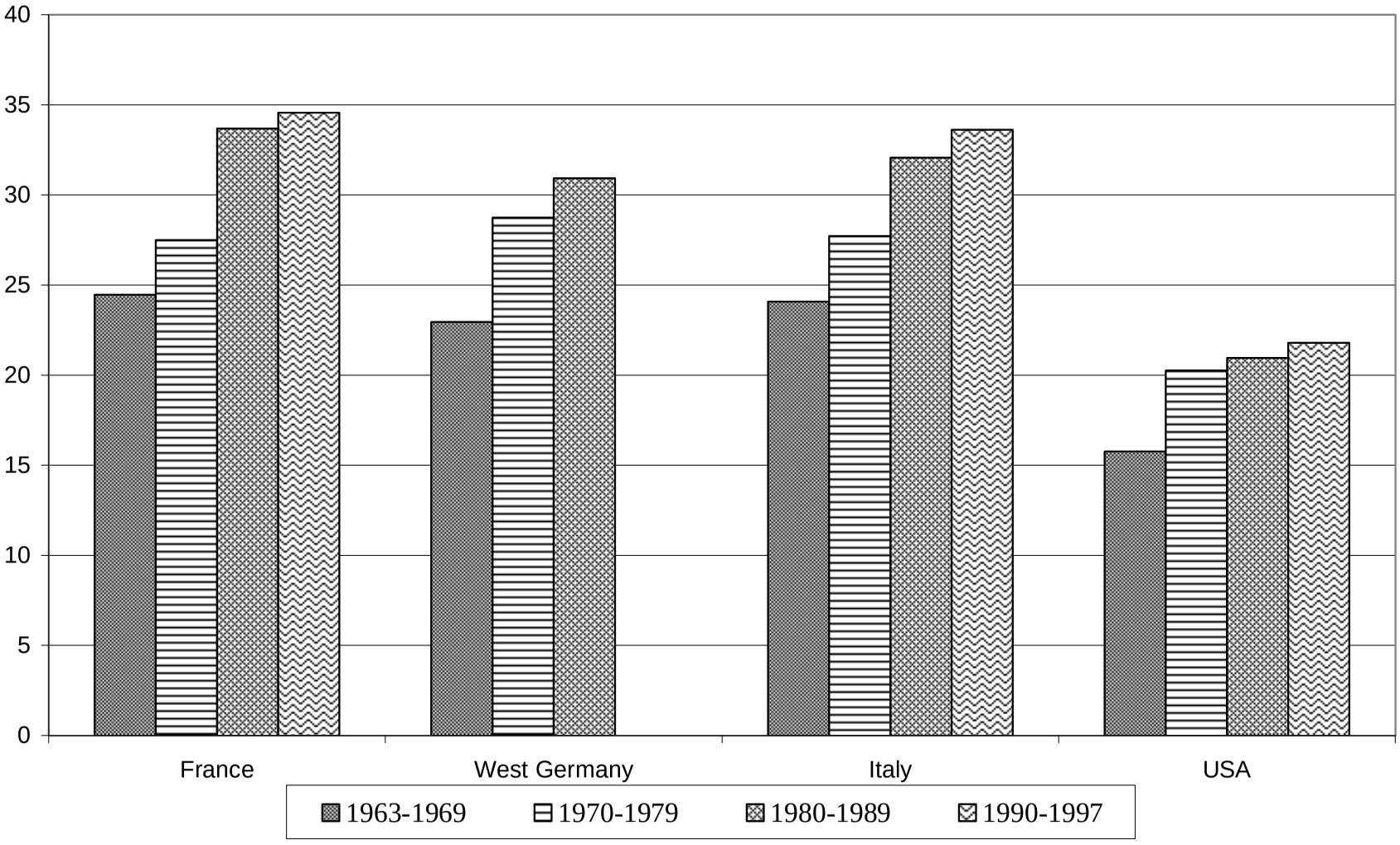
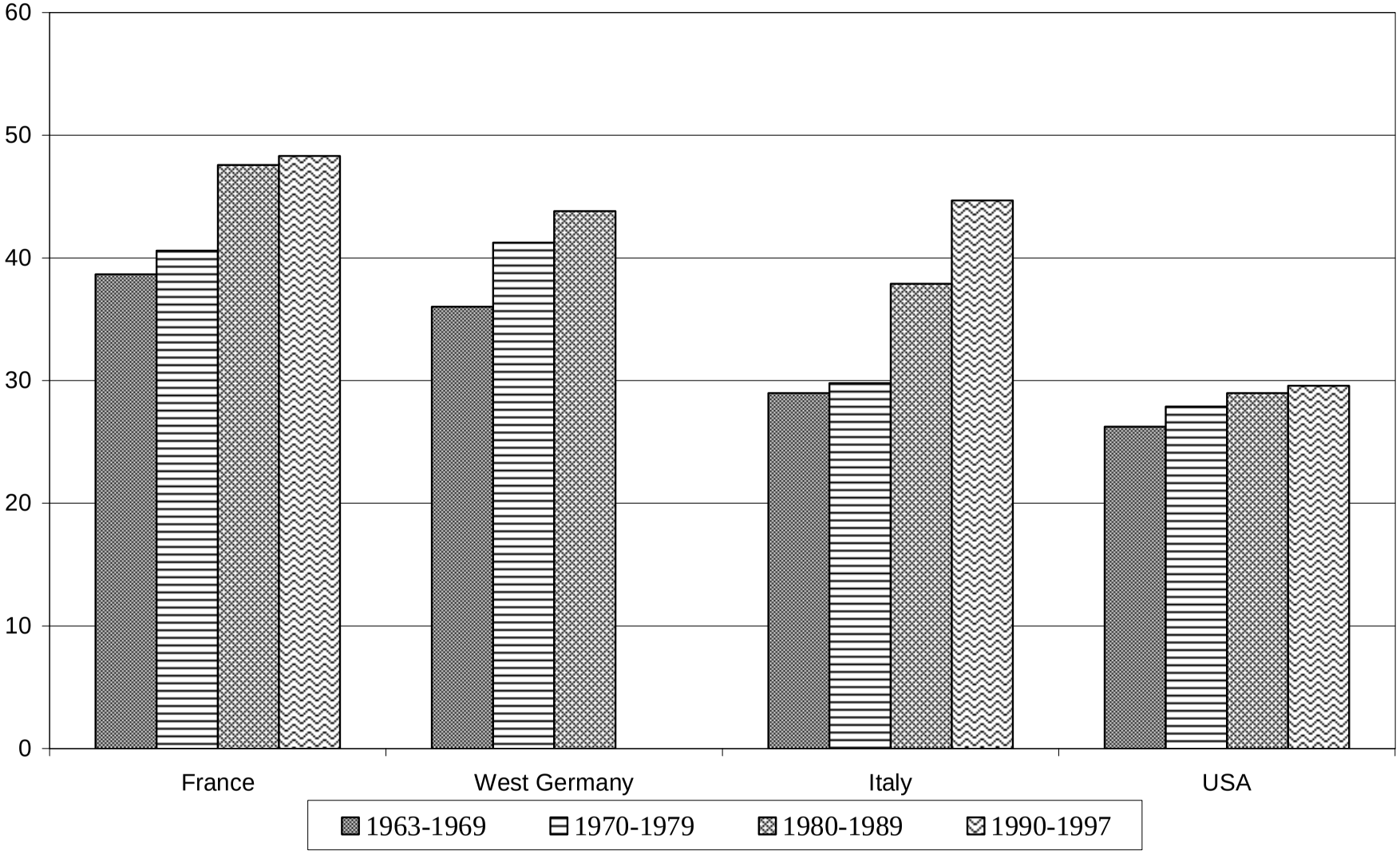


Figure 2: Revenue-to-GDP ratio in some OECD Countries (1963–1997)



before, during and after an episode of fiscal consolidation, the ex-post study allows a comprehensive analysis of the effects of a fiscal retrenchment on the level of economic activity. Many contributions identified some consolidation episodes which lead to an economic expansion. Among the elements resulting to play an important role in the determination of a macroeconomic success there is the *qualitative* composition of the fiscal adjustment.[6] McDermott and Wescott (1996), Alesina and Perotti (1997) and Alesina and Ardagna (1998) find that a consolidation implemented through a cut in public spending - and in wages and transfers, in particular - is more effective in producing positive macroeconomic effects, on average, than one operated by an increase in taxation. The justification for this goes through the credibility channel: a cut in public wages and transfers, by resulting more unpopular, would signal a stronger willingness to revert a deteriorated fiscal position.

The second line of research is based on the estimation of the response of economic variables to fiscal shocks by considering long time spans of data rather than case studies. This approach makes use of the Vector Autoregression (VAR) methodology. The most recent literature allows fiscal shocks to be estimated through the identification of a Structural VAR model (SVAR), which avoids the problem of arbitrarily choosing an indicator for the fiscal stance.

So far, the SVAR methodology has been largely and successfully applied in the empirical monetary policy literature (see, for instance, Christiano, Eichenbaum and Evans, 1998), but it has been only used for fiscal policy exercises in a few recent works. The first contributions using VAR for fiscal policy analysis are those by Ramey and Shapiro (1998), Edelberg, Eichenbaum and Fisher (1999) and Burnside, Eichenbaum and Fisher (1999, 2000). In these papers fiscal exogenous shocks are selected according to the so-called "narrative approach", which consists of identifying the most relevant fiscal episodes through the reading and the interpretation of historical documents.

A recent development of the methodology avoids the problem of subjectively selecting fiscal exogenous shocks. Fiscal shocks are rather estimated after a structural VAR (SVAR) is identified, namely after some restrictions are imposed on the contemporaneous relationships among the variables included in the VAR.

The most relevant contribution in this literature has been provided by Blanchard and Perotti (2002) for the US economy. The authors make use of institutional information on the tax and transfer systems of this country to identify structural fiscal shocks and to estimate their impact on macroeconomic variables. The basic idea of the identification scheme is that a quarter (the periodicity used to estimate the model) is too short a period for output economic variables to affect fiscal policy variables. The policy-maker requires time to collect information about the state of the economy, to think about fiscal policy reactions and finally to implement them. The model is composed of three variables: government expenditure, tax revenues

[6]Other studies identified different factors. In their preliminary works, Giavazzi and Pagano (1990, 1996) highlight the importance of the size of fiscal adjustments in positively affecting the likelihood of a success. A sizeable consolidation effort, rather than one of small magnitude, seems to lead more likely to an expansion of the economy. Von Hagen and Strauch (2001) and Von Hagen, Hughes Hallett and Strauch (2002) stress also that the initial economic conditions in which a consolidation episode starts are relevant for its success, while Zaghini (2001) emphasises the persistence of the adjustment.

and the level of output. While tax revenue can be contemporaneously affected by output, there is no feedback from economic activity to public spending. The simultaneous reaction of taxes, however, would only catch automatic effects and not the discretionary reactions of the policy-maker. The economic activity (measured by real GDP) is supposed to be contemporaneously affected by unexpected changes in both fiscal variables. The inclusion of taxation and spending in the model allows the authors to consider two possible ways in which the budget items can affect each other: taxation decisions come first and spending follows, and taxation innovations follow exogenous spending decisions.[7] The two fiscal models are estimated separately. As they are exactly identified, no formal testing is applicable to discriminate among them. However, data do not allow to select one of the two models as the coefficients of the reaction of spending to taxation and of taxation on spending are not statistically significant.

The simulation of the model shows a standard keynesian reaction of the economy to both kinds of shocks: an increase in taxation has negative effects on output and consumption, while a positive innovation in public expenditure produces positive effects on these variables.[8]

In another application, Perotti (2002) enlarges the model to include additional macroeconomic variables (the price level and the nominal interest rate) and extends the application to other countries.[9] The evidence confirms the previous findings but, consistently with the prediction of more developed keynesian models, it shows the weakness of the effects of fiscal policies on the economy, especially in the last 20 years. This results in very low spending and tax multipliers, which the author justifies with the increased openness of the economies, the switch from a fixed to flexible exchange rate regime and the possible change of monetary policy regimes.

The empirical application we propose is inspired by the model of Blanchard and Perotti (2002) as we adopt a similar identification scheme and use the same econometric tool to investigate the economic effects of fiscal shocks. However, our approach differs from theirs to the extent to which we estimate an *overidentified* model - rather than an exactly identified one - to test whether taxation decisions precede or follow spending decisions.

Our contribution may be also linked to the first line of research since we study the quantitative and qualitative role of shocks in government expenditure on wages and transfers. The "ex-post approach" has highlighted the relevance of this variable in determining an economic success. Here, we estimate its weight in the determination of the other fiscal variables and evaluate the effect of innovations in such expenditure on output by using long (and homogenous) time periods rather than episodes or case studies.

[7]The issue of the intertemporal relation between government spending and revenues was first raised by Von Furstenberg et al. (1986). They found support for the sequence allowing taxes to respond to expenditure innovations rather than for the reverse sequence.

[8]A variant of this model, which includes other macroeconomic variables, have been proposed by Fatas and Mihov (2000), when a preliminary version of the Blanchard and Perotti's paper was published. The identification scheme is basically the same, and the model produces keynesian responses.

[9]Countries selected are US, West Germany, UK, Canada and Australia, for which are available reliable and detailed quarterly fiscal data from national sources.

4 Fiscal Policy Shocks and Fiscal Policy Regimes

Terms like "shock" and "regime", commonly used in the empirical monetary policy literature (see, for instance, Walsh, 1998, or Christiano, et al., 1998), are in this paper applied to fiscal policy.

Like in monetary policy, fiscal policy actions may be well anticipated by economic agents or may show up quite unexpectedly. The expected component of fiscal policy represents all the fiscal decisions and the changes in fiscal variables that the market is able to anticipate given the currently available information set. Changes in public expenditure and revenues owing to the operation of automatic stabilizers are good examples. On the contrary, innovations in fiscal policy variables that the market is not able to predict are the unexpected components of fiscal policy. According to the rational expectation theory, these policy surprises have the most relevant impact on endogenous variables. The unexpected component of fiscal policy is more commonly known in the literature as the *fiscal policy shock*.

Within the SVAR framework, the identification of the shock goes through the selection of the fiscal policy variables to include in the model and the setting of the relationships among these. As in this application we distinguish between government expenditure on wages and transfers, residual spending and revenues, we identify three fiscal policy shocks corresponding respectively to the three budgetary items.[10]

The distinction of these three fiscal variables gives the chance to empirically analyse the relationships among them. In particular, we want to find out whether there is an *order* in the occurrence of such fiscal shocks: do shocks in taxation precede innovations in public expenditure? Or, alternatively, are changes in public wages and transfers preceded by taxation and residual spending decisions? Such shock orderings are defined as different *fiscal policy regimes*. They design alternative ways of implementing fiscal policy.[11]

With respect to the existing literature on the design of fiscal regimes, our original contribution is the focus on government expenditure on wages and transfers and the possibility to empirically test among regimes. The explicit role of innovations in government wages and transfers is relevant for policy considerations: establishing whether innovations in such variable preceded tax changes – probably with the scope of financing the expenditure increase – is useful to assess the care of the policy-maker for the sustainability of public finances.

A great deal of the empirical literature on monetary policy has dealt with the selection of an operative target for monetary policy, whether this can be the short-

[10] According to the structural VAR technique used in this paper, the number of innovations have to be equal to the number of variables in the VAR. For a discussion on the limitation of the number of driving shocks, see the appendix in Blanchard and Quah (1989); see also Lippi and Reichlin (1993) and the recent proposal of dynamic factor models by Stock and Watson (2002) and Forni, et al. (2000).

[11] The ordering of the shocks (expenditure shocks preceding taxation shocks, or vice-versa) is simply a time ordering and cannot be interpreted as a formal causality ordering. However, there is a relationship with Granger causality. To the extent to which expenditure shocks precede taxation shocks, we can conclude that expenditure shocks formally Granger-cause taxation. Granger causality concerns the ability of some variables (or shocks) to help forecasting others, but cannot be interpreted with the broader meaning of economic causality.

term interest rate, some money/reserve aggregate or some combination of the two (Christiano and Eichenbaum, 1992, Eichenbaum, 1992, Strongin, 1995, Bernanke and Mihov, 1997 and 1998). The market for bank reserves, where central banks intervene, is commonly used as a reference to design the different monetary regimes.

The modelling approach for fiscal policy exercises presents slight differences in this respect. The absence of an operative target in fiscal policy (like the short-term interest rate or bank reserves for monetary policy) makes the concept of fiscal policy regime different from that of monetary regime. A fiscal regime is interpreted in this literature as an ordering and/or a combination of fiscal policy shocks which, however, is still able to illustrate the way in which the policy-maker implements fiscal policy.

5 A Model of Fiscal Policy Regimes

The present application is based on Structural VAR econometrics and is inspired by the recent literature on monetary policy.[12] Following this literature, we propose a distinction of the variables included in the model between *policy* and *non-policy* variables. This distinction is based on the ability of the authorities to directly affect the policy variables. As it is standard practice in the monetary policy literature, the policy variables usually include short-term interest rates and bank reserves, while the second group includes the final objectives of the monetary authorities actions, such as output and/or price level. Since monetary policy authorities are generally quick to react to "news" on non-policy variables, it is commonly assumed that policy variables react to innovations in the non-policy variables *within* the same unit of time (say one month, if using monthly data); however, it takes more than one sample period to observe any reaction in the non-policy variables to a change in the policy variables.

We propose a similar distinction between fiscal policy variables and macroeconomic aggregates, although we assume different relationships among them.[13] We identify two groups of variables: the *fiscal policy* (FP) variables and the *non-fiscal policy* (NFP) variables. The former are supposed to be under the direct control of the policy-maker, whereas the latter interfere with fiscal policy decisions but are not able to react to fiscal policy shocks within the same unit of time. A particular status is assigned to the level of output of the economy, which is not included among the NFP variables. On the one hand, unlike the monetary policy exercises, we assume that output reacts contemporaneously (i.e. within the same unit of time) to the fiscal policy variables because some of these (e.g. public expenditure on final goods) are part of the aggregate demand. On the other hand, because of the lags that characterize fiscal policy, innovations in output are likely to take more than one period to affect fiscal policy decisions. Indeed, once fiscal measures to stabilise the economy have been detected, it takes more than a quarter before these measures are passed by Parliament with appropriate laws.[14] Therefore, the real output is considered the most endogenous variable in the model.

[12] See Christiano, Eichenbaum and Evans (1998) for a detailed survey.

[13] This modellization is similar to that of Blanchard and Perotti (2002).

[14] This argumentation does not necessarily hold for revenues. Revenues can be contemporaneously affected by output through the change of tax basis. Further discussion is provided in section 5.2 describing fiscal variables.

In the next three sections we present the econometric model we estimate, the fiscal variables included in the model and the identification restrictions imposed in the structural VAR.

5.1 VAR Structure: Identification and Estimation

The estimation of a structural VAR involves two stages. In the first stage, the unrestricted VAR generates a vector of reduced-form residuals that cannot be economically interpreted. The second stage establishes a set of links between the reduced-form innovations and the (economically meaningful) structural innovations, which are mutually uncorrelated. The links between the reduced-form and the structural innovations represent an explicit way to model the contemporaneous correlations of the reduced-form residuals. These links are shaped according to plausible restrictions among the economic variables of the original VAR.

Let us group all the economic variables of the VAR into the vector $\mathbf{x}_t$, which is in turn disaggregated in three subvectors: $\mathbf{x}_{NFP,t}$, which contains the NFP variables, $\mathbf{x}_{FP,t}$ with the FP variables and, finally, the level of output, y_t.[15]

The NFP subvector contains (from the top to the bottom) the price level and the short-term interest rate. Changes in these variables may determine changes in the fiscal variables.[16] In particular, because of progressive taxation systems in all countries, the price level can affect nominal tax revenues. Moreover, changes in the interest rate may have a direct effect on residual government expenditure - which includes interest payments - especially in countries with a high public debt. We assume that prices are sticky in the short-run and react to changes in the other variables with at least one period (i.e. one quarter) lag. The role of interest rate can be justified either as a monetary instrument, assuming that monetary policy decisions are taken independently from fiscal policy decisions, or, more generally, as a (weakly) exogenous variable for the fiscal policy regimes.

The FP vector contains three fiscal aggregates: government expenditure for wages and transfers, other government expenditure and current revenues. In the first stage, the estimation of the unrestricted VAR (given by (1)) generates three subvectors of innovations, one for NFP variables ($\mathbf{u}_{NFP,t}$), one for FP variables ($\mathbf{u}_{FP,t}$) and one for output ($u_{y,t}$):

$$\mathbf{R}(L) \begin{bmatrix} \mathbf{x}_{NFP,t} \\ \mathbf{x}_{FP,t} \\ y_t \end{bmatrix} = \begin{bmatrix} \mathbf{u}_{NFP,t} \\ \mathbf{u}_{FP,t} \\ u_{y,t} \end{bmatrix} \tag{1}$$

In the notation above, $\mathbf{R}(L)$ is a matrix of polynomials in the lag operator L and $\mathbf{R}(0) = \mathbf{I}$.

[15] Bold lower-case (capital) letters indicate vectors (matrices).

[16] Some empirical studies include inflation rather than the price level. We decided to consider the latter for both econometric and economic reasons. First, as the price level is a I(1) variable, we prefer to include this along with all the other I(1) variables in the model, rather than a I(0) variable, like inflation. Second, the reaction function of the monetary authorities in the empirical monetary policy literature is usually based on the interest rate, the price level and the output level. We think it is important to maintain the same structure for the identification of the possible fiscal-policy reaction function.

In the second stage, for the estimation of the orthogonalised, economically meaningful (structural) innovations, a recursive causal block-order is assumed from the set of NFP variables to the set of both the FP variables and then to output. Moreover, a recursive causal order is also established for the NFP variables belonging to $\mathbf{x}_{NFP,t}$.[17] In terms of the relationship between the fundamental innovations ($\mathbf{u}_{NFP,t}$, $\mathbf{u}_{FP,t}$ and $u_{y,t}$) and the structural innovations ($\mathbf{v}_{NFP,t}$, $\mathbf{v}_{FP,t}$ and $v_{y,t}$, which are all mutually and serially uncorrelated), this implies:

$$\begin{bmatrix} \mathbf{A}_{1,1} & \mathbf{0} & \mathbf{0} \\ \mathbf{A}_{2,1} & \mathbf{A}_{2,2} & \mathbf{0} \\ \mathbf{a}_{3,1} & \mathbf{a}_{3,2} & 1 \end{bmatrix} \begin{bmatrix} \mathbf{u}_{NFP,t} \\ \mathbf{u}_{FP,t} \\ u_{y,t} \end{bmatrix} = \begin{bmatrix} \mathbf{B}_{1,1} & \mathbf{0} & \mathbf{0} \\ \mathbf{0} & \mathbf{B}_{2,2} & \mathbf{0} \\ \mathbf{0} & \mathbf{0} & b_{3,3} \end{bmatrix} \begin{bmatrix} \mathbf{v}_{NFP,t} \\ \mathbf{v}_{FP,t} \\ v_{y,t} \end{bmatrix} \tag{2}$$

The shape of the matrices that link the NFP shocks to the FP shocks are all known according to the definition of NFP variables given above.[18] In addition, we assume that the output reacts to all fundamental innovations, which implies that $\mathbf{a}_{3,1}$ and $\mathbf{a}_{3,2}$ are full vectors, with no zero restrictions.

The core of our identification are the matrices $\mathbf{A}_{2,2}$ and $\mathbf{B}_{2,2}$, which shape the relationships among the fiscal innovations and the fiscal shocks:

$$\mathbf{A}_{2,2}\mathbf{u}_{FP,t} = \mathbf{B}_{2,2}\mathbf{v}_{FP,t}. \tag{3}$$

The idea behind our identification scheme is that of proposing different shapes for $\mathbf{A}_{2,2}$ and $\mathbf{B}_{2,2}$ (or parameter constraints), namely different sets of (weakly) causal links among the fiscal variables which identify the policy line of the fiscal authorities and that we therefore define as "fiscal policy regimes". We assume that fiscal shocks are correctly identified once a fiscal regime has been selected by data.

The imposition of constraints on $\mathbf{A}_{2,2}$ and $\mathbf{B}_{2,2}$ is necessary to identify model (2) from the estimates of the parameters of the unrestricted VAR (1). When more than the necessary constraints to identify exactly the model are imposed, a test for overidentifying restrictions can be applied to check whether the additional constraints are accepted by the data.[19]

[17] According to the definitions of our vectors, this means that the price level affects contemporaneously the short-term interest rate, but not vice-versa. Hence, the interest rate equation may be interpreted as a monetary policy rule that focuses on inflation.

[18] More in details, $\mathbf{A}_{1,1}$ is lower triangular, $\mathbf{B}_{1,1}$ is diagonal and $\mathbf{A}_{2,1}$ is a full matrix.

[19] In this exercise, the non-stationarity of the data is not emphasised and the cointegration analysis is not undertaken. A first justification is that the data may be *quasi-nonstationary*; in fact, the presence of unit roots in the time series cannot be tested with high power.

The neglecting of cointegration constraints is further motivated by the following considerations. The analysis is generally focused on short-run constraints and the short-run dynamic response of the system. When cointegration constraints are excluded, this only implies that the *long-run* responses of some variables are not constrained and might follow a divergent path. However, the short-run analysis is still valid. Moreover, Sims, Stock and Watson (1990) proved that standard asymptotic inference is not affected even when the variables included in the VAR in levels are cointegrated. Finally, although FIML estimates are no longer efficient if cointegration constraints are not included, they still remain consistent. The lower efficiency in the estimates can be justified by the difficulty in the economic interpretation of some of the cointegration constraints showed by the data (for some countries we found four cointegrating vectors).

5.2 The Fiscal Policy Variables

Before proceeding with the identification of the fiscal regimes, it is important to better qualify the fiscal policy variables (FP) that we use in our analysis. This helps justifying the zero constraints imposed in the system (2).

The zero constraints of the coefficient of output in the two equations of expenditure and on that on revenues mean that the FP variables do not react contemporaneously to output. Concerning expenditure equations, this is justified by the lag related to the implementation of fiscal policy decisions. As already mentioned, this lag is due to the time needed to approve new laws.[20]

However, the same argument is more difficult to support for revenues. Indeed, output changes have an immediate effect on the tax bases which may translate into automatic variations in revenues. Blanchard and Perotti (2002) compute the elasticity of revenues to output and impose the estimated value in their equation for tax revenues. Here we follow a different approach and assume that that coefficient can take value zero or one. Revenues is the only variable to enter the model as a share of GDP. In this case, a coefficient equal to one would imply that a change in output immediately affects tax bases, but takes more than one quarter to affect revenues. The zero assumption, instead, describes the opposite situation: tax bases and revenues react immediately and one-to-one in the same quarter to a change in output.

Among the two assumptions, we consider more plausible and use in the rest of the analysis the one according to which revenues react within the same quarter to output changes (the zero assumption): structural innovations on the revenue side are therefore recovered from innovations on the revenue ratio (henceforth defined as fiscal pressure).[21] The case in which the coefficient equals one is examined only when responses to tax shocks are analysed.

The next subsection describes the constraints we impose on system (3) for the identification of the fiscal policy regimes.

5.3 Identifying Fiscal Policy Regimes

Focusing only on the relationships among fiscal shocks given by system (3), lets define the reduced form innovations on government expenditure for wages and transfers with g_w, those on residual government expenditure with g_r and those on current revenues with τ. We assume that there are no direct links among the reduced-form innovations of each FP variable. Therefore the reduced form innovations depend on the structural innovations of each FP variable.

The links among the FP innovations can be rewritten in the following way:[22]

[20] Blanchard and Perotti (2002) impose the same constraint by setting $b_1 = 0$ in their terminology.

[21] Similarly to the approach of Blanchard and Perotti (2002), we have also estimated the coefficient that captures the influence of output on fiscal pressure. This is equivalent to let the elasticity of revenues to output being freely estimated. For all countries (except for the US) all the coefficients were highly non-significant. Moreover, the inclusion of that additional coefficient makes the system exactly identified, thus unabling to check for different regimes.

[22] For simplicity, we omit the time t subscript as all the relationships are contemporaneous.

$$\begin{array}{rcl} g_w &=& \sigma_w \nu^w + \quad \gamma_1 \nu^r + \quad \gamma_2 \nu^\tau \\ g_r &=& \gamma_3 \nu^w + \quad \sigma_r \nu^r + \quad \gamma_4 \nu^\tau \\ \tau &=& \phi_1 \nu^w + \quad \phi_2 \nu^r + \quad \sigma_\tau \nu^\tau \end{array} \tag{4}$$

where ν^w, ν^r and ν^τ are the structural (i.e., mutually uncorrelated and economically meaningful) shocks of the two expenditure aggregates and revenues.

The overall system is underidentified since the number of parameters to be estimated (24) is higher than the number of degrees of freedom that the available covariances of the first stage allow (21). Therefore, three additional constraints are required in order to estimate the model exactly. Here we impose four restrictions, so that we are able to calculate an overidentification test. We propose four sets of restrictions which identify four different fiscal policy regimes.

1. T Regime: $\phi_1 = \phi_2 = \gamma_1 = \gamma_3 = 0$. This regime is characterized by the (weak) exogeneity of the tax decisions, which affect expenditure decisions without being influenced in return. Moreover, the two expenditure aggregates are contemporaneously uncorrelated with each other. Were this regime not rejected by the data, the structural innovations of revenues would represent the fiscal policy shock.

2. G Regime: $\gamma_1 = \gamma_2 = \gamma_3 = \gamma_4 = 0$. In this case expenditure decisions are taken without any contemporaneous feedback from the revenue side, whereas tax decisions take into account the expenditure shocks. Both expenditure decisions are taken separately and there is no interaction between the two; they can be both considered as fiscal policy shocks.

3**. GW Regime:** $\phi_2 = \gamma_1 = \gamma_2 = \gamma_4 = 0$. This is a slight but significant variation of the previous expenditure regime, in which government wages and transfers play a central role. Changes in revenues and other expenditure components occur in order to accommodate exogenous decisions on wages and transfers. The fiscal policy shocks consist of structural innovations on expenditure on wages and transfers.

4. GR Regime: $\phi_1 = \gamma_2 = \gamma_3 = \gamma_4 = 0$. This regime is similar to the GW regime, but it takes residual spending as the most exogenous component of fiscal policy. The fiscal policy shocks are innovations to residual spending: both the spending on wages and transfers and revenues are adjusted according to these shocks. It should be noticed that the influence of changes in the interest rate on this item is already taken into account, since innovations in the interest rate enter the g_r equation via the coefficient which takes the place (2,2) in the matrix $\mathbf{A}_{2,1}$. Therefore, shocks to this equation are innovations that do not depend on changes in interest rates.

The first two regimes are not completely new in the literature. They were firstly proposed by Blanchard and Perotti (2002), although in a less extensive model. The GW Regime, is instead proposed here for the first time and is justified by the willingness to check whether savings in government expenditure on wages and transfers have a different macroeconomic impact than other spending. The GR regime is added for completeness. In all four cases, the overall system is overidentified by one parameter. The overidentification test allows to compare the appropriateness of the model designed with an exactly identified model.

In the following section for each country we test which of the proposed fiscal regimes is accepted by the data, and present a simulation analysis on the responses

Table 1: Probability Values of LR Tests for the Identification of the Fiscal Regimes (boldface=significant at 5%)

Countries	*Regime T*	*Regime G*	*Regime GR*	*Regime GW*
France	$6.70 * 10^{-15}$	$9.03 * 10^{-15}$	**0.409**	**0.334**
West Germany	$2.43 * 10^{-13}$	$8.52 * 10^{-14}$	**0.072**	**0.995**
Italy	0.006	0.006	**0.262**	**0.852**
USA	0.032	**0.069**	**0.091**	0.005

of output to the identified fiscal shocks.

6 Empirical Findings

The model has been estimated for the three largest European countries (West Germany, France and Italy) and for the US, which is used as a benchmark as most of the existing empirical applications refer to it. We used quarterly data from the OECD database for the period 1960-1997, with the only exception of West Germany, for which we considered the subsample 1961-1989. Concerning the non fiscal policy variables, we used the GDP deflator as an indicator of the price level and the money market rate for the short-term interest rate, with the exception of Italy, for which we used a medium-term government bond yield. Since policy decisions usually concern nominal variables, the fiscal policy variables were considered in nominal terms.[23] The real GDP is the variable used to test the effects of fiscal shocks on the economy. All the variables, but nominal interest rates, are log-transformed.

The dynamic structure of the model have been selected according to the usual optimality criteria on the number of lags.[24] The estimation method used is the Fully Information Maximum Likelihood and the standard errors of the impulse response functions were computed via the Delta method.[25] As explained in section 5.2, the default model considers a contemporaneous one-to-one reaction of taxes to changes in GDP. The distinction between the one-to-one and the zero reaction of revenues to output is dealt with when we consider the impulse response functions to tax shocks.

Table 1 shows the results of the overidentification test (likelihood ratio, LR, test) for the four regimes we want to test. The table indicates a clear prevalence of fiscal regimes where the spending decisions come first rather than those where tax decisions precede. At the 5% confidence level, the GR regime is not rejected for all countries. Moreover, the GW regime is still not rejected for all the European countries, whereas the G regime cannot be rejected for the US. The US is the only country for which the overidentification test does not clearly discriminate between the expenditure and the taxation regimes. Blanchard and Perotti (2002) cannot test

[23]We have also implemented the analysis using nominal government expenditure deflated with the GDP deflator, as in Blanchard and Perotti (2002). No major differences have been found in the impulse response functions and all the overidentifying tests provided the same fiscal regimes for all the countries.

[24]The Akaike, Hannan-Quinn and Schwarz tests suggested to use three lags for Italy and the US and four for France and West Germany.

[25]See Hamilton (1994) and Amisano and Giannini (1997).

for fiscal policy regimes in the US since their system is exactly identified; however, they stress that since tax and expenditure innovations are scarcely correlated, the order of causality between the two variables is not relevant for the analysis of the impulse response functions. The result of our test for US are in line with those of Blanchard and Perotti (2002).

How stable are the accepted fiscal regimes over time? In order to check for the possible change of fiscal regimes in our sample, we have computed recursively the overidentifying tests for all the samples starting in 1960:1 and ending at consecutive dates from 1980:1. The probability values of the most relevant regimes for each country are reported in Fig. 3–6. The results for France and Italy show the acceptance of the GW and the GR regimes over all the subsamples. In West Germany the regime GW is accepted with an higher probability than the GR regime over all the sample period. For the US the GR regime is valid only starting from the end of the 1980s, whereas the G regime is valid from the beginning of the 1990s. We report the estimation and simulation details only for the not-rejected regimes.

The estimates of the coefficients involved in the system (4), together with that of the interest rate in the residual expenditure equation, are reported in Table 2. We define "virtuous" the fiscal authority who decide to finance an increase of expenditure either by a decrease in some other type of expenditure or/and by an increase in revenues. In our framework we are able to evaluate whether the fiscal authorities were "virtuous" by looking at the signs of estimated coefficients.

In all European countries the two expenditure aggregates are positively correlated: both γ_1 and γ_3 are significantly positive, i.e. an increase in government wages and transfers occurs together with an increase in the residual spending. At the same time, no contemporaneous response is present in the tax revenue, since ϕ_1 and ϕ_2 are not statistically significant. Hence, it seems that in West Germany, France and Italy fiscal authorities did not adopted a virtuous behaviour as decisions on the expenditure were not linked with those on taxes and were not compensated by other spending restraints.

A different conclusion holds for the US: a positive shock to government expenditure (especially the residual part) induces an increase in revenues, as ϕ_2 is significantly positive. No significant link exists between the two expenditure decisions in the GR regime.

Amongst the other parameters of the matrix $\boldsymbol{A}$ in (2), it is interesting to consider the coefficient which describes the effect of a change in interest rates on the residual spending equation. Table 2 shows that the reaction of the residual government expenditure to nominal interest rate innovations (parameter $\eta_{gr,r}$) has only a positive sign for Italy (although not significant), thus showing that an increase in the interest rate induces an increase in the residual spending. For all the other countries, the sign is negative (even significantly in the US). As the residual spending contains all the other government expenditures (including investment spending), the positive effect on interest payments might be overcome by the effects on other spending.

6.1 Responses to Government Spending Shocks

In describing the estimated impulse-response functions (IRFs), we show both the effects of the innovation which characterises the regime (i.e. the innovation on

Figure 3: ***France***: Probability Values for the LR Tests of the Fiscal Regimes computed recursively from 1980:1 to 1997:4

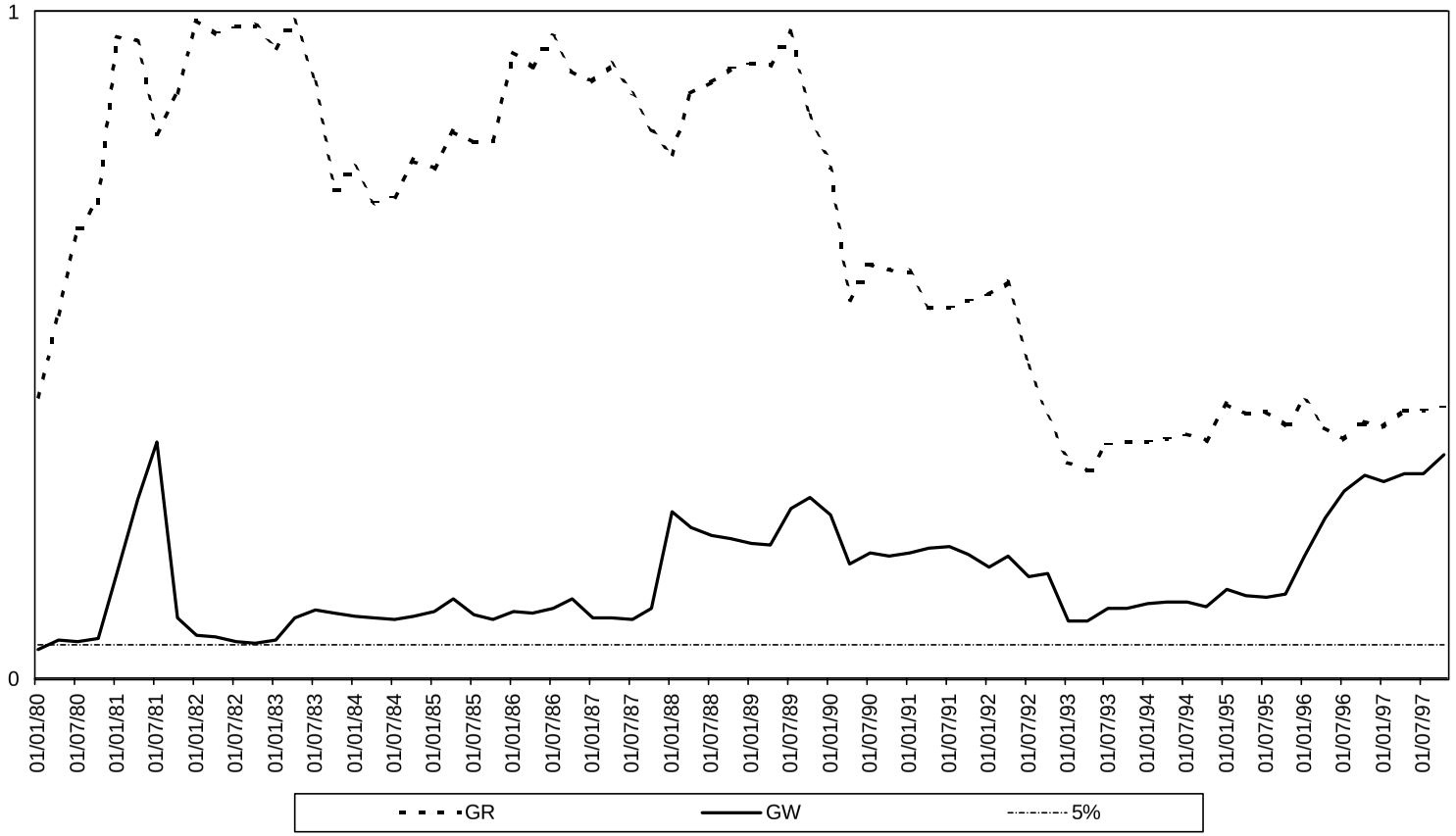


Figure 4: ***West Germany***: Probability Values for the LR Tests of the Fiscal Regimes computed recursively from 1980:1 to 1989:4

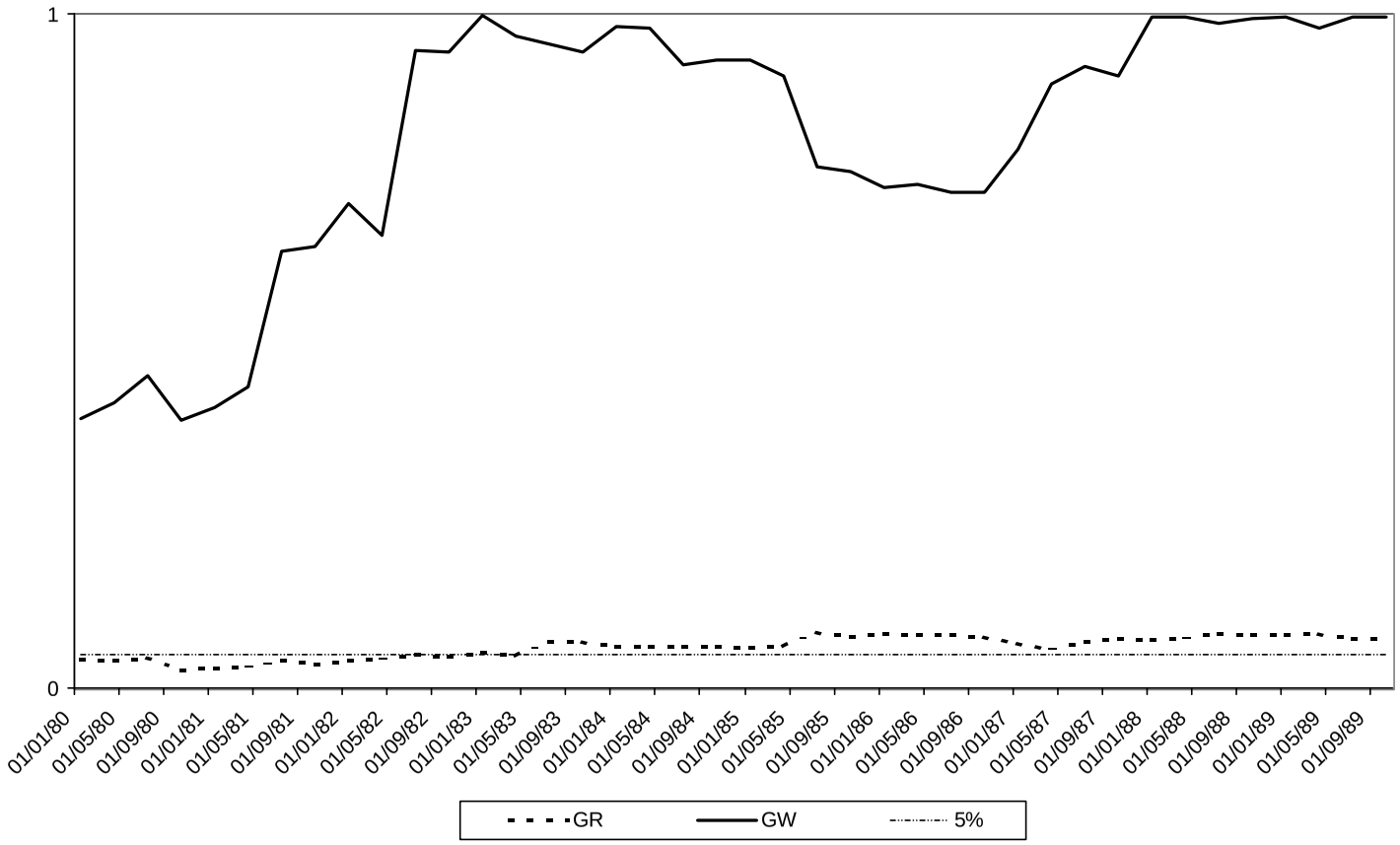


Figure 5: ***Italy***: Probability Values for the LR Tests of the Fiscal Regimes computed recursively from 1980:1 to 1997:4

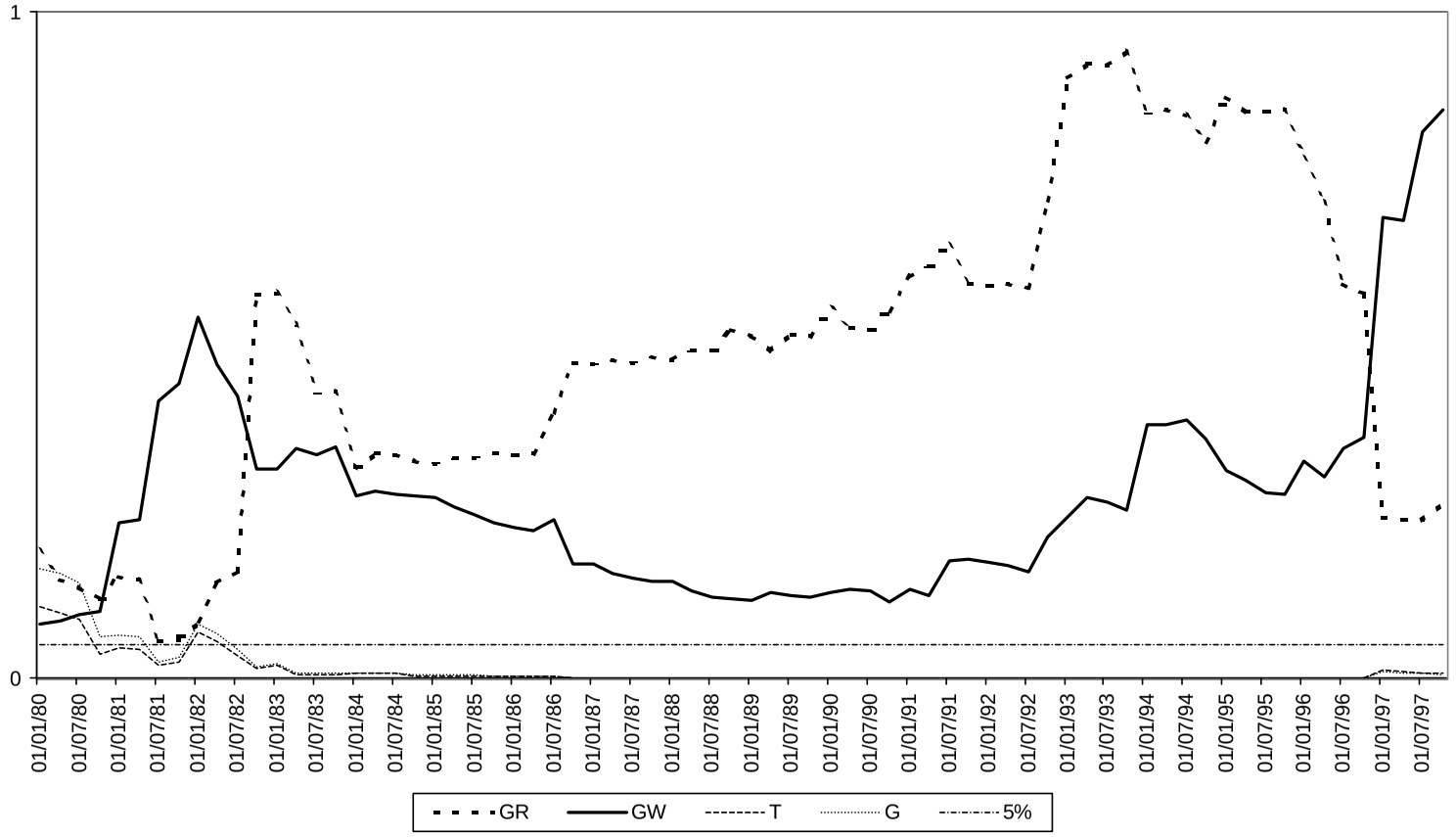


Figure 6: ***USA***: Probability Values for the LR Tests of the Fiscal Regimes computed recursively from 1980:1 to 1997:4

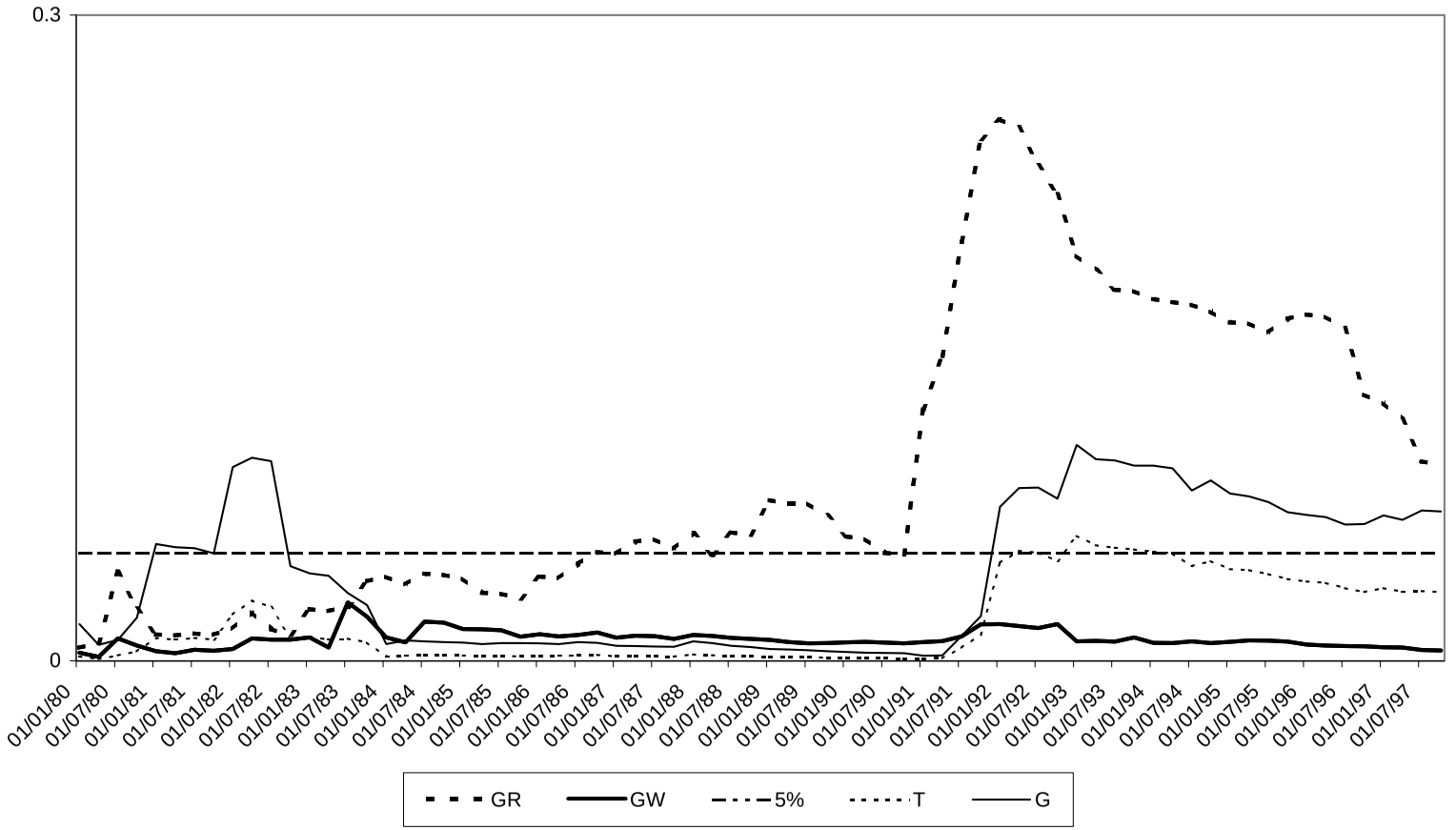


Table 2: Parameter Estimates (boldface=significant at 5%; italics=10%)

Parameters	*France*		*Germany*		*Italy*		*USA*	
	Reg. GR	*Reg. GW*	*Reg. GR*	*Reg. GW*	*Reg. GR*	*Reg. GW*	*Reg. G*	*Reg. GR*
γ_1	**0.0052**	–	**0.011**	–	**0.0026**	–	–	*0.0015*
γ_3	–	**0.0052**	–	**0.013**	–	**0.0029**	–	–
ϕ_1	–	0.0005	–	0.003	–	-0.0015	*-0.0019*	–
ϕ_2	-0.0009	–	0.002	–	-0.0006	–	**0.0032**	**0.0030**
$\eta_{gr,r}$	-0.0025		-0.005		0.0021		**-0.0065**	

government expenditure on wages and transfers in the GW regime) on the other fiscal variables and output (part (a) of each figure) and the effect of the innovation of the "other" (with respect to the fiscal regime considered) expenditure item on the own expenditure and output (part (b) of each figure). All the simulations presented in this section refer to an initial negative shock on public expenditure; the bands around the IRFs refer to a 95 per cent confidence interval. In order to compare the macroeconomic effects of fiscal shocks among countries, fiscal shocks have been normalised by computing the responses to a 1 per cent decrease in the expenditure-to-GDP ratio.[26]

Fig. 7–8 refer to France and show the effects of fiscal policy innovations on the expenditure side to the other fiscal variables and output.[27] In the GW regime, shocks to government spending on wages and transfers have the strongest and most significant effect on output: after an initial positive reaction, output decreases by more than 0.05 per cent quarterly as a response to a 1 per cent decrease in the government wages and transfers-to-GDP ratio.[28] In the GR regime the response of output to both kind of expenditure shocks is scarcely significant. However, under the GR regime the decrease in output occurs together with a decrease in the price level below trend (not reported in our figures): this co-movement of prices and output (which is found also for other countries) may signal that the system is moving along the AS curve and that we are correctly identifying AD shocks.

For West Germany, the effect of a shock in government spending on wages and transfers on output is not significant in any of the two regimes GW and GR (Fig. 9 and 10), while the negative effect of a shock that decreases the residual spending as a share of GDP is significant only for few quarters. Moreover, in the latter case the maximum impact on output of a 1 per cent decrease in the government expenditure ratio never goes beyond the 0.04 per cent quarterly. The exercise for West Germany seems to signal that government expenditure does not play a very important role for the dynamic of output in this country.

In Italy government wages and transfers expenditure has the strongest effect on output under both the accepted regimes (GW and GR). Both Fig. 11 and 12 show a similar reaction of output, which permanently decreases by 0.1 per cent. On the contrary, an initial negative shock on residual spending lowers output significantly only in the first two quarters under both fiscal regimes.

Finally, in the US we find a similar pattern as in Italy (Fig. 13–14): both in the G and in the GR regimes, an initial negative shock on GW has a significantly negative effect on output starting from the fourth quarter. the maximum decrease of output is around 0.1 per cent after 13 quarters. A shock to the residual spending item produces only an initial (significant) negative impact on output.

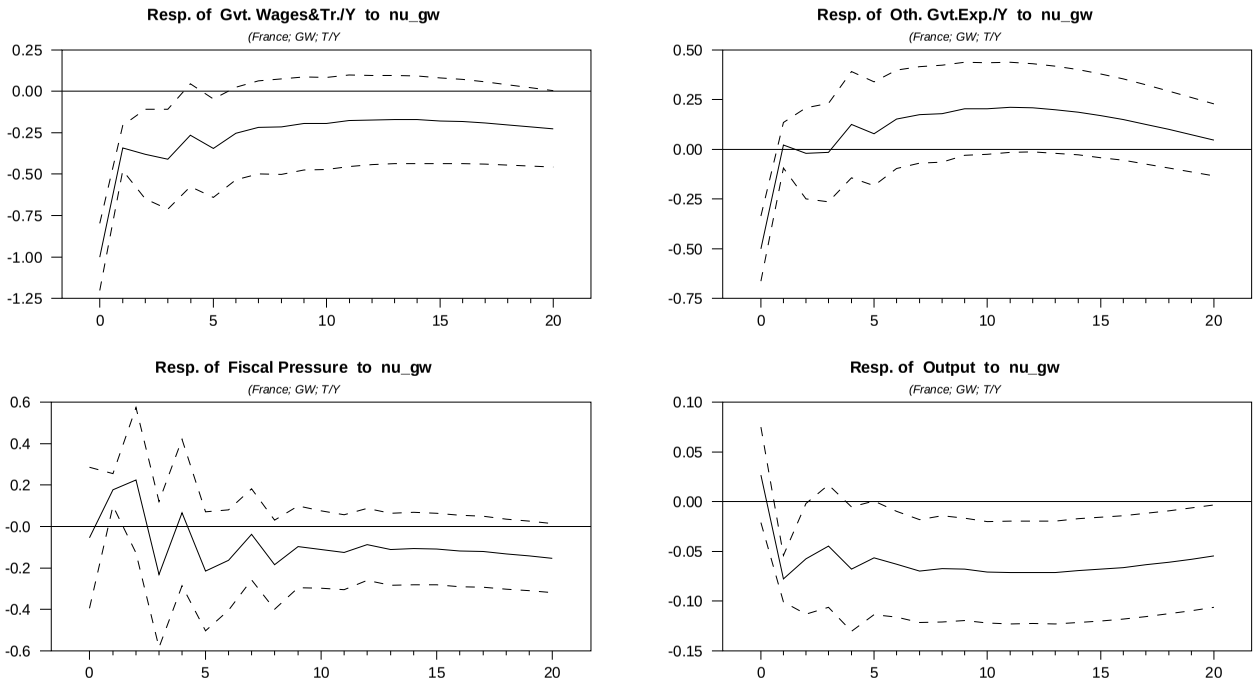
These impulse response functions are characterised by a weak effect of government spending on GDP. This is also confirmed by Perotti (2002) who, in addition, finds significant responses to spending shocks only in Germany and the US.

[26]Blanchard and Perotti (2002) show the dollar-to-dollar reaction of output to government expenditure and taxes. Here, we decided to consider a different normalization for the shocks to highlight the effect on output growth and to consider the ratios to GDP of fiscal variables.

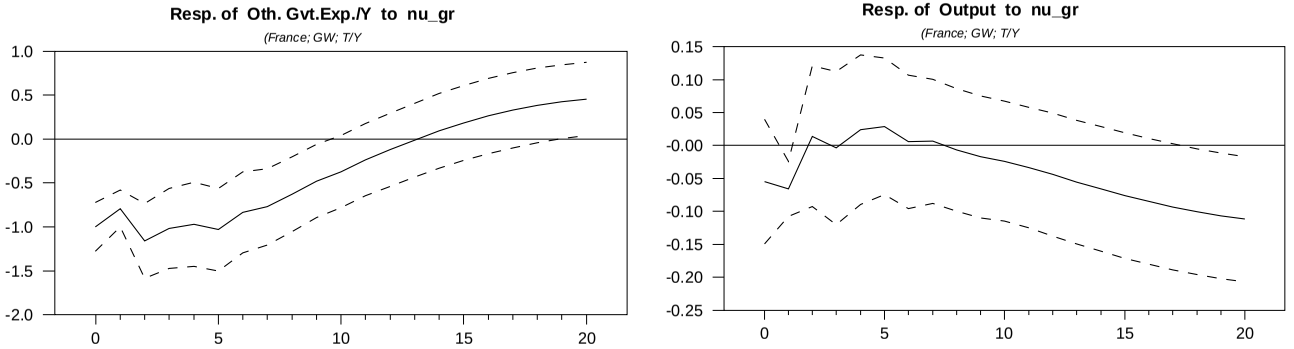
[27]The responses to all the other variables (i.e. price level and interest rate) are available upon request.

[28]The response of output to shocks in other expenditure is scarcely significant.

Figure 7: ***France***: Impulse Responses in the Regime GW

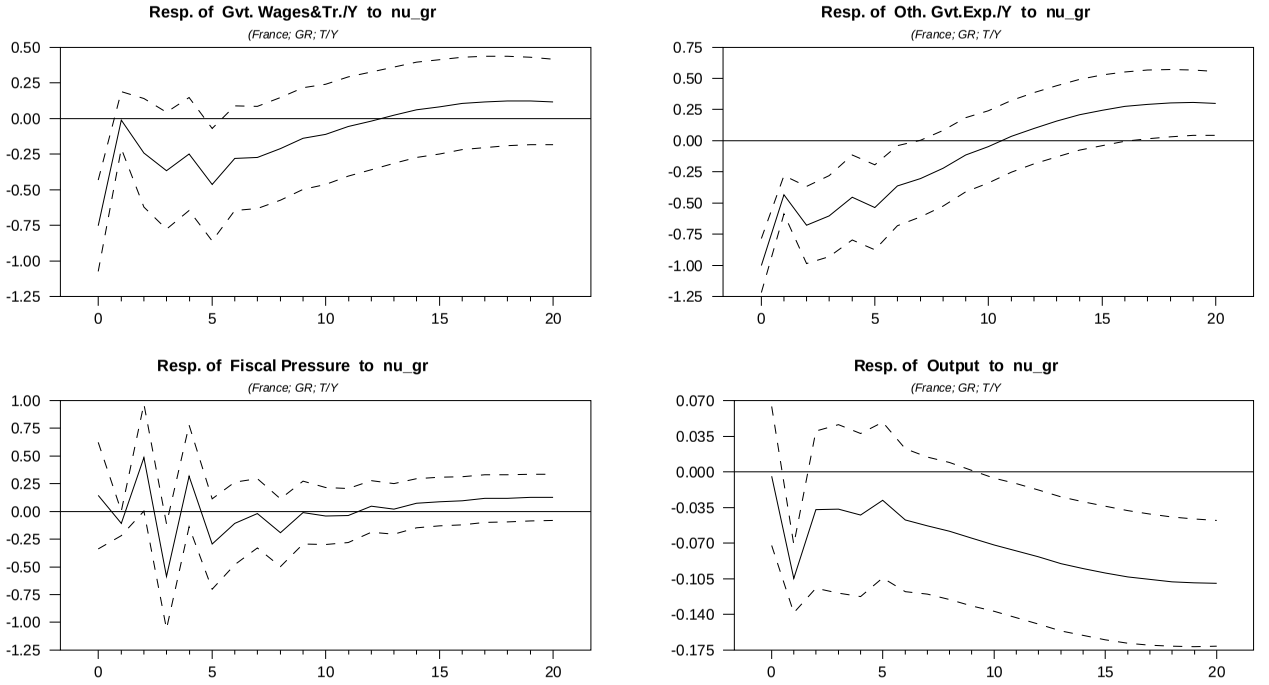


(a) *Responses to a 1% decrease in (Govt.Wages & Transf./Y)*

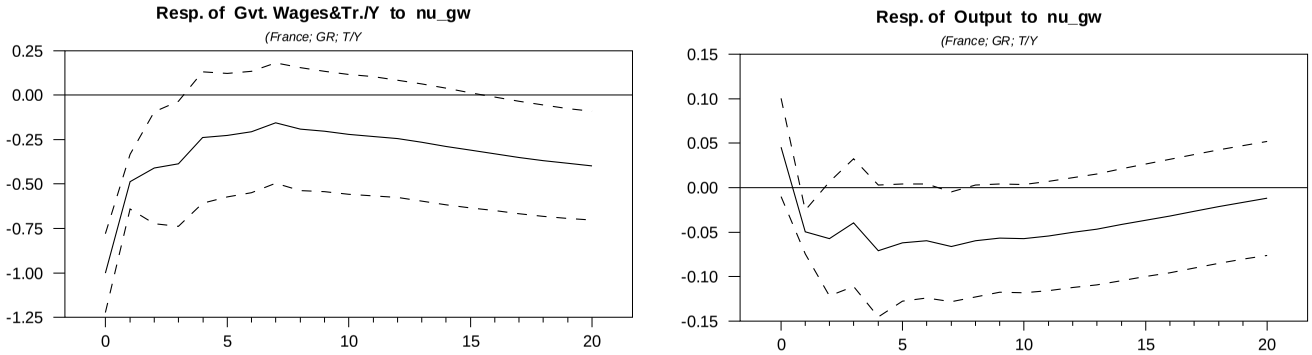


(b) *Responses to a 1% decrease in (Residual Govt.Exp./Y)*

Figure 8: ***France***: Impulse Responses in the Regime GR

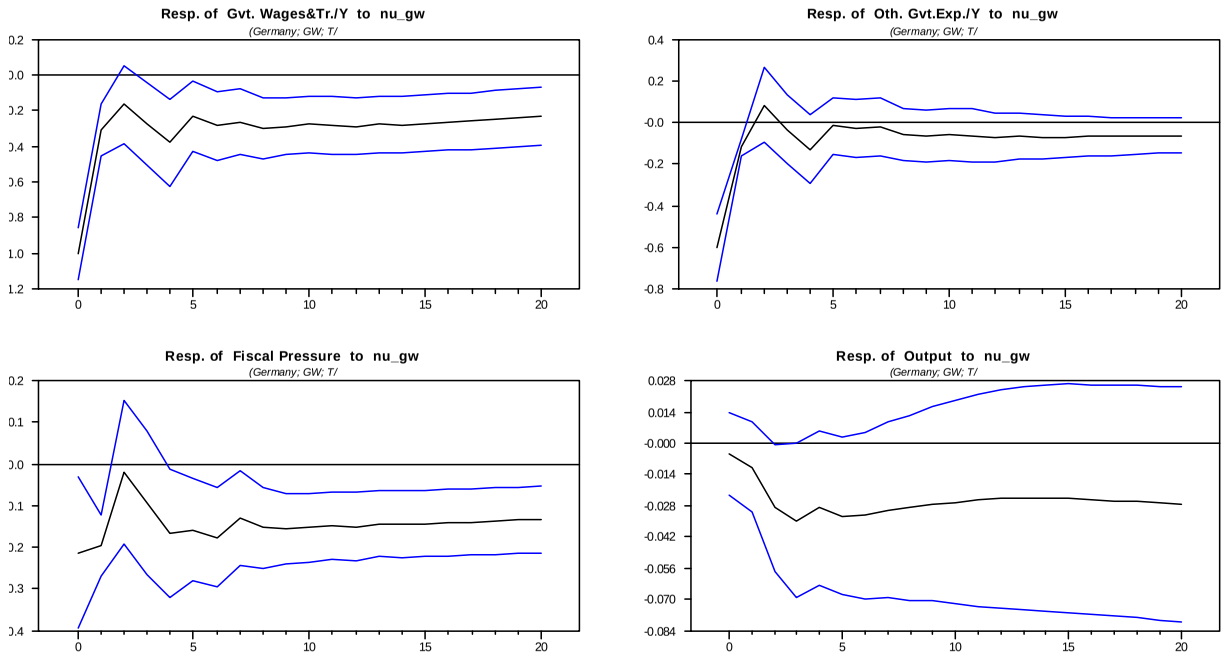


(a) *Responses to a 1% decrease in (Residual Govt.Exp./Y)*

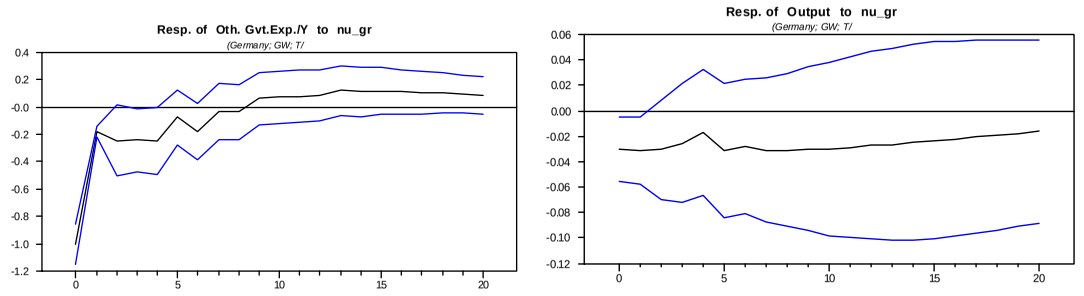


(b) *Responses to a 1% decrease in (Govt. Wages & Transf./Y)*

Figure 9: ***West Germany***: Impulse Responses in the Regime GW

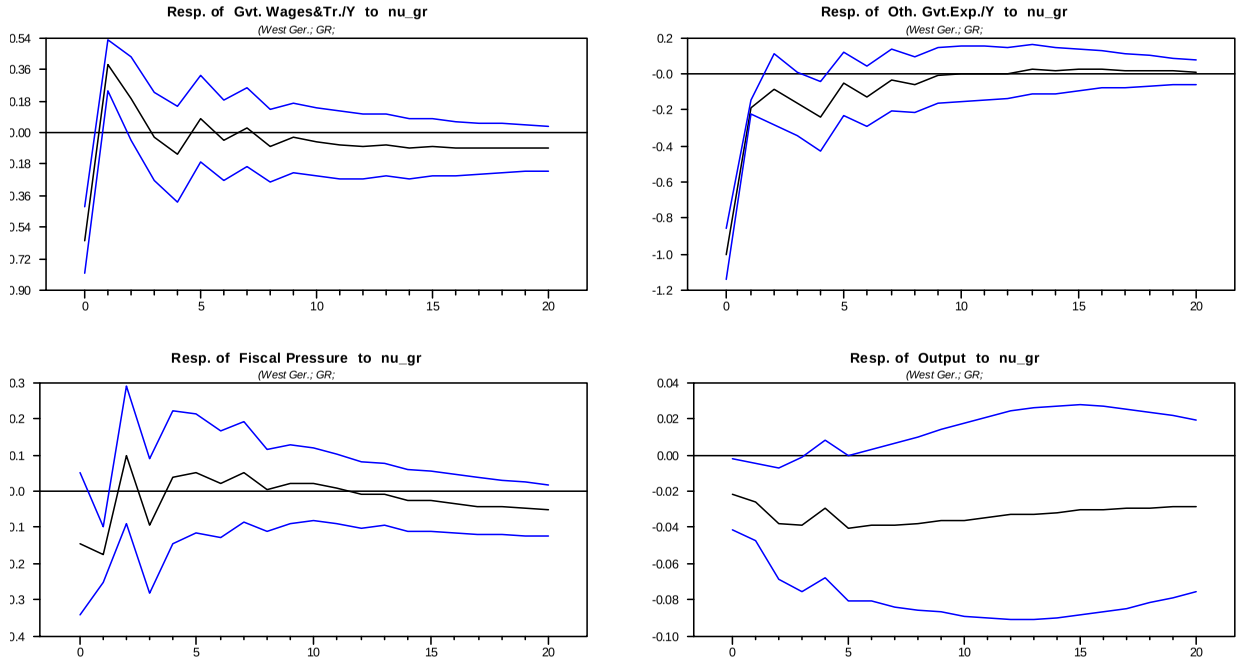


(a) *Responses to a 1% decrease in (Govt.Wages & Transf./Y)*

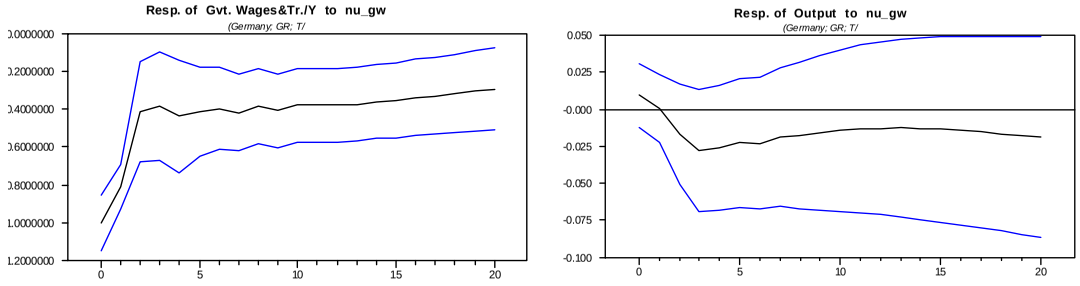


(b) *Responses to a 1% decrease in (Residual Govt.Exp./Y)*

Figure 10: ***West Germany***: Impulse Responses in the Regime GR

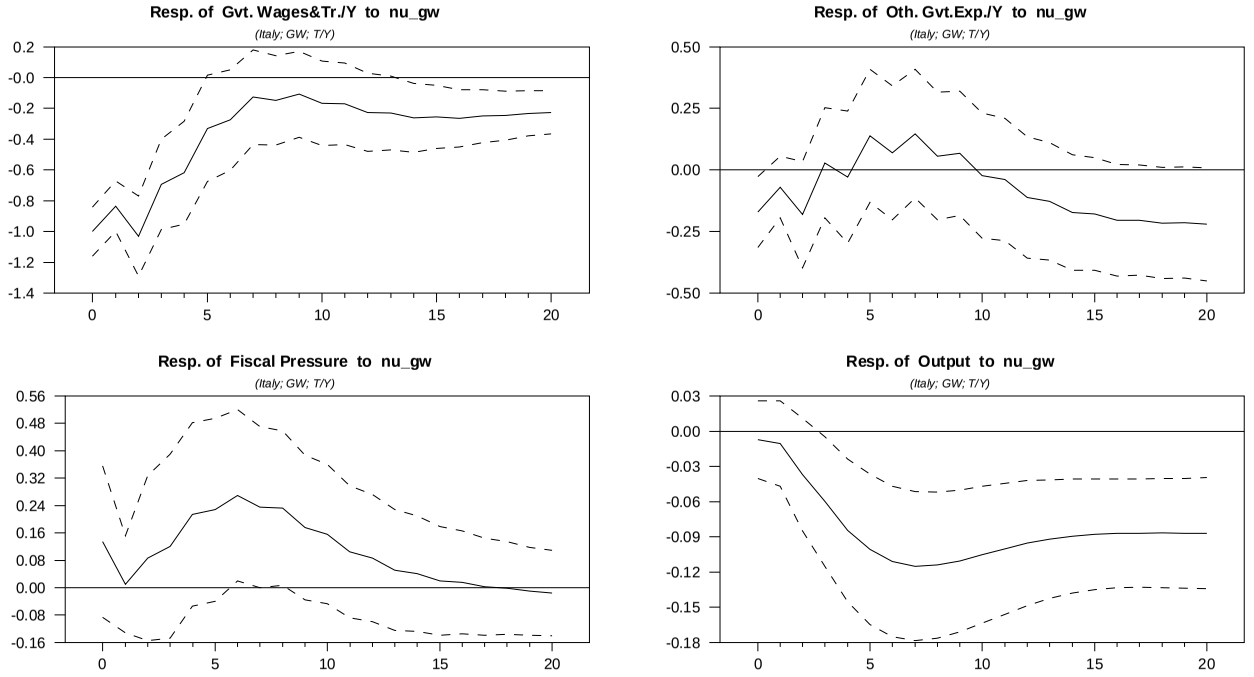


(a) *Responses to a 1% decrease in (Residual Govt.Exp./Y)*

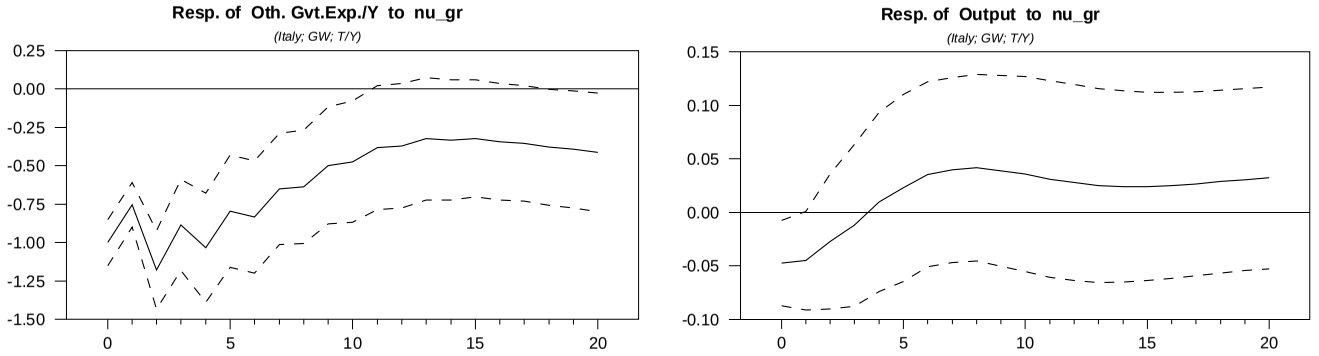


(b) *Responses to a 1% decrease in (Govt.Wages & Transf./Y)*

Figure 11: ***Italy***: Impulse Responses in the Regime GW

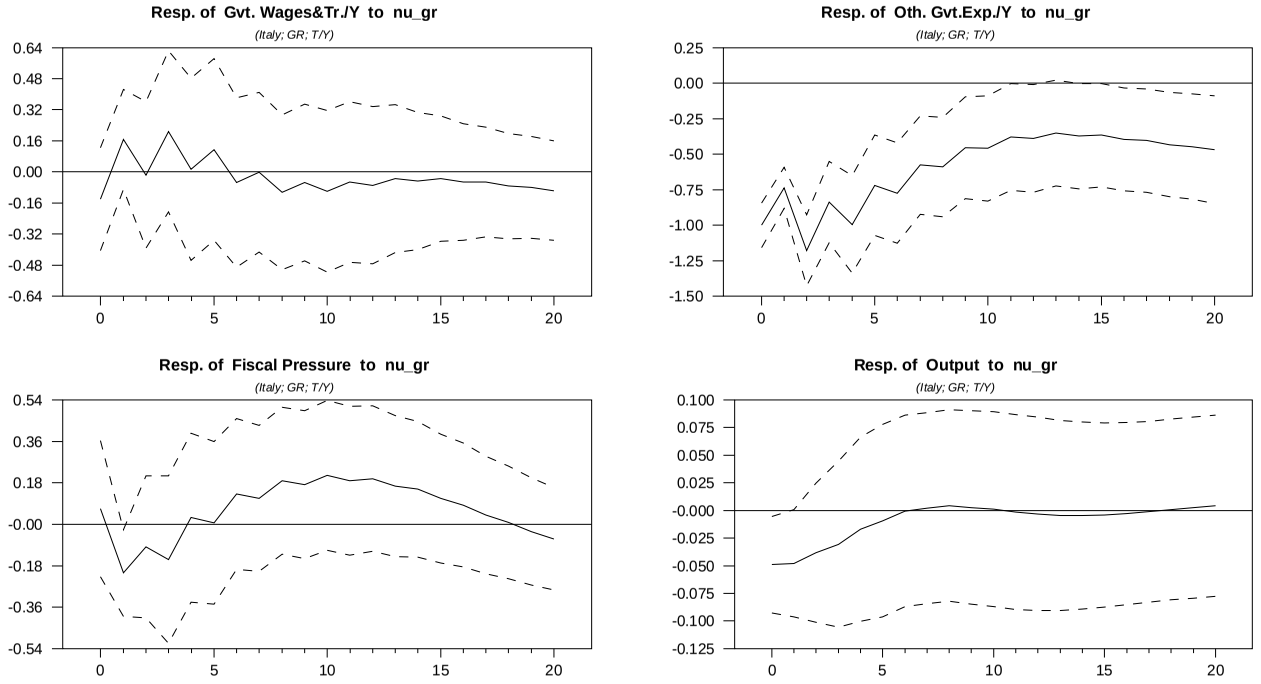


(a) *Responses to a 1% decrease in (Govt.Wages & Transf./Y)*

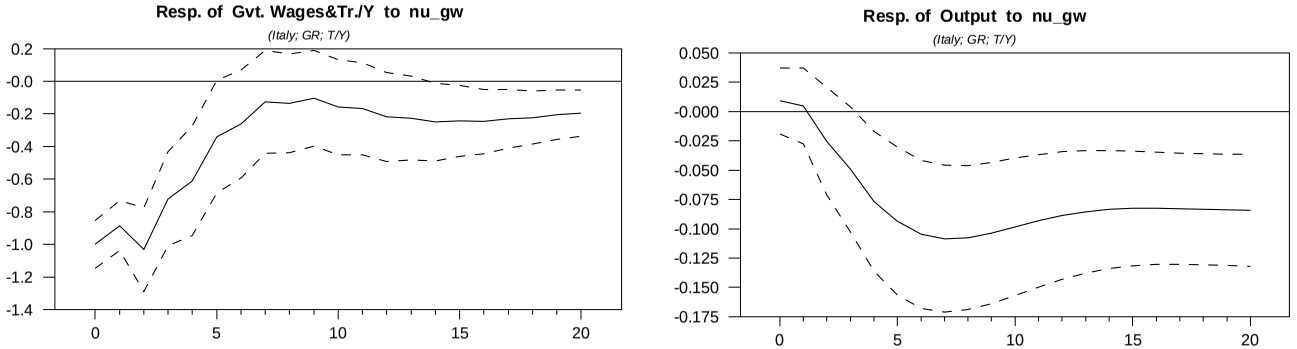


(b) *Responses to a 1% decrease in (Residual Govt.Exp./Y)*

Figure 12: ***Italy***: Impulse Responses in the Regime GR

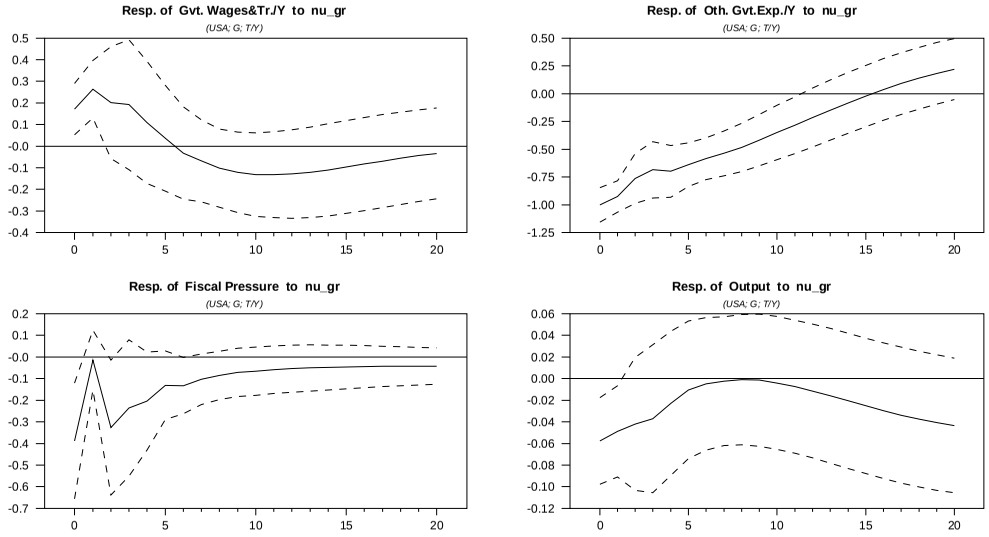


(a) *Responses to a 1% decrease in (Residual Govt.Exp./Y)*

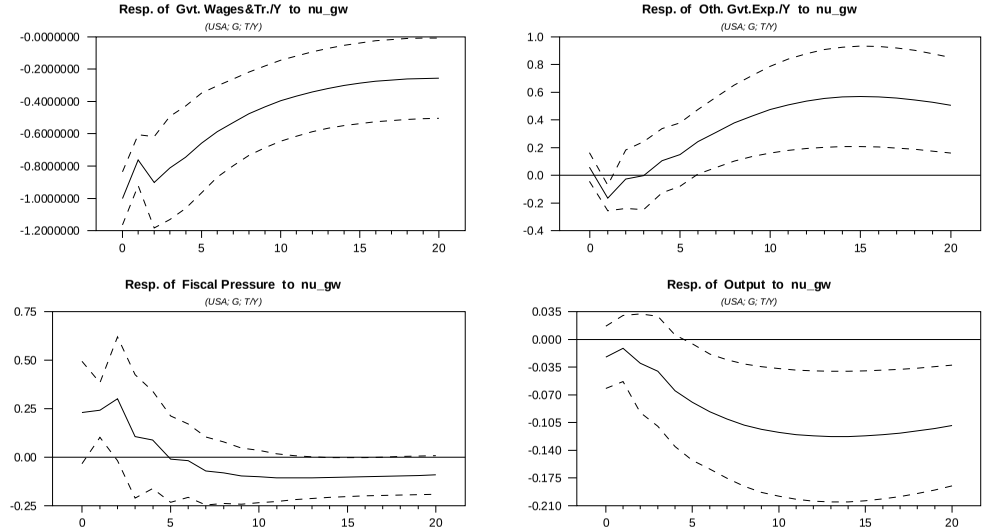


(b) *Responses to a 1% decrease in (Govt.Wages & Transf./Y)*

Figure 13: ***USA***: Impulse Responses in the Regime G

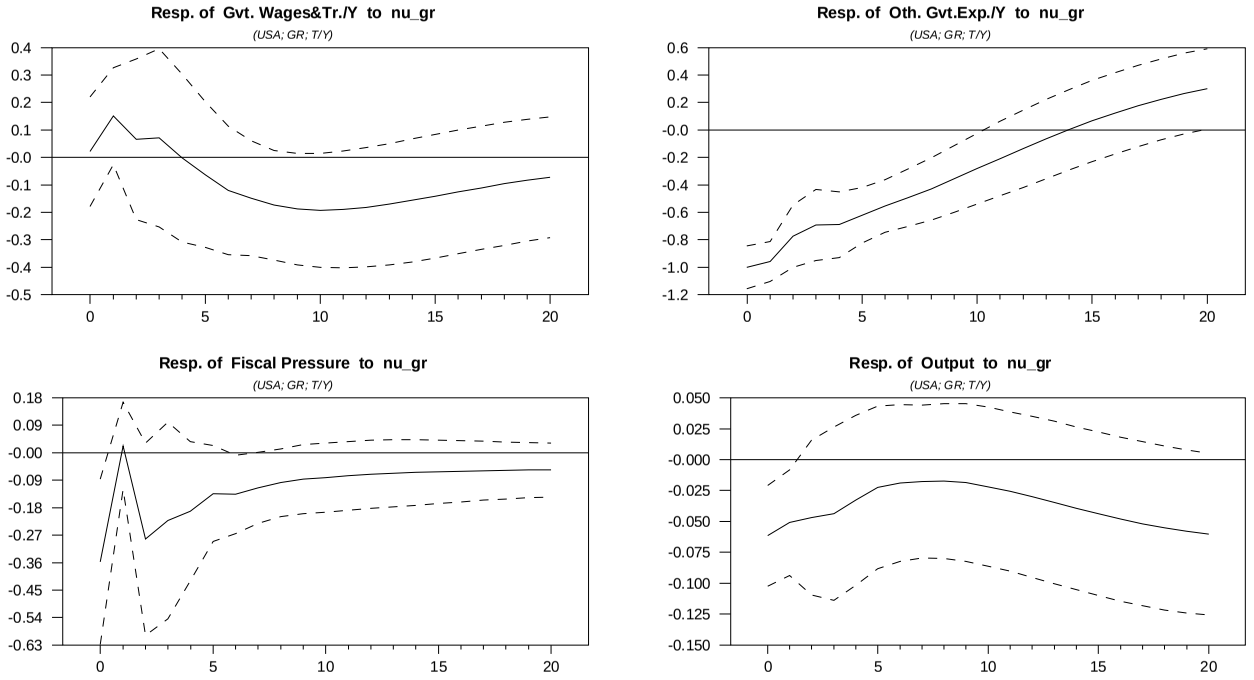


(a) *Responses to a 1% decrease in (Residual Govt.Exp./Y)*

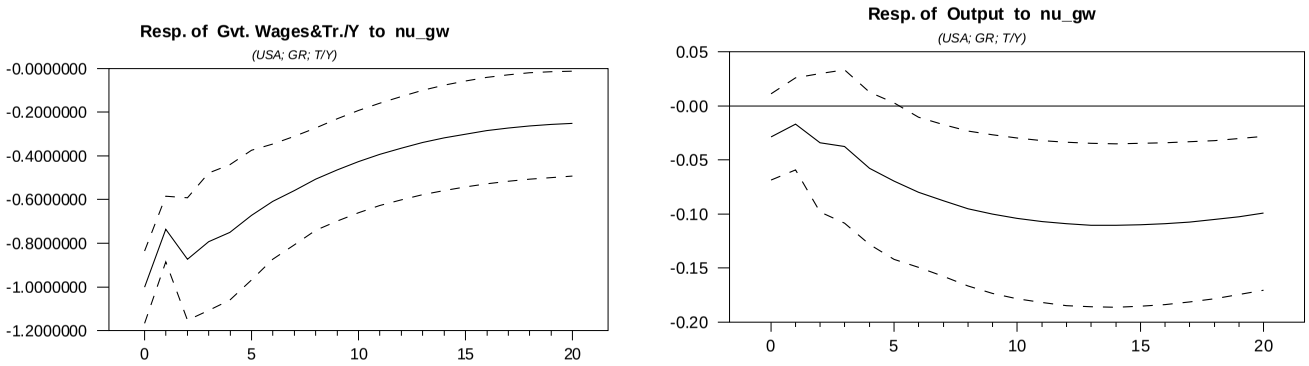


(b) *Responses to a 1% decrease in (Govt.Wages & Transf./Y)*

Figure 14: ***USA***: Impulse Responses in the Regime GR



(a) *Responses to a 1% decrease in (Residual Govt.Exp./Y)*



(b) *Responses to a 1% decrease in (Govt.Wages & Transf./Y)*

6.2 Responses to Tax Shocks

As mentioned above, we designed two different ways in which revenues can react to output: they can contemporaneously react one-to-one to output changes or no contemporaneous reaction can be assumed. The simulation exercises described so far considered the first case. When analysing the effects of tax shocks on output, we refer to both cases in order to obtain the two case limits.

Fig. 15 – 18 show the effects of a tax shock that reduces the revenue ratio by 1 per cent point. The two panels of each figure show the two extreme cases: i.e. when tax revenues fully react contemporaneously or do not react immediately at all.[29]

In all countries the stimulating effects on GDP are stronger when revenues react one-to-one to output than in the opposite case. In the first case, in all countries but France we observe an increase in output, even though with different characteristics. In West Germany and Italy, the increase in output is immediate, although it remains significant only for few quarters. The maximum magnitude of the increase is 0.04 per cent in West Germany and 0.07 per cent in Italy on a quarterly base. In France the output never reacts significantly to a revenue shock. In the US, the decrease in taxes has a surprisingly negative effect on output on impact that turns out to be positive, although not significant, after one quarter. This latter result may suggest that a further reduction in revenues in a country where fiscal pressure is already relatively low, like the US, may not induce a positive effect on output. When we assume a null contemporaneous reaction of revenues to output, in two cases (France and US) we notice a negative effect of a decrease in taxation to GDP, while in the other two cases the responses are not statistically significant.

6.3 Forecast Error Variance Decomposition

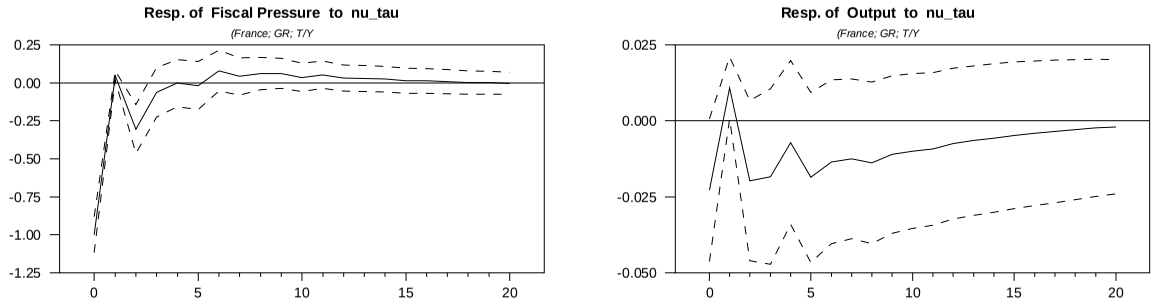
In order to measure the quantitative relevance of the fiscal shocks in the dynamics of output, in this section we briefly analyse the forecast error variance decomposition of output. The Italian case is the only one where the contributions of fiscal shocks in the explanation of variability of output are statistically significant at the 95 per cent confidence level. Fig. 19 shows that in Italy the shocks to government wages and transfers and to fiscal pressure are the most important in explaining the variability of output. In particular, shocks to public wages and transfers are more relevant in the medium-long run, whereas shocks to fiscal pressure are relevant in the short run. The structural shock to government wages and transfers, ν^w, is significant starting from the ninth step ahead and is able to explain up to 26 per cent of the forecast error variance of output (at 21 step ahead). Shocks to fiscal pressure (ν^τ) are instead significant up to the fourth step ahead explaining between 18 per cent (first step) and 10 per cent (fourth step) of the output variability.

A similar picture has been found for France, where the role of fiscal pressure, although very small compared to the case of Italy, is the most relevant in the short run, and shocks to public wages and transfers explain more than 10% of the forecasts error variance decomposition of output in the medium/long term.

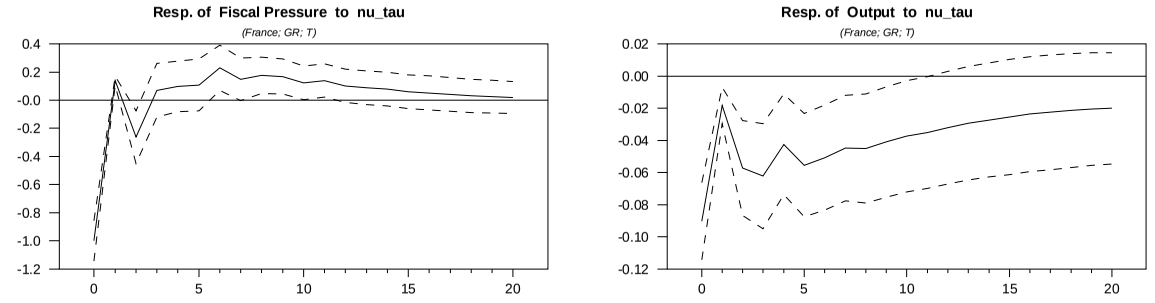
In West Germany and US, the shocks to the residual spending are the most

[29]The figures show the impact on output of a shock in taxation in only one of the accepted regimes for each country. The responses for the omitted regimes are very similar.

Figure 15: ***France***: Impulse Response Functions of Output to Innovations in the Fiscal Pressure



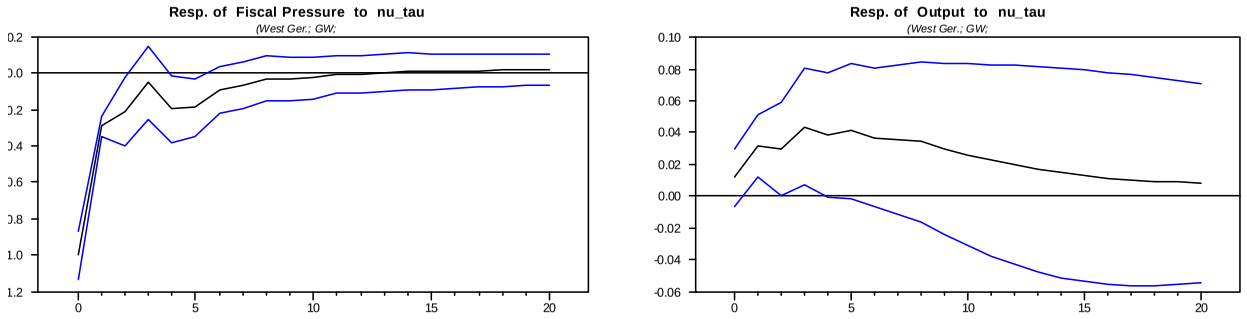
(a) *Resp. to a 1% decrease in (T/Y) – One-to-one contemporaneous reaction of T to Y*



(b) *Resp. to a 1% decrease in (T/Y) – No contemporaneous reaction of T to Y*

Figure 16: ***West Germany***: Impulse Response Functions of Output to Innovations in the Fiscal Pressure

(a) *Resp. to a 1% decrease in (T/Y) – One-to-one contemporaneous reaction of T to Y*



(b) *Resp. to a 1% decrease in (T/Y) – No contemporaneous reaction of T to Y*

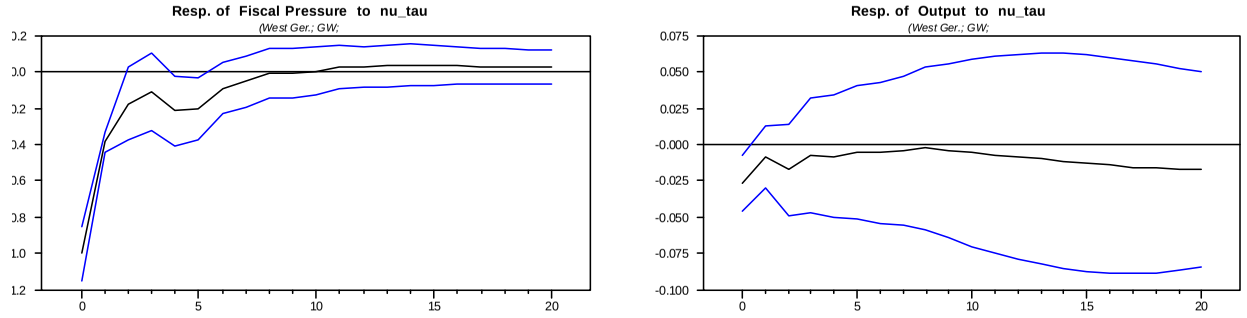
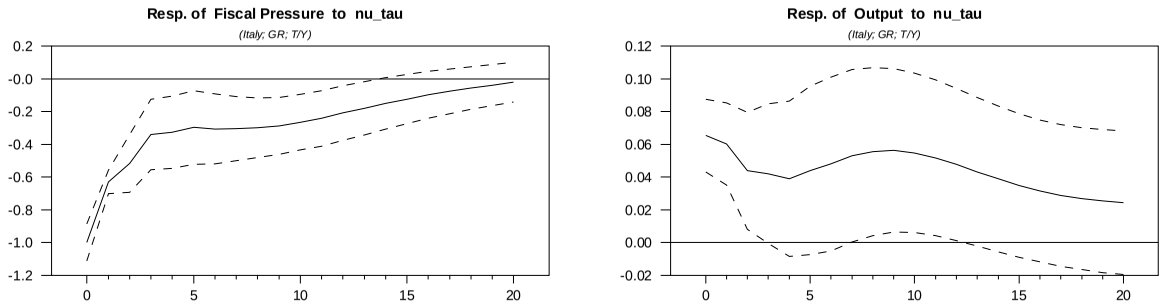
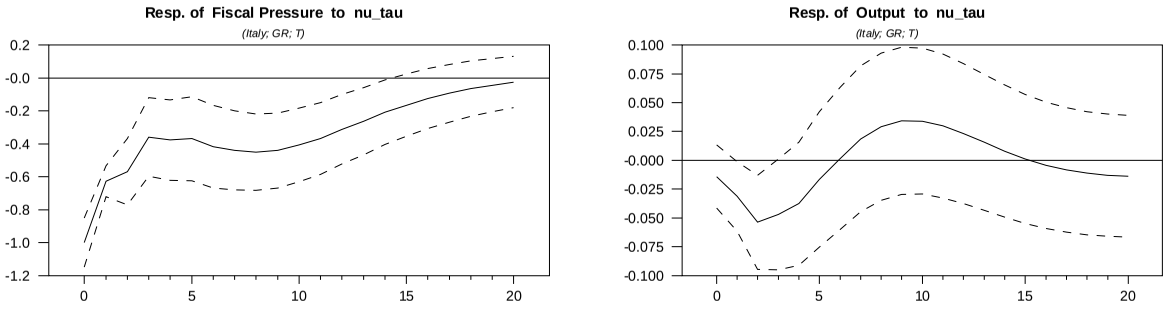


Figure 17: ***Italy***: Impulse Response Functions of Output to Innovations in the Fiscal Pressure

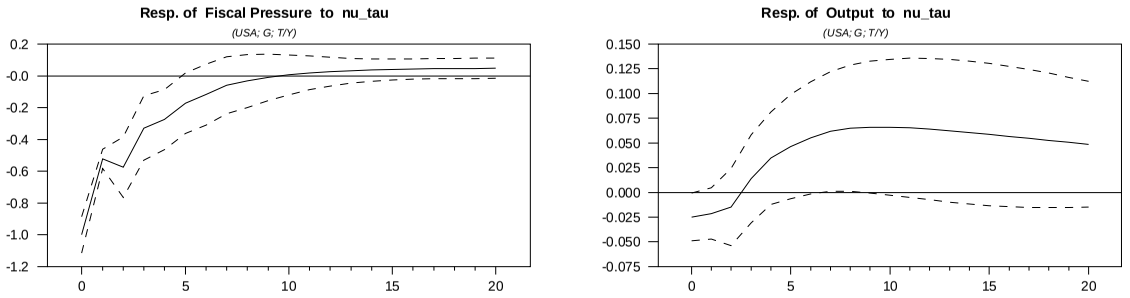


(a) *Resp. to a 1% decrease in (T/Y) – One-to-one contemporaneous reaction of T to Y*

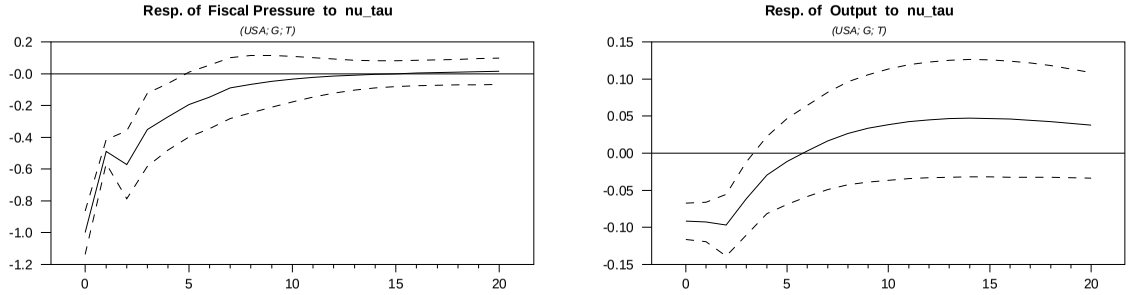


(b) *Resp. to a 1% decrease in (T/Y) – No contemporaneous reaction of T to Y*

Figure 18: ***USA***: Impulse Response Functions of Output to Innovations in the Fiscal Pressure



(a) *Resp. to a 1% decrease in (T/Y) – One-to-one contemporaneous reaction of T to Y*



(b) *Resp. to a 1% decrease in (T/Y) – No contemporaneous reaction of T to Y*

important in the short run, explaining around 5-7% of output variability. In the long period, in both cases, shocks to public wages and transfers and to taxation explain from 10% (in West Germany) to more than 20% (in US) of output variability.

7 Conclusions

Different ways of conducting fiscal policy are here defined as *fiscal policy regimes*. In this paper we proposed an approach to test for these regimes. By distinguishing between different budgetary categories, we wanted to test whether some fiscal decisions preceded others. In order to do so, we designed the structural VAR in a way to obtain an *overidentified* structural form so that each fiscal regime could be tested.

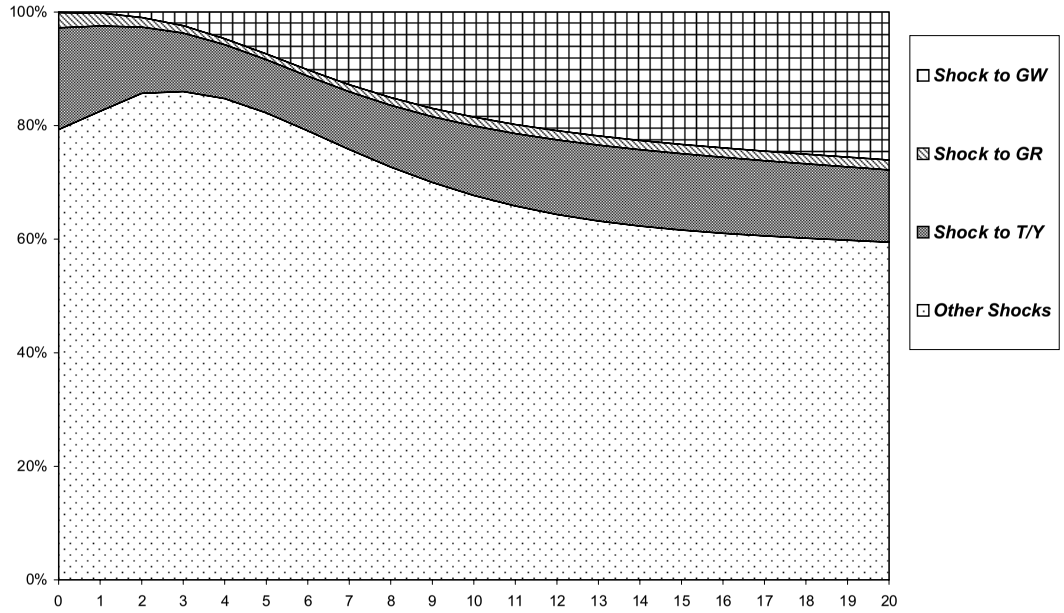
In West Germany, France and Italy, the so-called GW regime, where government expenditure on wages and transfers is decided before the other fiscal variables, was not rejected by data. However, the GR regime, that targets the residual spending was also accepted, thus indicating that both fiscal shocks are relevant and generally precede tax decisions. A clear-cut distinction between spending and taxation decisions was not possible, instead, for the US.

Consistently with the findings of Blanchard and Perotti (2002) and Perotti (2002), all kinds of fiscal shocks (both on expenditure and on taxation) identified within the selected fiscal regimes produce keynesian results on output. In contrast with Alesina and Perotti (1995, 1997), we find that structural innovations in government spending for wages and transfers have the strongest positive effect on output in Italy, the US and France (although the GW regime is rejected in the US).

In all the simulations the maximum impact of the fiscal policy shocks is limited: a 1 per cent change in government spending on GDP or taxes/GDP rarely has an impact on output larger than 0.1 per cent in a quarter. In no country does the shock to tax revenues have a long-run impact. The finding of low multipliers is in line with Perotti's (2002) analysis.

In terms of output dynamics, the results are country-specific. In Italy, the only country where the results are statistically significant, shocks to government expenditure on wages and transfers are able to explain more than one-fourth of the total variance in the forecast error of output in the long run. An important role is also assigned to shocks to revenues (between 10 and 18 per cent), especially in the short run. A similar picture is found for France, while in West Germany and US shocks to the residual spending are the most relevant in explaining the variability of output in the short run.

Figure 19: ***Italy***: Forecast Error Variance Decomposition of Output (Regime GW)



Data Appendix

The data come from the OECD Statistical Compendium and the IMF database. Data on fiscal variables refer to the general government. Some of the available data are at quarterly frequency but, as some other budget items are released only at biannual frequency, quarterly series for them have been derived by distributing the biannual values among the quarters following the pattern of a related and available quarterly series. In what follows, sources, codes and definitions of the variables are presented.

OECD Business Sectoral Database:

CGW = Government Consumption, Wages
GDP = Gross Domestic Product (Market Prices), Value
GDPV = Gross Domestic Product (Market Prices), Volume
IG = Fixed Investment, Government
PGDP = Deflator for GDP at Market Prices, Base year=100
TIND = Indirect Taxes
TSUB = Subsidies
TYB = Direct Taxes, Business

OECD Economic Outlook:

CGNW = Government Consumption, Excluding Wages
SSPG = Social Benefits Paid by Government
SSRG = Social Security Contributions Received by Government
TRPG = Other Current Transfers Paid by Government
TRRG = Other Current Transfers Received by Government
TY = Total Direct Taxes
YPEPG = Property Income Paid by Government
YPERG = Property Income Received by Government
YPG = Current Disbursement, Government
YRG = Current Receipts, Government

OECD Main Economic Indicators:

126207D = Call Money Rate, Germany
426227D = US Dollar in London 3-Month, US

IMF International Financial Statistics:

line 61b = Government Bond Yield, Medium-Term, Italy
line 60b = Money Market Rate, France

Definitions of the variables used in the application:

- Price: PGDP
- Interest rates: 126207D, 426227D, 61b, 60b
- Government spending on wages and transfers: GW=CGW+(TSUB+SSPG+TRPG)

(Transfers (TSUB+SSPG+TRPG) smoothed using total expenditure)
Total expenditure: YPG+IG = CGW+CGNW+TSUB+SSPG+TRPG+YPEPG+IG
(Smoothed using CGW and TSUB)
- Residual spending: GR=YPG+IG-GW
- Current revenues: YRG = YPERG+TIND+TY+SSRG+TRRG
(Smoothed using TIND and TYB)
- Real GDP: GDPV

Countries and samples used for the estimation

West	1961:1 - 1989:4
France	1963:1 - 1997:4
Italy	1960:1 - 1997:4
US	1961:1 - 1997:4

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