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Some stylized facts on non-systematic fiscal policy in the Euro area

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Abstract

We derive a set of stylized facts on the effects of non-systematic fiscal policy in the four largest countries of the Euro area. We find relevant differences across countries in the effects of non-systematic fiscal policy, and substantial uncertainty about the size of these effects. Yet, in general, expenditure shocks are usually rather ineffective in increasing output growth, and can require deficit financing. Tax policies also appear to have minor effects on output, but usually tax increases do not have negative effects. Disaggregating expenditures and receipts yields some interesting results, in particular increases in government consumption decrease output in all countries, while social benefits can increase it.
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1. Introduction

The increased centralization of monetary policy across the world, into currency boards or through dollarization, or by the pooling of monetary policy as in the Euro area, has reawakened interest in fiscal policy and in the role of fiscal policy in stimulating economic activity.

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The systematic part of fiscal policy in the form of automatic stabilizers or, more generally, plans for government expenditure and taxes and the implications for future taxation should largely be internalized in saving and investment decisions. The non-systematic part of fiscal policy, or fiscal shocks, can be very relevant for the analysis of short term fluctuations. It is also important as a policy instrument at the level of individual countries when monetary policy is no longer available, as in the case of the members of the Euro area. Yet, the effects of fiscal shocks has not received much attention in the literature on the Euro area so far.

From an econometric point of view, fiscal shocks can be considered as the residuals of estimated fiscal rules (e.g. Favero, 2002). As an alternative, it is possible to use VARs that include fiscal variables and macroeconomic variables, where the equations for the fiscal variables can be thought of as the reduced form of the fiscal rules so that their residuals, after a proper structuralization, can be considered as fiscal shocks. Both methods have been applied to recover monetary shocks, usually leading to very similar results (e.g. Favero et al., 2005). However, the definition of fiscal shocks is more problematic than in the monetary case, as discussed at length below.

Having defined fiscal shocks, we provide a set of stylized facts on their effects in the four largest countries of the Euro area. The stylized facts are then used to shed light on the effectiveness of fiscal policy shocks in stabilizing the economies and on the interaction of fiscal and monetary policy.

Differences emerge across countries in the effects of non-systematic fiscal policy, and substantial uncertainty about the size of these effects. In general, expenditure shocks are found to be rather ineffective in increasing output, and, since they are not accompanied by tax increases that balance the budget, they can require deficit financing. Tax policies also appear to have minor effects on output, and, in general, tax increases do not lead to significant output losses.

A more disaggregate analysis reveals some differences in the effects of different components of taxes and expenditures, such as government consumption and social benefits. In particular, the former tends to have a negative effect on output, the latter a positive one, but in both cases there is substantial uncertainty around the point estimates. As far as receipts are concerned, higher social contributions have the biggest effect in terms of output loss, and indirect taxes in terms of increased inflation, but, in general, the effects remain not statistically significant.

The paper is organized as follows: Section 2 provides a brief review of the recent related literature. Section 3 describes the dataset and develops the econometric methodology. Section 4 evaluates the effects of non-systematic fiscal policy on the output gap, inflation, and the interest rate. Section 5 considers the effects of disaggregated receipts and disbursements. Section 6 concludes.

2. Literature review

Few attempts have been made to derive stylized facts on the effects of non-systematic fiscal policy in the Euro area using small-scale models, although similar analyses are available for monetary policy (see e.g. Favero and Marcellino, 2001). There are also a few studies of the effects of fiscal policy shocks for the US (e.g. Blanchard and Perotti, 2002; Fatas and Mihov, 2001a,b or Mountford and Uhlig, 2002). Most of the available evidence is based on simulations from large-scale structural models, which differ substantially on the extent of the effects of fiscal policy, mainly because of different hypotheses on the percentage of financially constrained consumers in the economy.

Two recent attempts to bridge the gap are Favero (2002) and Perotti (2002). The former develops a small-scale structural model, and dynamically simulates it by setting to zero the fiscal shocks in order to compare the behavior of the output gap and inflation with the benchmark case where the shocks are not set to zero. The difference measures the effects of non-systematic fiscal policy. Perotti (2002) exploits and extends the methodology in Blanchard and Perotti (2002), which is based on the computation of dynamic responses to fiscal shocks identified using structural VARs. The identification of fiscal shocks in Blanchard and Perotti (2002) combines external information on the effects of macroeconomic variables on fiscal variables with other restrictions on the contemporaneous effects of the fiscal variables. Even though these papers represent important developments in this field, they can suffer from (different) identification problems, discussed in more detail in the next section. Following Perotti (2002), we adopt a structural VAR approach, but the choice of the variables under analysis allows a better identification of the fiscal shocks, without relying on external information.

It is worth discussing briefly what we mean by fiscal shocks and how we identify them. More details are provided in the next section, and there is no consensus on the appropriate way to identify fiscal shocks in the literature (see e.g. Perotti, 2002). Some authors, such as Burnside et al. (2004) and Ramey and Shapiro (1999) identify deviations of fiscal policy from its normal path by using dummy variables that capture specific episodes that can arguably be treated as exogenous such as the Korean war or the Reagan fiscal expansion. Others identify fiscal shocks starting from the residuals of VARs or simultaneous equation models (e.g. Perotti, 2002; Mountford and Uhlig, 2002; Favero, 2002; Fatas and Mihov, 2001a,b). Within this approach, different procedures are implemented to identify the mapping from the residuals to the shocks. In particular, Mountford and Uhlig (2002) impose sign restrictions on the impulse responses, rather than contemporaneous restrictions as in the other papers mentioned above. Our methodology belongs to this second approach, and we use standard structural VAR identification techniques to stress the point that the main issues are the choice of the variables to be jointly modeled in the VAR and the restrictions imposed.

A few caveats are also in order to interpret correctly the results we obtain in the following sections. First, there is an implicit hypothesis that announced changes in fiscal policy do not have effects before they are implemented. This led Mountford and Uhlig (2002) to use the sign restriction identification scheme, but this can only in part address the issue. If there are announcement effects, in general they will be poorly captured by the VAR.[1] Second, there are several problems with data collection, in particular for Europe. Perotti (2002) carefully collected a quarterly dataset without interpolating yearly values, but Germany is the only country in the Euro area in his data set. Following Favero (2002), we use

[1] Notice that in rational expectation models currently announced future fiscal actions can have effects today. If the model is linear, its reduced form is a VAR since expected variables are proxied by linear combinations of lags of the variables in the model. Therefore, in this case the VAR would provide a proper basis also for the evaluation of announcement effects. Yet, there can be situations where the announced future actions are not linear combinations of past values of the variables under analysis. In this case, the VAR residuals, that form the basis for the structural shocks in the structural VAR literature, cannot be interpreted as unexpected shocks, in the sense that they do not reflect the difference between the future fiscal actions and their expected value.

half-yearly OECD data, which are comparable across countries. We also focus first on aggregate expenditures and receipts and then disaggregate them, to have a measure of the overall effect on non-systematic fiscal policy but also to evaluate whether particular taxes or disbursements have different effects (see e.g. Alesina and Perotti, 1995). Third, we stress that we focus on non-systematic fiscal policy and that the effects of systematic policy could be rather different (see e.g. Baldacci et al., 2001), while Hemming et al. (2002) provide a comprehensive survey on the consequences of the systematic component of fiscal policy. Fourth, we focus on the effects of fiscal variables on key macroeconomic variables, but there can be other welfare effects of fiscal policy, e.g. on income distribution or the quality of life that are not captured. Fifth, both Favero (2002) and Perotti (2002) found substantially different effects after the '70s than before; consequently, we focus on the period 1981–2001 to avoid serious bias in the results. The drawback of this choice is that the limited number of observations is reflected in substantial uncertainty about the estimated effects. This problem is exacerbated by the identification procedure that requires the estimation of a large number of parameters. Finally, it is difficult to capture within our linear VAR framework non-linear effects of fiscal policy related to specific episodes, such as those arising from re-establishing credibility or solvency (see e.g. Giavazzi and Pagano, 1990, 1996; Giavazzi et al., 2000; Perotti, 1999). However, some of our results can be interpreted along these lines.

3. The variables and the econometric methodology

In this section we briefly describe the variables under analysis for France, Germany, Italy and Spain, and discuss the identification scheme adopted in the structural VARs for the identification of fiscal shocks.

The starting point of the analysis is a VAR that includes five macroeconomic variables and two fiscal indicators: the output gap (measured as the deviation of real GDP from its one-sided HP-filtered values) divided by GDP (y); the CPI inflation rate (p); the log of the nominal exchange rate with respect to the Deutsche Mark, or to the US Dollar for Germany (e); a short term foreign interest rate, the German one, or the US one for Germany (i^*); the home short term interest rate, as a proxy for the monetary policy rate (i); and the ratios of total receipts and disbursements to GDP (t and g, respectively).

The data source is the OECD, as in Favero (2002), and the frequency is half-yearly. This choice contrasts with the standard adoption of monthly data for the analysis of monetary policy. It is dictated first by data availability, and second by the fact that in most countries the major fiscal decisions are taken once a year, and possibly revised once. For all countries the sample under analysis is 1981:1–2001:2. Though for some countries longer series are available, as mentioned before, Favero (2002) and Perotti (2002) found a clear indication of different effects of fiscal policy after the '70s, and monetary policy was also in general rather different.

For the sake of comparability, the seven variables under analysis are modeled by a VAR with 1 lag and a constant for all countries:

$$x_t = c + Cx_{t-1} + u_t, \quad u_t \sim \text{i.i.d.}(0, \Sigma), \tag{1}$$

where $x_t = (i^*_t, i_t, e_t, g_t, t_t, y_t, p_t)'$ and u_t is a vector of i.i.d. errors. It is important to evaluate whether this specification provides a proper statistical framework for the variables under analysis. In particular, we do not include any dummies to capture the potential effects of the introduction of the Maastricht criteria on fiscal variables and of the adoption of the single currency in the final part of the sample. The rationale for this choice is that these events did not cause sudden changes in policy (and therefore in the parameters), but rather resulted in a slow evolution that lasted several years. The latter cannot be adequately captured by the use of dummy variables, and the adoption of more sophisticated models such as smooth transition VARs is not feasible with the short sample available. On the other hand, the use of short lags in the autoregressive structure of the model should be capable of capturing the evolution in the variables.

To address the issue of correct model specification more formally, we report in Table 1 tests for no correlation, homoskedasticity and normality of the estimated residuals, together with Hansen's (1992) tests for stability of the variance and of all the estimated parameters, for each equation of the VAR and for each country. Overall, the null hypotheses are not rejected in most cases, which provides support for the use of the constant parameter VAR(1) model. It turns out that an even better specification can be achieved for Germany with the inclusion of a step dummy with a value of one after 1991, to capture

Table 1
Diagnostic tests on VAR(1)

	Foreign interest rate	Domestic interest rate	Exchange rate	Total expenses	Total revenue	Output gap	Inflation
Germany							
Autocorrelation	4.8415*	0.2882	7.4863**	1.3719	0.4051	7.0435**	3.0517
Heteroskedasticity test	1.6867	1.3412	0.5633	4.0614**	0.9881	2.7160*	1.2665
Normality test	2.0972	0.0601	2.7931	8.9119*	1.4899	16.6120**	0.7711
Instability variance	0.5578*	0.6002*	0.0419	0.2288	0.0953	0.1113	0.1573
Instability joint	1.7723	1.5174	2.1782	0.9894	1.3383	2.3526*	0.9467
France							
Autocorrelation	0.8215	7.1465**	0.6209	2.4564	8.4423**	0.0451	7.9002**
Heteroskedasticity test	2.0842	0.8214	1.1222	0.4831	0.6312	0.7288	1.8064
Normality test	1.6848	0.1849	3.0266	0.4927	0.2148	3.5108	19.5460
Instability variance	0.7374*	0.1523	0.1447	0.1477	0.0847	0.5238*	0.7505*
Instability joint	1.9819	1.3570	1.9692	1.2833	1.2329	1.4392	1.7893
Italy							
Autocorrelation	0.9586	1.4897	6.2376**	3.6483*	10.646**	3.8773*	3.6862*
Heteroskedasticity test	1.2946	0.3161	0.8132	0.99927	0.7995	1.8040	1.8647
Normality test	0.4537	2.4879	12.4460**	3.4417	0.9447	0.0250	1.5288
Instability variance	0.7718*	0.0748	0.3063	0.2553	0.3323	0.2477	0.8404**
Instability joint	1.9184	1.1736	2.4539*	0.6375	1.2656	1.1807	1.6410
Spain							
Autocorrelation	13.1730**	2.1841	0.6075	5.5210**	7.7142**	1.6753	2.0388
Heteroskedasticity test	16.1530**	0.852	2.5802*	0.6578	0.4224	2.1298	0.8487
Normality test	74.6860**	2.7761	3.8897	0.3543	1.6996	2.2118	4.3312
Instability variance	0.6750*	0.8365**	0.2284	0.1294	0.2078	0.2612	0.2165
Instability joint	1.3151	2.6368*	1.4381	2.3198	1.6756	1.7119	1.1453

Note: The reported values are the outcome of an LM test for no serial correlation up to second order, White's homoskedasticity test without cross products in the auxiliary regression, Jarque and Bera's normality test, and Hansen's test for variance or all parameters stability; * and ** indicate rejection of the null hypothesis at the 5% and 1% significance levels, respectively.

the effects of the re-unification. Therefore, the results for Germany are based on this specification.[2]

Dynamic simulation of the VAR(1) models (not reported to save space) indicates that the future behavior of expenditures and receipts is in line with the requirements of the Stability and Growth Pact for each country, and the interest rates converge to a single value.

We can now deal with the identification of the orthogonal structural shocks (e) starting from the VAR residuals (u). Here we are only interested in identifying the fiscal shocks. The scheme $Au_t = Be_t$ is adopted, so that the model becomes

$$Ax_t = Ac + ACx_{t-1} + Be_t, \quad e_t \sim \text{i.i.d.}(0, I), \tag{2}$$

where

$$A = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ \alpha_{ii^*} & 1 & 0 & 0 & 0 & 0 & 0 \\ \alpha_{ei^*} & \alpha_{ei} & 1 & 0 & 0 & 0 & 0 \\ 0 & \alpha_{gi} & \alpha_{ge} & 1 & 0 & \alpha_{gy} & 0 \\ \alpha_{ti^*} & \alpha_{ti} & 0 & \alpha_{tg} & 1 & \alpha_{ty} & 0 \\ \alpha_{yi^*} & \alpha_{yi} & \alpha_{ye} & \alpha_{yg} & \alpha_{yt} & 1 & 0 \\ \alpha_{pi^*} & \alpha_{pi} & \alpha_{pe} & \alpha_{pg} & \alpha_{pt} & \alpha_{py} & 1 \end{bmatrix},$$
$$B = \begin{bmatrix} \beta_{i^*i^*} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \beta_{ii} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & \beta_{ee} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \beta_{gg} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \beta_{tt} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \beta_{yy} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & \beta_{pp} \end{bmatrix}. \tag{3}$$

This set of restrictions achieves exact identification. Though not all the parameters are significant for all the four countries under analysis (see Table 2), the non-significant variables are, in general, country specific, and, for the sake of comparability, we prefer not to impose different restrictions in each country. Moreover, often non-significance of a coefficient is due to the large uncertainty surrounding the point estimate because of the short sample available, so that imposing a zero restriction could be dangerous. Actually, imposing the set of additional zero restrictions is either rejected by a likelihood ratio test or leads to non-convergence of the non-linear optimization algorithm. With reference to the non-convergence issue, it is worth mentioning that, since many parameters have to be estimated, there can also be numerical accuracy problems in the just identified models in samples as small as ours. We have tried several different starting values for the parameters to make sure that the optimization algorithm converged to a global and not to a local optimum.

[2] Interaction dummies that can also modify the dynamics of the VAR(1) are in general not statistically significant.

Table 2
Structural VAR estimates

GERMANY

Estimated A matrix:

1	0	0	0	0	0	0
-0.474 (0.067)	1	0	0	0	0	0
0.001 (0.003)	0.015 (0.005)	1	0	0	0	0
0	0.002 (0.001)	0.080 (0.043)	1	0	-0.544 (0.436)	0
0.002 (0.004)	-0.005 (0.006)	0	-1.663 (1.542)	1	-0.328 (1.088)	0
-0.004 (0.003)	0.005 (0.005)	0.267 (0.144)	0.536 (1.428)	2.885 (1.107)	1	0
-0.000 (0.0001)	-0.002 (0.001)	0.175 (0.039)	0.642 (0.179)	0.088 (0.181)	0.152 (0.093)	1

Estimated B matrix:

1.279 (0.140)	0	0	0	0	0	0
0	0.556 (0.061)	0	0	0	0	0
0	0	0.019 (0.002)	0	0	0	0
0	0	0	0.005 (0.003)	0	0	0
0	0	0	0	0.009 (0.010)	0	0
0	0	0	0	0	0.012 (0.003)	0
0	0	0	0	0	0	0.004 (0.000)

FRANCE

Estimated A matrix:

1	0	0	0	0	0	0
-0.503 (0.146)	1	0	0	0	0	0
0.010 (0.003)	-0.001 (0.002)	1	0	0	0	0
0	0.010 (0.001)	0.038 (0.120)	1	0	0.452 (0.710)	0
0.003 (0.001)	0.000 (0.001)	0	-0.268 (1.684)	1	0.450 (1.310)	0
-0.006 (0.011)	-0.004 (0.012)	-0.337 (0.761)	0.978 (4.514)	-3.451 (5.535)	1	0
-0.001 (0.002)	-0.004 (0.001)	0.078 (0.075)	-0.342 (0.278)	-0.955 (0.295)	-0.669 (0.163)	1

Estimated B matrix:

0.724 (0.079)	0	0	0	0	0	0
0	0.684 (0.075)	0	0	0	0	0
0	0	0.011 (0.001)	0	0	0	0
0	0	0	0.003 (0.000)	0	0	0
0	0	0	0	0.004 (0.003)	0	0
0	0	0	0	0	0.012 (0.021)	0
0	0	0	0	0	0	0.005 (0.001)

ITALY

Estimated A matrix:

1	0	0	0	0	0	0
-0.276 (0.174)	1	0	0	0	0	0
0.012 (0.005)	-0.009 (0.005)	1	0	0	0	0
0	0.003 (0.003)	-0.120 (0.143)	1	0	-1.180 (1.081)	0
-0.002 (0.004)	-0.000 (0.001)	0	0.286 (0.985)	1	0.532 (0.388)	0
-0.016 (0.023)	-0.001 (0.004)	0.228 (0.408)	5.253 (9.066)	-3.257 (8.732)	1	0
0.002 (0.001)	-0.003 (0.001)	0.039 (0.029)	-0.128 (0.174)	-0.121 (0.164)	-0.212 (0.105)	1

Estimated B matrix:

0.877 (0.097)	0	0	0	0	0	0
0	0.979 (0.108)	0	0	0	0	0
0	0	0.029 (0.003)	0	0	0	0
0	0	0	0.013 (0.009)	0	0	0
0	0	0	0	0.006 (0.003)	0	0
0	0	0	0	0	0.026 (0.047)	0
0	0	0	0	0	0	0.005 (0.001)

SPAIN

Estimated A matrix:

1	0	0	0	0	0	0
-0.101 (0.175)	1	0	0	0	0	0
-0.000 (0.003)	0.002 (0.003)	1	0	0	0	0
0	-0.001 (0.000)	0.008 (0.030)	1	0	0.210 (0.279)	0
0.000 (0.000)	-0.001 (0.001)	0	-0.336 (0.316)	1	-0.136 (0.277)	0
-0.001 (0.001)	-0.002 (0.002)	-0.076 (0.051)	0.229 (1.214)	1.007 (1.439)	1	0
-0.001 (0.000)	0.000 (0.001)	-0.043 (0.035)	-0.458 (0.287)	0.377 (0.320)	-0.311 (0.145)	1

Estimated B matrix:

1.533 (0.167)	0	0	0	0	0	0
0	1.743 (0.190)	0	0	0	0	0
0	0	0.029 (0.003)	0	0	0	0
0	0	0	0.004 (0.001)	0	0	0
0	0	0	0	0.003 (0.001)	0	0
0	0	0	0	0	0.007 (0.002)	0
0	0	0	0	0	0	0.006 (0.001)

Note: Estimated A and B matrices in $Au = Be$, as in Eq. (1) in the text, with standard errors in parentheses.

The economic rationale for the identification scheme in Eq. (3) is the following. The national interest rate is contemporaneously affected by the foreign one to mimic the situation in Europe where the Bundesbank monetary policy was closely followed by the other central banks, in particular in the '90s. The national interest rate also reacts to its own lag, which is typically the regressor with the highest explanatory power, and to the lags of the other variables, which can be considered as proxies for the expected future output gap and inflation that typically appear in Taylor rules.

The exchange rate can react to contemporaneous home and foreign interest rates to allow for uncovered interest rate parity and to the lags of all the variables. Other contemporaneous variables such as inflation and the output gap might be significant, but, in alternative identification schemes, these effects were either not significant or the estimation algorithm did not converge.

The expenditure and tax to GDP ratios can depend on contemporaneous values of i^*, e, i, and y (and t can also depend on g). While i^* and e should have no effects unless they proxy for foreign influences on the domestic economy that matter for policy makers (no effects of i^* on g and of e on t are imposed), y could have a contemporaneous impact through the effects of automatic stabilizers and the tax system, i because the quicker accumulation of public debt due to higher interest rate payments could require a restrictive fiscal policy, and g could affect t because of the presence of regulations that often require balanced budget changes. The estimated parameters reported in Table 2 indicate that not all contemporaneous effects are statistically different from zero. As mentioned above, this result is partly due to the substantial uncertainty surrounding the point estimates because of the short sample available, so that setting these coefficients to zero is not appropriate. On the other hand, this finding is in line with a substantial hysteresis in the conduct of fiscal policy because of informational and decisional lags.

Finally, y and p can be affected by all contemporaneous variables, with the exception that p cannot influence y. Focusing on the y equation, in all countries there are no statistically significant contemporaneous regressors. As noted above, such an outcome can be due either to delays in the impact of these variables or to the substantial estimation uncertainty. The results are rather different for inflation, where the contemporaneous y matters in all countries, and usually either i or e is also significant. The fact that the output effect is negative in three countries is likely related to the particular sample under analysis that is characterized by a strong reduction of inflation, starting from the high levels of the early '80s. The contemporaneous effect of fiscal variables on inflation is more limited with the only significant effects from g for Germany and from t for France.

Before analyzing the dynamic behavior of the structural systems by computing the impulse response functions, it is useful to discuss some other identification procedures adopted in the literature. The proposals closer to our scheme are those by Favero (2002) and Perotti (2002), but there are some important differences. In particular, Favero assumes, in our notation, that α_{yt} and α_{yg} are equal to zero. While this seems a reasonable assumption because of the commonly hypothesized delays in the effects of fiscal policy, and is in line with our estimation results, in Perotti (2002) these parameters are estimated and found to be significantly different from zero in several cases, so that it is best not to impose zero restrictions on a priori grounds.

Perotti (2002), on the other hand, extends a procedure proposed in Blanchard and Perotti (2002) to estimate the parameters α_{ty}, α_{tp}, α_{ti}, α_{gy}, α_{gp}, α_{gi} as elasticities using external information. While such a procedure was uncontroversial in Blanchard and Perotti, it is unclear whether it is suited in this more general context since, for example, α_{ty} now measures the contemporaneous reaction of t to y conditional not only upon lagged values of the variables but also upon contemporaneous values of p and i, which cannot be considered as constant in the data used to compute the elasticities. Moreover, Perotti's choice of modeling the log of GDP and of the price level makes the identification of the interest rate shock problematic, since the latter is usually supposed to react to the output gap and inflation in specifications of monetary policy reaction functions such as the Taylor rule.

To conclude, notice that the structural fiscal shocks could also be interpreted as the deviation from a fiscal rule that relates the behavior of the fiscal variables to contemporaneous values of the other variables, to their own lags (to allow for partial adjustment and hysteris), and to the lags of the other variables in the VAR (to allow for delayed reactions; see, e.g., Ballabriga and Martinez-Mongay, 2002). Basically, this corresponds to a Choleski identification where the fiscal variables are ordered last (and therefore have no contemporaneous effects on the other variables). In the next section we will also compare the results for this scheme with those obtained using Eq. (3). Moreover, we will evaluate whether the public debt plays a relevant role for the evaluation of the effects of fiscal policy.

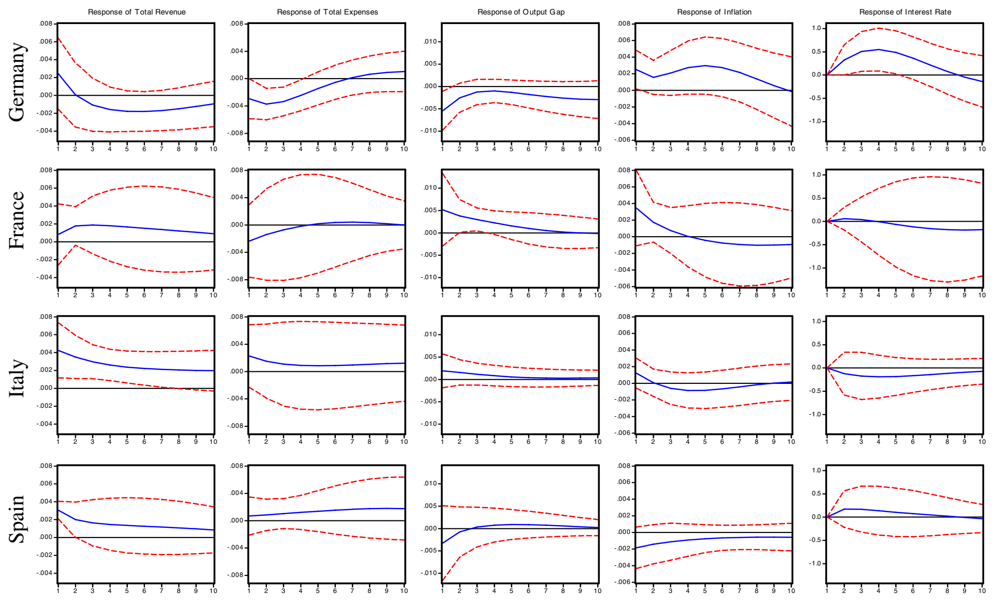

Fig. 1. The base case VARs. Responses to structural one standard deviation innovation to total revenue. *Note:* The base case VAR is made up of seven variables: total revenue/GDP, expenditure/GDP, output gap/GDP, commodity price inflation, the exchange rate with Mark (for all countries except for the German VAR, for which the exchange rate with the US dollar is used), the German short-term interest rate (except for the German VAR, for which the US short term interest rate is used) and the country's short term interest rate and is estimated on 1981:01–2001:02. The figure contains the responses and the 95% confidence bands of total revenue/GDP, expenditure/GDP, output gap/GDP, commodity price inflation, interest rate to a shock to total revenue/GDP, identified as in Eq. (3).

4. The effects of fiscal shocks

In this section we evaluate the dynamic responses of the variables to a shock in the government disbursements (e_g) or receipts (e_t), in the four countries under analysis, where the shocks arise from the VAR(1) models identified as in the previous section (see also Table 2).

From Fig. 1, we can draw four main conclusions on the effects of a (positive) tax shock. First, the output gap significantly decreases, as predicted by Keynesian theory, in Germany only. In France and Italy the effects are limited but positive, perhaps as a consequence of the improvement in the government deficit and more generally in fiscal solvency that improves the expectation climate and the confidence of consumers and firms (see e.g. Giavazzi and Pagano, 1990, 1996). An alternative explanation for the positive effects of a tax shock could be that, since it is actually a revenue shock, it can be due either to an increase in the tax rate or to an increase in the tax base, and the latter is positively correlated with the output gap. Yet, if this were the case, an increase in the output gap should be also associated with higher revenues, while this does not appear to be generally the case. In the case of Spain the effects are negative but not statistically significant. It is worth mentioning that the behavior of the tax to GDP ratio in Spain is rather different from the other countries, with a steep increase in the '80s (but starting from the lowest lev-

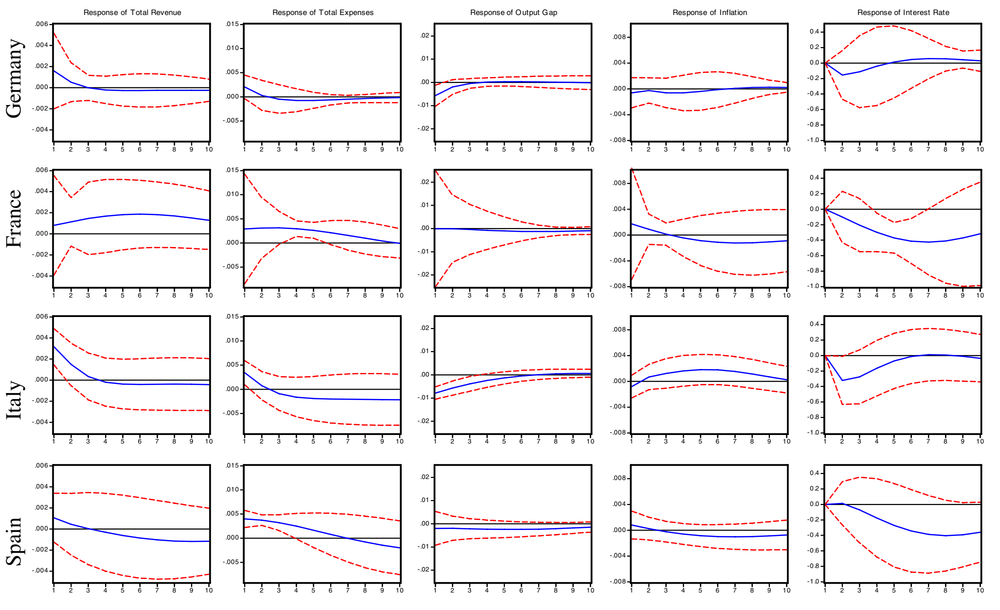

Fig. 2. The base case VARs. Responses to structural one standard deviation innovation to total expenditure. *Note:* The base case VAR is made up of seven variables: total revenue/GDP, expenditure/GDP, output gap/GDP, commodity price inflation, the exchange rate with Mark (for all countries except for the German VAR, for which the exchange rate with the US dollar is used), the German short-term interest rate (except for the German VAR, for which the US short term interest rate is used) and the country's short term interest rate and is estimated on 1981:01–2001:02. The figure contains the responses and the 95% confidence bands of total revenue/GDP, expenditure/GDP, output gap/GDP, commodity price inflation, interest rate to shocks to total expenditure/GDP, identified as in Eq. (3).

els among the four countries, about 24%), a very stable behavior in the '90s (at values of around 35%), and an overall much less cyclical behavior. This pattern is accompanied by an even faster increase in expenditures, until the enforcement of the Maastricht treaty, which leads to the rapid accumulation of public debt, with a debt to GDP ratio that starts at around 25% in the early '80s to reach about 80% in the mid '90s. The debt accumulation phenomenon is common to the other three countries, but the rate of growth of public debt is slower than Spain even in Italy.

Second, the consequences of the tax shock on inflation are, in general, limited and positive for all countries, with the exception of Spain, but not statistically significant.

Third, the effects on interest rates are always positive, except for Italy, mostly due to the effects on the output gap and inflation. The increase in interest rate is strongest in Germany, because of the stronger inflation aversion of the Bundesbank and its generally tighter monetary policy over this period, and weakest in France.

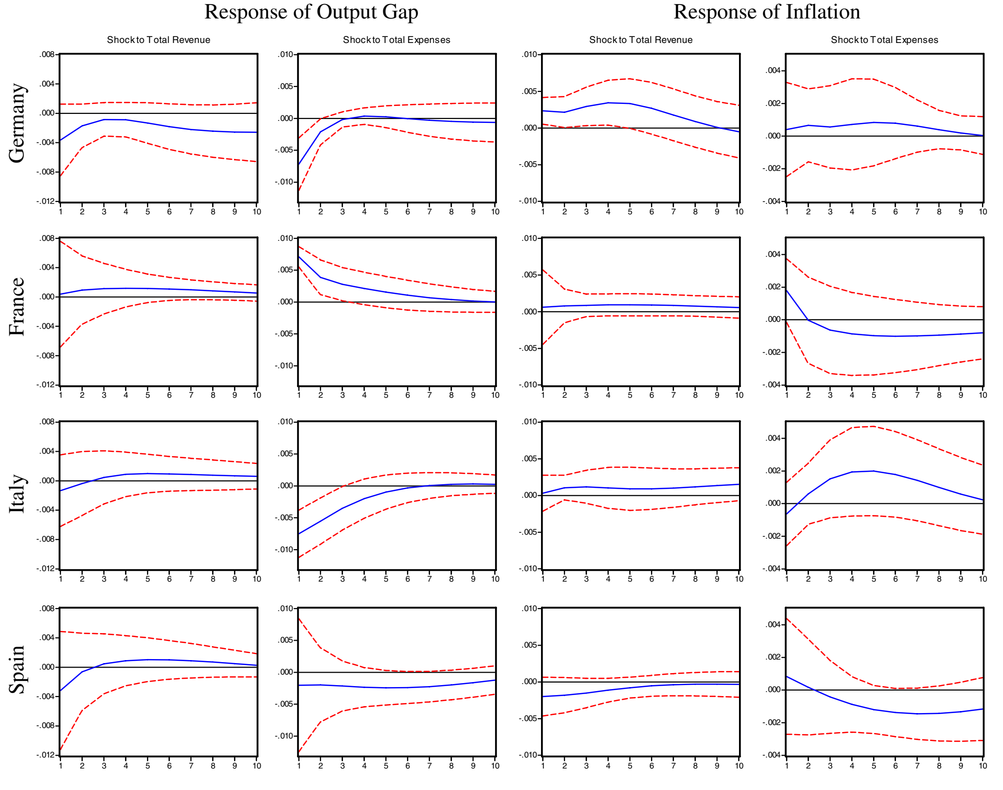

Fig. 3. VARs with debt/GDP. Responses of output gap/GDP and inflation to a shock to fiscal variables. *Note:* The VAR with debt is made up of eight variables: debt/GDP, total revenue/GDP, expenditure/GDP, output gap/GDP, commodity price inflation, the exchange rate with Mark (for all countries except for the German VAR, for which the exchange rate with the US dollar is used), the German short-term interest rate (except for the German VAR, for which the US short term interest rate is used) and the country's short term interest rate and is estimated on 1981:01–2001:02. The figure contains the responses and the 95% confidence bands of output gap/GDP and inflation to a shock to total revenue and to total expenses, identified as in Eq. (3) with debt/GDP added as the last variable.

Finally, in all countries, a tax shock is associated with only a limited increase in expenditures, or even a minor reduction in Germany and France, the two countries with the lowest debt to GDP ratio over the period under analysis, so that overall the deficit is reduced.

As far as the expenditure shock is concerned, the responses in Fig. 2 suggest four main comments. First, its effects on the output gap are very limited in all countries, and even negative and significant in Germany and Italy.

Second, the impact reaction of inflation is very limited. It increases slightly in France and Spain, but decreases in Germany and Italy. In subsequent periods, inflation temporarily increases in Italy, while it decreases in the other countries.

Third, in all countries, the interest rate decreases, although it is virtually stable initially in Spain. This outcome might suggest an accommodating monetary policy, but it should be interpreted with care because of the substantial uncertainty around the point estimates.

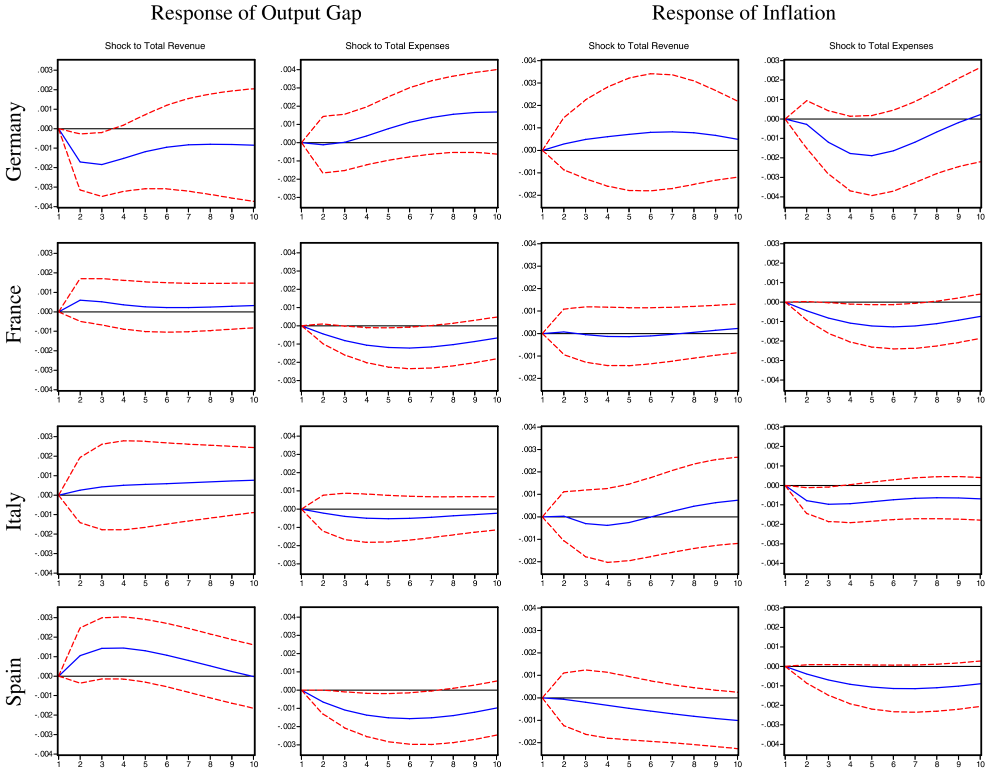

Fig. 4a. Response of output gap/GDP and inflation to a shock to fiscal variables using Choleski identification. *Note:* The VAR is made up of seven variables: total revenue/GDP, expenditure/GDP, output gap/GDP, commodity price inflation, the exchange rate with Mark (for all countries except for the German VAR, for which the exchange rate with the US dollar is used), the German short-term interest rate (except for the German VAR, for which the US short term interest rate is used) and the country's short term interest rate and is estimated on 1981:01–2001:02. The figure contains the responses and the 95% confidence bands of output gap/GDP and inflation to a shock to total revenue and to total expenses, using the Cholesky ordering i^*, i, e, y, p, g, t.

Finally, in general, the cumulated response of taxes is lower than that of expenses, suggesting that the former is not sufficient to balance the budget, but again the standard errors are large.

In summary, the effects of fiscal shocks are rather different across countries, likely reflecting the different institutional frameworks, and surrounded by considerable uncertainty. Yet, a consistent pattern is that expenditure and tax shocks have limited stabilization effects, a result in line with Perotti (2002). Tax shocks can play a role in deficit reduction, without major negative output effects, while expenditure shocks may require deficit financing, without major positive output effects. Monetary policy seems to react to non-systematic changes in expenditures in an accommodating manner, while the main effects of tax shocks are through their impact on output and inflation.

We now evaluate whether the results we have obtained so far are robust to the inclusion of the debt to GDP ratio into the analysis, since a high level of public debt can affect both the conduct of fiscal (and monetary) policy and its effects on the economy (see e.g. Sargent and Wallace, 1981; Perotti, 1999). Moreover, the criteria in the Maastricht treaty and in

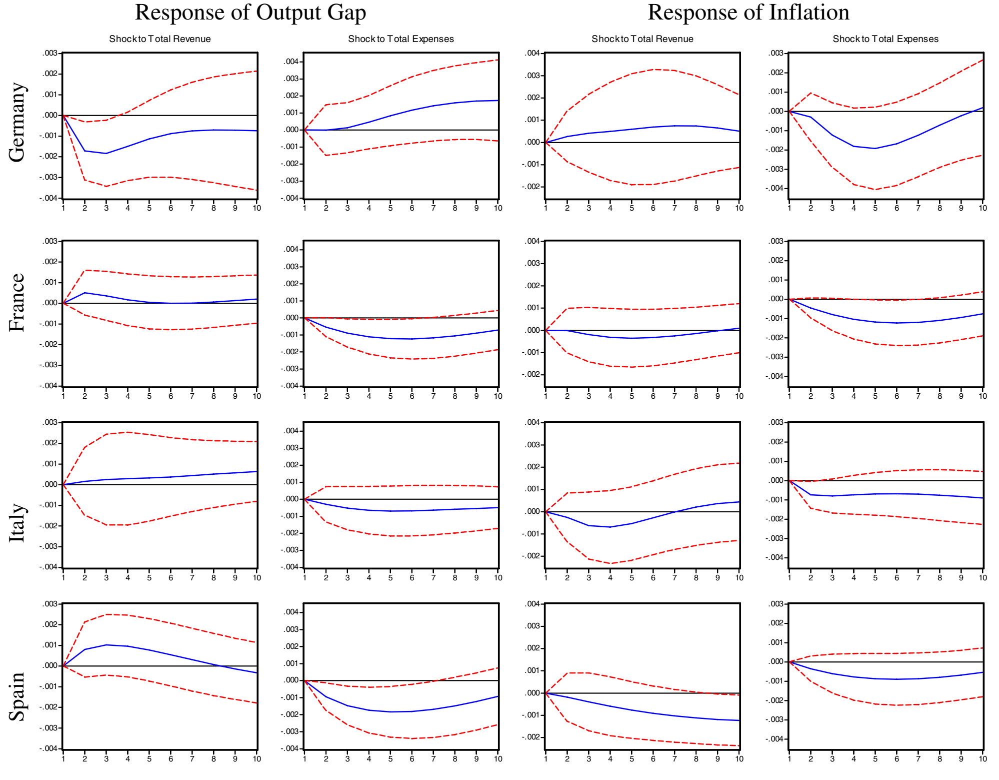

Fig. 4b. Response of output gap/GDP and inflation to a shock to fiscal variables using Choleski identification. *Note:* The VAR is made up of seven variables: total revenue/GDP, expenditure/GDP, output gap/GDP, commodity price inflation, the exchange rate with Mark (for all countries except for the German VAR, for which the exchange rate with the US dollar is used), the German short-term interest rate (except for the German VAR, for which the US short term interest rate is used) and the country's short term interest rate and is estimated on 1981:01–2001:02. The figure contains the responses and the 95% confidence bands of output gap/GDP and inflation to a shock to total revenue and to total expenses, using the Cholesky ordering i^*, i, e, y, p, t, g.

the Stability and Growth pact have imposed binding constraints on some countries, such as Italy.

With respect to the identification scheme in Eq. (3), we include the debt to GDP ratio as the last variable in the system, allowing for a possible contemporaneous effect of all variables. This preserves exact identification and comparability across countries, and the ordering is justified because output growth (proxied by the output gap) and inflation are two important determinants of the evolution of the debt to GDP ratio.

Focusing for brevity on the effects of fiscal shocks on the output gap and inflation, from Fig. 3 the effects on output are basically unaffected. Exceptions are a negative rather than a

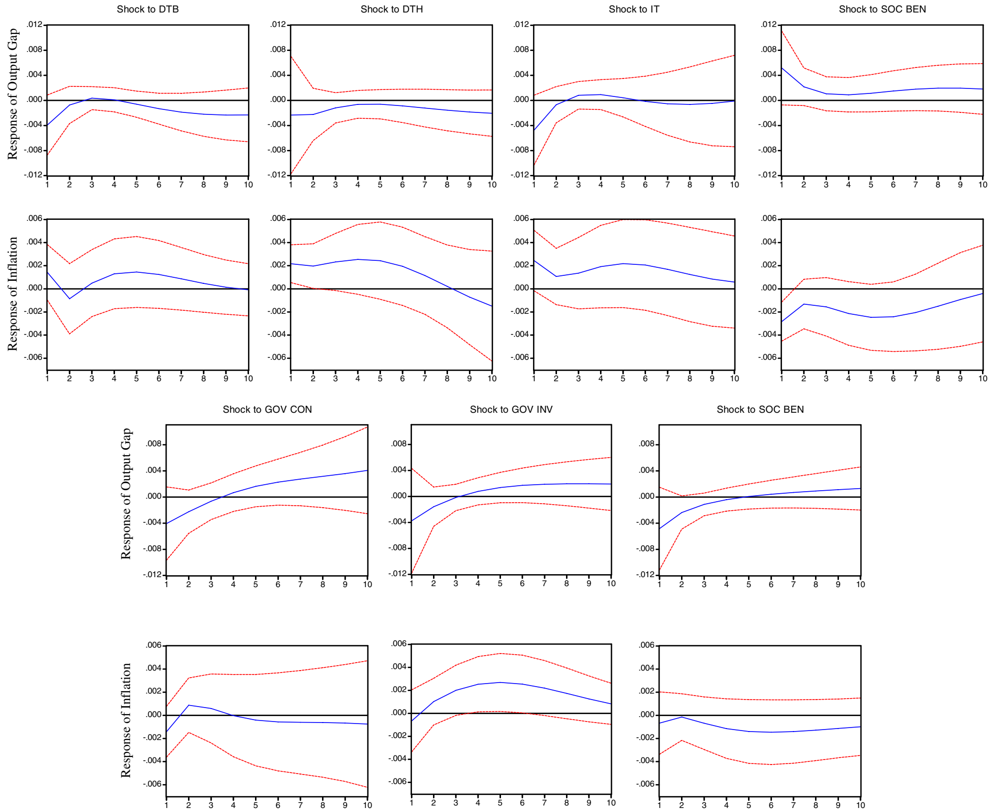

Fig. 5. VARs with disaggregated taxes and expenditures for Germany. *Note:* DTB = direct taxes from businesses, DTH = direct taxes from households, IT = indirect taxes, SSR = social security contributions received, GOV CON = government consumption, GOV INV = government investment, SOC BEN = social benefit payments. The VARs with disaggregated taxes are made up of seven variables (one of total revenue/GDP's components, expenditure/GDP, output gap/GDP, commodity price inflation, the exchange rate with US dollar, the US short-term interest rate and the country's short term interest rate) and are estimated on 1981:01–2001:02. The VARs with disaggregated expenses are made up of seven variables (total revenue/GDP, one of total expenditure/GDP's components, output gap/GDP, commodity price inflation, the exchange rate with US dollar, the US short-term interest rate and the country's short term interest rate) and are estimated on 1981:01–2001:02. The figure contains the responses and the 95% confidence bands of output gap/GDP and commodity price inflation to a shock each component of total revenue and total expenditures, identified as in Eq. (3) but with the disaggregated variables instead of its aggregated counterpart.

positive impact of the tax shock in Italy, which is still not significant, and a positive and significant effect of the expenditure shock in France, rather than close to zero and not significant. The effects on inflation are also virtually the same, with the exception of Germany where higher expenditures are now associated with higher (but not significantly different from zero) inflation.

Overall, these findings indicate that, although the debt to GDP ratio can have a relevant role in the determination of the impact of systematic fiscal policy (see e.g. Giavazzi et al., 2000), its contribution in explaining the effects of non-systematic fiscal policy is minor. Therefore, we will continue our analysis with the basic seven variable VAR without public debt.

Another issue that deserves investigation is whether the alternative identification scheme introduced at the end of the previous section affects the results. Therefore, we consider a Choleski decomposition with g and t ordered last to reflect a delayed effect of fiscal policy, but a possible contemporaneous effect of all other macroeconomic variables on fiscal decisions.

Focusing again on the reaction of the output gap and inflation, Fig. 4a indicates that the only changes in the output response to higher revenues are for Spain, where a positive rather than a negative effect is now found, but the response remains not statistically different from zero. The pattern of response to the expenditure shock is basically unaltered,

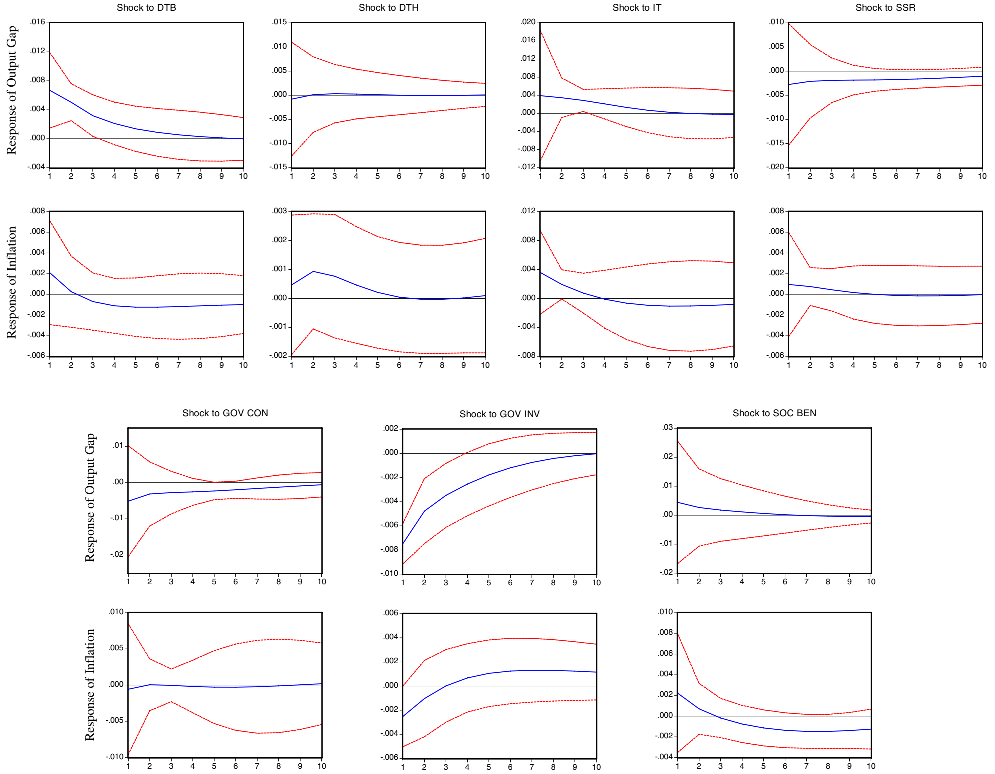

Fig. 6. VARs with disaggregated taxes and expenditures for France. *Note:* see note to Fig. 5.

but the responses become not significant for Germany and Italy. The effects of the tax shock on inflation are even more limited than before, while the expenditure shock has systematic minor negative effects in all countries, with the estimated point responses well within the confidence bands obtained with the previous identification scheme (see Fig. 2).

The final issue we consider is whether a change in the ordering of expenditures and receipts in the Choleski decomposition matters. In particular, in Fig. 4b the impulse response functions are computed assuming that t can have a contemporaneous effect on g but not vice versa. Comparing Figs. 4a and 4b, there are no modifications in the pattern of response.

In summary, we can conclude that, overall, the results we have obtained with the seven variable VARs are also robust to this change in identification scheme.

5. Disaggregating taxes and expenditures

In this section we want to evaluate the effects of shocks to disaggregated fiscal revenues and expenditures. In particular, we disaggregate the receipts into revenues from taxes on business (t_b) and on households (t_h), from indirect taxes (t_ind), and from social contributions (t_soc). Similarly, we consider separately three components of disbursements: government consumption (g_c), investment (g_i), and social benefits (g_soc).

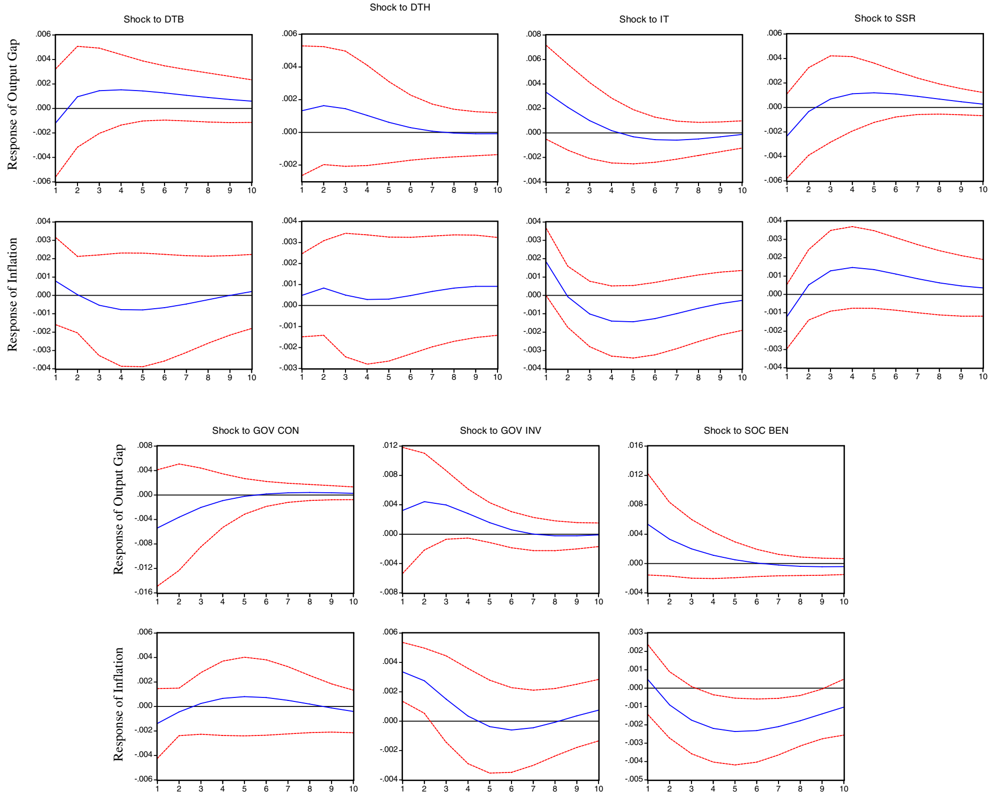

Fig. 7. VARs with disaggregated taxes and expenditures for Italy. *Note:* see note to Fig. 5.

We use the same methodology as in the previous sections. Specifically, the identification scheme is as in Eq. (3), but a disaggregated component is used instead of its aggregate counterpart while the other variables remain the same. A more proper approach would require jointly considering all the disaggregated expenditures and receipts since there can be relevant interactions, but the short sample available obliges us to consider the disaggregated components one by one.

In Figs. 5–8 we report, for each country, the responses of the output gap and inflation to shocks to each of the disaggregated fiscal variables. Three main results emerge. First, taxes on business or households and indirect taxes do not appear to have a negative effect on output, with the exception of Germany where the reaction is negative but not significant, in line with the response to the aggregate shock. Social contributions lead to a negative, though not significant, output effect in France and Italy, positive in Germany and Spain.

Second, in all countries government consumption has a negative impact on the output gap, and the same is true for government investment, with the exception of Italy. Instead, social benefits shocks have a positive impact, but in general all the responses are imprecisely estimated.

Third, indirect taxes and taxes on households, with the exception of Spain, have a positive, though not significant, impact on inflation. Different results across countries are

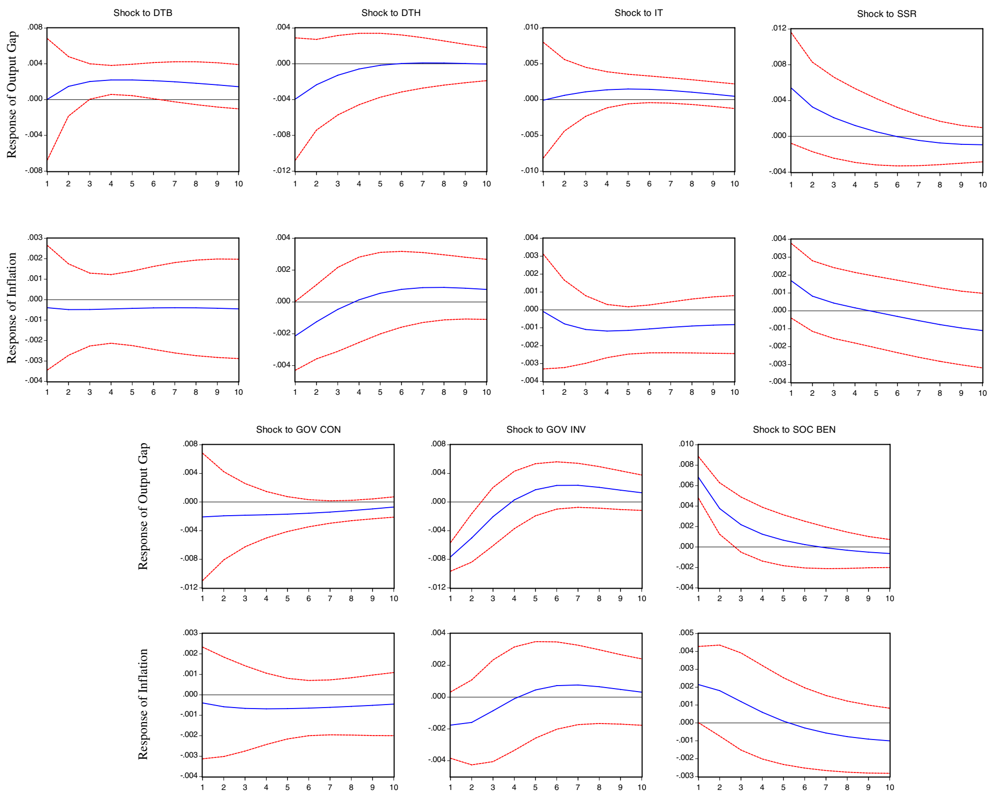

Fig. 8. VARs with disaggregated taxes and expenditures for Spain. *Note:* see note to Fig. 5.

obtained for taxes on businesses and social contributions. The results for expenditures are also rather varied, with the exception of government consumption shocks that have a negative, though not significant, effect in all countries, likely associated with the generalized decrease in output.

To conclude, it may be worth recalling once more that here we are measuring the effects of the non-systematic components of fiscal policy, so that the level of each of the taxes or expenditures we have considered could generate additional effects on the output gap or inflation. It is also remarkable and relevant for policy making that there are some common effects across countries in the effects of fiscal policy, in particular higher social contributions can decrease output and social benefits can increase it, while typically indirect taxes increase inflation.

6. Conclusions

This paper provides a set of stylized facts on the effects of non-systematic fiscal policy in the four largest countries of the Euro area. Though fiscal shocks on average account for only about 2% of the fiscal variables to GDP ratios, an econometric evaluation of their causes and effects can provide an interesting input for the current economic policy debate.

The overall picture that comes out is that expenditure policies are rather ineffective in reducing the output gap, possibly with the exception of social benefits, and can require deficit financing. Tax shocks also appear to be rather ineffective in reducing business cycle fluctuations, but they could be used to reduce the government deficit when needed, without any major negative effects on output or inflation (except for indirect taxes and, partly, taxes on households).

These findings suggest that the systematic component of fiscal policy (which amounts to about 98% of the total) rather than fiscal shocks should be in charge of fiscal stabilization, and whether and to what extent it can achieve this goal is an interesting topic for future research.

To conclude, we would like to remember the long list of warnings we made in Section 2 for a correct interpretation of the results. A final caveat to be added to the list is that this analysis covers a period when the fiscal conditions of the countries changed considerably, in particular in the '90s after the signing of the Maastricht treaty and of the Stability and Growth pact. The question then is whether the enhanced fiscal discipline, combined with a single currency, can be expected to substantially change the results we have obtained. For example, the requirement of a close to balanced budget can force the governments to improve the efficacy of government expenditure by carefully selecting its composition or changing the decision and implementation process. Alternatively, the pressing comments of the European Central Bank on those high debt countries that could create problems for the stability of the Euro could convince them to create stronger links between taxes and expenditures. But recent experience has shown that it takes time for governments to accept the stricter rules imposed by the monetary union, so that the results we have derived could provide a good guide for the near future.

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