DISCRETIONARY POLICY INTERACTIONS AND THE FISCAL THEORY OF THE PRICE LEVEL: A SVAR ANALYSIS ON FRENCH DATA

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1. Introduction

The "fiscal theory of the price level" (FTPL; Woodford, 1995 and 2001) marks the revival of interest for fiscal policy, after the long blackout that followed the crisis of Keynesian economics. Among the causes of this revival, an important role was played by the dramatic drop in US public debt during the Clinton presidency. The reduced stock of bonds in the hands of households led researchers to re-investigate the relationship between consumption, the government intertemporal budget constraint, wealth effects and monetary policy. As we will argue below, the attempts to give empirical support to the FTPL – that had its theoretical precursors in the work of Leeper (1991) and Sims (1994) among others –, have been rather unsuccessful so far, so that its main merit lies in the fact that it brought back into the debate the interaction between fiscal and monetary policy and its effects on the level of activity and on prices.

One of the consequences of this resurgence of interest is a small but growing literature that tries to isolate and quantify the effects of fiscal policy shocks. With a few notable exceptions, most of this literature finds Keynesian effects of discretionary fiscal shocks. This result is particularly interesting when related to European countries because it introduces an element of complexity in the debate linked to the European institutional setting and, in particular, to the Stability and Growth Pact (SGP). In fact, the ineffectiveness (and even the harmfulness) of discretionary fiscal policy is one of theoretical foundations of the original institutional setting (the balanced-budget-over-the-cycle feature of the SGP), that only allows for automatic stabilization in "bad times". If we are unable to rule out effects on output of discretionary fiscal policy, the main reason for restricting government action to automatic stabilization drops, and the debate on European economic "governance" can be looked at from a different perspective. The modifications of the SGP adopted in March 2005 are quite interesting in this respect. They extend the "exceptional circumstances" to slow growth and the relevant factors that can justify that the limit of the 3 per cent of GDP has not been enforced. Nevertheless, the "new SGP" still involves a deficit limit that heavily constrains the

scope for discretionary policy, so long as budget deficits will not have converged towards zero.

Our paper aims at investigating the empirics of fiscal and monetary policies in France within a precise theoretical framework and, meanwhile, to shed light on the current debate regarding the optimality, necessity and drawbacks of the SGP. We take our motivation in particular from the papers of Blanchard and Perotti (2002), and of Biau and Girard (forthcoming) who constitutes an application of the former to France. Both papers find Keynesian effects of structural shocks to fiscal policy. The objective of this paper is twofold: First, it constitutes a robustness test for the results of Biau and Girard, in that we try to apply their methodology to a different, more complex, theoretical framework. Second, the structural VAR that we test is constructed to embed the main features of the FTPL (notably the interaction of wealth effects linked to the stock of debt, and the interaction of fiscal and monetary reaction functions), that are also used as the theoretical assumptions behind identification: one objective of the paper is to test the underlying theory.

The paper is structured as follows: the next section discusses the literature that is related to this paper, both the theoretical research on the fiscal theory of the price level, and the literature on structural VAR and fiscal policy. In Section 3 we start with a simple theoretical model that sketches the channels by which fiscal policy changes affect output and prices. We then present the VAR model, and discuss the identification procedure that has been used, together with main underlying assumptions. Section 4 describes the dataset, and contains a detailed discussion concerning the issue of quarterly public finance data. Section 5 presents the results. Even though they are obtained within a different theoretical framework, the findings confirm the "Keynesian story" already highlighted by Blanchard and Perotti (2002) for the US and by Biau and Girard (forthcoming) for France. Quite unusually within this strand of the literature, the impact of a monetary shock is also presented. Finally, as a side result, main findings also seem to give support to the FTPL predictions that a fiscal shock should have a positive impact on prices. Section 5 presents some robustness checks. The last section concludes.

2. Related literature

2.1 The fiscal theory of the price level (FTPL)

The renewal of interest in favor of expansionary fiscal policy can be traced back to the development of the fiscal theory of the price level in the early Nineties.[1] Before that, mainstream literature had endeavored to show that expansionary fiscal policies would either harm the price stability objective of a "conservative" central banker (Barro and Gordon, 1983; Rogoff, 1985), or induce a steep rise in private savings (along the lines of the so-called Ricardian equivalence principle, see

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[1]   Comprehensive surveys related to the roots of the FTPL can be found in Creel and Sterdyniak (2001) and Woodford (2001).

Barro, 1974), or induce, quite unexpectedly, a mix of the two previous effects that would lead to a contractionary impact on real GDP[2] (see Giavazzi and Pagano, 1990; Giavazzi, Jappelli and Pagano, 2000), or provoke higher long-term interest rates (the so-called "crowding-out effects").[3]

In comparison with this overwhelming literature, the FTPL focuses on the interactions between monetary and fiscal policies. The main message of the FTPL is that there are two different mechanisms that enable the *ex ante* satisfaction of the government present-value budget constraint, *i.e.* this budget constraint is not viewed as an identity but as an equilibrium condition.[4] In the first case, the fiscal authority adjusts its future spending and taxes so that they meet the constraint for any value of the interest rate and the nominal income.

In the second case – the FTPL case –, the fiscal authority does not act in accordance with the fulfillment of its budget constraint, so that it is the "task" of the price level to ensure equilibrium. The FTPL thus states that the government can exogenously set its real spending and revenue plans, and that the price level will take on the value required to adjust the real value of its contractual nominal debt obligations to ensure government solvency. This theory hence emphasizes that the price level is able to "jump" in relation to the government present value budget constraint. The allocation of instruments to targets in this case can be totally reversed from that chosen in the EU.

Although Woodford (2001) argues in favor of the Maastricht public finances criteria, his theoretical framework may be seen as a contradiction to the current EU institutional and macroeconomic setting. His model shows that the situation of governments as followers *vis-à-vis* the European Central Bank (ECB) could be reversed without disturbing the steady state. With governments acting as leaders in the strategic policy game with the ECB, general equilibrium would only necessitate a less reactive monetary policy *vis-à-vis* inflation deviations from target than that ensuing from the application of a usual "monetary Taylor rule".[5]

But does the FTPL works "in real life"? Tests by Canzoneri, Cumby and Diba (2001) showed that the FTPL was invalidated by the data in the US. More recently,

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[2] The Barro and Gordon (1983) and the Barro (1974) stories are inconsistent with each other: the former states that active policies would change the domestic inflation rate, at full employment; whereas the latter states that active fiscal policies have no impact on an economy at full employment: higher savings just matches higher public investment (or expenditures).

[3] The plausibility of these four effects is investigated both theoretically and empirically in Creel *et al.* (2004).

[4] The main message of Buiter (2002) is that the FTPL is flawed in this respect. The response of Woodford (2001) is that the budget constraint is still satisfied *ex post* and does not contradict the identity. This controversy is beyond the scope of this paper, as the macroeconomic framework that will be used is more about flows than about stocks. As demonstrated by Niepelt (2004), such a framework establishes a link between fiscal policy and the price level, but unlike Niepelt we consider that this alternative – in our case, macroeconomic – framework to the FTPL goes beyond the conclusions of Sargent and Wallace (1981) in that it incorporates a wealth effect (absent from Sargent and Wallace) that makes old-fashioned unrealistic money debt financing unnecessary to solve the model.

[5] This is the theoretical conclusion of Leeper (1991).

Creel and Le Bihan (2006) have extended their work to European countries. Based upon a modified VAR analysis that makes a distinction between cyclically-adjusted and non-cyclically-adjusted deficits, they have shown that the FTPL was also invalidated in these countries.

Although these results seem to cast doubts on the empirical relevance of the FTPL, they do not diminish the usefulness of the theory: renewing the interest for fiscal policy aimed at stabilization, for wealth effects, for public debt and for the interactions between monetary and fiscal policies within a common framework is largely enough to gain consideration. Moreover, as we show in Section 5, the FTPL would gain support for France within our SVAR identification.

2.2   Structural VARs and the analysis of discretionary fiscal policy effects

The long-lasting debate on the effects of fiscal policy on GDP and other macroeconomic variables has struggled with the methodological issue of correctly identifying such a policy. First, as argued by Creel and Sterdyniak (1995), and also more recently by Galí and Perotti (2003), the existing measures of structural and cyclical deficits do not correctly deal with a functional classification of public expenditure and revenues. For instance, the cyclically-adjusted deficit usually incorporates interest payments, although they may originate in past cyclical downturns that have provoked higher overall deficits. Second, difficulties arise in isolating the effects of discretionary policy on economic activity from other effects at work, as for example the change in interest rate payments, automatic stabilization, and so on. Thus, until very recently, no serious attempt had been made to assess the effects of fiscal policy shocks on the economy.

The development of SVAR models, originally conceived for the analysis of monetary policy (Bernanke, 1986; Blanchard and Watson, 1986; were among the first ones), has initiated a relatively small body of literature that in the past years has tried to look into this issue.[6] The first paper, by Blanchard and Perotti (2002), investigates the United States, and obtains identification by imposing contemporaneous restrictions based on the institutional features of the tax and expenditure system.[7] Such a method allows the authors to isolate the effects of fiscal policy shocks on GDP and its components. Their estimates are broadly consistent with standard textbook Keynesian analysis, in that positive public expenditure shocks, and negative tax shocks have significant and positive effects on GDP and consumption. These results are nevertheless mitigated by the effects on investment that are instead negative for expenditure increases and positive for tax reductions,

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[6]   Here we do not discuss other identification schemes (all applied to the US) such as the "narrative approach" (Ramey and Shapiro, 1998; Edelberg, Eichenbaum and Fisher, 1999; Burnside, Eichenbaum and Fisher, 2004); that identify the VAR by means of well-known exogenous fiscal episodes; or the "sign restriction" approach, in which the sign of impulse responses is pre-imposed on the basis of theoretical priors (Mountford and Uhlig, 2002; Canova and Pappa, 2003).

[7]   The authors also use dummies to take into account large shocks (as the temporary tax cut of 1975).

results that are more consistent with variants of the neoclassical model. Similar results are obtained by Fatás and Mihov (2001), who focus on public expenditures, and show that GDP, employment and consumption react positively to expansionary fiscal policy shocks. Their identification procedure however is relatively more standard, and ranks fiscal shocks first in the Choleski decomposition; the authors conclude that their empirical findings are at odds with a number of versions of Real Business Cycles models, while they concord with the predictions of a standard textbook IS-LM model.

Most of the existing literature on the effects of fiscal policy deals with the US. Among the few papers using the SVAR methodology and dealing with other countries we can cite two that are directly related to our work. The first, by Biau and Girard (forthcoming), replicates Blanchard and Perotti with French data.[8] The conclusions are also similar, making the case for Keynesian results. The short term impact of fiscal policy is expansionary and larger than one; as was the case for the US, this result passes through positive effects on private consumption. An increase in tax receipts, on the other hand, has weak effects, even if the sign is negative as expected in a Keynesian framework. The difference with the US data as reported by Blanchard and Perotti is explained by the different estimated elasticity of tax receipts to GDP: whereas Blanchard and Perotti use a value of 2, Biau and Girard opt for a value of 0.8. The main difference between these two values stems from the elasticity of employment to GDP, which is four times lower in Biau and Girard than in Blanchard and Perotti. In this respect, Biau and Girard mention that the *quarterly* elasticity of tax receipts to GDP in Blanchard and Perotti is relatively close to that estimated in the US with *annual* data. Finally, they also include an innovation with respect to Blanchard and Perotti in that they explicitly consider monetary policy, with the inclusion of the interest rate in the VAR. Doing so, they are closer to Perotti (2004). Nevertheless, in their paper the interest rate is shown to have only negligible effects on fiscal multipliers.

Perotti (2004) also considers monetary policy, and extends the framework to five OECD countries.[9] He finds results contrasting with those reported above. The evidence of an important structural break around 1980, for all the countries, allows drawing a number of conclusions. First, GDP effects of expansionary fiscal policy are limited, and the multiplier is larger than one only in one case (the US before 1980). In general, the effects of fiscal policy have weakened over time, to the point of becoming significantly negative in a number of cases in the post-1980 period. Second, tax cuts and spending increases do not emerge as having significantly different effects. This conclusion contrasts with the findings of Alesina and Perotti (1995) that expenditures cuts are better than tax hikes when a fiscal contraction is

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[8] The German and Italian cases were also investigated, respectively by Mohr (2002) and Giordano *et al.* (2005).

[9] USA, West Germany, UK, Canada, Australia. According to the author, for the other countries the quality of data at quarterly frequency is too low to permit a meaningful analysis. As explained at length in Section 4 below, we believe that the quality of French quarterly data is good enough to perform this type of analysis.

under way. Third, while interest rates were substantially unaffected in the pre-1980 period, the effect of fiscal policy shocks became positive in the most recent period. This reaction of interest rates to changes in fiscal variables explains the weaker and often negative impact on GDP that can be observed after 1980. The author explains the difference with the original Blanchard and Perotti results by the division in two sub-samples. And in fact, he argues, when taking the whole sample the results are in line with most of the existing literature. Perotti concludes arguing that neither the neoclassical nor the Keynesian (or New-Keynesian) models are successful in explaining this complex set of findings.

3.   Model and methodology

3.1   *A simple model of price determination*

In this section we present a very simple model of an economy in which debt and the price level are related *via* the fiscal and the monetary authorities' behaviors. The model is a macroeconomic version of the FTPL quite close to that developed by Leith and Wren-Lewis (2000) and is borrowed from Creel and Sterdyniak (2002).

The first equation is an aggregate demand relationship (all variables are real; fiscal variables are expressed in percent of GDP):

$$y = cy_{-1} - \delta r + \varphi b + t - s, \tag{1}$$

where real debt affects demand positively (due to a wealth effect), the real interest rate has a negative influence on demand, and public expenditure is written as the difference between tax receipts and primary surplus, $g = t - s$.

Aggregate supply is standard, and relates inflation to the level of output:

$$\pi = \pi_{-1} + v(y - y^*) \tag{2}$$

Real debt cumulates according to the law of motion:

$$b = b_{-1}(1 + r) - s \tag{3}$$

Finally, the last two equations define the reaction functions of fiscal and monetary authorities:

$$s = s^* + h(b - b^*) \tag{4}$$

and:

$$r = r^* + \alpha(\pi - \pi^*) + \beta(y - y^*) \tag{5}$$

Equation (4) states that the fiscal authority reacts to deviations of debt from its steady state value, while equation (5) is a standard Taylor rule relation if α is positive (hence an inflationary shock would provoke a rise in the *real* interest rate).

If both fiscal and monetary policies are active in contrasting inflation (large α) and increases in debt (large h), prices are under the control of the monetary

authority and fiscal solvency is guaranteed by fiscal policy. Given that fiscal policy responds strongly to debt deviations, expansionary fiscal shocks will be followed by a fiscal restriction of the same size in present discounted value to stabilize debt, and as a consequence equilibrium is restored through larger surpluses.

If debt and inflation do not trigger reaction from fiscal and monetary authorities (small h and α), the intertemporal balance of the budget and fiscal solvency will be guaranteed by price changes, the typical FTPL mechanism: an expansionary fiscal shock will stimulate aggregate demand through wealth effects.[10] This in turn drives prices up, inflation deflates the stock of nominal debt and there is no need for corrections in the surplus process.

Thus, in the latter framework, debt, the price level and the instruments of fiscal and monetary policies are linked by a set of complex relationships. The structural VAR that we present in the next paragraph tries to look into these relationships.

3.2 The 5-variable VAR and the identification assumptions

Our starting point is a canonical VAR in five variables: primary surplus, net debt (both expressed in percent of GDP), real GDP growth (expressed in percent), the inflation rate (computed as the first difference in the log of the CPI), and the short term interest rate:

$$\mathbf{Y_t} = \mathbf{A}(L)\mathbf{Y}_t + \mathbf{X_t}\boldsymbol{\beta} + \mathbf{u}_t \tag{6}$$

where $\mathbf{Y}_t = [s_t, b_t, y_t, \pi_t, r_t]'$ is the vector of endogenous variables, while $\mathbf{X}_t$ is a vector of exogenous variables, notably the German interest rate, a Maastricht dummy, and an interaction variable taking care of the interest rate convergence after 1993. Data are quarterly and go from 1978:1 to 2003:4. A detailed description of the variables and of the sources is given in Section 4 below.

After performing a sequential LR test on the VAR, taking 8 quarters as a lag maximum, we found 5 lags to be the optimum. In this our model does not depart from that of Biau and Girard. What is different is our choice of performing a VAR in level, with variables that are non stationary: the ratio of public debt to GDP, the inflation and interest rates. Doing this, we follow Sims' (1980) recommendation against differencing even if the variables contain unit roots because the goal of a VAR analysis is to determine the inter-relationships among the variables, not to determine estimates. As reported in Sims, Stock and Watson (1990), VARs with non stationary variables incur some loss in estimators' efficiency without any costs in

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[10] In this sketchy and pedagogical version of the model we abstract from expectations that of course play a crucial role in the FTPL. See Creel and Sterdyniak (2002) for a more complete description of the model and of its stability conditions. Creel and Sterdyniak notably show that in the case of backward-looking expectations, the FTPL is incompatible with Ricardian consumers. Interestingly, this conclusion is similar to that of Niepelt (2004) although it is obtained in a very different setting: for the FTPL to function, Creel and Sterdyniak argue that a wealth effect is required whereas Niepelt argue that "surprise inflation" is.

terms of estimators' consistency. In the present case, another – economic – reason lies at the heart of our methodological choice: with a stationary primary surplus and a public debt on GDP having a unit root, we would have to take the latter in first difference and include two indicators of the fiscal stance in the VAR: the primary surplus and the government overall surplus. Economically, this would largely depart from the theoretical background, implying a loss of information.

Consistently with our priors, two exogenous variables (the German interest rate and its interaction with the Maastricht dummy) are significant for the interest rate equation (results not reported). These exogenous variables capture the influence of German monetary policy on the estimated monetary reaction function of France, when the two countries were members of the European Monetary System.

The residuals of the canonical VAR are uninformative on the response of endogenous variables to shocks; to obtain response functions meaningful for the analysis of economic policy we need to isolate structural shocks. Thus, while the canonical residual of, say, the primary surplus collects information on all the unexpected movements of the variable, the corresponding structural residual is obtained by eliminating all feedback mechanism (automatic or discretionary) triggered by changes in the other variables. Thus, the structural residual will be interpreted as an autonomous, discretionary shock, whose effects on the other variables can be examined by means of the impulse response functions (IRF).

The procedure originally suggested by Sims (1980) to pass from canonical to structural innovations, a triangularization of the residual covariance matrix, was soon criticized as being arbitrary and difficult to justify from an economic viewpoint. Structural VARs, originally proposed by Shapiro and Watson (1988), aim at substituting this identification procedure with one that has sounder roots, in the sense that the constraints on the variance matrix of residuals stem from economic behavior. Specifically, Shapiro and Watson, like Blanchard and Quah (1989) shortly after, impose long run restrictions by assuming that only supply shocks have permanent effects. The identification here, following Blanchard and Perotti (2002), is instead based on restrictions in the contemporaneous correlation matrix. In particular, Blanchard and Perotti use the institutional features of the American tax system to impose constraints to the matrix. If we write the relationship between canonical (u_t) and structural (ε_t) residuals as:

$$\mathbf{M_1 u_t} = \mathbf{M_2 \varepsilon_t} \qquad (7)$$

The identification procedure consists in imposing constraints on the elements of the two matrices that allow writing:

$$\varepsilon_t = \mathbf{M_2}^{-1} \mathbf{M_1 u_t} \qquad (8)$$

The system of equations that has been used to build the matrices $\mathbf{M_1}$ and $\mathbf{M_2}$ is the following (the time subscript is omitted, as we only deal with contemporaneous relationships, and all the variables are indexed by *t*):

$$u_s = \alpha_{sb} u_b + \alpha_{sy} u_y + e_s$$
$$u_b = \alpha_{b\pi} u_\pi + \alpha_{br} u_r + \beta_{bs} e_s + e_b$$
$$u_y = \gamma_{ys} u_s + \gamma_{yb} u_b + \gamma_{y\pi} u_\pi + \gamma_{yr} u_r + e_y \qquad (9)$$
$$u_\pi = \gamma_{\pi y} u_y + e_\pi$$
$$u_r = \gamma_{ry} u_y + \gamma_{r\pi} u_\pi + e_r$$

The model (9) replicates the theoretical model presented above (equations 1 to 5). Following Blanchard and Perotti (2002), we identify the two matrices **M₁** and **M₂** in three steps:

- the first step consists in estimating contemporaneous elasticities that relate unexpected shocks within the same quarter, when the institutional features of the system are such that discretionary reactions may be excluded (for which, in other words, we can safely assume that regressors and residuals are uncorrelated). Thus, if we assume that policy makers cannot react within the quarter to unexpected GDP shocks, we can use the estimated elasticity of primary surplus to GDP, $\alpha_{s,y} = (ds/dy)(y/s)$ to fix the coefficient. If two variables are not assumed to be related at all within the quarter, the corresponding α will be set to 0;

- using these elasticities, we can construct the cyclically-adjusted reduced-form primary surplus and debt residuals that are no longer correlated with the other structural shocks. Within an FTPL framework, the causation between surplus and debt is more from the former to the latter than the reverse. We thus assume that the instantaneous response of the surplus to a structural shock on debt $\beta_{sb} = 0$. Hence, the surplus structural shock is equal to the cyclically-adjusted primary surplus residual. Estimating the cyclically-adjusted debt residual on the surplus structural shock finally gives β_{bs};

- the unexpected shocks, for which the theory and/or the institutional features make it impossible to rule out discretionary responses within the quarter, are estimated and the coefficients are denoted by $\gamma_{x,y}$. Of course, the correlation between residuals and explanatory variables requires instrumental-variable estimation.

These three steps permit to isolate different kinds of responses to innovations: elasticities give what can be labeled "automatic and immediate responses" to shocks; step 2 gives the "autonomous discretionary responses" of governments to a surplus unexpected innovation; and step 3 gives the "systematic and instantaneous discretionary responses" to structural shocks. In the case of the primary surplus, the "autonomous discretionary responses" can be considered as the economically correct response of the "cyclically-adjusted" part of the surplus to an innovation.

In Blanchard and Perotti's (2002) methodology, the key to the identification procedure is that the use of quarterly data allows ruling out some instantaneous responses because of diffusion lags, as well as some discretionary responses because

of decision delays and policy implementation lags. With these assumptions and the knowledge of the non discretionary (automatic) component of the responses of some variables to unanticipated changes in others, it is possible to fix many non-diagonal elements of $\mathbf{M}_1$ to 0. Such is the case for the third equation in bloc (9): we assume that the responses of GDP to unanticipated changes in inflation and the interest rate, respectively, within the quarter can be set equal to 0 (*i.e.* $\gamma_{y\pi} = 0$; $\gamma_{yr} = 0$). Doing so, it is possible to regress GDP on the primary surplus and public debt, taking the structural shocks on both as instruments.[11] For the two remaining equations of bloc (9), we still use as instruments the structural shocks related to the explanatory variables. The induced structural shocks are then fully uncorrelated with the canonical VAR residuals.

To sum up, the matrices $\mathbf{M_1}$ and $\mathbf{M_2}$ can be written as:

$$\mathbf{M}_1 = \begin{pmatrix} 1 & -\alpha_{sb} & -\alpha_{sy} & 0 & 0 \\ 0 & 1 & 0 & -\alpha_{b\pi} & -\alpha_{br} \\ -\gamma_{ys} & -\gamma_{yb} & 1 & 0 & 0 \\ 0 & 0 & -\gamma_{\pi y} & 1 & 0 \\ 0 & 0 & -\gamma_{ry} & -\gamma_{r\pi} & 1 \end{pmatrix} \tag{10}$$

and:

$$\mathbf{M}_2 = \begin{pmatrix} 1 & 0 & 0 & 0 & 0 \\ \beta_{bs} & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix} \tag{11}$$

Fixing α_{sy} and α_{sb} allows for identification of e_s, the structural shock on the primary surplus, which is obtained by simple calculation, since the values of the residuals of the canonical VAR are known. Once $\alpha_{b\pi}$ and α_{br} have been fixed and e_s is known we can estimate by OLS β_{bs} and isolate the structural shock on debt e_b in the equation of the canonical residual of the debt. We can then use e_s and e_b as instruments in the third equation in order to obtain estimates for γ_{ys} and γ_{yb} and the structural shock on activity e_y. We do the same in the equation of the canonical residual of the inflation rate to estimate $\gamma_{\pi y}$, and the structural shock on inflation rate e_π, and in the fifth equation to estimate γ_{ry}, and $\gamma_{r\pi}$ and the structural monetary shock e_r.

Elasticities of the public debt-to-GDP ratio resulted from OLS regressions *vis-à-vis*, alternatively, the interest rate and the inflation rate (all variables were

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[11]   We thus assume that structural fiscal shocks can have an immediate impact on GDP (residual): to motivate our choice, without relying exclusively on methodological convenience, we affirm that real variables have a more immediate impact on real variables than nominal ones.

expressed in first difference for elasticities' calculations). Elasticities of the public-surplus-to-GDP ratio followed a two-step procedure: the primary surplus was separated between public expenditures (excluding interest payments) and tax receipts and both items were regressed *vis-à-vis*, alternatively, real GDP and the public-debt-to-GDP ratio. Finally, the elasticity of the primary surplus was equal to the corresponding weighted sum of the elasticity of tax receipts less that of public expenditures.

Elasticities took the following values: $\alpha_{sy} = 0.1$; $\alpha_{sb} = -6.5 \cdot 10^{-5}$; $\alpha_{bp} = -0.7$; and $\alpha_{bi} = 0.2$ α_{sy} corresponds to the elasticity of the primary surplus in percent of GDP to GDP and should not be confused with that of the primary surplus to GDP (generally equal to 0.5 in the literature). If we consider the institutional features reported by Biau and Girard for France, their value for α_{sy} can be confirmed.[12]

Second, the low elasticity of public debt *vis-à-vis* interest rate (within a quarter) is consistent with one important feature of French public debt, 80 per cent of which is issued at a fixed interest rate. Third, the relatively high elasticity of debt *vis-à-vis* inflation is also consistent with French debt's institutional features: 95 per cent of this debt is non-indexed. Finally, the computation of an elasticity of the primary surplus to the public debt residual, rather than fixing it to zero, can be explained from two different perspectives. The less satisfactory one is technical: fixing α_{sb} to zero would give the FTPL interpretation of data an *ex ante* prominence that would bias *ex post* results. The other, more satisfactory, perspective relies on institutional information: the uncertainty surrounding debt financing quasi-automatically induces a stop in the program of public capital expenditures and has thus an effect on the primary surplus.[13] In the present situation, it is straightforward to show that this effect is marginal: α_{sb} is almost zero.

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[12]   Biau and Girard consider that the elasticity of net receipts to GDP is equal to 0.8 while that of public expenditures is equal to 0 (real expenditures are not modified within a quarter): expressed in percent of GDP, it is straightforward that the net receipts ratio decreases less than the public expenditures ratio after GDP has grown; hence, the surplus increases in percent of GDP.

[13]   In France, since the mid-Eighties, the "new public debt" is auctioned every month over the fiscal year, the program of these auctions for mid-term and long-term public bonds being decided at the end of the preceding fiscal year. This program of debt auction depends on planned public net borrowing and on planned capital amortization charges. Every month, the interest rate at which the auction has taken place is uncertain, depending on supply and demand, and so does capital amortization charges. Hence, although debt financing is planned in advance, the conditions at which it takes place give rise to monthly (and, in our case, quarterly) errors in the measurement of the real value of public debt. As a matter of fact, the French Treasury is fully aware of the quarterly cost of debt and can quasi-automatically compensate the increase (decrease) in the future streams of interest charges by a delay (acceleration) in the implementation of public capital expenditures. Note that the computed value of α_{sb} is sufficiently small to validate this mechanism. For a comprehensive survey of French public finances, see Llau (1996).

4.   Description of data

The estimation period goes from 1978:1 to 2003:4. We use French quarterly national accounts from INSEE for gross domestic product and for primary surplus. French and German price consumer indexes and nominal short term (3-month) interest rates are obtained from DATASTREAM. Annual data for the stock of net liabilities come from the INSEE Balance Sheets; quarterly government net lending figures come from INSEE National Accounts; and quarterly data for net lending from the Financial Accounts of the Bank of France are used to construct a quarterly series of net financial liabilities. All variables have been seasonally adjusted by the original sources. Only GDP and main budget aggregates, notably operations on goods and services, are also adjusted for working days. Quarterly general government budget figures, as part of the ESA95 integrated system of National Accounts, are consistent with national income data.

Real gross domestic product is the only variable deflated by the GDP deflator. We use the French consumer price index to deflate all French nominal series and the German consumer price index to obtain the real German interest rate. We have included a Maastricht dummy (DUMMA) starting from 1992:1 as well as a composite dummy (INTER), which is the product of the German interest rate and of DUMMA to take care of the interest rate convergence after 1993. Government primary surplus is obtained as the sum of government net lending and interest payments. The quarterly series for net financial liabilities from 1978 to 1994 is obtained by adding to the 1977 annual figure of the stock of net liabilities the quarterly observations on government net borrowing. For the 1995-2003 period, quarterly observations on the flow of net financial liabilities replace those on government net borrowing. There is a difference between the authentic annual series and the annual series stemming from this artificial quarterly series, in that in the 1978-94 period information concerning revaluations and changes in volume of net liabilities is lost, since these items are omitted in government net borrowing observations from National Accounts. This difference has thus been calculated and then interpolated at quarterly frequency. It has been reattributed on a quarterly basis to the quarterly observations. The new artificial quarterly series thus obtained, when annualized, is consistent with the annual data from the INSEE Balance Sheets. This statistical artifice provides us with a quarterly series of government net financial liabilities containing more quarterly information than a simply interpolated series.

Although not completely free from interpolation, French government series contain a considerable amount of quarterly information. On the expenditure side, almost all components of actual collective and individual consumption are calibrated using quarterly indicators. So are social transfers in kind. Social benefits other than transfers in kind are obtained by quarterly observations from social protection institutions. Seventy percent of public investment (construction) is made of genuinely quarterly series. As far as government receipts are concerned, social contributions are mainly genuinely quarterly data or calibrated by quarterly indicators. As a consequence, only some items on the government revenue side are

pure quarterly interpolations from annual data: business and net wealth taxes, rights on real property, and property income.

The public finance variables are plotted in Figure 1. They reveal the general orientation of French fiscal policy since the late Seventies. They also shed light on the very close relationship between the primary surplus, net public debt and the real interest rate that thus gives peculiar importance to the above-mentioned model.

It is well known that public deficits increased dramatically in the early Eighties since upon taking office in the spring of 1981, the new socialist government decided to reflate despite the so-called "external constraint" (that finally turned out to bite). It is interesting to note that although public deficits were soaring, primary surpluses increased dramatically and thus emphasized the key incidence of the sudden rise in interest charges on the overall fiscal stance of French fiscal policy in the early Eighties. The reversal to a stricter economic policy began in the summer of 1982. The "*tournant de la rigueur*" (materialized in the execution of the budget after the spring 1983 third devaluation of the French Franc in the European Monetary System) resulted in a slow improvement of the primary-deficit-to-GDP ratio by the end of 1983. As fiscal consolidation became a declared objective of left- and right-wing policy makers over the period 1984-87, primary balance was almost achieved over this period. From 1989 to 1992, primary balances were continuously positive and the remaining overall public deficits of France were mainly due to growing real interest rates. The primary surplus worsened dramatically between 1993 and 1995 mostly due to the recession of 1991-93 (real economic growth for 1993 had been equal to −1.3 per cent). Since 1991, social security experienced a deficit (which represented 0.9 points of GDP in 1993). At the end of 1993, the public deficit ratio reached 6 per cent of GDP (*i.e.* twice the Maastricht 3 per cent limit), half of which could be attributed to the primary deficit. The next phase was characterized by fiscal consolidation in order to meet the Maastricht limit of the 3 per cent of GDP. Since the end of 1994, fiscal policy turned to be strongly restrictive, resulting in sharp increase in the primary surplus, from −2 of GDP 1996 to +2 per cent of GDP four years later. Between 2001 and 2004, however, fiscal policy has been less restrictive and the primary deficit in percent of GDP has reached the level of 1995, hence has erased the "convergence years".

As far as the public-debt-to-GDP ratio is concerned, it is noteworthy that its rise over the Eighties occurred despite the increase in the primary-surplus-to-GDP ratio. This leads to conclude that, the impact of the real interest rates on debt growth has been predominant. In the Nineties, the steep increase in the public-debt-to-GDP ratio coincided mainly with that of the primary deficits; only in the late Nineties did the relatively low real interest rates permit a decrease in the public-debt-to-GDP ratio.
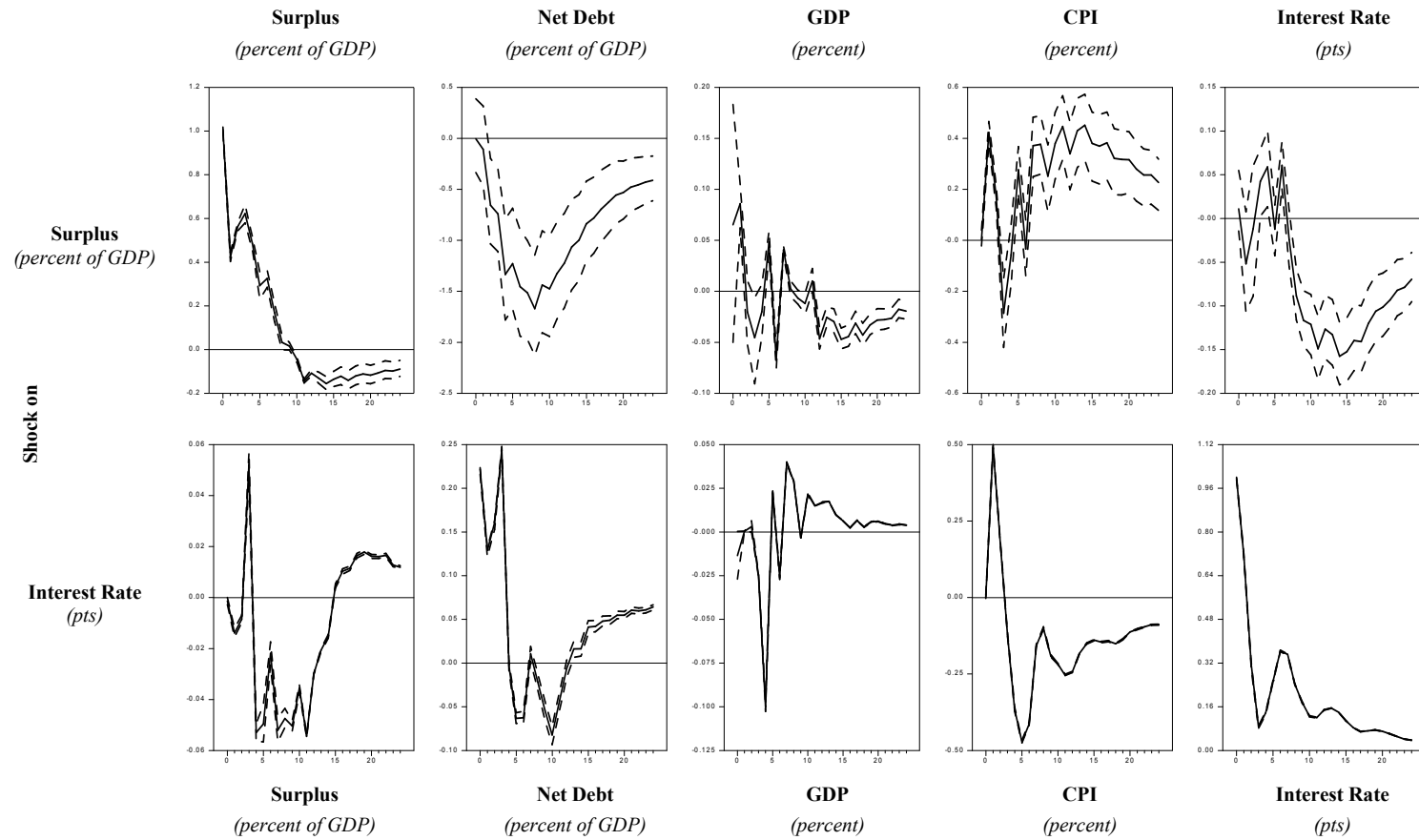
Public Finances and the Real Interest Rate
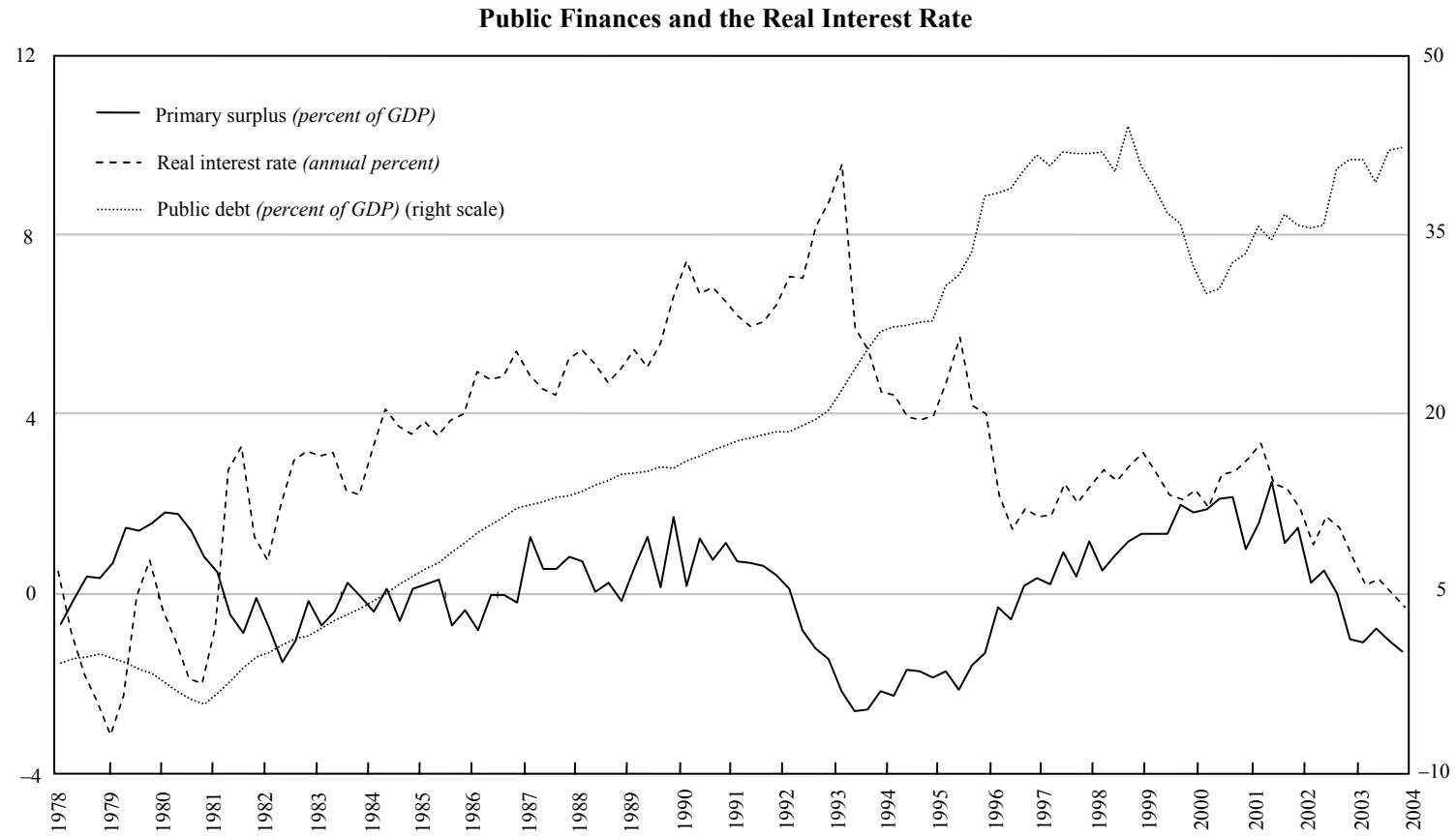
Source: INSEE and DATASTREAM.

Figure 2

Impulse Response Functions for the Full Sample, 1978-2003

5.   **Results**

Figure 2 displays the responses of the five endogenous variables to two different shocks: first a shock to e_s equal to 1 percent of GDP; second a shock to e_r equal to 100 basis points. Like in Perotti (2004), the figure also displays the two symmetric one standard error bands computed by bootstrapping, as in Stock and Watson (2001).

5.1   *A fiscal shock*

The first outcome worth emphasizing is the negative significant impact of a positive surplus shock on GDP, from the second quarter after the shock has occurred. In fact, although the immediate response of the interest rate to the fiscal shock leads to a one-quarter long increase in GDP and prices, FTPL characteristics appear from the second quarter on. Two non-Keynesian episodes carrying no significance appear during the first 3 years, most surely driven by the fall in the interest rate. Nevertheless, afterwards FTPL properties prevail and non-Keynesian arguments can be disregarded for France. This negative impact increases in absolute value although at a decreasing rate from the sixth year after the shock has occurred. The effect continues to deploy in the longer run, remaining however quite low in absolute value. This confirms the Keynesian properties of fiscal policy in France that were the main conclusion of Biau and Girard. However, the fiscal multiplier that we obtain is lower than theirs.

As could be expected from the theoretical framework, the wealth effect plays a crucial role in the long-lasting decrease in GDP: in fact, after the decrease in the real interest rate, the negative wealth effect is shown to have a more substantial impact on GDP than the usual positive private investment effect. The effect on output in the long run thus stems from the negative wealth effect which is itself consecutive to the sharp decrease in public debt. Origins of the latter are twofold: a temporary shock on the primary surplus and a decrease in the real interest rate.

The incidence of the surplus shock on prices appears unable to reject the FTPL; after the instantaneous fiscal-induced pick up in prices, the price level adjusts to lower aggregate demand, inflates net public debt thus reestablishing the intertemporal budget balance. A new steady state with lower net debt and lower wealth justifies the persistence of a lower GDP. This result is relatively at odds with the conclusions of Creel and Le Bihan (2006) for France. In their paper, the VAR only incorporated the primary surplus and net debt (both expressed in percent of GDP) whereas the interactions between monetary and fiscal policies were not studied.[1] This latter element might be crucial in the present context. As Figure 2 shows, monetary policy loosens in the medium run, in response to the contractionary fiscal shock, and it surely has a positive impact on prices.

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[1]   Also noteworthy, Creel and Le Bihan (2006) do not use the same sample: data are on an annual basis and start in 1963.

Revealed substitutability in the behaviors of monetary and fiscal authorities in France, stemming from the fiscal shock, might seem quite amazing if we were trying to argue that both authorities have long worked hand in hand without conflict. The story is simpler: with the substantial rise in nominal and real interest rates that occurred in the Western countries during the Volcker's era at the end of the Seventies and beginning of the Eighties, some countries like France implemented expansionary fiscal policy that were meant to cushion the negative impact on private consumption and investment that this monetary shock had provoked. As we show in Section 6, in the more recent years, most notably after the disinflation strategy had been launched and during the Maastricht convergence period, the "complementary behaviors" have disappeared and a new regime made up of fiscal contraction and relatively restrictive monetary policies has arisen.

5.2   A monetary shock

The most interesting response is that of GDP: we observe an immediate significant decrease in output until economic growth resumes two years after the shock, when the monetary shock has disappeared. However, an immediate increase in the price level is observed despite the fall in aggregate demand. The VAR monetary literature has long exhibited a puzzling phenomenon: following a positive innovation on the policy interest rate (here related to the real interest rate, rather than the nominal one, for reasons that have to do with the FTPL framework, see paragraph 3.1), the price level tends to increase rather than to decrease. According to Sims (1992), this so-called "price puzzle" arises due to an error in identifying the exogenous part of monetary policy. Without an indicator for *future* inflation among the endogenous variables of the VAR, the price rise following a positive shock on the nominal interest rate would appear as a normal response to higher *expected* inflation: what has been labeled an "exogenous monetary shock" in fact contains some portion of the endogenous response of monetary authorities to higher future (or expected) inflation. In order to circumvent the "puzzle", Sims and others have suggested incorporating commodity prices as endogenous variables in VARs. Doing so, the truly exogenous component of monetary policy would be more accurately identified.[2] It is noteworthy here that the "price puzzle" seems to be present in spite of the fact that the monetary policy shock is exogenous, thanks to the overall methodology which has been implemented. However, the price puzzle rapidly disappears and the pick up in GDP growth stems from the positive wealth effect that has resulted from the increase in net public debt; the latter after having immediately responded to the structural monetary shock and subsequently to the pick up in inflation, is finally driven by the fall in the price level. As in the case of a fiscal shock we observe a "coordination" of the fiscal and monetary authorities as a monetary restriction yields an immediate expansionary response of fiscal authorities, supporting growth until the positive effect of higher wealth takes over.

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[2]   Two recent contributions on the "price puzzle" have cast some doubts on the favourable incidence of introducing commodity prices in VARs (Giordani, 2004; Hanson, 2004).

Consistently with the predictions of the FTPL, public debt dynamics appear to react to the real interest rate and prices rather than to the evolution of the primary surplus: after a structural fiscal shock, the decrease in net debt is mainly driven by the immediate and sharp decrease in the real interest rate. Its upsurge, once the fiscal shock has disappeared, is led by the fall in prices. After a structural monetary policy shock, net debt decreases immediately while the primary deficit shows a persistent increase. The subsequent rise in net debt is led by the price movement while the primary deficit declines.

6.   Robustness

In this section we perform a simple test to check the robustness of the results described in the previous section. We split our sample in two, the pre- and post-Maastricht periods, and we computed the impulse response functions corresponding to the two sub-samples. Table 1 shows how the computed elasticities changed.

It is interesting to notice that the changes over the two sub-periods are substantial, and that they denote a change in policy. The Maastricht discipline shows in the sign of α_{sb}, that, though extremely small in absolute value, changed from positive to negative. The sensitivity of the debt-to-GDP ratio to the interest rate went from large and positive to negative; the overall result is a small and positive value. Finally, the important swing of α_{sy} reflects the institutional change intervened with the Maastricht treaty, when primary surplus became an objective rather than an instrument.

Figures 3 and 4 show the impulse response functions computed for the two sub-samples. With respect to the complete sample, the optimal lag length passed from 5 to 4. Obviously, we dropped from the two regressions the Maastricht
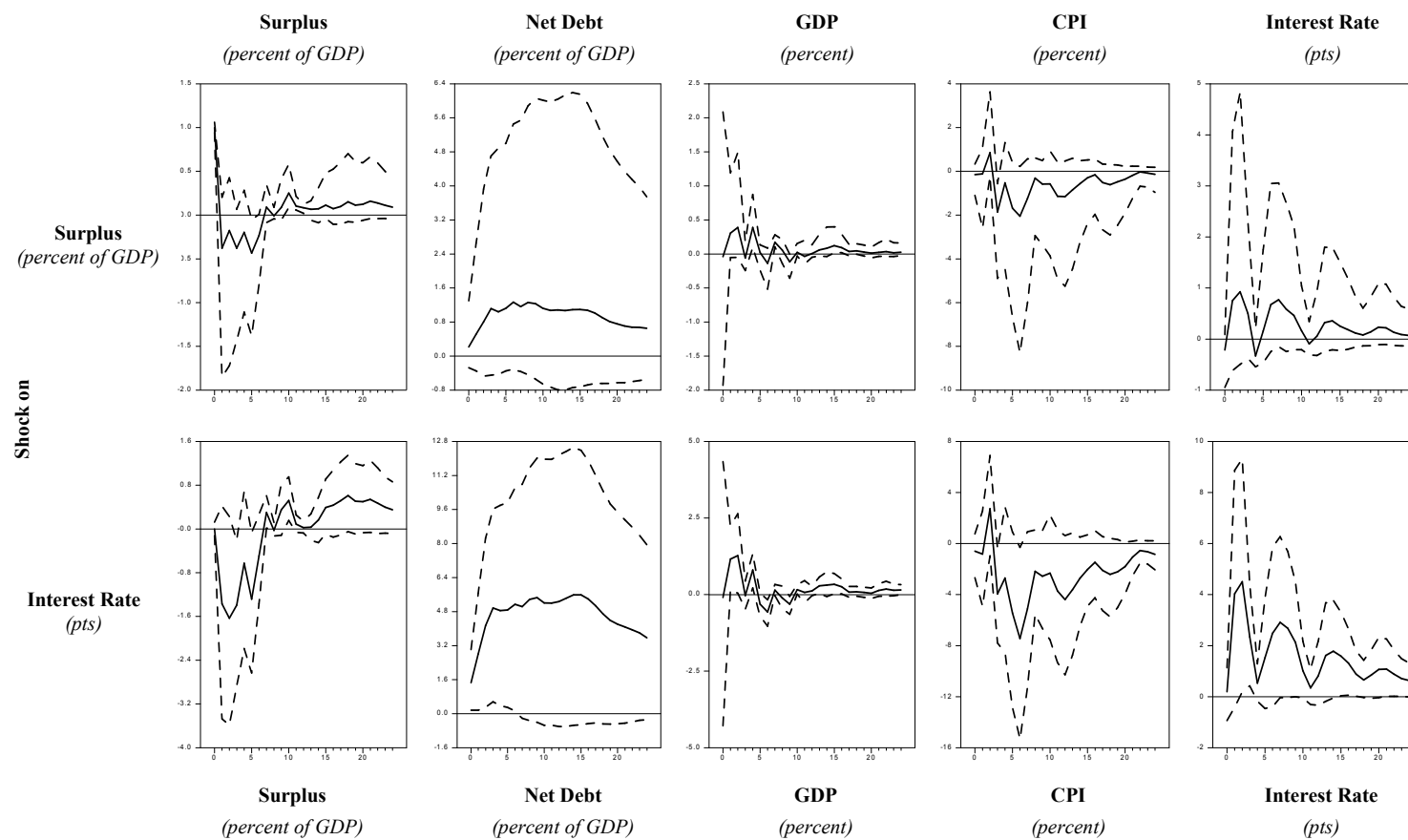
Table 1

Computed Elasticities

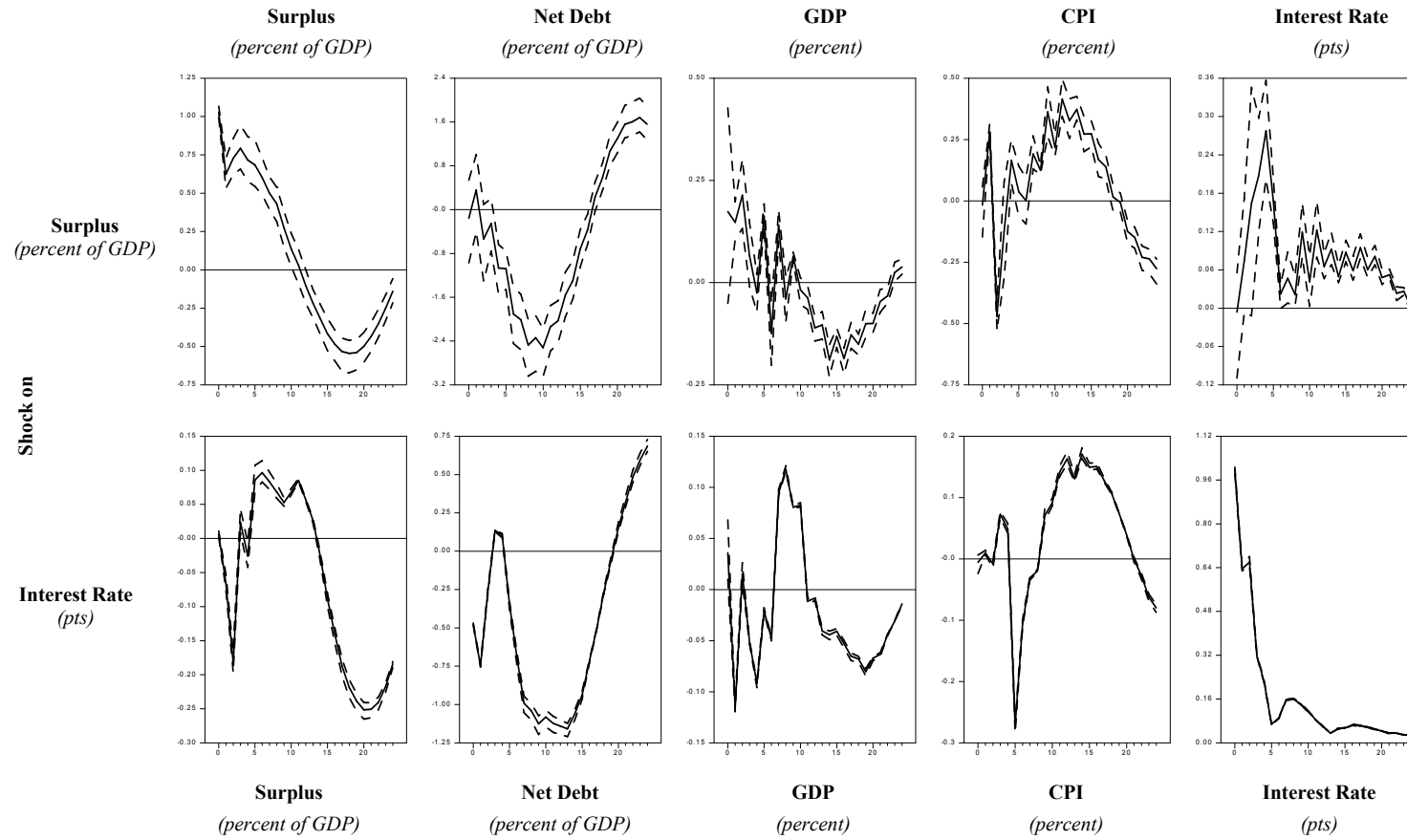| Sample	all	1978-91	1992-2003
α_{sy}	0.10	0.03	0.16
$\alpha_{b\pi}$	−0.69	−1.49	−0.31
α_{br}	0.22	3.27	−0.48
α_{sb}	$-6.5 \cdot 10^{-5}$	$3.3 \cdot 10^{-4}$	$-3.5 \cdot 10^{-4}$

Source: Authors' calculations.

Figure 3

Impulse Response Functions for the First Sub-sample, 1978-91

Figure 4

Impulse Response Functions for the Second Sub-sample, 1992-2003

| Surplus *(percent of GDP)* | Net Debt *(percent of GDP)* | GDP *(percent)* | CPI *(percent)* | Interest Rate *(pts)* |

Shock on

Surplus *(percent of GDP)*

Interest Rate *(pts)*

| Surplus *(percent of GDP)* | Net Debt *(percent of GDP)* | GDP *(percent)* | CPI *(percent)* | Interest Rate *(pts)* |

dummy, so that the exogenous variables are the constant and the German interest rate.

The results for the first sub-sample (1978-91) are that neither fiscal nor monetary policy shocks yield significant responses of the main macroeconomic variables. Two factors in our opinion contribute to explaining this result of policy ineffectiveness. The first is the high inflation environment of the late Seventies and early Eighties, that on one side made it very hard for fiscal and monetary authorities to design and implement efficient policy measures, and on the other made coordination harder to obtain. The second and in our opinion even more convincing explanation is that the process of European integration has progressively transformed the European Union in a large economy, in which policy has an important role to play. In the Eighties, on the other hand, such a process was just beginning, and even the largest European economies were strongly influenced by external factors. In that decade, in particular, the strong fluctuations of the dollar, and the US interest rates can explain most of the macroeconomic developments of the European economies (Fitoussi and Phelps, 1988). Thus, it is hardly surprising that national policies were not as effective as they had been when these economies were less open.

As for the Maastricht years (1992-2003) the discourse is more complex. By looking at Figures 2 and 4 we can observe that the overall behaviour over this sub-sample is similar to that over the full sample, with two important differences. The first is the response of interest rates to fiscal shocks that shows how the substitutability between fiscal and monetary policy was reduced. In the full sample monetary policy loosens in the medium run, in response to a contractionary fiscal shock. This has the effect of softening the effects on GDP, even if at the price of a persistent effect on inflation. In the past decade, instead, monetary policy tended to reinforce the effects of fiscal shocks. Thus, while inflation was curbed, the loss in terms of output growth was more pronounced. The lower degree of coordination between fiscal and monetary policy also emerges from the response to monetary shocks. While in the full sample monetary restrictions yield an expansionary response of fiscal authorities, in the past decade this behaviour was disrupted by the fiscal rules introduced with the Maastricht Treaty. Many governments including France were forced to react to GDP slowdowns and to the ensuing degradation of the fiscal position by taking a tighter stance. Thus, the response of primary surplus to a contractionary monetary shock is unsurprisingly positive at least in the medium run.

7.   Conclusion

This paper develops along the lines traced by a recent body of literature that tried to assess the effects of fiscal policy shocks on the economy. We tackled the issue from a new perspective, using as a background model the fiscal theory of the price level. It has allowed a richer structure than in the current literature, in

662 Jérôme Creel, Paola Monperrus-Veroni and Francesco Saraceno

particular in what concerns the importance of wealth effects and of the strategic interaction between fiscal and monetary policy.

In spite of this new and more complex setup, our paper is in line with the consensus that is emerging in the literature, in particular on the effects of fiscal policy shocks. On the one hand, our results confirm the standard textbook effects of fiscal expansions, though the size of the impulses should not be overstated. On the other hand, the impulse response functions of the structural VAR are consistent with the theoretical predictions of FTPL models, mainly as regards the positive link between the primary surplus and the price level. Moreover the wealth effect has been shown to work quite well and it facilitates the general understanding of the complex relationships between monetary policy, fiscal policy, net debt accumulation and GDP.

Our analysis has concerned one of the largest European economies, France. Thus, the results carry a very strong political economy implication. The whole set of rules that governs the European Union has been designed based on the assumption that fiscal policy is largely ineffective, when not harmful; an assumption that is in line with the theoretical results that characterized the literature on non-Keynesian effects that developed along the Nineties, when the Treaties were debated and written. In light of the results presented in this paper and in the literature it refers to, the Stability and Growth Pact, that is designed to let *at most* automatic stabilization play a role, lacks an empirical foundation.

On a more general level, the resurgence of interest in fiscal policy shows how dangerous are the attempts to crystallize in a constitutional framework the policy prescriptions that come from a particular doctrine. As our understanding of the mechanisms governing the economy deepens, the policy prescriptions and the tools best suited to face given shocks are also likely to change, so that the institutions in charge of governing the economy should be given the freedom to adapt to the new advances in economic theory.

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