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The Effects of Fiscal Shocks on the Exchange Rate in Spain

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Abstract: We analyse the impact of fiscal shocks on the Spanish effective exchange rate over the period 1981-2008 using a standard structural VAR framework. Government spending brings about positive responses of output and private consumption, jointly with real appreciation and a fall in trade balances. Real appreciation is explained by persistent nominal appreciation and higher relative prices. Accordingly, our results are largely consistent with the predictions of not only the conventional Mundell-Fleming model, but also of a number of New Keynesian models under standard calibrations. Moreover, our estimations are also consistent with the "twin deficits" hypothesis.

I INTRODUCTION

Recent years have witnessed increasing empirical evidence on the macroeconomic effects of discretionary fiscal policy in a wide set of countries. Probably, the two most interesting and promising methodologies to identify fiscal policy shocks in VARs were those proposed in Blanchard and Perotti (2002)[1] and in Mountford and Uhlig (2009). The method proposed by

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[1] Perotti (2004) developed this methodology further and has constituted the basis of later studies focused on different countries.

Blanchard and Perotti (2002) exploits decision lags in policy making and information about elasticities of fiscal variables to economic activity, whereas the Mountford and Uhlig (2009) methodology consists in imposing some sign restrictions to impulse response functions. Although most papers have focused on the U.S. (Edelberg *et al.*, 1999; Fatás and Mihov, 2001; Blanchard and Perotti, 2002; Perotti, 2004; Mountford and Uhlig, 2009, among others), growing evidence on other countries has arisen. Some examples in this regard are Heppke-Falk *et al.* (2010) for Germany, De Castro (2006) and De Castro and Hernández de Cos (2008) for Spain, Giordano *et al.* (2007) for Italy, Marcellino (2006) for the four largest countries of the euro area, Afonso and Sousa (2009a, 2009b) for Germany, Italy and Portugal, Bénassy-Quéré and Cimadomo (2006) for Germany, the U.K. and the US, or Burriel *et al.* (2010) for the whole euro area, among others.

However, most of these papers fail to analyse in depth the implications of fiscal shocks on external competitiveness, a crucial element especially for small open economies. This paper aims to fill this gap by focusing on the effects of public spending shocks on the real effective exchange rate, relative prices and the current account balance in Spain. There are some recent studies in this field, although as it is commonplace in the analysis of discretionary fiscal shocks, broad agreement on their effects is lacking. Thus, Kim and Roubini (2008), Corsetti *et al.* (2009) and Enders *et al.* (2011) for the US, Monacelli and Perotti (2010) for Australia, the US and the U.K. and Ravn *et al.* (2007) for a pool of Australia, Canada, the US and the U.K., find that higher government expenditure yields real depreciations. By contrast, Beetsma *et al.* (2008) for a panel of EU counties, or Bénétrix and Lane (2009a) or Galstyan and Lane (2009a) for Ireland argue that government spending shocks lead to real appreciations. Bénétrix and Lane (2009b) get the same result with a panel of euro area countries. In addition, Froot and Rogoff (1991), De Gregorio *et al.* (1994) and Galstyan and Lane (2009b) observe a long-run real appreciation in response to increases in government consumption.

Real depreciations and private consumption increases following spending build-ups represent a theoretical challenge as real appreciation is a robust theoretical prediction in most RBC and new-Keynesian DSGE models. Under complete international markets for state-contingent assets, higher public expenditure results in a negative wealth effect that depresses private consumption. In this context, the usual consumption risk sharing condition implies that lower domestic private consumption calls for an appreciation of the real exchange rate. Erceg *et al.* (2005) show that allowing for Rule-of-Thumb consumers leads to positive private consumption responses to government shocks, jointly with real appreciation. In this context, the real

appreciation is obtained because the exchange rate movements are only determined by consumption by forward-looking agents in that it is assumed that only these agents have access to complete international financial markets.

Some arguments have been put forward to justify real depreciations caused by government expenditure shocks. Obstfeld and Rogoff (1995) argue that in a large economy, a fiscal expansion increases the real interest rate and depresses private consumption. The latter induces a fall in money demand, which in the presence of sticky prices leads to a depreciation of the nominal and real exchange rate. Alternatively, spending-led depreciations are also justified by the presence of deep habits in consumption (Ravn *et al.*, 2007) or by the fact that international price movements tend to amplify instead of mitigate country-specific consumption risk in the short run (Enders *et al.*, 2010). In addition, Corsetti *et al.* (2009) argue that the expectation of spending reversals in a context of sticky prices may lead public spending shocks to lower long-term interest rates and thereby to real depreciation.

We aim to provide further evidence in this area by assessing the effects of government spending shocks on external competitiveness and the current account balance in Spain. We base our conclusions on impulse response functions drawn from structural VARs, wherein discretionary fiscal shocks have been identified following the methodology proposed by Blanchard and Perotti (2002) and Perotti (2004). To our understanding, this is the first paper that tackles these issues for Spain within this framework.

The rest of the paper is organised as follows: Section II presents predictions by different models concerning mainly the reaction of real exchange rates to public spending shocks, Section III describes the data, Section IV the methodological issues and Section V the results. Finally, we present our conclusions in Section VI.

II THE RELATIONSHIP BETWEEN SPENDING SHOCKS, EXCHANGE RATE MOVEMENTS AND TRADE BALANCES IN THEORETICAL MODELS

On the theoretical field, although there is not full unanimity about the sign of the response of the exchange rate to public spending shocks, in most of the models fiscal expansions lead to real appreciation. The traditional Mundell-Fleming model, an open economy version of the Hicksian IS-LM framework, predicts that higher government spending would spur economic activity and hence private consumption. The resulting higher final demand would then provoke an upward reaction of nominal and real interest rates that would trigger capital inflows and entail nominal and real appreciation. Higher

final demand and currency appreciation would lead to a fall in the trade balance.

Home bias is another usual argument behind spending shocks-led real appreciations in the literature. Insofar as government spending mostly concentrates on home-produced goods, fiscal expansions should make these goods relatively scarcer, thereby increasing their relative price with respect to imported goods and leading to real appreciation (see Frenkel and Razin, 1996).

Likewise, real appreciation is a robust theoretical prediction in most RBC and DSGE models. Under complete international markets for state-contingent assets, higher public expenditure results in a negative wealth effect that depresses private consumption.[2] In this context, the usual consumption risk sharing condition implies that lower domestic private consumption calls for an appreciation of the real exchange rate.[3] However, the assumption of complete markets is not crucial for real appreciation. Galí *et al.* (2007) show that the introduction of Rule-of-Thumb consumers may bring about positive private consumption responses to government shocks provided that the share of these consumers is sufficiently high. In this connection, Erceg *et al.* (2005) allow for Rule-of-Thumb consumers in one version of their open macroeconomic model and obtain the positive private consumption responses to government shocks, jointly with real appreciation. The latter takes place because irrespective of the share of Rule-of-Thumb consumers, consumption by forward-looking agents still declines due to the negative wealth effect. As only these agents have access to complete international financial markets, their consumption behaviour determines exchange rate movements via the aforementioned usual consumption risk sharing condition.

A number of possible explanations for real depreciations caused by government expenditure shocks have also been put forward. Obstfeld and Rogoff (1995) predict that in a large economy, under the assumption that the government follows a balanced budget rule, a fiscal expansion increases the real interest rate, thereby depressing private consumption. Since the demand for money is assumed to depend on private consumption, insofar as prices are sticky, a fall in consumption leads to a depreciation of the nominal and real exchange rate. The problem with this hypothesis is, however, that in most

[2] Higher expenditure has to be financed either by raising taxes or by issuing public debt. In this latter case, rational forward-looking agents would discount that such higher public debt has to be eventually paid. Hence, for a given path of government expenditure, forward-looking consumers discount future tax increases. Accordingly, regardless of whether higher government expenditure is financed with present or future tax hikes these options entail a lower present value of consumers' income.

[3] Monacelli and Perotti (2010) make an interesting comparison of the effects of government spending shocks on private consumption and the real effective exchange rate across different theoretical frameworks.

pieces of empirical evidence private consumption rises following government spending shocks.

Accordingly, some recent papers have endeavoured to build theoretical models aimed at reconciling both stylised facts, notably positive consumption responses and real exchange rate depreciation to government spending shocks. Probably, the most promising attempt is Ravn *et al.* (2007), which introduces deep habits in consumption in an otherwise standard DSGE open economy model. In this framework, an increase in public expenditure provokes a countercyclical reaction of equilibrium markups, a rise of wages and private consumption and a deterioration of the trade balance. They argue that the decline of domestic markups makes the domestic economy relatively inexpensive with respect to the foreign one, thereby causing real exchange rate depreciation.

Corsetti *et al.* (2009) argue that the economy's response to a spending rise depends highly on agents' expectations of spending reversals in the future. Thus, if current deficits are expected to be at least partly offset in the future, long-term interest rates might even go down. In this context, private consumption would increase jointly with a depreciation of the real exchange rate.

Enders *et al.* (2011) put forward a different explanation. They employ a two-country business cycle model featuring some conventional frictions such as various degrees of price rigidity, wherein each country specialises in the production of a particular type of good and intermediate goods firms operate under monopolistic competition. They allow for home bias in the composition of final goods. They simulate their model for a wide range of plausible parameterisations and show that no clear-cut predictions for the real effective exchange rate can be obtained. Then, they identify a VAR by means of imposing sign restrictions for the variables that the model provided clear-cut predictions, while remaining agnostic about the response of the real exchange rate. They justify real depreciations on the grounds of short-run international price movements tending to amplify instead of mitigate country-specific consumption risk, contrary to the implications from conventionally calibrated business cycle models.

III THE DATA

The baseline VAR includes quarterly data on public expenditure (g_t), net taxes (t_t) and GDP (y_t), all in real terms,[4] the GDP deflator (p_t), the three-year

[4] The nominal variables have been deflated by the GDP deflator in order to obtain the corresponding real values.

interest rate of government bonds (r_t)[5] and the real effective exchange rate (REER henceforth) vis à vis the rest of the world. All variables are seasonally adjusted and enter in logs except the interest rate, which enters in levels.[6] The definition of fiscal variables follows Blanchard and Perotti (2002) and Perotti (2004). In particular, government spending (g_t) is defined as the sum of government consumption and investment, whereas net taxes (t_t) are defined as total government receipts less transfers excluding interest payments on government debt.[7] In turn, the REER is defined vis-à-vis the rest of the world and gauged with consumer prices in a way that an increase reflects a real appreciation.

We try other VAR specifications aiming to better understand the responses of certain variables to fiscal shocks. For this purpose, we also assessed the reactions of the nominal effective exchange rate, net exports, exports and imports of goods and services or the role of relative prices. In those cases, nominal values of net exports, exports and imports were all deflated by the GDP deflator in order to avoid neglecting the effect of the different prices on the overall external balance. On the other hand, as we are also interested in the analysis of exchange rate responses to different types of fiscal shocks, we included non-wage government consumption, government spending on wages and salaries and public investment in turn as endogenous variables. As before, the GDP deflator was used to get their corresponding real values.

Our sample covers the period 1981:Q1 to 2008:Q4. GDP volumes and deflator, exports, imports and net exports have been taken from the Quarterly National Accounts (National Institute of Statistics, INE), while the three-year bond rate has been obtained from the Banco de España database. The domestic Consumer Price Index has also been taken from the INE. In turn, quarterly fiscal variables until 2000 were taken from Estrada *et al.* (2004), which were estimated applying monthly and quarterly official fiscal indicators on a cash basis to the official ESA-95 annual account data. These fiscal variables are the same as in De Castro (2006) and De Castro and Hernández de Cos (2008). From 2000 on, quarterly fiscal variables are not interpolated; they are official figures published by the IGAE (Ministry of Economy and

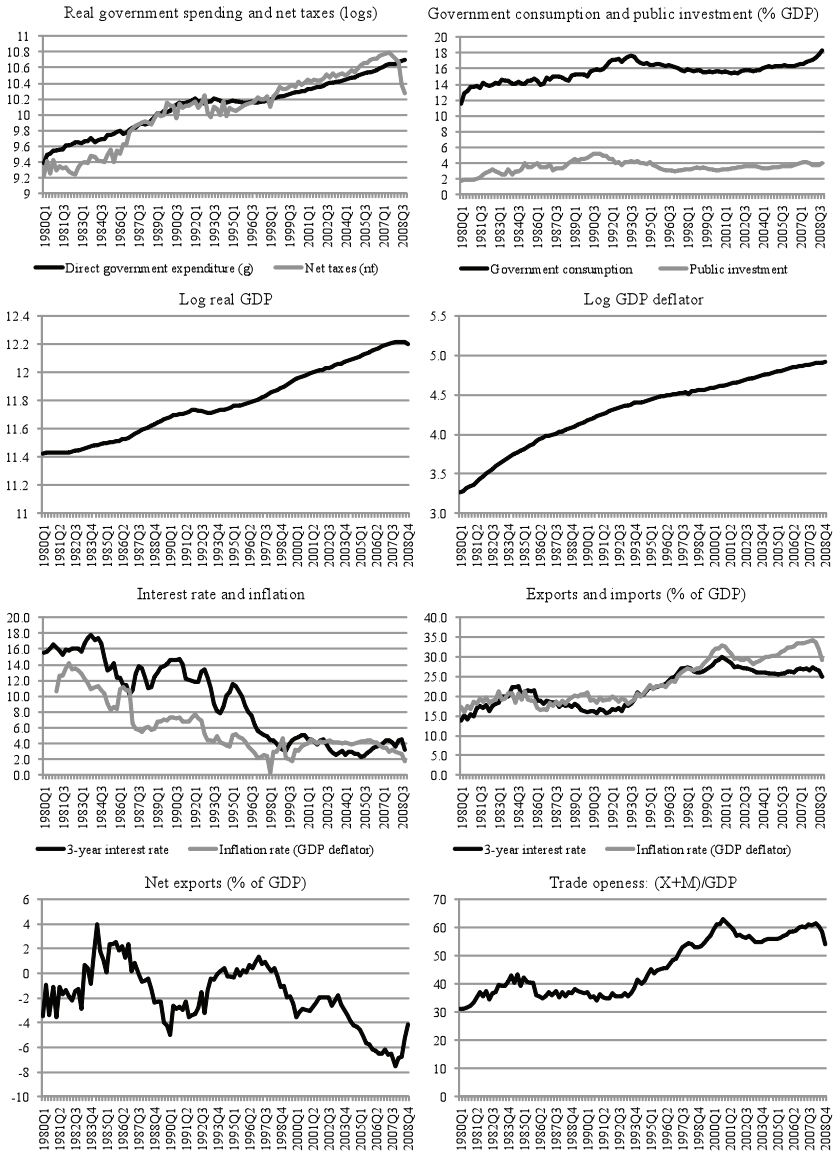
[5] The long-term interest rate is preferred to the short-term one because of its closer relationship with private consumption and investment decisions. However, this choice turned out to be immaterial to the results in that the inclusion of short-term rates in the VAR led to similar conclusions.

[6] In order to assess the effects on the exchange rate, it could even be more appropriate to express variables relative to the weighted average of trading partners. Unfortunately, we cannot follow this approach due to the lack of availability of all necessary data for the whole sample period.

[7] More concretely, transfers include all expenditure items except public consumption, public investment and interest payments.

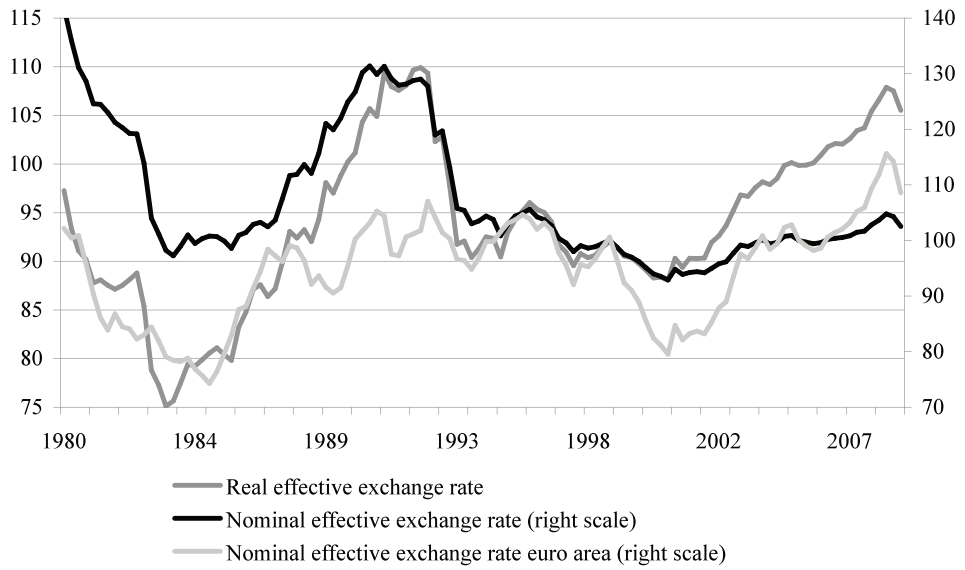
Finance). Finally, real and nominal effective exchange rates vis-à-vis the rest of the world have been obtained from the IFS (IMF) database, while the real effective exchange rate with respect to the euro area, also used in one simulation, was taken from the BIS database. Figure 1 plots the variables used in the analysis.

Figure 1: *Main Variables Used in the Analysis*



Real exchange rate reactions to spending shocks can be due to the reaction of the nominal exchange rate, to changes in relative home prices or both. Spain is a small open economy. The bottom charts of Figure 1 show that the degree of openness measured by the sum of imports plus exports as a percentage of GDP stood at around 60 per cent before the advent of the 2008 crisis, when it fell to some 50 per cent, with exports amounting to some 25 per cent of GDP, the destination of most of which being the euro area and the European Union (around 70 per cent thereof). Hence, in view of its small size jointly with its relatively high degree of openness, relative price responses to domestic fiscal shocks should mainly arise from the reaction of domestic prices. On the other hand, while Spain joined the euro area in 1999, the exchange rate was largely pegged to the Deutsche Mark, especially since the late 1990s. Figure 2 compares nominal and real effective exchange rates for Spain and the euro area. Until 1993, the REER of Spain presents sizeable movements that to a large extent seem to be explained by the NEER. Between 1993 and 1999 the NEER in Spain evolves in line with that of the euro area. However, as of 1999 with the adoption of the euro some decoupling between both indexes seems to show up. In this period, the NEER shows an appreciation trend, although of considerable lower intensity than in the euro area as a whole, which reflects some idiosyncratic factors affecting the Spanish NEER in spite of having a fixed nominal exchange rate with the rest of the euro area countries. In any

Figure 2: *Nominal and Real Effective Exchange Rate Indexes in Spain and the Euro Area*



case, it is true that after the adoption of the common currency, real exchange movements take mainly the form of inflation differentials with respect to the rest of the euro area, which cannot be properly interpreted without considering the long-run real exchange rate drivers (Galstyan and Lane, 2009b), whereas NEER movements are largely determined by factors affecting the euro area as a whole.

IV SPECIFICATION AND IDENTIFICATION OF THE BASELINE (S)VAR MODEL

The reduced-form baseline VAR is specified in levels, where $X_t \equiv (g_t, t_t, y_t, p_t, r_t, reer_t)$ is the vector of endogenous variables. The benchmark specification includes a constant and a deterministic time trend.[8] The vector $U_t \equiv (u_t^g, u_t^t, u_t^y, u_t^p, u_t^r, u_t^{reer})$ contains the reduced-form residuals, which in general will present non-zero cross-correlations. The baseline VAR includes four lags of each endogenous variable according to the information provided by LR tests, the Akaike information criterion and the final prediction error (see Table 1).[9]

Table 1: *Lag-length Criteria (Baseline VAR)*

Lag	*Log Likelihood*	*Sequential Modified LR*	*Final Prediction Error*	*Akaike*	*Schwarz*	*Hannan-Quinn*
0	739.65		9.16E-14	–12.99	–12.70	–12.88
1	1,565.94	1,534.55	6.82E-20	–27.11	–25.94*	–26.63
2	1,626.60	106.16	4.42E-20	–27.55	–25.51	–26.72*
3	1,643.22	27.29	6.34E-20	–27.20	–24.29	–26.02
4	1,701.63	89.71*	4.37E-20*	–27.60*	–23.81	–26.06

Note: The asterisk indicates the lag-order selected by the relevant criterion.

[8] This choice is based on the fact that the deterministic trend turned out to be significant in the GDP, net taxes and price equations. We estimated our VAR with and without a time trend and the likelihood ratio test yielded a value of 47.9, which for a χ^2 distribution with 6 degrees of freedom implies that the null hypothesis of no deterministic trend is rejected at the 1 per cent significance level.

[9] As Table 1 shows, Schwarz and Hannan-Quinn information criteria suggested more parsimonious specifications. In order to assess the robustness of our results to different specifications and transformations, we tried several alternatives, including estimating with two lags, removing the time trend or substituting the long-term interest rate by a short-term one. These different alternatives showed the same qualitative results.

We apply the identification strategy proposed by Blanchard and Perotti (2002) and Perotti (2004), which exploits decision lags in policy making and information about the elasticity of fiscal variables to economic activity. Their strategy relies on the assumption that the reduced-form residuals of the g_t and t_t equations, u_t^g and u_t^t, can be thought of as linear combinations of three types of shocks: a) the automatic responses of spending and net taxes to the rest of the macroeconomic variables in the system, b) systematic discretionary responses of fiscal policy to the same set of macro variables and c) random discretionary fiscal policy shocks, which are the truly uncorrelated structural fiscal policy shocks the effects of which are the purpose of our analysis.

This strategy consists in imposing some contemporaneous restrictions to the relationships between the fiscal variables and the rest of the variables in the system. The main ones are: a) government spending is largely predetermined within the quarter with respect to the rest of the variables; b) the automatic reaction of net taxes to output and price innovations are obtained as weighted averages of the elasticities of the different net-tax components, including transfers according to the methodology proposed in Giorno *et al.* (1995).

Specifically, the innovations model can be written as $\Gamma U_t = \mathrm{B}V_t$, where $V_t \equiv (e_t^g, e_t^t, e_t^y, e_t^p, e_t^r, e_t^{reer})$ is the vector containing the orthogonal structural shocks. Accordingly, the reduced-form residuals are linear combinations of the orthogonal structural shocks of the form $U_t = \Gamma^{-1}\mathrm{B}V_t$,. The respective matrices Γ and B can be written as:

$$\Gamma = \begin{pmatrix} 1 & 0 & -\alpha_{g,y} & -\alpha_{g,p} & -\alpha_{g,r} & -\alpha_{g,reer} \\ 0 & 1 & -\alpha_{t,y} & -\alpha_{t,p} & -\alpha_{t,r} & -\alpha_{t,reer} \\ -\gamma_{y,g} & -\gamma_{y,t} & 1 & 0 & 0 & 0 \\ -\gamma_{p,g} & -\gamma_{p,t} & -\gamma_{p,y} & 1 & 0 & 0 \\ -\gamma_{r,g} & -\gamma_{r,t} & -\gamma_{r,y} & -\gamma_{r,p} & 1 & 0 \\ -\gamma_{reer,g} & -\gamma_{reer,t} & -\gamma_{reer,y} & -\gamma_{reer,p} & -\gamma_{reer,r} & 1 \end{pmatrix} \quad (1)$$

$$\mathrm{B} = \begin{pmatrix} 1 & \beta_{g,t} & 0 & 0 & 0 & 0 \\ \beta_{t,g} & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 \end{pmatrix}$$

As we are interested in analysing the effects of the "structural" discretionary fiscal shocks e_t^g and e_t^t on the rest of the variables in the system,

estimations for the $\alpha_{i,j}$'s and $\beta_{i,j}$'s in (1) are needed. In general, approving and implementing new measures in response to specific economic circumstances typically takes longer than three months. Hence, one key assumption in this approach is that quarterly variables allow setting the discretionary contemporaneous responses of fiscal variables to changes in the underlying macroeconomic conditions to zero. Therefore, the coefficients $\alpha_{i,j}$'s in (2) only reflect the automatic responses of the fiscal variables to the rest of the variables in the system, the first source of innovations aforementioned.

The way fiscal variables are defined allows making further assumptions concerning the values of the $\alpha_{i,j}$'s. Specifically, the semi-elasticities of the fiscal variables to interest rate innovations are set to zero given that interest payments on government debt are excluded from both definitions. Moreover, the automatic responses of public expenditure to economic activity and the real exchange rate are also set to zero.[10] The case of the price elasticity is different because some share of purchases of goods and services is likely to respond to the price level. Thus, we set the price elasticity of government expenditure to –0.5.[11]

The elasticities of the different tax categories to their respective tax-bases have been taken from van den Noord (2000) and Bouthevillain *et al.* (2001), whereas the output elasticities of the relevant tax bases were estimated with the relevant quarterly data by means of VEC models when cointegration was detected. Total output and price elasticities of net taxes, $\alpha_{t,y}$ and $\alpha_{t,p}$, were gauged as weighted averages of the elasticities of the different net-tax components, including transfers. These output and price elasticities are estimated at 0.64 and 0.87, respectively, fully in line with those in De Castro and Hernández de Cos (2008).[12]

Furthermore, given that our main interest lies on expenditure shocks we assume that spending decisions are prior to tax ones, which implies a zero value for $\beta_{g,t}$. This allows us to retrieve a_t^g directly and use it to estimate $\beta_{t,g}$ by OLS, which completes the identification of the first two equations. For the remaining shocks the sequential ordering u_t^y, u_t^p, u_t^r and u_t^{reer} is imposed. The corresponding structural shocks are estimated by instrumental variables in turn, using e_t^g and e_t^t as instruments for u_t^g and u_t^t, respectively. In any case,

[10] The absence of contemporaneous response to real exchange rate innovations can be justified on the grounds of the popular home bias of public expenditure items, especially public consumption.
[11] We took this assumption from Perotti (2004). De Castro and Hernández de Cos (2008) and Burriel *et al.* (2010) show that this assumption affects neither Spanish nor EMU results.
[12] In order to test the sensitivity of the main results to these values, we have run an additional specification wherein we have imposed values for the output and price elasticities twice as high as those employed in the baseline specification. This choice does not seem to affect the results. The results of this test are available upon request.

since we are interested in studying the effects of fiscal policy shocks, the ordering for the remaining variables is immaterial to the results.

In what follows we present our results in terms of impulse response functions jointly with usual 68 per cent confidence bands[13] obtained by Monte Carlo integration methods with 1,000 replications.

V THE EFFECTS OF GOVERNMENT SPENDING SHOCKS

5.1 *The Baseline VAR*

Figure 3 displays the responses of the endogenous variables to a rise in public expenditure.[14] The shock is remarkably persistent and only phases out after three years. An increase in government expenditure entails a positive reaction of output for the first two years following the shock, which is largely in line with previous evidence for different countries,[15] although the size and persistence of output multipliers varies significantly across studies.[16] However, in the long term output falls due to the increase in interest rates. In turn, interest rates rise owing to higher inflation[17] and higher financing needs of the government. Net taxes also go up mainly due to more buoyant economic activity stemming from the innovation and to the higher need for funds to finance expenditure. As the rise of public spending outweighs the response of net taxes the budgetary primary balance falls. Finally, the real effective exchange rate vis-à-vis the rest of the world appreciates in response to higher government spending.[18]

[13] Edelberg *et al.* (1999), Fatás and Mihov (2001), Blanchard and Perotti (2002) or Perotti (2004) among others, also choose this bandwidth to present their results.

[14] Impulse responses show deviations with respect to the baseline to a 1 per cent shock of the relevant fiscal variable. Hence, GDP responses cannot be directly interpreted as output multipliers.

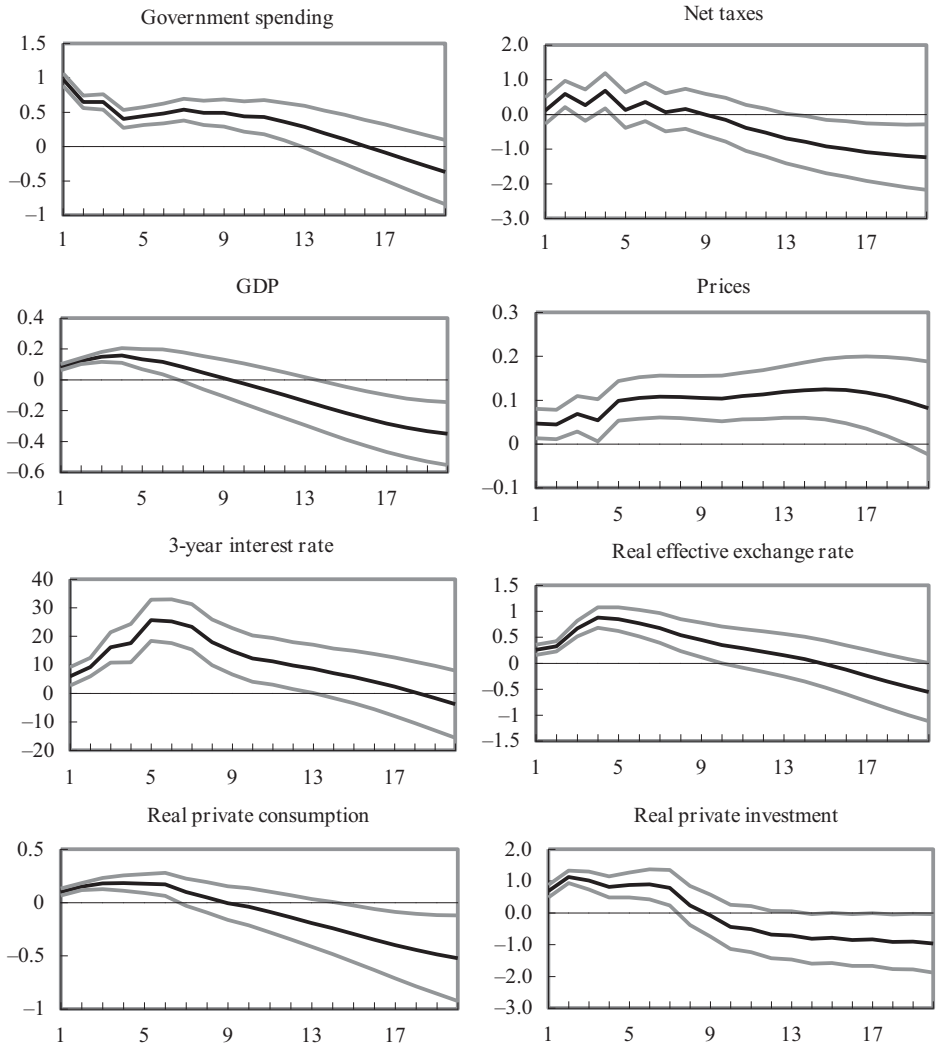
[15] See, for instance, Blanchard and Perotti (2002), Perotti (2004), Fatás and Mihov (2001) or Mountford and Uhlig (2009) for the US, Heppke-Falk *et al.* (2010) for Germany, De Castro (2006) and De Castro and Hernández de Cos (2008) for Spain or Giordano *et al.* (2007) for Italy.

[16] Caldara and Kamps (2008) show that, after controlling for differences in the specification of the reduced form model, all identification approaches used in the literature yield qualitatively and quantitatively very similar results for government spending shocks. Differences are, however, more marked in the case of tax shocks.

[17] We also estimated our baseline VAR until 2009. In this case prices did not react to spending shocks, although the responses of the other variables were broadly the same. This is due to the special circumstances that affected the Spanish economy that year. Specifically, a sizeable fiscal stimulus package implemented in 2009 was concomitant with the negative inflation due to the credit crunch.

[18] Bénétrix and Lane (2009a, 2009b) obtain similar results for Ireland and for a panel of the EMU countries, respectively.

Figure 3: *Responses to an Increase in Government Spending: Baseline VAR*



In order to assess the co-movements of private consumption and private investment with the other variables, especially the real exchange rate, the baseline VAR has been enlarged accordingly to include them in turn. Figure 3 shows that both private consumption and private investment rise following spending shocks. The most remarkable aspect is that the increase in private consumption takes place jointly with the appreciation of the real exchange rate.

These responses are consistent with the main predictions of not only the conventional Mundell-Fleming model, but of a number of New Keynesian formulations embedding nominal and real frictions such as price stickiness and a given share of rule-of-thumb consumers (see Erceg *et al.*, 2005). Namely, higher public spending would entail an increase in nominal and real interest rates that would trigger capital inflows and the subsequent appreciation. Moreover, insofar as government spending mostly concentrates on home-produced goods, fiscal expansions should make these goods relatively scarcer, thereby increasing their relative price with respect to imported goods and leading to real appreciation. However, our results in this regard contrast with those in Kim and Roubini (2008) and Corsetti *et al.* (2009) for the US, Monacelli and Perotti (2010) for Australia, the US and the U.K. or Ravn *et al.* (2007) for a pool of Australia, Canada, the US and the U.K., where higher government expenditure yields real depreciations.

We also try an alternative specification that uses the real effective exchange rate vis-à-vis the euro area, instead of the rest of the world. In this case, the responses of the different variables barely change, although the real appreciation is much more persistent than in the baseline case (see Figure 4). This result is probably due to the higher degree of persistence of inflationary shocks in Spain than in the euro area.[19] In this case, it is worth noticing that after EMU accession real exchange movements with respect to the rest of the euro area stem exclusively from inflation differentials.

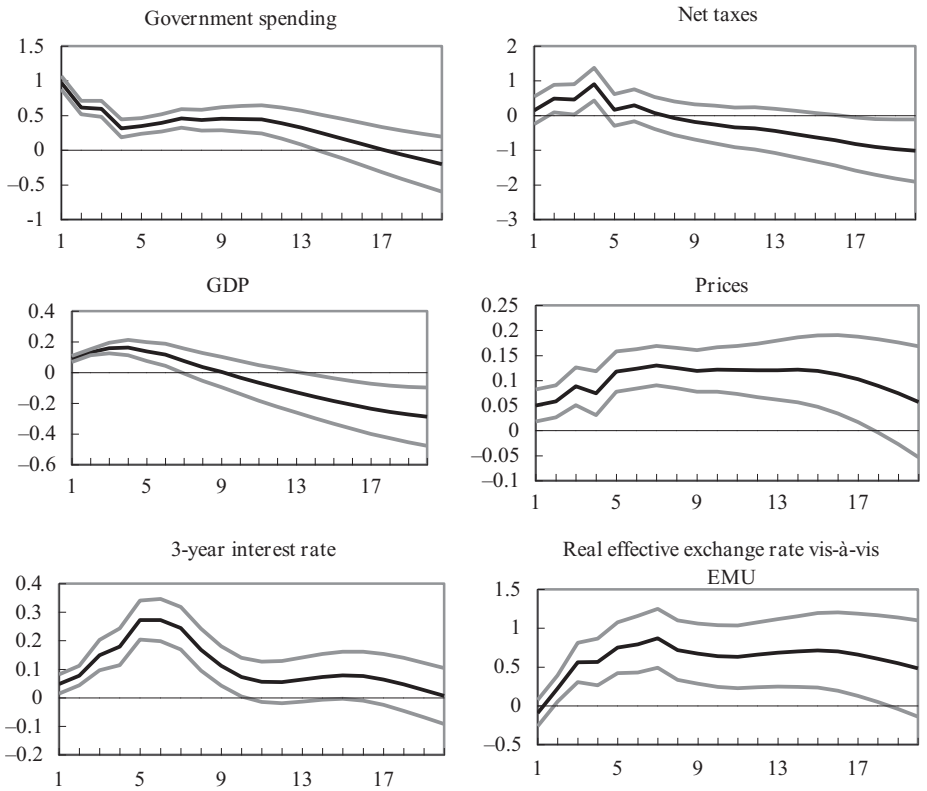
It could be argued that including the GDP deflator as an endogenous variable in our VAR would imply some degree of double counting of relative prices, although the real effective exchange rate used here is gauged on the basis of consumer prices. Hence, we estimated our VAR without the GDP deflator to test to what extent our results might be affected. Figure 5 shows that impulse responses of the rest of the endogenous variables do not differ significantly from the baseline specification. Only some difference in terms of significance of the response of net taxes after the thirteenth quarter is perceived. Accordingly, the hypothetical double counting of relative prices does not seem to affect the results.

5.2 *The Effects on Relative Prices and the Nominal Effective Exchange Rate*

Real appreciation driven by spending shocks can be due to nominal appreciation, an increase in relative home prices or both. In our case, since Spain is a small economy, it seems highly unlikely that domestic spending

[19] There are a number of elements behind this feature. Specifically, the European Commission and the ECB have repeatedly claimed that indexation clauses in collective bargaining have a pervasive effect on inflation persistence in Spain.

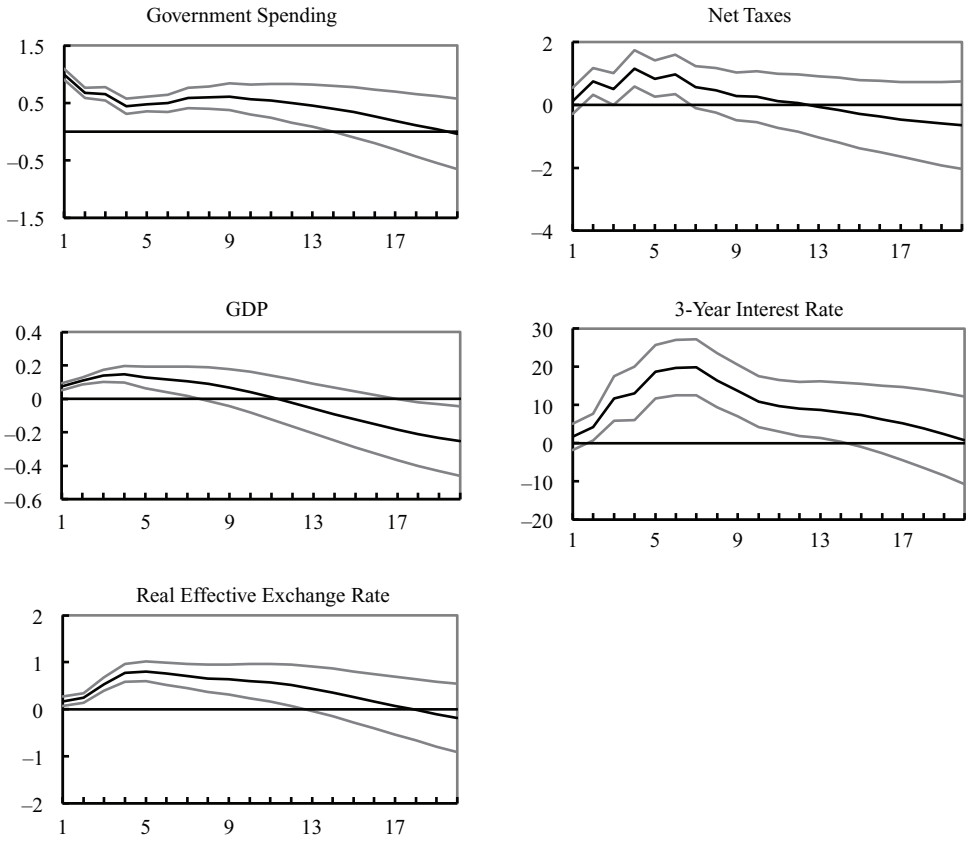
Figure 4: *Responses to an Increase in Government Spending: REER Vis-à-Vis the Euro Area*



shocks lead to significant effects on the level of foreign prices. Hence, relative price responses to domestic fiscal shocks should mainly arise from the reaction of domestic prices. On the other hand, after the adoption of the euro it could be expected that the effects of fiscal policies on the REER of Spain mainly reflected the response of relative home prices and took the form of inflation differentials with respect to the rest of the euro area. However, as Figure 2 shows, the evolution of the NEER of Spain reflects not only euro area elements, but also some idiosyncratic factors affecting the Spanish economy.

In order to deepen the understanding of responses of the real effective exchange rate, this variable and the GDP deflator in the baseline VAR were replaced by the nominal effective exchange rate (NEER) and the CPI in order to account for the effect of relative prices and to avoid an explicit double counting of price effects. The identification strategy was similar to the benchmark VAR. Figure 6 shows that higher public spending causes a

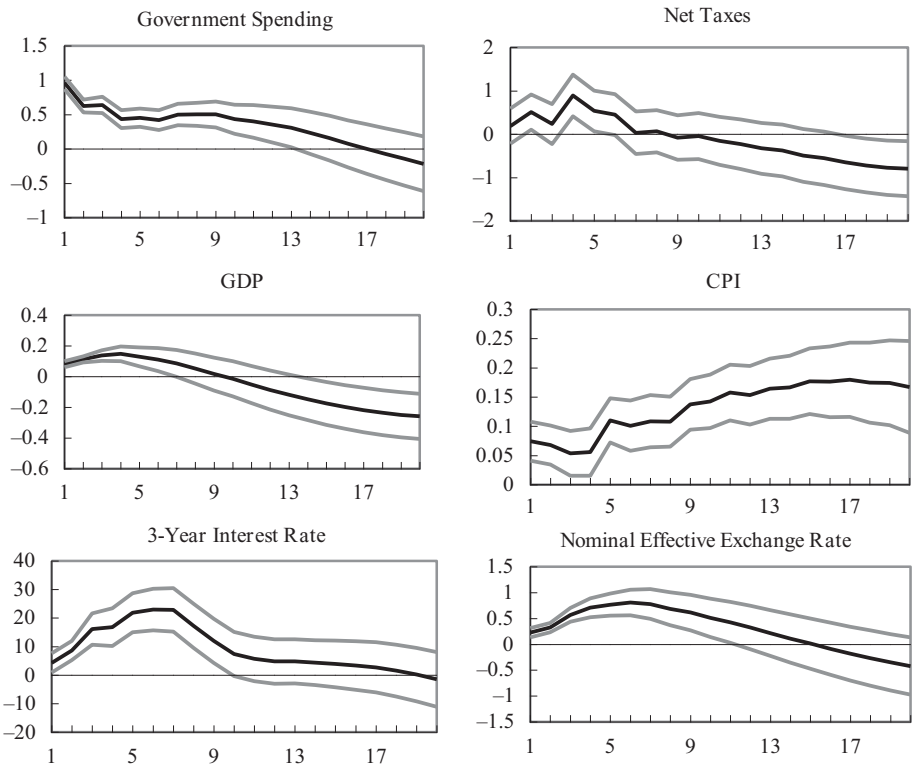
Figure 5: *Responses to an Increase in Government Spending: VAR Without Prices*



persistent nominal appreciation, which in fact turns out to be similar to the response of the real exchange rate displayed in Figure 3. Such nominal appreciation is consistent with the increases in nominal interest rates following the shock. Domestic consumer prices also rise persistently. As external prices can be assumed not to react to domestic fiscal shocks, such increase in home consumer prices reflects further competitiveness losses. Therefore, the real appreciation caused by fiscal shocks stems from both nominal appreciation and higher relative home prices.[20]

[20] The VAR was also estimated with the GDP deflator, the NEER and relative prices. Expenditure shocks also led to the appreciation of the nominal effective exchange rate and to higher relative prices in the short term, although this latter effect turned out to be much lower, possibly due to the explicit double counting of prices.

Figure 6: *Responses of Nominal Effective Exchange Rate and Consumer Prices to an Increase in Government Spending*



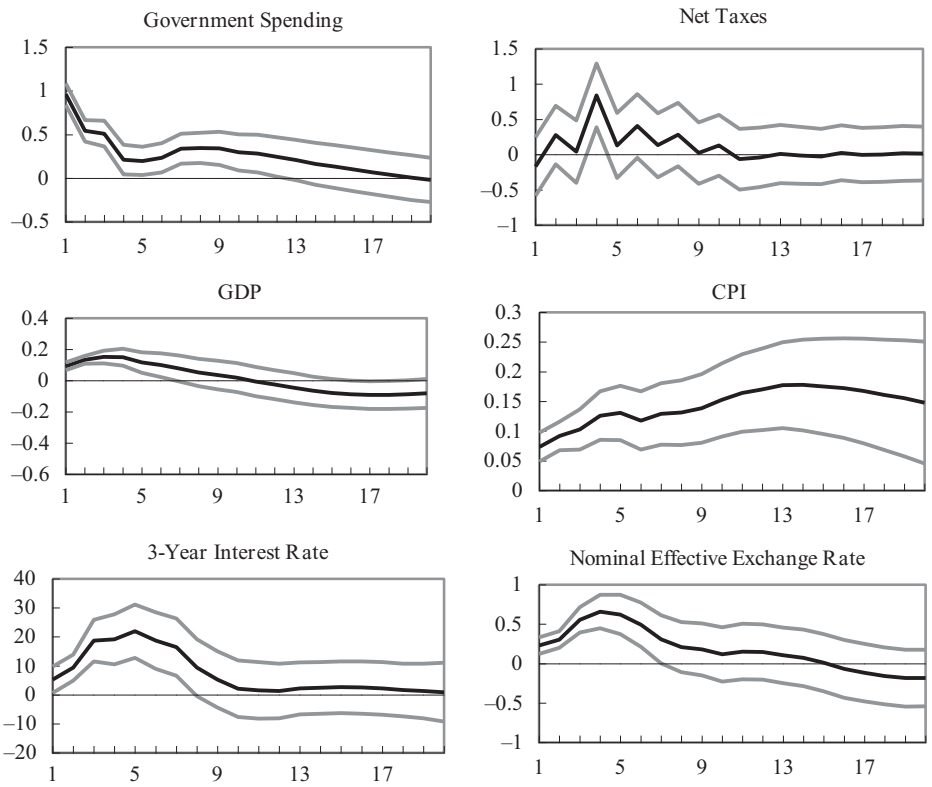
The adoption of the euro entails a fixed exchange rate vis à vis the rest of the EMU countries. As most of the Spanish trade takes place with other EMU coutries, the responses of the NEER to government spending shocks are expected to be muted since 1999.[22] On the other hand, movements in the NEER are largely determined by factors affecting the euro area as a whole, for which this variable could be deemed as exogenous as far as Spain is concerned. In view of the insufficient number of observations to estimate our VAR with an acceptable degree of accuracy since euro accession, we carried out two alternative exercises. First, we restricted our sample to the years before 1998; Figure 7 shows the corresponding impulse responses. Leaving aside the fact

[21] Recall that the NEER is calculated with respect to the rest of the world.

[22] The same model was estimated with a dummy with ones from 1999Q1 onwards. This dummy turned out to be significant only in the NEER equation, but its inclusion did not alter the results at all.

that the long-term fall of GDP is now non-significant, the rest of the variables present similar responses to those obtained with the whole sample: spending shocks bring about both nominal effective exchange rate appreciation and higher relative prices.

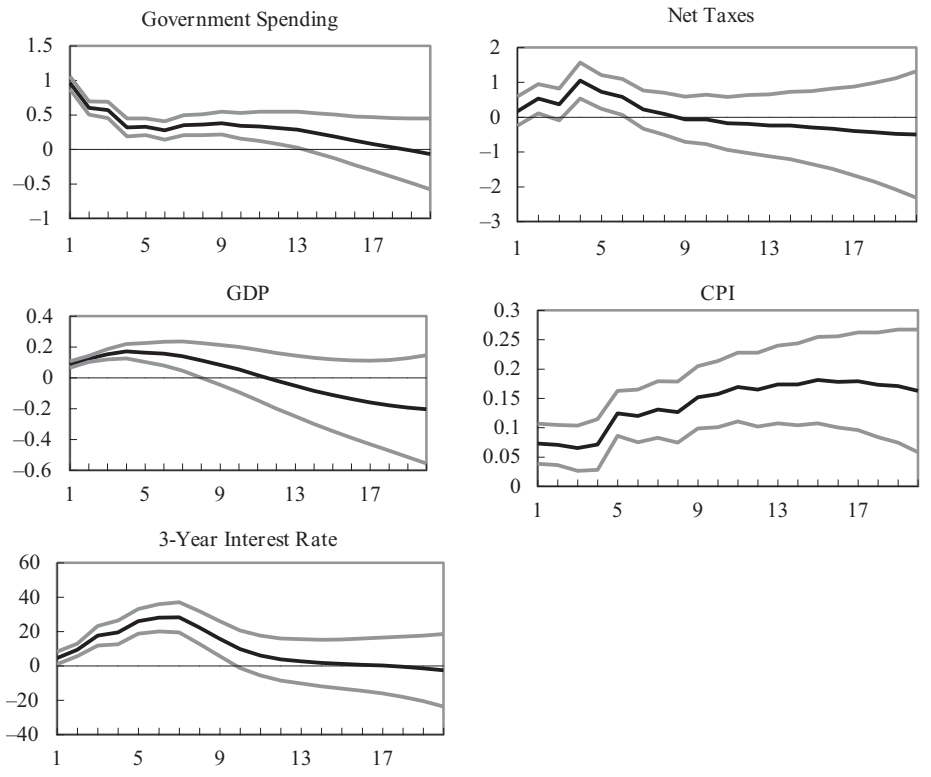
Figure 7: *Responses to an Increase in Government Spending for the Period 1980-1998*



Second, we estimated a 5-variable VAR wherein the NEER entered as an exogenous variable. Arguably, this model might better fit the current setting and accordingly be somewhat more accurate to assess the effects on relative prices. Nevertheless, as Figure 8 shows, the reaction of the endogenous variables, including consumer prices (and accordingly relative home prices since foreign prices are assumed not to respond to Spanish shocks) did not differ significantly from previous specifications.[23] Specifically for the purpose

[23] In fact, the NEER only turned out to be significant in the government spending equation.

Figure 8: *Responses to an Increase in Government Spending with Exogenous Nominal Effective Exchange Rate*



of this paper, spending shocks lead to real appreciation due to higher relative domestic prices. Interestingly, our results indicate that the adoption of the common currency has not implied a change in the way fiscal shocks affect relative prices and undermine external competitiveness.[24]

5.3 *Effects on Net Exports*

To assess the effect of spending innovations on the external sector of the economy we enlarged our baseline model in two different ways: firstly, we specified a 7-variable VAR model including net exports; secondly, we estimated an 8-variable VAR where in addition to the variables in the baseline model, we included exports and imports of goods and services. Both specifications are

[24] Especially since 1999, the 3-year Spanish interest rate can be viewed in terms of a benchmark rate plus a spread. Accordingly, we re-specified the model including the interest rate of German bonds as an exogenous variable and the spread as the endogenous one in lieu of the 3-year rate. As expected, results did not change.

formally equivalent, although the latter allows a better understanding of the driving forces behind the reaction of net foreign demand. The corresponding impulse responses are presented in Figure 9.

Higher government spending deteriorates the balance of goods and services for around two and a half years due to the real appreciation. On the one hand, the home-bias of government expenditure explains the initial lack of response of imports. On the other hand, the real appreciation discourages the external demand of domestic production and consequently exports decline for around 10 quarters, their response becoming non-significant thereafter. Given the relatively high import content of Spanish exports, their decline contributes to reducing the demand of foreign-produced goods as of the second year after the shock. Such decline offsets the negative response of exports only partially.

As spending shocks also entail a deterioration of the budgetary primary balance, our results are fully consistent with the "twin deficits" hypothesis. It could be argued that Spain enjoyed a protracted period of fiscal consolidation since the mid-1990s (with the exception of 2008) nonetheless accompanied by a sharp deterioration of the external balance of goods and services, which seems to contradict the "twin deficits" hypothesis. However, only in the first years of this period can an expenditure-based fiscal consolidation be considered to have taken place. Figure 10 compares the evolution of our government expenditure variable and net exports, both as percentages of GDP, and shows a remarkably dynamic behaviour of government spending since 2000. The significant improvement of government balances since then is almost entirely due to sizeable revenue windfalls to a large extent linked to the housing boom (see Morris *et al.*, 2009), rather than to expenditure retrenchment. In fact, Figure 10 shows a negative correlation between government expenditure and net exports, which supports our assessment about the "twin deficits" hypothesis. Our conclusions in this regard are also in accordance with Corsetti and Müller (2006), notably small and more open countries are more likely to register twin deficits, especially when fiscal shocks are very persistent, which is also the case here.

5.4 *Variance Decompositions*

Variance decompositions in Figure 11 show the percentage of the forecast error of the nominal and real effective exchange rates, consumer prices as a proxy for relative prices and the net exports. In the quarters immediately after the shock the largest share of the variance of the forecast error of the REER is mainly explained by prices and by its own shocks, while GDP, interest rates and government spending only accounted for less than 10 per cent of the whole variance each. The peak contribution of government spending is reached in

Figure 9: *Effects of Government Spending on Net Exports*

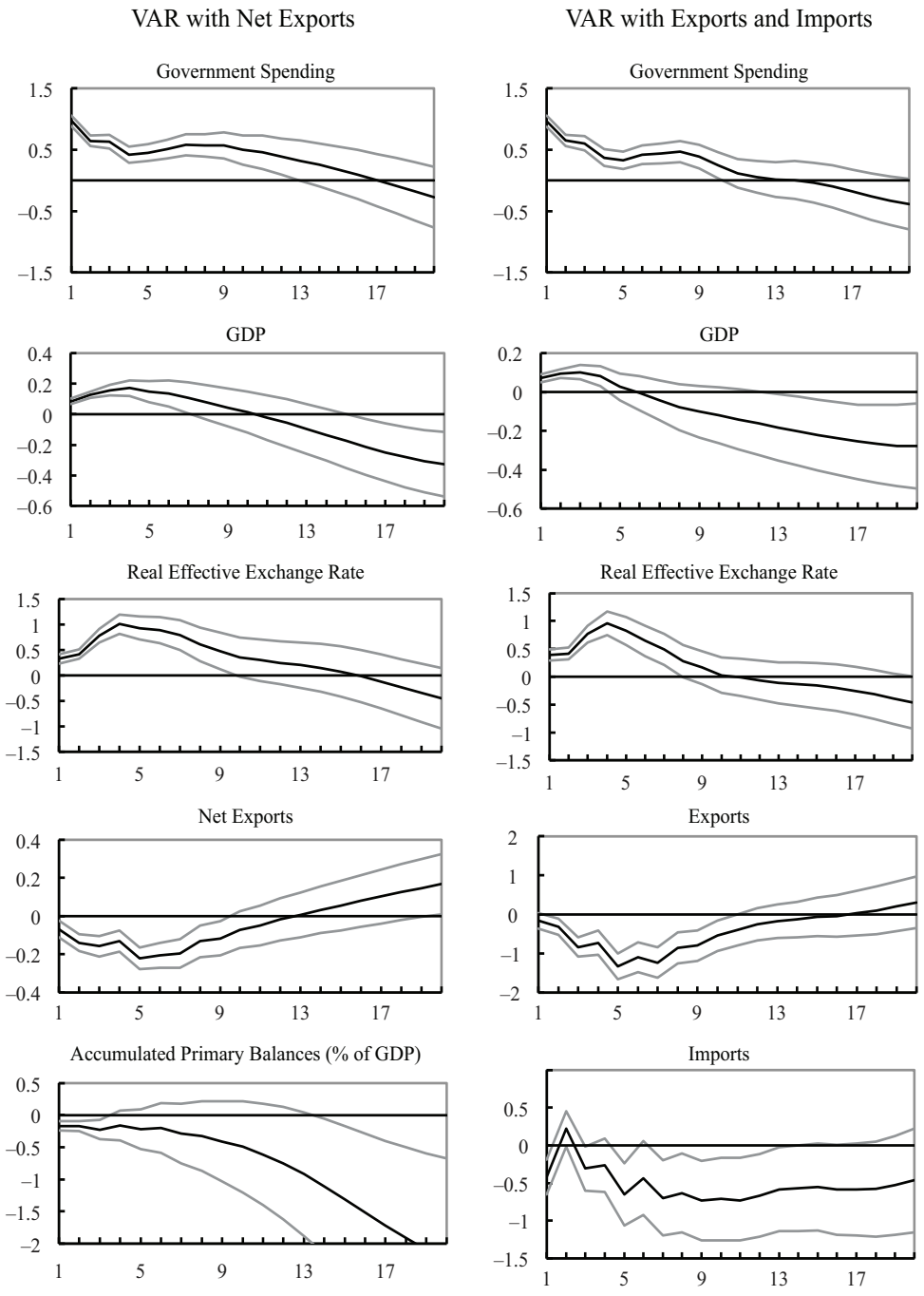
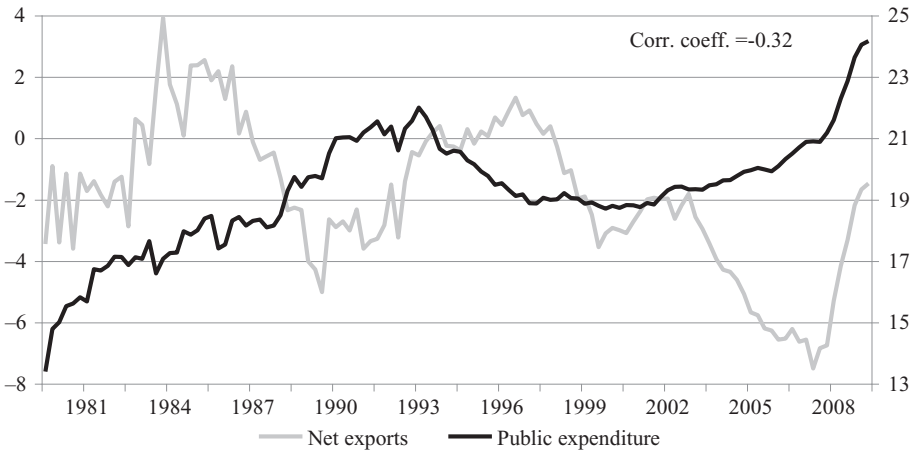


Figure 10: *Government Expenditure and Net Exports (Percentage GDP)*



the fifth quarter, with some 10 per cent, whereas the interest rate takes around 20 quarters to get to this level. However, from the second year onwards most of the forecast error variance of the REER is explained by GDP (around 80 per cent), whereas the share explained by prices decline to some 10 per cent after 5 years, close to the contribution of the interest rate.

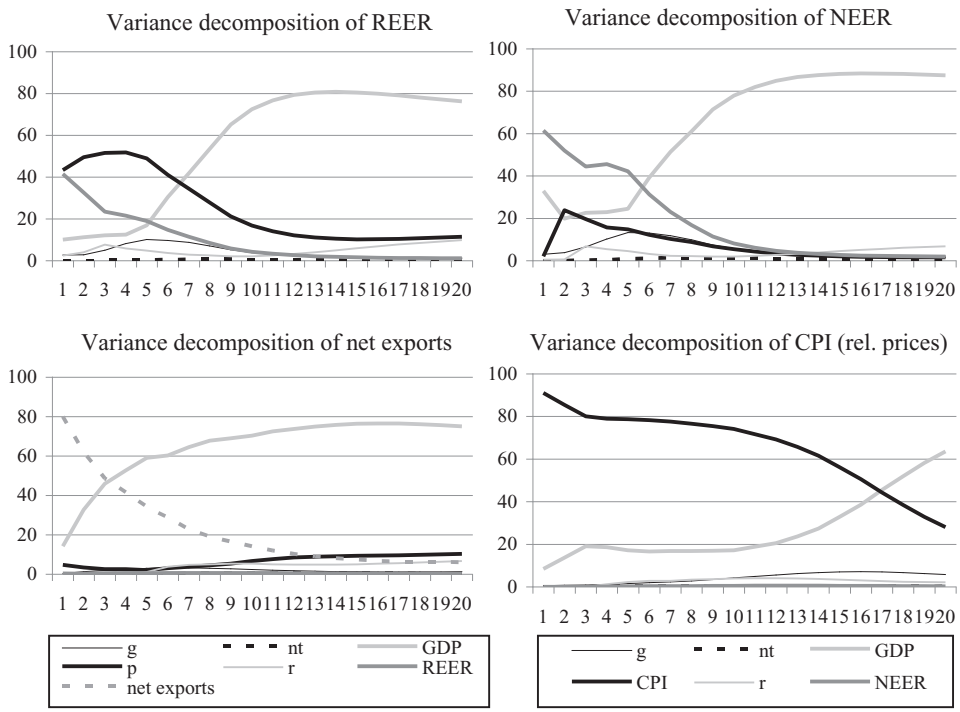
The case of the NEER is similar, with the contribution of government spending peaking in the fifth quarter at some 13 per cent, while that of GDP increasing steadily to slightly below 90 per cent. The share explained by the interest rate presents a similar pattern to the case of the REER. In turn, the forecast error variance of consumer prices in the quarters following the shock is mainly attributed to their own and to GDP innovations, with the latter accounting for between 10 per cent and 20 per cent of the total variance. As of the third year the contribution of GDP shocks increases sharply to account for the biggest proportion. Contrary to previous cases though, the share attributed to government spending shocks increases gradually to amount to 7.2 per cent in the sixteenth quarter.

Regarding net exports, while in the first quarters most of the variance of its forecast error is explained by own developments, GDP and prices become the main explanatory variables in the medium to long term.

5.5 *The Effects of Different Expenditure Components*

In general, the different government expenditure items are expected to entail non-homogeneous effects on other economic variables. In particular, Baxter and King (1993) argue that an increase in government investment has a stronger impact on output than an increase in government consumption, while Alesina *et al.* (2002) argue that public wage increases may exert upward

Figure 11: *Variance Decompositions*



pressure on the equilibrium wage of the economy that would lead to lower profits and investment. In turn, Straub and Tchakarov (2007) find that increases in public investment generate larger fiscal multipliers than those from increases in public consumption in that public investment not only increases aggregate demand, but it also raises aggregate supply by enhancing aggregate production and the marginal productivity of labour and private capital.

However, evidence on the impact on external competitiveness is scarcer: Ricci *et al.* (2008) and Lee *et al.* (2008) highlight the empirical role of government consumption as an important driver of medium-term real exchange rate movements for a large panel of countries; Froot and Rogoff (1991), De Gregorio *et al.* (1994) and Galstyan and Lane (2009b) found that increases in government consumption lead to long-run real appreciation.[25]

Government consumption and government investment may be expected to have different effects on relative prices. It is usually assumed that an increase in government consumption triggers the relative demand for non-tradables,

[25] Lane and Milesi-Ferretti (2002), Galstyan and Lane (2009a) and Bénétrix and Lane (2009a) provide some similar evidence for Ireland.

thereby causing a real appreciation. By contrast, a long-run increase in public investment is deemed to have an ambiguous impact on the real exchange rate depending on its effects on the productivity of traded relative to non-traded goods. Thus, an increase in public investment that enhances productivity in the tradables sector may generate a real appreciation through the Balassa-Samuelson mechanism, whereas if such productivity gains take place fundamentally in non-tradables sector, it may actually lead to a real depreciation. In this regard, Galstyan and Lane (2009b) show that as government investment is usually associated with a decline in the relative price of non-traded goods, it has no significant long-term impact on the real exchange rate for the EMU countries.

To assess their effects, we replaced government expenditure by purchases of goods and services, personnel expenditure and public investment in turn in our baseline VAR. Figure 12 shows the responses of the REER to shocks to these different government components. As expected, an increase in purchases of goods and services entails a real appreciation as a result of a higher relative demand for non-traded goods. However, a rise in personnel expenditure provokes a positive, though non-significant response of the REER in the very short term that after some quarters becomes negative and significant. Such real depreciation may be linked to the fall in private investment profitability (Alesina *et al.*, 2002) and the subsequent productivity losses led by the upward pressure on private wages. Finally, a shock to public investment generates a real appreciation, which seems to suggest that productivity gains derived from higher public investment materialise more intensively in the tradables sector.

It might be argued that public investment could capture more accurately the discretionary aspects of fiscal policy. However, while many consumption expenditure programmes may display a high degree of persistence, insofar as they are not directly linked to the general economic performance changes, in these programmes can reasonably be deemed as largely discretionary. On the other hand, in economic slowdowns with rising public deficits, public investment in Spain has very often been used as the adjustment variable. Therefore, its higher accuracy compared to public consumption for capturing discretionary fiscal shocks is at best doubtful.

5.6 *Output Multipliers*

While cumulative output multipliers[26] on impact are estimated at slightly below 0.5, they rise to around one or even above one year after the shock (see Table 2) in the different models we estimate. In view of their standard errors, output multipliers are not statistically different across the different

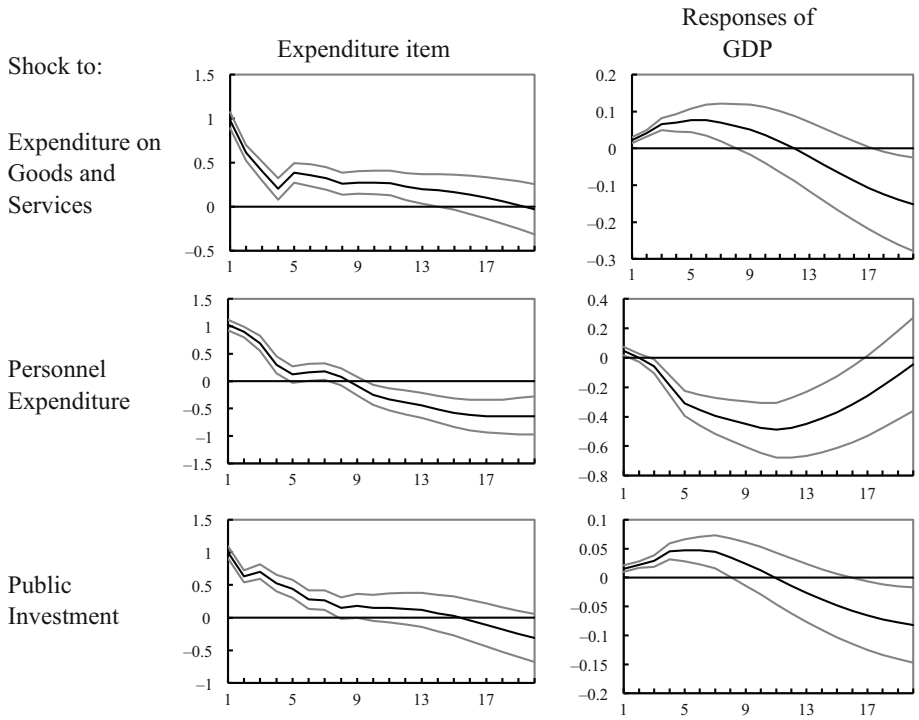
[26] The cumulative multiplier at a given quarter is obtained as the ratio of the cumulative response of GDP and the cumulative response of government expenditure at that quarter.

Table 2: *Cumulative Output Multipliers in Different Specifications*

	Quarters After the Shock			
	q=1	*q=4*	*q=8*	*q=12*
Baseline VAR	0.41*	0.94*	0.95*	0.55
Baseline VAR without GDP deflator	0.37*	0.84*	0.91*	0.69*
VAR with $NEER_t$ and CPI	0.42*	0.89*	0.93*	0.57
VAR with CPI and exogenous $NEER_t$	0.44*	1.07*	1.45*	1.2*
VAR with net exports	0.43*	1.003*	1.04*	0.73*
Baseline VAR since 1989	0.49*	1.36*	1.98*	1.78
Baseline VAR 1980-1998	0.34*	0.66*	–0.52	–1.3
Expenditure on goods and services	0.39*	1.56*	2.36*	2.21*
Personnel expenditure	0.42*	–0.64	–4.59*	–14.09
Total public consumption	0.28*	0.23	–1.03*	–3.08*
Public investment	0.4*	1.03*	1.89*	1.75

Notes: Cumulative output multipliers at a given quarter are defined as the cumulative output response relative to the cumulative increase in the relevant expenditure item. An asterisk indicates that the estimated value is significant within a 68 per cent confidence interval.

Figure 12: *Effects of Expenditure Components on the Exchange Rate*



specifications. For instance, although multipliers gauged with the VAR without the GDP deflator look slightly smaller, they are within the one-standard deviation confidence interval of those obtained with the baseline VAR. These values are broadly in line with multipliers gauged in De Castro (2006) or De Castro and Hernández de Cos (2008) in the case of Spain, Giordano *et al.* (2007) for Italy and Heppke-Falk *et al.* (2010) for Germany. By contrast, these turn out to be somewhat higher than VAR-based output multipliers for the US. (Fatás and Mihov, 2001; Perotti, 2004; Mountford and Uhlig, 2009; Burriel *et al.*, 2010) or for the EMU as a whole (Burriel *et al.*, 2010).

However, the effects of fiscal policy depend, inter alia, on the exchange rate regime, the degree of economic openness and the monetary policy regime. In particular, the effects of fiscal policy shocks on output are deemed to be larger under fixed exchange rates and with accommodative monetary policy. Conversely, fiscal multipliers are expected to decrease with the degree of openness. In connection to this, Spain has undergone significant changes in these areas over the period covered by our sample. Firstly, Spain's EU accession in 1986 meant an unprecedented opening to international trading flows. Secondly, both floating and fixed exchange rates have prevailed since 1980. Spain joined the European Monetary System (EMS) mechanism in 1989, which set a quasi-fixed exchange rate regime with respect to the Deutsche Mark, and later on joined the EMU.[27] Therefore, a (quasi) fixed exchange rate regime has prevailed in Spain since 1989. Finally, the Law of Autonomy of the Bank of Spain was approved in 1993, according to which monetisation of public deficits were forbidden ever since.

These factors, especially the exchange rate regime, may presumably have affected fiscal multipliers. In order to assess its importance we re-estimated our baseline VAR for the period 1989-2009, characterised by a (quasi) fixed exchange rate regime. While in this case our output multiplier on impact stood at 0.5, it rose to 1.4 four quarters after the shock, which turned out to be statistically higher than with the whole sample. By contrast, when we restricted the sample period to before 1998, i.e. skipping the fixed exchange rate period strictly speaking, output multipliers turned out to be significantly lower, falling below 0.7 four quarters after the shock and becoming non-significant thereafter. Therefore, our estimates for Spain are consistent with the hypothesis of fiscal policy being more effective under fixed than under flexible exchange rates.

By spending component, all items bring about positive output multipliers on impact around 0.4. However, differences appear in medium term responses.

[27] Despite the quasi-fixed exchange rate regime, constant depreciations within the bands set by EMS along with four devaluations took place between 1992 and 1995 as a consequence of the turmoil in the EMS after the rejection of the Maastricht Treaty by Denmark.

Specifically, public investment involves a stronger impact on output than government consumption and total government spending as a whole in the medium term. This evidence is consistent with Baxter and King (1993) and suggests the presence of spillovers between public investment and private sector productivity. Moreover, public spending on goods and services yields similar or even higher output multipliers than public investment. This can be explained due to the fact that a significant share of public investment, i.e. machinery equipment, is materialised in imported goods and, therefore, does not affect home multipliers. In addition, not all public investment projects can be deemed as "productive", for which the usual argument about the positive spillovers on private sector productivity does not apply in all cases. Conversely, personnel expenditure yields positive and significant output multipliers on impact that become negative and significant two years after the shock. These negative output effects derived from the government's wage bill also explain the negative multipliers of total public consumption in the medium term in that personnel expenditure is the largest item of public consumption.[28]

VI CONCLUSIONS

This paper contributes a new piece of evidence on the effects of public expenditure on variables characterising the external side of the economy in Spain. Our analysis shows that government spending brings about positive output and private consumption responses, jointly with real appreciation. Such real appreciation is explained by persistent nominal appreciation and higher relative home prices, although after EMU accession, real exchange rate movements are to a large extent the result of inflation differentials. Moreover, our results indicate that the adoption of the common currency has not implied any significant change in the way fiscal shocks affect external competitiveness through their influence on relative prices. In turn, the current account deteriorates when government spending rises mainly due to the fall of exports caused by the real appreciation. Accordingly, our results in this regard are largely consistent with the usual predictions of the conventional Mundell-Fleming model and with a number of New Keynesian frameworks. On the other hand the exchange rate appreciation following public spending shocks seems to suggest that, on average, private agents have not embedded expectations of future public expenditure reversals; rather, increases in public

[28] Regarding the effects stemming from different spending items, De Castro and Hernández de Cos (2008) obtain similar results.

spending have been regarded as permanent. As public spending shocks lead to both budgetary primary and trade deficits, our estimations are also consistent with the "twin deficits" hypothesis.

Concerning expenditure components, we observe that while spending on goods and services and public investment increase output and lead to real appreciation, higher personnel expenditure weights on economic activity and brings about real depreciation already in the second year after the shock. Such real depreciation might be linked to lower potential growth as a result of lower investment profitability stemming from higher labour costs.

Finally, we obtain output multipliers of around 0.5 on impact and slightly above unity one year after the shock. These multipliers are in line with previous empirical evidence regarding other individual European countries, such as Germany, Italy or even Spain itself, although they seem to be on the high side when compared with multipliers estimated for other OECD countries, including the US. In the case of Spain, output multipliers are found to be higher under fixed exchange rates.

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