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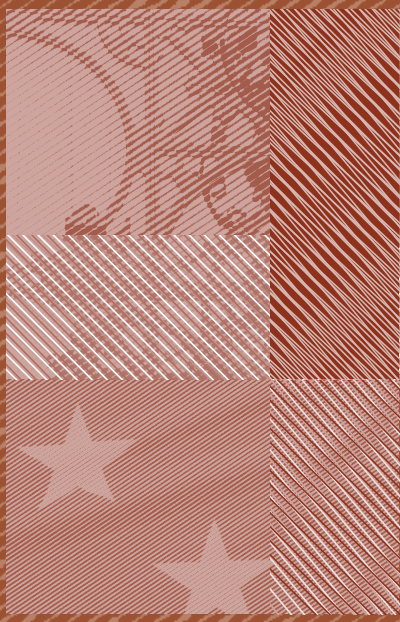

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Francisco de Castro and Laura Fernández-Caballero [**]

BANCO DE ESPAÑA

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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. We show that government spending brings about positive output responses, jointly with real appreciation. Such real appreciation is explained by persistent nominal appreciation and higher relative prices. 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 effect 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 not only with the conventional Mundell-Fleming model and, in general a traditional Keynesian view, but also with a wide set of RBC or New Keynesian models under standard calibrations. Moreover, our estimations are fully in line with the "twin deficits" hypothesis. Furthermore, we show that shocks to purchases of goods and services and public investment lead to real appreciation, whereas the opposite happens with higher personnel expenditure. We obtain output multipliers around 0.5 on impact and slightly above unity one year after the shock, which are in line with previous empirical evidence regarding some individual European countries.

JEL Classification: E62, H30.

Keywords: SVAR, Fiscal shocks, Effective exchange rates, Twin deficits, Fiscal multipliers.

Resumen

En este trabajo analizamos los efectos de perturbaciones fiscales sobre el tipo de cambio efectivo de España durante el período 1981-2008 mediante un marco estándar de modelos VAR estructurales. Aquí se muestra que el gasto público conlleva respuestas positivas de la producción, conjuntamente con una apreciación real. Esta apreciación real se explica tanto por una persistente apreciación del tipo de cambio efectivo nominal, como por el aumento de los precios relativos. Nuestros resultados indican que la adopción de la moneda común no parece haber implicado cambios significativos respecto a la manera en que las perturbaciones fiscales afectan a la competitividad exterior a través de su efecto sobre los precios relativos. Por su parte, el saldo por cuenta corriente se deteriora en respuesta a incrementos de gasto público principalmente como consecuencia de la caída de las exportaciones provocada por la apreciación real. Por lo tanto, nuestros resultados son en gran medida compatibles no solo con el modelo Mundell-Fleming convencional y, en general, con una visión Keynesiana tradicional, sino también con un amplio abanico de modelos de ciclo real o de corte neo-Keynesiano con calibraciones estándar. Asimismo, nuestras estimaciones están plenamente en consonancia con la hipótesis de «déficits gemelos». Por otra parte, mostramos que aumentos en las compras de bienes y servicios y en inversión pública conllevan apreciaciones reales, mientras que lo contrario sucede ante aumentos de los gastos de personal de las AAPP. Finalmente, se obtienen multiplicadores del gasto público alrededor de 0,5 en impacto y ligeramente por encima de la unidad transcurrido un año después del aumento del gasto. Estos valores están en consonancia con la evidencia empírica disponible para algunos países europeos.

Códigos JEL: E62, H30.

Palabras clave: SVAR, perturbaciones fiscales, tipos de cambio efectivos, déficits gemelos, multiplicadores fiscales.

1 Introduction

Last years have witnessed an increasing literature on the macroeconomic effects of discretionary fiscal policy in a wide set of countries. This strand of the literature gained momentum with Blanchard and Perotti (2002), who proposed a new and interesting methodology to identify fiscal policy shocks in VARs with quarterly data by exploiting decision lags in policy making and information about elasticities of fiscal variables to economic activity.[1] Notwithstanding, other studies such as Mountford and Uhlig (2009) assess the effects of fiscal shocks under a different methodology that consists in imposing some sign restrictions to impulse response functions. While most papers have focused on the U.S. [Edelberg et al. (1999); Fatás and Mihov (2001); Blanchard and Perotti (2002); Perotti (2004), and Mountford and Uhlig (2009), among others], growing evidence on other countries has arisen. Some examples in this regard are Heppke-Falk et al. (2006) 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 or Afonso and Sousa (2009a and 2009b) for Germany, Italy and Portugal, Bénassy-Quéré and Cimadomo (2006) for Germany, the U.K. and the U.S., 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 such as Spain. Still, there are some recent studies assessing the effects of fiscal, mainly spending, shocks on the nominal or real exchange rate, relative prices or the terms of trade. Nevertheless, as it is commonplace in the analysis of discretionary fiscal shocks, broad agreement on their effects is lacking. Thus, Kim and Roubini (2008) and Enders et al. (2011) for the U.S., Monacelli and Perotti (2010) for Australia, the U.S. and the U.K. and Ravn et al. (2007) for a pool of Australia, Canada, the U.S. and the U.K., find that higher government expenditure yields real depreciations. By contrast, Beetsma et al. (2008) for a panel of EU counties, Corsetti et al. (2009) for the U.S. or Bénétrix and Lane (2009a) or Galstyan and Lane (2009a) for Ireland argue that government spending shocks lead to real appreciations. Moreover, Bénétrix and Lane (2009b) get the same result with a panel with the euro area countries. In addition, Froot and Rogoff (1991), De Gregorio et al. (1994) and Galstyan and Lane (2009b) observe long-run real appreciation in response to increases in government consumption.

In the related literature real depreciation caused by government expenditure shocks is justified on the basis of the following argument: in a large economy, a fiscal expansion increases the real interest rate, which depresses 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 [see Obstfeld and Rogoff (1995)]. Moreover, it is also argued that in the short run international price movements tend to amplify instead of mitigate country-specific consumption risk [Enders et al. (2010)].

Conversely, a usual argument behind spending shocks-led real appreciations is that insofar as government spending mostly concentrates on home-produced goods, fiscal expansions should make these goods relatively scarcer, thereby increasing their relative

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

price with respect to imported goods and leading to real appreciation [see Frenkel and Razin (1996)].

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 under this framework.

We find that government spending shocks lead to real appreciation and deterioration of the external balance. Hence, our results are in line with the "twin deficits" hypothesis. For the pre EMU period, the real appreciation is explained by both an appreciation of the nominal effective exchange rate and by an increase in relative prices; however, within EMU such real appreciation stems mainly from the raise of domestic prices. This pattern is consistent with not only the conventional Mundell-Fleming model and Keynesian analysis, but also with a wide set of RBC models under standard calibrations or with some New Keynesian formulations [see, Corsetti et al. (2009)].

By spending component, we show that shocks to purchases of goods and services and public investment lead to real appreciation, whereas the opposite happens with higher personnel expenditure. Finally, we obtain output multipliers around 0.5 on impact and slightly above unity one year after the shock, which are in line with previous empirical evidence regarding some individual European countries. However, we offer interesting evidence of output multipliers being higher if we constraint our estimations to a period characterised by a quasi-fixed exchange rate regime.

The rest of the paper is organised as follows: section 2 describes the data, section 3 methodological issues and section 4 the results. Finally, we present our conclusions in section 5.

2 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,[2] the GDP deflator (p_t), the three-year interest rate of government bonds (r_t)[3] 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.[4] 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 current receipts, less current transfers excluding interest payments on government debt.[5] In turn, the REER is defined vis-à-vis the rest of the World and with consumer prices. As usual, 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 nominal effective exchange rates, 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.

We use data covering 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 those used in De Castro (2006) and De Castro and Hernández de Cos (2008). However, from 2000 on, those variables are not interpolated; they are official figures published by the IGAE (Ministry of Economy and 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 obtained from the BIS database. Effective exchange rates are defined in such a way that an increase reflects an appreciation.

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

3. 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.

4. In order to assess the effects on the exchange rate, an even better and more appropriate option would be to express variables relative to the weighted average of trading partners. Unfortunately, we could not follow this approach due to the lack of availability of all necessary data for the whole sample period.

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

3 Specification and identification of the baseline (S)VAR model

The reduced-form baseline VAR is specified in levels and can be written as

$$X_t = D(L)X_{t-1} + U_t \tag{1}$$

where $X_t \equiv (g_t,\ t_t,\ y_t,\ p_t,\ r_t,\ reer_t)$ is the vector of endogenous variables and $D(L)$ is an autoregressive lag-polynomial. The benchmark specification includes a constant and a deterministic time trend. 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.[6]

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 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 whose effects are the purpose of our analysis.

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:

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

$$\mathrm{B} = \begin{pmatrix} 1 & \beta_{g,t} & 0 & 0 & 0 & 0 \\ \beta_{t,g} & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 \end{pmatrix} \tag{2}$$

6. 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.

As we are interested in analysing the effects of "structural" discretionary fiscal shocks e_t^g and e_t^t on the rest of the variables of the system, estimations for the $\alpha_{i,j}$'s and $\beta_{i,j}$'s in (2) 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 discretionary contemporaneous responses of fiscal variables to changes in underlying macroeconomic conditions to zero. Therefore, the coefficients $\alpha_{i,j}$'s in (2) only reflect the automatic responses of fiscal variables to the rest of the variables of 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 fiscal variables to interest rate innovations are set to zero given that interest payments on government debt are excluded from both definitions.[7] Moreover, the automatic responses of public expenditure to economic activity and the real exchange rate are also set to zero.[8] 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.[9]

Output and price elasticities of net taxes, $\alpha_{t,y}$ and $\alpha_{t,p}$, are estimated at 0.64 and 0.87, respectively, fully in line with those in De Castro and Hernández de Cos (2008). These are obtained as weighted averages of the elasticities of the different net-tax components, including transfers, computed on the basis of information like statutory tax rates and estimations of the contemporaneous responses of the different tax-bases and, in the case of transfers, the relevant macroeconomic aggregate to GDP and price changes.[10]

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 e_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, 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. As usual, these are reported jointly with 68% confidence bands[11] obtained by Monte Carlo integration methods with 1000 replications.

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7. In many cases, the income tax base includes interest income as well as dividends, which in general co-vary negatively with interest rates. Nevertheless, the full set of effects of interest rate innovations on the different tax categories are very complex to analyse and, on the other hand, their contemporaneous effects are deemed to be very small.

8. 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.

9. 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.

10. Further details are provided in the appendix.

11. 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.

4 The effects of government spending shocks

4.1 The baseline VAR

Figure 1 displays the responses of the endogenous variables to a rise in public expenditure.[12] 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. In general, government spending shocks are found to yield positive output responses in the short-term as shown by Blanchard and Perotti (2002), Perotti (2004), Fatás and Mihov (2001) or Mountford and Uhlig (2009) for the US, Heppke-Falk et al. (2006) for Germany, De Castro (2006) and De Castro and Hernández de Cos (2008) for Spain or Giordano et al. (2007) for Italy, although the size and persistence of output multipliers varies significantly across studies.[13] However, in the long term output falls due to the increase in interest rates. In turn, interest rates rise owing to higher inflation[14] and higher financing needs of the government. Net taxes also go up, partly aimed at providing funds for increased expenditure but mainly due to more buoyant economic activity stemming from the innovation. However, such initial rise in net taxes does not fully offset the increase in spending, leading to accumulate primary deficits.

The real effective exchange rate vis-à-vis the rest of the World appreciates in response to higher government spending.[15] This pattern is consistent with not only the conventional Mundell-Fleming model and Keynesian analysis, but also with a wide set of RBC models under standard calibrations or with some New Keynesian formulations [see, for instance, Corsetti et al. (2009)]. Accordingly, 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.

We also try an alternative specification that uses the real effective exchange rate vis-à-vis the euro area, instead of that with respect to the rest of the World. In this case, the responses of the different variables barely changed, although the real appreciation is fairly more persistent than in the baseline case (see Figure 2). This result is probably due to the higher degree of persistence of inflationary shocks in Spain than in the euro area.[16] It is worth noticing that, especially in this case, after EMU

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12. Impulse responses show deviations with respect to the baseline to a one-percent shock of the relevant fiscal variable. Hence, GDP responses cannot be directly interpreted as output multipliers.

13. 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.

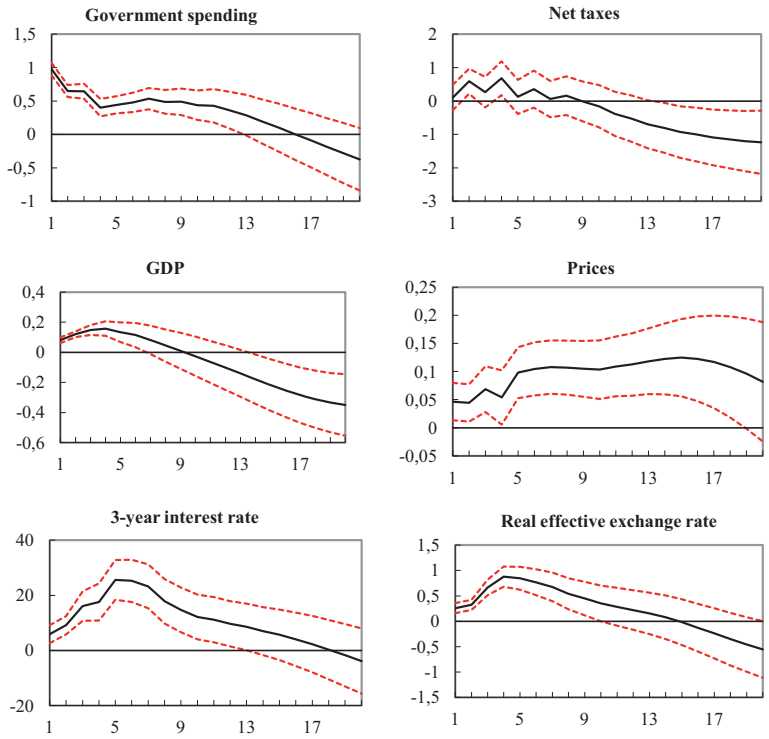
14. We also estimated our baseline VAR until 2009. In this case prices did not react to spending shocks, although the responses of the other variables were broadly the same. This is due to the special circumstances that affected the Spanish economy that year. Specifically, a sizeable fiscal stimulus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

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

16. 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.

accession, real exchange movements with respect to the rest of the euro area stem exclusively from inflation differentials.

Figure 1: Responses to an increase in government spending: Baseline VAR



However, our results in this regard oppose to Kim and Roubini (2008) for the US for the period 1973-2002, Monacelli and Perotti (2010) for Australia, the U.S. and the U.K. or Ravn et al. (2007) for a pool of Australia, Canada, the U.S. and the U.K., where higher government expenditure yields real depreciations.

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 as they enter in the definition of the real effective exchange rate as well, although the latter are calculated with consumer prices. Hence, we estimated our VAR without the GDP deflator to test to what extent our results might be affected. Figure 3 shows that impulse responses of the rest of the endogenous variables do not differ significantly from Figure 1. Only some difference in terms of significance of the response of net taxes after the 13th quarter after the shock is perceived. Accordingly, the hypothetical double counting of relative prices does not seem to affect the results.

Figure 2: Responses to an increase in government spending: REER vis-à-vis the euro area

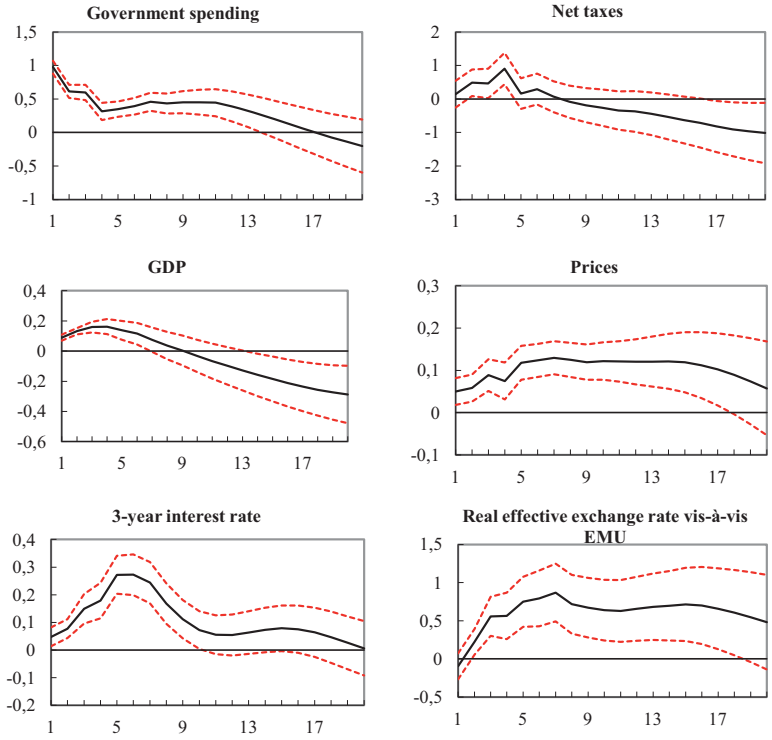
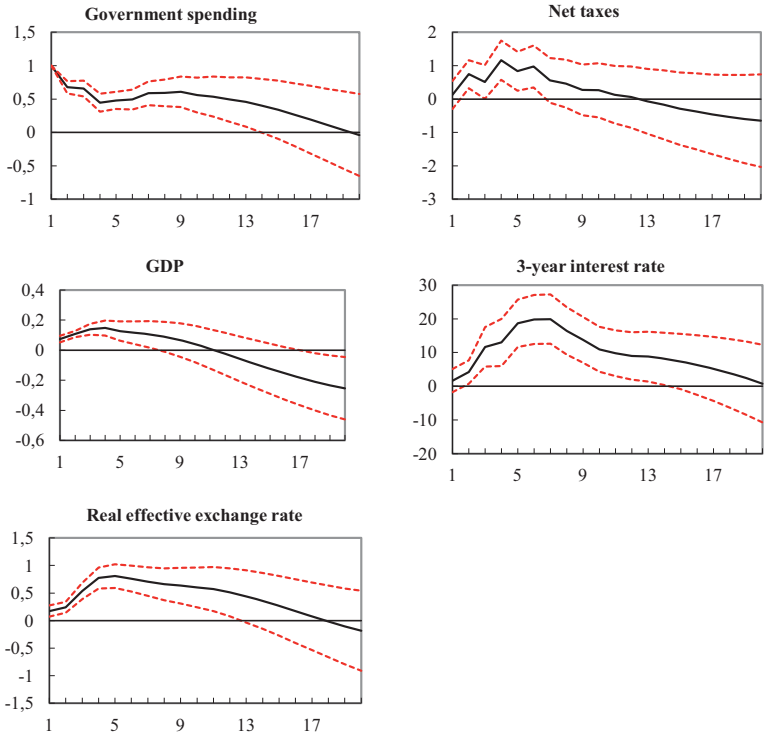


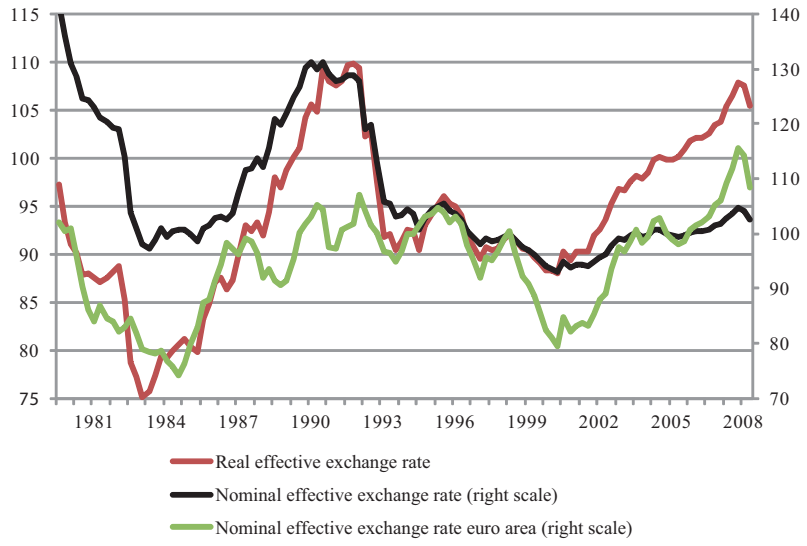
Figure 3: Responses to an increase in government spending: VAR without prices



4.2 The effects on relative prices and the nominal effective exchange rate

Real appreciation driven by spending shocks can be due to nominal appreciation, increase in relative home prices or both. In our case, since Spain is a small economy, it seems highly unlikely that domestic spending 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. Figure 4 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. As of 1993 though, the NEER displays a more stable behaviour. However, after 1999 some decupling between both indexes seems to show up reflecting the adoption of the euro. In this period, the NEER shows an appreciation trend, although of considerable lower intensity than in the euro area as a whole, which reflects the evolution of some idiosyncratic factors in the NEER in spite of having a fixed nominal exchange rate with the rest of the euro area countries. In any 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 drivers [Galstyan and Lane (2009b)].

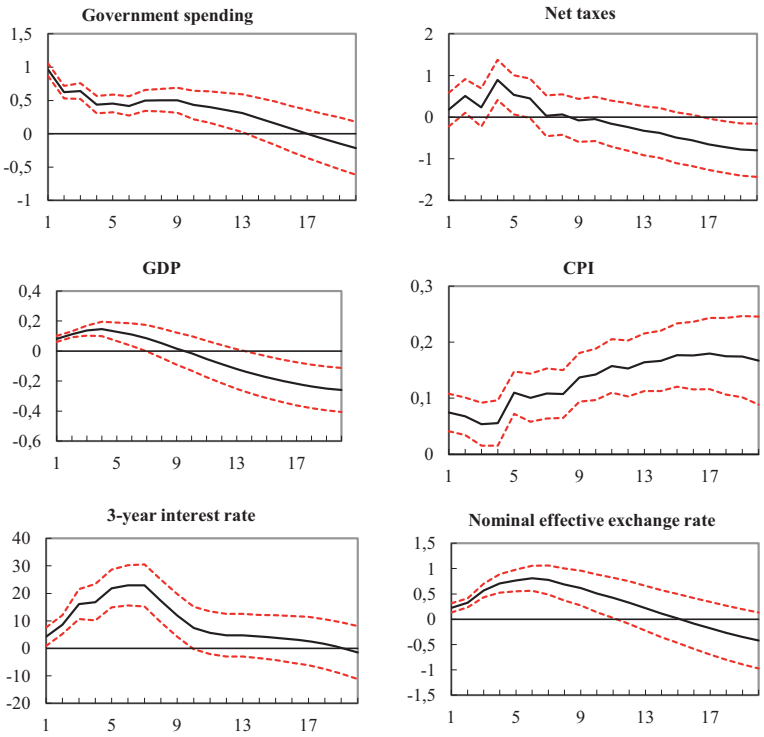
Figure 4: Nominal and real effective exchange rate indexes in Spain and the euro area



In order to deepen the understanding of responses of the real effective exchange rate we substituted in our VAR the REER by the nominal effective exchange rate (NEER). Moreover, in order to account for the effect of relative prices, given that the real exchange rate is calculated with consumer prices, we substituted the GDP deflator by the CPI index so as to avoid an explicit double counting of price effects. The identification strategy was similar to the baseline VAR. Figure 5 shows that higher public spending leads to nominal appreciation as indicated by the upward and persistent response of NEER, which in fact turns out to be similar to the response of the real exchange rate displayed in Figure 1. Such nominal appreciation is consistent with the increase in nominal interest rates following the shock. On the other hand, domestic consumer prices also rise persistently.

As external prices can be assumed not to react to domestic fiscal shocks, such increase in consumer prices reflects further competitiveness losses due to higher relative home prices.Therefore, real appreciation in response to fiscal shocks stems from both nominal appreciation and higher relative prices.[17]

Figure 5: Responses of nominal effective exchange rate and consumer prices to an increase in government spending



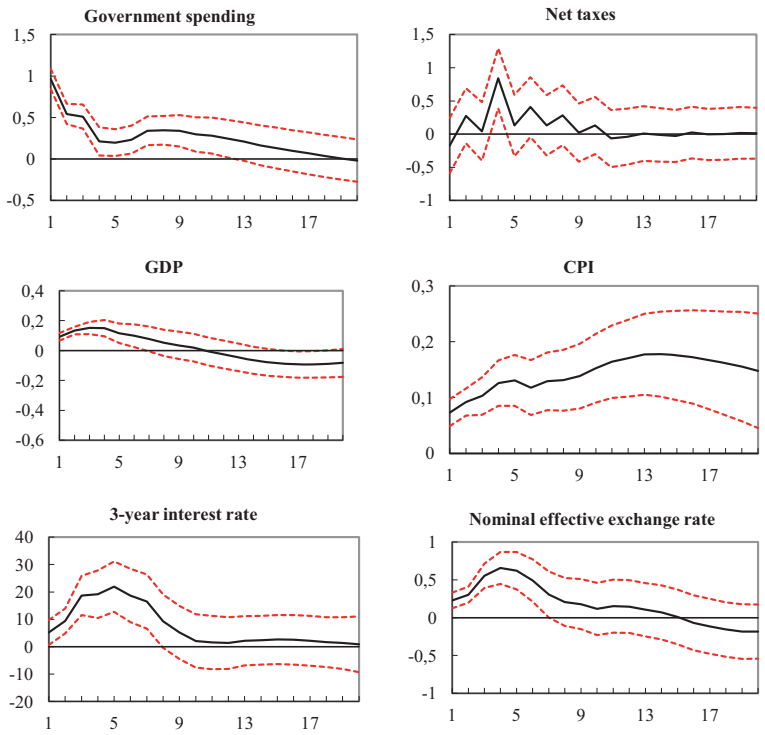
As explained above, the adoption of the euro entails a fixed exchange rate vis à vis the rest of the EMU countries. Given that most of Spain's trade takes place with EMU countries it could be expected an almost negligible response of NEER[18] to government spending shocks as of 1999[19] as NEER movements are largely determined by factors affecting the euro area as a whole,[20] which to some extent 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. Firstly, we restricted or sample until 1998; Figure 6 shows the corresponding impulse responses. Leaving aside the fact that the long-term fall of GDP is now non-significant, the rest of the variables present similar responses to those obtained

17. 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.
18. Recall that the NEER is calculated with respect to the rest of the world.
19. 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. Nevertheless, the inclusion of such dummy did not alter the results at all.
20. However, as Figure 4 shows there are still significant idiosyncratic factors behind NEER movements.

with the whole sample: spending shocks bring about both nominal effective exchange rate appreciation and higher relative prices.

Secondly, we estimated a 5-variable VAR where 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 7 shows, the reaction of endogenous variables, including consumer (and accordingly relative since foreign prices are assumed not to respond to Spanish shocks) prices did not differ significantly from previous specifications.[21] Specifically for the purpose 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.[22]

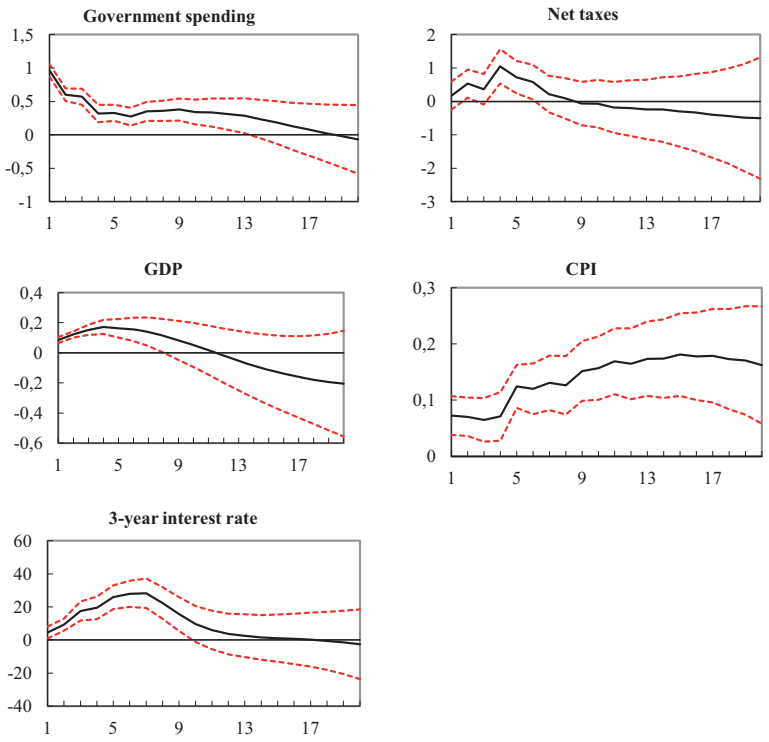
Figure 6: Responses to an increase in government spending for the period 1980-1998



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

22. 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.

Figure 7: Responses to an increase in government spending with exogenous nominal effective exchange rate



4.3 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 formally equivalent, although the latter allows us to better understand the driving forces behind the reaction of net foreign demand. The corresponding impulse responses are presented in Figure 8.

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, real appreciation discourages the external demand of domestic production and consequently exports decline for around 10 quarters, becoming their response 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. Nevertheless, such decline offsets only partially the negative response of exports.

As pointed out in section 4.1 and shown in the last chart in the first column of Figure 8, spending shocks also lead to run up primary deficits. Therefore, 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-nineties (with the exception of 2008) nonetheless characterised 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. In fact, Figure 9 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. Therefore, the significant improvement of government balances since then is 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. Interestingly, Figure 9 shows a negative correlation between government expenditure variable and net exports, which supports our assessment about the "twin deficits" hypothesis. Moreover, our conclusions so far 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.

Figure 8: Effects of government spending on net exports

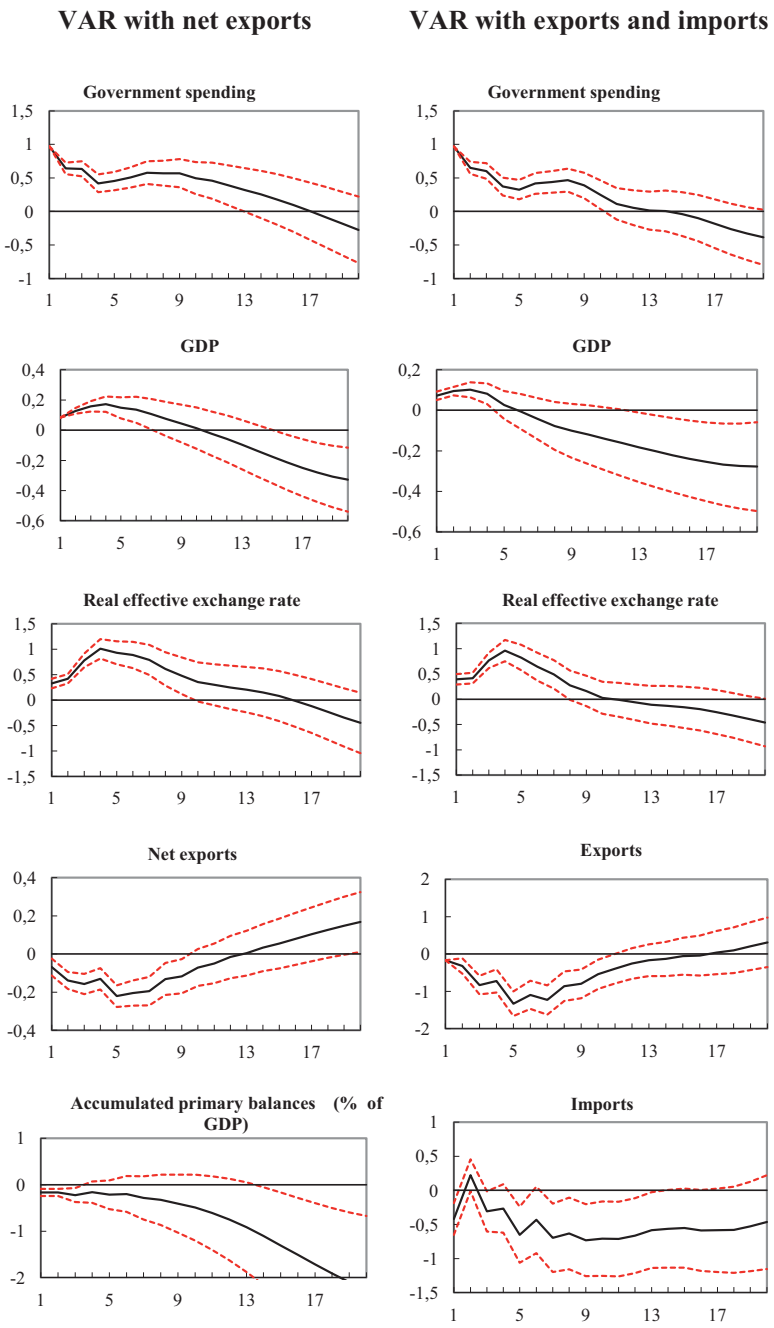
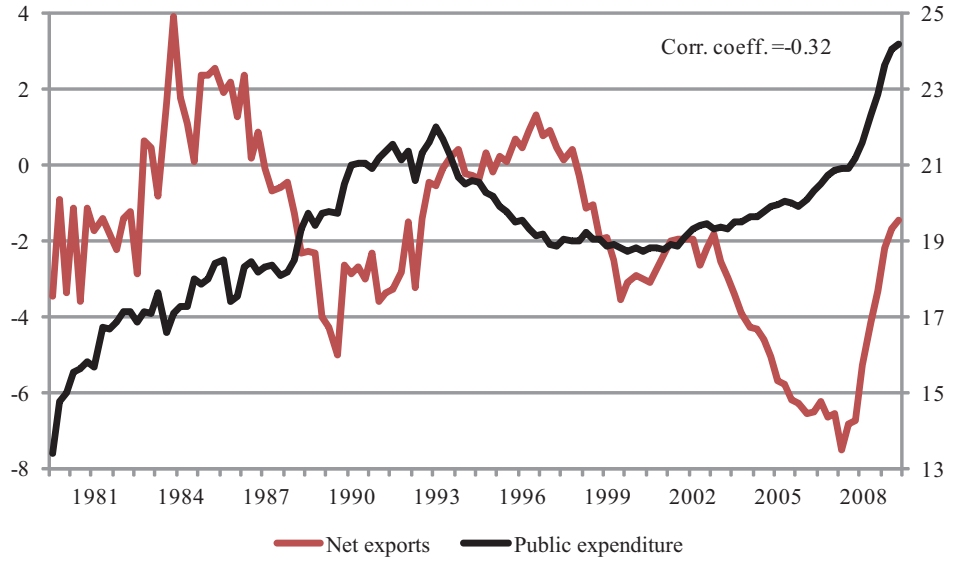


Figure 9: Government expenditure and net exports (% GDP)



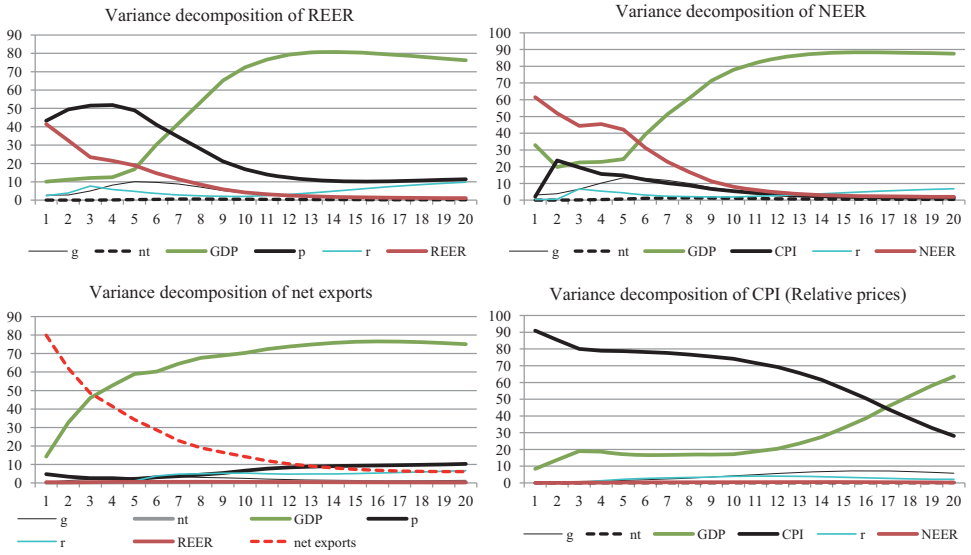
4.4 Variance decompositions

Variance decompositions in Figure 10 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% of the whole variance each. The peak contribution of government spending is reached in the fifth quarter, with some 10%, 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 the GDP (around 80%), whereas the share explained by prices decline to some 10% 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%, while that of GDP increasing steadily to slightly below 90%. 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% and 20% of the total variance. Nevertheless, 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% in the 16th quarter.

Regarding net exports, conclusions are very alike. 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.

Figure 10: Variance decompositions



4.5 The effects of different expenditure components

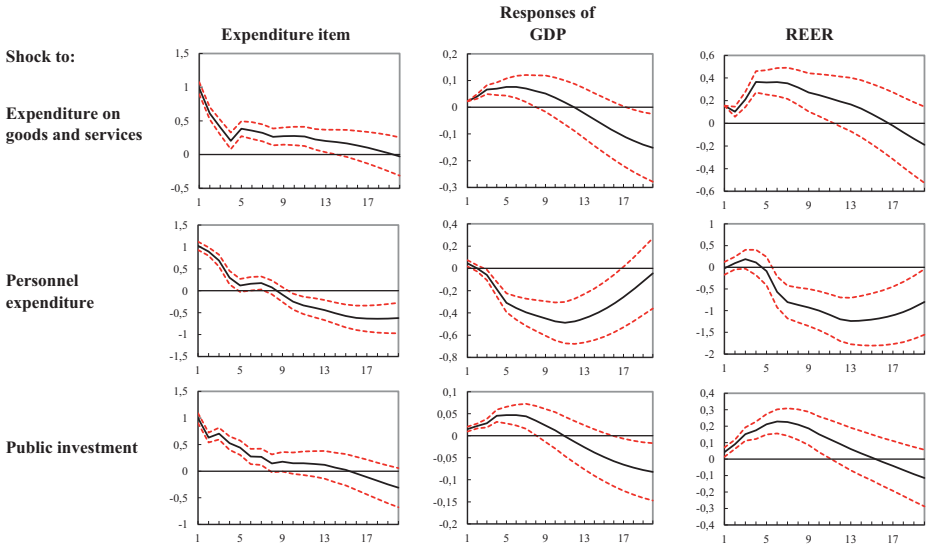
In general, the different government expenditure items are expected to entail non-homogeneous effects on other economic variables. In particular, Baxter and King (1993) argue that an increase in government investment has a stronger impact on output than an increase in government consumption, while Alesina et al. (2002) argue that public wage increases may exert upward pressure on the equilibrium wage of the economy that would lead to lower profits and investment. 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; moreover, 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.[23]

On the other hand, 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 and thereby causes real appreciation. By contrast, a long-run increase in public investment is deemed to have an ambiguous impact on the real exchange rate because an expansion in the stock of public capital may be expected to enhance productivity. In this connection, an increase in public investment that enhances productivity in the tradables sector may generate real appreciation through the Balassa-Samuelson mechanism, whereas if such productivity gains take place fundamentally in non-tradables sector, it may actually lead to 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-tradables, it has no significant long-term impact on the real exchange rate for the EMU countries.

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

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 11 shows the responses of 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 higher relative demand for non-tradables. 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 exerted by public 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, in line the Balassa-Samuelson argument.

Figure 11: Effects of expenditure components on the exchange rate



4.6 Output multipliers

While cumulative output multipliers[24] on impact are estimated at slightly below 0.5, they rise to around one or even higher one year after the shock (see Table 1) in the different models we estimate. In fact, in view of their standard errors, output multipliers are not statistically different across the different specifications. For instance, although multipliers gauged with the VAR without the GDP deflator looked slightly smaller they were 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. (2006) for

24. 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.

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), and 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 this connection, Spain has undergone significant changes in these areas over the period covered by our sample. Firstly, Spain joined the EU in 1986, which meant an unprecedented opening to international trading flows. Secondly, both floating and fixed exchange rates have prevailed since 1980. Specifically, 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.[25] 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 thereafter.

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 until 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 show up in medium term responses. 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 by the fact that significant share of public investment, i.e. machinery equipment, materializes in imported goods and, accordingly, 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 hold in all cases. Conversely, personnel expenditure, despite yielding positive and significant output multipliers on impact, they quickly become negative and significant during the second year after the shock. Therefore, these negative output effects derived from the government's wage bill explain the

25. 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.

also negative multipliers of total public consumption in the medium term in that personnel expenditure is the largest item of public consumption.[26]

Table 1: Cumulative output multipliers in different specifications

	Quartes 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% confidence interval.

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

5 Conclusions

The empirical literature on the effects of public spending on the exchange rate and the current account is especially inconclusive. Most of this strand of the literature focuses on the US economy, while evidence about other countries is scanter. This paper contributes a new piece of evidence for the Spanish case. In order to assess the effects of public expenditure on variables characterising the external side of the economy we estimate a SVAR following the methodology sketched in Blanchard and Perotti (2002).

Our analysis shows that government spending brings about positive output responses, jointly with real appreciation. Such real appreciation is explained by persistent nominal appreciation and higher relative 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 effect 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 not only with the conventional Mundell-Fleming model and, in general a traditional Keynesian view, but also with a wide set of RBC or New Keynesian models under standard calibrations. Moreover, our estimations are fully consistent with the "twin deficits" hypothesis.

As for 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.

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

Appendix: Construction of output and price elasticities

In order to calculate the output and price elasticities we basically follow the OECD methodology proposed in Giorno et al. (1995), which focuses on four tax categories, i.e. personal income tax, corporate income tax, indirect taxes and social security contributions. In addition, they consider the elasticity of transfer programmes, notably unemployment benefits. According to this methodology, the output elasticity of the personal income tax can be obtained as:

$$\varepsilon_{tdirh,y} = (\varepsilon_{tdirh,w}\varepsilon_{w,emp} + 1)\varepsilon_{emp,y} \quad \text{(A.1)}$$

where $\varepsilon_{tdirh,w}$ is the elasticity of personal income tax revenues to earnings, measured by the compensation per employee, $\varepsilon_{w,emp}$ is the employment elasticity of the real wage and $\varepsilon_{emp,y}$ the GDP elasticity of employment. Analogously, the output elasticity of social security contributions is:

$$\varepsilon_{ss,y} = (\varepsilon_{ss,w}\varepsilon_{w,emp} + 1)\varepsilon_{emp,y} \quad \text{(A.2)}$$

with $\varepsilon_{ss,w}$ being the elasticity of social contributions to earnings.

The output elasticity of corporate income tax revenues stems from:

$$\varepsilon_{tdirc,y} = \varepsilon_{tdirc,gos}\varepsilon_{gos,y} \quad \text{(A.3)}$$

where $\varepsilon_{tdirc,gos}$ is the elasticity of tax revenues to the gross operating surplus and $\varepsilon_{gos,y}$ the output elasticity of the gross operating surplus. In the same fashion, given that the main tax base for indirect tax collections is private consumption, the output elasticity of indirect taxes is obtained as:

$$\varepsilon_{tind,y} = \varepsilon_{tind,c}\varepsilon_{c,y} \quad \text{(A.4)}$$

where $\varepsilon_{tind,c}$ and $\varepsilon_{c,y}$ are the private consumption elasticity of indirect taxes and the output elasticity of private consumption, respectively.

Since we employ data on a national accounts basis, collection lags should not affect the elasticities to the respective tax-bases significantly. Hence, these have been taken from van den Noord (2000) and Bouthevillain et al. (2001). The output elasticities of the relevant tax bases were, however, obtained from econometric estimation on a quarterly basis. In general, the general equation used for estimating these elasticities was:

$$\Delta Ln(B_t^i) = \gamma + \varepsilon_i \Delta Ln(Y_t) + \eta_t \quad \text{(A.5)}$$

where B^i is the relevant tax base for the i[th] tax category and ε_i is the output elasticity of such tax base. These equations, given the likely contemporaneous correlation between the independent variable and the error term, were estimated by instrumental variables. However, if the variables B^i and Y are cointegrated, (A.5) contains a specification error. In this case, the following ECM specification would be preferable:

$$\begin{aligned}\Delta Ln(B_t^i) = \gamma + \mu(Ln(B_{t-1}^i) - \lambda Ln(Y_{t-1}) - \phi) + \varepsilon_i \Delta Ln(Y_t) \\ + \sum_{j=1}^{k} \varphi_j \Delta Ln(Y_{t-j}) + \sum_{j=1}^{k} \nu_j \Delta Ln(B_{t-j}^i) + \eta_t\end{aligned} \tag{A.6}$$

where λ measures the long-term contemporaneous elasticity we are interested in.

Information on the output elasticity of net transfers is more limited than in the former cases. Although unemployment benefits respond to the underlying economic conditions, many expenditure programmes do not have built-in conditions that make them respond contemporaneously to employment or output. Therefore, recalling Perotti's argument, an output elasticity of net transfers of -0.2 has been assumed.

As for price elasticities, following van der Noord (2000) those of direct taxes paid by households, corporate income taxes and social contributions were obtained as $\varepsilon_{tdirh,p} = \varepsilon_{tdirh,w} - 1$, $\varepsilon_{tdirc,p} = \varepsilon_{tdirc,gos} - 1$ and $\varepsilon_{ss,p} = \varepsilon_{ss,w} - 1$, respectively. Indirect taxes are typically proportional. Hence, following Perotti (2004), a zero price elasticity was assumed. Finally, although transfer programmes are indexed to the CPI, indexation occurs with a considerable lag. Thus, the price elasticity of transfers was set to -1.

Accordingly, contemporaneous output elasticities of net taxes can be calculated as:

$$\alpha_{t,y} = \sum_i \varepsilon_{T_i,B_i} \varepsilon_{B_i,y} \frac{T_i}{T} \tag{A.7}$$

with $T = \sum T_i$ being the level of net taxes[27], ε_{T_i,B_i} the elasticity of the i[th] category of net taxes to its own tax base and $\varepsilon_{B_i,y}$ the GDP elasticity of the tax base of the i[th] category of net taxes. Price elasticities are obtained in a similar fashion. Table 2 shows the resulting output and price elasticities.

27. The T_i's are positive in the case of taxes and negative in the case of transfers.

Table 2: Output and price elasticities of net taxes

		Output elasticities		Price elasticities	
$\varepsilon_{tdirh,w}$	1.8	$\varepsilon_{tdirh,y}$	0.17	$\varepsilon_{tdir,p}$	0.8
$\varepsilon_{w,emp}$	0.0	$\varepsilon_{ss,y}$	0.17	$\varepsilon_{ss,p}$	-0.2
$\varepsilon_{emp,y}$	0.17	$\varepsilon_{tdirc,y}$	1.04	$\varepsilon_{tind,p}$	0.0
$\varepsilon_{ss,w}$	0.8	$\varepsilon_{tind,y}$	0.3	$\varepsilon_{transf,p}$	-1.0
$\varepsilon_{tdirc,gos}$	1.0	$\varepsilon_{transf,y}$	-0.2	$\boldsymbol{\varepsilon_{t,p}}$	**0.87**
$\varepsilon_{gos,y}$	1.04	$\boldsymbol{\varepsilon_{t,y}}$	**0.62**		
$\varepsilon_{c,y}$	0.3				
$\varepsilon_{tind,c}$	1.0				

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