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The Dynamic Effects of Monetary Policy and Government Spending Shocks on Unemployment in the Peripheral Euro Area Countries

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Pietro Dallari[a] and Antonio Ribba[b]*

[a]International Monetary Fund, Washington, USA
[b]Università di Modena e Reggio Emilia, Italy

Abstract. In this paper we study the response of unemployment to monetary policy and government spending shocks in the peripheral Euro-area countries. By applying the structural near-VAR methodology, we jointly model area-wide and national variables. Our main finding is that fiscal multipliers vary across countries and the results are consistent with the prediction of the standard New Keynesian model only in Italy and Greece. Instead, in Ireland, Portugal and Spain increases in government spending are recessionary. Thus we find that Keynesian results of fiscal policy seem to prevail in high public-debt countries, whereas non-Keynesian outcomes seem to characterize high private-debt countries. As for the monetary policy shock, we find that it plays an important role, jointly with the other area-wide shocks, as a long-term driver of national unemployment.

* Correspondence to: Antonio Ribba, Department of Economics Marco Biagi, Università di Modena e Reggio Emilia, Viale Berengario 51, 41121 Modena, Italy.
E-mail: antonio.ribba@unimore.it

Pietro Dallari, International Monetary Fund, Washington, USA.
E-mail:pdallari@imf.org

1. Introduction

Do contractionary fiscal policies produce recessionary effects in the economic system? Or, instead, do these policies cause expansions in economic activity? These are old debated issues in macroeconomics, and are indeed still controversial.

In this paper we aim to investigate these issues by focusing on a group of Euro-area countries in which fiscal austerity has been forced in, recent years, both by the European fiscal rules and by an economic and financial environment characterized by rising debt and related fears concerning its sustainability. In particular, we adopt a structural near-VAR approach and concentrate attention on the response of a key variable of the labour market, i.e. the unemployment rate, to national government spending shocks.

Thus, we choose to use the unemployment rate to describe the economic cycle. Peripheral European countries have proved to be particularly vulnerable to the rapid escalation of unemployment, which may stay persistently high even when upturns in output materialize. A recovery in aggregate income that is not followed by a comparable improvement in employment inevitably leads to increasing inequality which, according to recent cross-country empirical evidence, hurts growth for given levels of redistribution (IMF, 2014). High unemployment also leads to human capital losses, is more likely to determine social turmoil (Voth and Ponticelli, 2012), and leads to shortfalls in income that increase economic volatility (Gerardi et al., 2013). Also, maximizing social welfare is typically part of the political mandate that policymakers receive from the electorate, and is commonly assumed among their preferences in a large class of economic models. Therefore, we believe that a number of reasons make unemployment a relevant yardstick to assess the impact of policy initiatives on the economy.

Indeed, in recent years, the southern European countries - Greece, Italy, Portugal and Spain - and Ireland have experienced a number of unprecedented economic shocks.

The favorable borrowing costs and cross-border financial integration prevailing under the umbrella of the monetary union and, in the case of Ireland, a low corporate tax rate, have attracted large capital inflows since the late Nineties. The external financing contributed to growing current account deficits and fuelled bubbles in some sectors of the economy, primarily the real estate market. As the financial crisis shattered the world economy in 2007, these countries found themselves exposed to falling real estate prices, plummeting trading volumes in the universe of risky asset classes, and sudden stops in capital inflows. In turn, the recapitalization of domestic financial institutions and the cost of welfare policies, in place to mitigate the social fallout of the crisis, triggered a series of confidence shocks on the sustainability of public finances and, more generally, on the viability of the Euro.

This sequence of events has generated renewed interest in understanding how similar or different peripheral Euro-area countries are in terms of the shocks they are exposed to, and their domestic transmission channels. It has also stimulated a debate centered on the tension between the centralized conduct of monetary policy and domestic fiscal policies, albeit implemented within a set of collective rules. In fact, for the first time European policymakers faced unemployment at or above the levels last seen in the mid-Nineties, when the common monetary system was not yet operational, raising questions about the most effective policy tools available in a monetary union.

Against this background, by adopting a structural near-VAR approach, in this paper

we investigate the dynamic effects exerted by a selected set of exogenous shocks on some key macroeconomic variables in the southern European peripheral economies and Ireland during the first eighteen years of the EMU to derive insights that can guide policy actions. In particular, we focus on the response of national unemployment rate to Euro-area monetary policy shocks and to domestic government spending shocks.

Although this near-VAR methodology has been previously used to investigate the role of monetary policy shocks in small open economies, the novelty of this paper is to apply this methodology in order to study the dynamic effects of monetary and government spending shocks in the peripheral Euro-area countries by jointly modeling Euro area and national variables.

To this end, we estimate a vector autoregressive model in which Greece, Ireland, Italy, Portugal and Spain are treated as small open economies acting in a monetary union. In the context of the Euro area it is important to take into account the particular institutional environment, with the conduct of monetary policy by the ECB at a supranational level, and fiscal policy decisions taken by governments at the single-country level. We accomplish this task by modeling both Euro area and national variables jointly, except that only the first group of variables is allowed to exert an influence on the second one. The set of exogenous, structural shocks is recovered by imposing a recursive structure.

Several interesting findings stem from our analysis. To start with, the effects of government spending shocks on unemployment vary considerably depending upon the country investigated. In particular, our results are consistent with the predictions of the standard New Keynesian model[1] only in Italy and Greece; in Ireland, Portugal and Spain we identify perverse effects of government spending shocks on unemployment.

The core of these empirical results is substantially confirmed by estimating national VAR models with full interaction among variables and in which an alternative identification strategy of the national government spending shocks, based on sign restrictions, is adopted. We are thus led to the conclusion that a better understanding of the macroeconomic outcomes of government spending shocks might require a separation of high public-debt countries (like Greece and Italy) from high private-debt countries (like Ireland and Spain).

Moreover, and not less important, our results contrast some conclusions recently reached in the literature. For example, Ilzetzki et al. (2013) find that fiscal stimuli exert recessionary effects in a panel of countries affected by high public debt. Of course, these contrasting results may be partially explained by the different sample periods considered. However, in our opinion, another important explanation is in our choice to conduct the investigation at the national level, since aggregate results obtained for selected group of countries might obscure significant differences among them.[2]

The strand of the literature applying the structural VAR methodology to study the effects of fiscal shocks on aggregate output was initiated by Blanchard and Perotti (2002).

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[1]More precisely, as emphasized by Canova and Pappa (2011), sticky-price New Keynesian models predict positive output effects of government spending expansions if the following conditions are met: (i) real wages increase; (ii) the labour-efficiency wedge falls; (iii) private expenditure shows non-negative movements in response to increase in government spending.

[2]It is also worth recalling that Ireland was one of the two countries, the other being Denmark, investigated by Giavazzi and Pagano (1990) in the 80s, where the authors found evidence of expansionary effects associated with fiscal consolidations.

They investigated the postwar US economy and found results in line with the traditional Keynesian interpretation of the role of fiscal policy in stabilizing business cycle fluctuations. Similar results for the US economy are obtained by Mountford and Uhlig (2009). The authors use a structural VAR in which government spending and revenue shocks are identified by imposing sign restrictions on the responses of the variables. One of the first applications of the sign restriction approach is provided in Rafiq and Mallick (2008), who investigated the effects of monetary policy shocks in Germany, France and Italy. A recent survey on the identification of fiscal and other macroeconomic shocks is provided by Ramey (2016).

Canova and Pappa (2011) have instead used a structural VAR model to investigate the dynamic effects of government expenditure shocks on real activity in the United States, the Euro area and the United Kingdom. One of the main points of the study is that fiscal policy may exert large effects on the real economy in the presence of negative real interest rate, caused, in turn, by accommodative monetary policy.

In Leeper et al. (2010) a RBC model is estimated and fitted to US data in order to analyze the role of fiscal financing for short-run and long-run multipliers. One of the main findings of the paper is that these multipliers may differ deeply at the different horizons, according to alternative strategies of fiscal financing.[3]

Christiano et al. (2011) have suggested that the size of the government-spending multiplier is small in the presence of monetary policy choices driven by Taylor rules. Instead, the size increases when the nominal interest rate is constant. The authors consider a particular case of constant nominal rates related to a binding zero lower bound on nominal interest rate. Nevertheless, having recognized the difficulties of empirically investigating the size of the fiscal multipliers at the zero lower bound, the authors build a dynamic stochastic general equilibrium model in order to draw plausible results on the government-spending multipliers.

In a very recent paper, Wang (2018) studies the interactions between unconventional monetary policy and fiscal policy in the U.S. and in Japan. The main finding is that the macroeconomic effects of these interactions are larger in the U.S.

The importance of the interaction between monetary and fiscal policy is also detected by Jawadi et al. (2016), who study the dynamic effects of monetary and fiscal policy shocks on economic activity in the BRICS. They use a PVAR approach and show that policy coordination causes a stronger recovery for economies hit by adverse macroeconomic shocks.

Canzoneri et al. (2016) have recently shown, by using a theoretical model of the business cycle with costly financial intermediation, that fiscal multipliers are much larger when the economy is in a recessionary phase. The empirical findings in Fazzari et al. (2015), concerning the US economy, show that government spending multipliers are bigger, and above one, in times of low capacity utilization. Nevertheless, Ramey and Zubairy (2018) have recently challenged these findings by showing that fiscal multipliers are smaller and, moreover, that the size of multipliers does not depend on the degree of economic slack.

However, in more recent years, a growing literature has broadened the scope of the anal-

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[3]In a recent paper, Leeper et al. (2015) have used a Bayesian approach to estimate fiscal multipliers for the US economy. The authors build a monetary DSGE model and estimate the fiscal multipliers by considering alternative monetary-policy stances.

ysis to include the dynamic effects of fiscal shocks on labor markets. Maybe not surprisingly, the results presented by researchers are far from homogeneous.

Monacelli et al. (2010) provide estimates of both output and unemployment fiscal multipliers for the postwar US economy using a structural VAR model. The exogenous innovations are identified by imposing a contemporaneous causal ordering, with government spending ordered first. The estimated unemployment multiplier, measured at the peak, equals 0.6, i.e. an increase in government spending of 1 percent of GDP causes a maximum decrease of 0.6 percent in unemployment.

Brückner and Pappa (2012) find, instead, that fiscal expansions can increase unemployment, both in the US economy and in other OECD countries. The authors show that, while the sample specification can in some cases play a role in determining opposite outcomes, the positive response of unemployment to expansionary fiscal shocks is robust to a number of alternative identification strategies and model specifications. In the paper, a rationale for this puzzling outcome is offered by introducing worker heterogeneity and assuming that outsider unemployment increases more than the reduction in insider unemployment.

Bermperoglu et al. (2013) investigate the effects of several categories of government outlays, such as government consumption, investment, vacancies and wages in the US, UK, Japan and Canada, and their conclusion is that contractionary shocks to government wages can produce expansionary effects on output and reduce unemployment, while vacancy cuts lead to output losses and increases in unemployment.

An interpretation of the heterogeneity of the results concerning the fiscal multipliers, is given in Ilzetzki et al. (2013). The authors investigate the macroeconomic effects of fiscal stimuli in 44 countries and show that both the sign and the amplitude of the fiscal multipliers are strongly related to key country features. Particularly interesting, given the group of countries studied in our paper, is the conclusion that fiscal multipliers are negative in countries characterized by high debt.

Our investigation refines and partially modifies the conclusions by Ilzetzki et al. (2013): countries' financial fragility is confirmed as an important factor capable of influencing the sign of the fiscal multipliers. Moreover, given the results observed for Ireland, Spain and Portugal in comparison to Italy and Greece, it seems that the presence of high indebtedness of the private sector may play a role in generating non-Keynesian effects of fiscal policy.

The rest of the paper is organized as follows. In section 2 the econometric approach of the paper is described. In particular, we present the main features of the estimated near-VAR model and focus on the strategy to recover the structural shocks. In this section we also report some descriptive statistics for the national economies. Section 3 presents the econometric evidence organized in several subsections. Section 4 examines in more detail the shocks that drive domestic unemployment. In section 5 we undertake a sensitivity analysis in order to check for the robustness of the results obtained. In particular, government spending shocks are identified by imposing sign restrictions. Section 6 concludes and some policy implications of our results are drawn.

2. The estimated VAR model

Let us consider the following, general VAR specification:

$$A(L)X_t = e_t \qquad [1]$$

where X_t is a $m \times 1$ vector of macroeconomic variables, including both Euro-area and national variables, and e_t is the $m \times 1$ vector of error terms, such that $E(e_t) = 0$ and $E(e_t e_t') = \Sigma_e$. Moreover, L is the lag operator and $A(L)$ is the $m \times m$ matrix polynomial in L. For all the estimated VARs of the present research, we take $m = 8$.

We impose the restriction $A_{21}(L) = 0$ and thus, for each of the countries included in the investigation, we estimate the following near-VAR model:

$$\begin{pmatrix} A_{11}(L) & A_{12}(L \\ 0 & A_{22}(L) \end{pmatrix} \begin{pmatrix} X_{1t} \\ X_{2t} \end{pmatrix} = \begin{pmatrix} e_{1t} \\ e_{2t} \end{pmatrix} \qquad [2]$$

Where X_{1t} and X_{2t} have dimension, respectively, $m_1 \times 1$ and $m_2 \times 1$, $A_{11}(L)$ has dimension $m_1 \times m_1$, $A_{12}(L)$ $m_1 \times m_2$, $A_{22}(L)$ $m_2 \times m_2$. Moreover, $m_1 + m_2 = m$.

More precisely, and in order to fix the notation, we have:

$$X_{1t}' = \begin{pmatrix} g_{it} & p_{it} & u_{it} & spread_{it} \end{pmatrix}$$

with X_{1t} 4×1 vector including national variables. The national variables included in the near-VAR are government spending, g_{it}; the consumer price index, p_{it}; the unemployment rate, u_{it}; and the differential between the yield on 10-year domestic government bonds and the corresponding German bond, $spread_{it}$.[4]
Government spending is constructed as the sum of government consumption and government investment (see Blanchard and Perotti, 2002). This approach is justified in the light of the fact that public spending on goods and services impacts aggregate demand directly.

The Euro-area variables are instead collected in the 4×1 vector X_{2t}:

$$X_{2t}' = \begin{pmatrix} p_t & u_t & i_t - i_t^* & \epsilon_t \end{pmatrix}$$

Thus the second block of the model instead includes only Euro-area variables. These are the Euro area consumer price index, p_t, and the unemployment rate, u_t, the differential between the Eonia and the federal funds rate, $i_t - i_t^*$, and the nominal exchange rate, ϵ_t, defined as US dollars per currency units. The first two series proxy aggregate supply and demand respectively. We use the differential between the Euro area and US short-term interest rate in order to account for the relative stance of the ECB via-à-vis the Fed in setting domestic monetary policy. In other words, the reaction function of the ECB is

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[4]Data sources are detailed in the Data appendix.

specified as a monetary rule for an open economy.[5] As standard in the literature, we adopt the short-term interest rates to measure the stance of monetary policy (see, *e.g.* Bernanke and Mihov, 1998 and Taylor, 1999).

It is worth stressing that, as the Euro area-wide series remain the same across specifications, the identified euro-wide shocks are invariant across simulations, allowing us to study the domestic dynamics conditional on common impulses that are identical despite we estimate a separate VAR system for each country.

The sample ideally covers the period of the EMU, although in practice it differs slightly in some countries due to data availability constraints: the data start in 2002:Q1 for Ireland and in 1999:Q1 in all remaining countries; the sample ends in 2016:Q3 for all countries.

The structural near-VAR that we adopt allows for a separation of the macroeconomic variables into two distinct blocks: a first fully endogenous block, including national variables unidirectionally caused by the Euro-area variables and a second exogenous block, including only Euro-area variables.

We use block exogeneity restrictions in order to characterize the dynamic interaction of small open economies which are part of the European Monetary Union (EMU) with the area-wide economy. Cushman and Zha (1997) used the near-VAR model to study the interaction between Canada (the small open economy) and the United States. In particular, they used such a model to provide a sounder identification of the monetary policy shocks affecting the small open economy in a context of flexible exchange rates.[6]

The fiscal variable, the consumer price index and the exchange rate enter the model in natural logs and the interest rate differential in basis points. The model is specified with the series in levels and includes a constant.[7] The lag length is set to one. We stress that the Schwarz information criterion provides support for this choice. Indeed, this choice strikes a balance between purging the residuals from autocorrelation and preserving as many observations as possible.[8]

In table 1 we report some descriptive statistics for the series included in the national blocks.[9] Clearly, even these simple statistics are able to describe the great instability that

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[5]Indeed, the interactions between the ECB and the Fed in the first fifteen years of the EMU have been substantial (see Scotti, 2011).

[6]Cavallo and Ribba (2015), in the context of EMU, have recently identified a structural near-VAR model to study the dynamic effects of monetary policy shocks on industrial production in a group of Euro-area countries in the first decade of the Euro. Other recent applications of this approach include, among others, Givens and Reed (2018), Boecks et al. (2017) and Conti et al. (2017). Instead, as for open economies, a more classical structural VAR approach to investigate sources of fluctuations in the UK is adopted for example in Cover and Mallick (2012).

[7]In our estimation we consider a period of eighteen years and use quarterly data. Thus, given the relatively small sample period we do not undertake the task of testing and identifying the possible existence of long-run equilibrium relations among variables, given the difficulties in identifying the cointegration space. However let us note that, in general, a Vector Error Correction Model can always be thought of as a reparametrization of a VAR model specified in levels. In other words, even in the presence of long-run relations, our near-VAR would not suffer from mis-specification. Two important references on this subject are Sims, Stock and Watson (1990) and Christiano, Eichenbaum and Evans (2005).

[8]Although we have not undertaken formal tests of serial correlation, a visual inspection of the VAR residuals does not highlight serial correlation patterns. However, given the relatively short sample available, attempting to add further lags could be problematic and create invertibility issues.

[9]Clearly, when dealing with descriptive statistics and making comparison among countries, the evolution

affected the European peripheral economies in the last decade, as well as some differences characterizing the selected group of macroeconomic indicators.[10]

Having estimated the VAR reduced form [2], the next step is to recover the structural shocks affecting the economic systems, both at the Euro-area and at the national level.

Thus, we first obtain the reduced-form moving average representation of system [2]:

$$X_t = C(L)e_t \qquad [3]$$

where $C(0) = I$.

Then, the structural shocks are recovered by imposing a contemporaneous recursive structure to the estimated VAR model:

$$X_t = B(L)\eta_t \qquad [4]$$

Where $B(L) = C(L)S$ and $\eta_t = S^{-1}e_t$. S is the Cholesky factor of Σ_e, *i.e.* is the unique lower triangular matrix such that $SS' = \Sigma_e$.

In particular, identification in the Euro area-wide block is achieved by assuming that a monetary policy shock does not influence either the price level or unemployment within the period; a demand shock exerts a delayed effect on prices; the exchange rate does not exert a contemporaneous effect on the differential between Eonia and the federal funds rate nor on other Euro area variables.[11] This orthogonalization of the structural shocks is widely adopted in the VAR literature studying the dynamic behaviour of large economies (see, for example, Christiano et al., 1999 and Eichenbaum-Evans, 1995).

Estimation of system [2] by using OLS ensures consistent estimates. Nonetheless, potential gains might be obtained by estimation based on Seemingly Unrelated Regressions (SUR) methods (Zellner 1962). Thus, we estimate system [2] by using SUR methods. Moreover, we use Gibbs sampling for doing impulse responses with error bands, where each Gibbs sweep requires performing a full estimate of the near-VAR by Seemingly Unrelated Regressions (see Doan, 2010). A standard Jeffreys prior is used for the covariance matrix.

The recursive identification strategy also characterizes the recent structural VAR investigation on the US economy by Monacelli et al. (2010).

As for the domestic block, the government spending shock is backed out by assuming that the government does not react within the same quarter to economic developments like

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of price levels as well as the evolution of government spending levels provide little information. Thus, while the national blocks of the VARs include government spending and the average price level (in logs), the table includes the inflation rate and the government spending share. On the other hand, the comparison among countries in terms of impulse response functions works quite well, since we characterize the dynamic response of variables in terms of changes of macroeconomic variables in response to unexpected changes in government spending or monetary policy. Moreover, since we include the logs of variables, we get elasticities.

[10]The presence of heterogeneity in the Euro Area, and the related problems for the smooth functioning of the currency area, have been amply documented in recent years (see e.g. Cavallo and Ribba (2014)).

[11]Inverting the order of the monetary policy and the exchange rate series does not change the results.

those in financial markets or in supply and demand, both at the national level and the Euro-area level.[12] While reasonable, this identification delivers a non-fundamental representation if economic agents foresee the fiscal shocks - e.g. because it is announced in advance, or as a result of delays in the process of parliamentary approval - and rationally respond to them before the shock actually occurs.

Leeper et al. (2013) use tax policies as an important example of foresight and show that output multipliers for taxes will be distorted if the econometric analyses neglect modelling foresight. Evidence of fiscal foresight in some European countries has recently been provided by Cavallari and Romano (2017).

Although the strategy of backing out the shock directly from the news narrative can help to overcome the non-fundamentalness (Ramey, 2011), the time-series of news announcements is not readily available for any of the countries in our dataset. Moreover, while effective in dealing with the non-fundamentalness problem, the narrative approach may be subject to biases in the distribution between expansionary and contractionary shocks that do not seem to characterize the recursive identification scheme (Barnichon and Matthes, 2015). As an alternative, leading indicators like stock prices and business confidence indexes can help to recover the true sequence of structural shocks (Forni and Gambetti, 2014). To this end, we add the composite index of the domestic stock market as an exogenous variable to each country VAR model.

The remaining restrictions in the domestic block involve restricting to zero the contemporaneous response of the price level to a local aggregate demand shock, and ordering last in the VAR the interest rate differential between national and German bonds, an assumption consistent with the practice of considering financial variables as fast moving series that react quickly to economic developments.

When referring to the unemployment multipliers, we mean the change in the unemployment rate for a given change in government spending. The multipliers can refer to any horizon j, in which case they are constructed as:[13]

$$\text{Unemployment Fiscal Multiplier } j \text{ periods ahead} = \frac{\Delta U_{t+j}}{\Delta G_t},$$

where U denotes unemployment and G the government series.

3. The effects of economic shocks in the Euro area periphery

Here we discuss our evidence. In order to economize on space and provide some structure to the discussion, we have organized this section in subsections. In particular, we concentrate on the evidence concerning the common Euro area monetary policy shock and the domestic government spending shocks. When reporting the impulse response functions, we display the median responses together with the error bands set at the 16th and the 84th percentiles following Sims and Zha (1999).

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[12]Similar identifying restrictions are adopted by, among others, Blanchard and Perotti (2002) and by Monacelli et al. (2010).

[13]Another measure of fiscal multiplier, sometimes used in the literature, is the cumulative multiplier at horizon j, given by $\frac{\Sigma_{t=1}^{j}\Delta U_{t+j}}{\Sigma_{t=1}^{j}\Delta G_{t+j}}$, (see IMF (2009)).

However, before analyzing the responses of national variables to Euro area-wide and national shocks, we briefly present the results concerning the responses of Euro-area consumer prices and unemployment rate to Euro area-wide shocks. Although studying these responses is not the focus of this investigation we report these results mainly in order to allow a qualitative evaluation of the recursive identification strategy that we adopted both in the exogenous block and in the local block of the VAR model.

3.1 Euro area-wide shocks effects on the Euro-area variables.

In figures from 1 to 3 the responses of prices and unemployment in the Euro area to, respectively, supply shocks, demand shocks and monetary policy shocks are reported.

On the whole, it seems that the labels we attached to the identified shocks are consistent with the conventional wisdom of the effects exerted by such macroeconomic shocks on prices and unemployment. For, as shown in figure 1, following a positive supply shock, in the short run there is an increase in unemployment which lasts for around five years.

Instead (Figures 2 and 3), both a negative aggregate demand shock and an unexpected monetary policy tightening push prices and unemployment in opposite directions in the short run, with a statistically-significant decrease in prices and an increase in unemployment.

Insert Figures 1-3 about here

3.2 Common monetary policy shock

An unexpected increase in the interest rate differential between the eonia and the federal funds rate causes a statistically-significant decrease in domestic prices in all countries included in the analysis except Spain, where the response of prices is not statistically significant at all horizons. Instead, for the domestic unemployment rate, it increases in all countries (Figure 4).

The contractionary monetary policy shock has the expected effects on the price level: prices gradually fall, reaching the maximal effect between twelve and twenty-four quarters after the shock. On impact, given the imposed zero restriction, the dynamic response of the price level is muted across all countries, but differences emerge along the path back to the long-term equilibrium. While in Greece, Italy and Portugal the price level shows a significant and persistent decrease, in Ireland changes are not only smaller but also less persistent. In Spain we find that the response is not statistically significant.

The transmission of a common monetary policy shock to unemployment rate in the peripheral economies is less homogeneous. Unemployment increases in response to the monetary contraction in all countries but Greece. Indeed, in Greece we find that despite an increase in the median estimate, given the wide confidence bands, the response of unemployment is not statistically-significant. In Italy and Spain we detect an increase in unemployment, following the contractionary monetary policy shock, which lasts for around three years and thereafter becomes non-significant. Instead, in Portugal and Ireland the

response of the unemployment rate has the expected sign for some periods, i.e. it increases, but the sign reverses from positive to negative after three-four years.

Insert Figure 4 about here

3.3 Domestic government spending shocks

Figure 5 collects the responses of the price level and the unemployment rate to a government spending shock.[14]

In Greece, an increase in government expenditures reduces unemployment and the maximal effect is reached eight quarters after the shock. The unemployment response is consistent with the evidence obtained in Tagkalakis (2013) using a different sample of data. Thus, in the case of Greece, we detect the presence of Keynesian effects associated with fiscal policy under the EMU.
A similar conclusion holds for Italy, since unemployment falls in response to a positive government spending shock. The peak response is reached approximately three years after the shock. However, the dynamic effects exerted by the fiscal shock remain significant for further two years and hence they are characterized by persistence.

Greece and Italy are the only two cases where we find responses of unemployment fully in line with the predictions of standard Keynesian models, i.e. increases in government consumption and investment are expansionary.
On the contrary, the evidence for Ireland, Portugal and Spain supports the hypothesis that expansionary fiscal policies can be detrimental to unemployment (Brückner and Pappa, 2012). The unemployment rate increases in these three countries in response to a positive government spending shock. The increase in unemployment is more persistent in Portugal and Spain, where it requires around three years for the effects to be vanished.

In table 2 we report the unemployment multipliers: these measure the change in the rate of unemployment at various horizons in response to a one percent increase in government expenditures. In Greece eight quarters are required to reach the maximum effect, and an increase of one percent in government consumption and investment provokes a negative change in the unemployment rate of 6.40 percent. In other words, on the basis of these results, in order to obtain a reduction of one percent in the unemployment rate one would need an increase of around sixteen percent in the level of government expenditures.

It is important to stress that these values of the unemployment multipliers seem to suggest that although Greek fiscal austerity may have turned out to be costly, other important shocks on the demand and-or on the supply side, both at the national and the Euro-area level, must have played a pre-eminent role as drivers of the unemployment rate in the last decade. Indeed, this conclusion is supported by the results presented in section 4, in which we measure the relative importance of the identified macroeconomic shocks in driving unemployment fluctuations.

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[14]We set the error bands at the 16th and the 84th percentiles. Nevertheless, setting, alternatively, the error bands at the 10th and the 90th percentiles does not produce any qualitative change in the results obtained.

In the other country that exhibits Keynesian effects, i.e. Italy, the size of unemployment multipliers is similar to Greece and reaches its maximum value after twelve quarters. It is also worth noting that on impact the unemployment multiplier in Italy is small and has a positive sign. However, as shown by the impulse response functions, the impact effect on unemployment of the fiscal shock is not significant.

In the remaining three, non-Keynesian, countries, we detect relatively sizeable fiscal multipliers for Ireland and Spain at horizons of twenty-four quarters. In particular, in the case of Spain, we find that an increase of one percent in government expenditures provokes an increase in the rate of unemployment of around 0.20 percent after six years.

Insert Figure 5 about here

Insert Table 2 about here

3.4. Summing up

Recent empirical research has claimed that there is a strong relation between size and signs of the fiscal multipliers and some, well selected countries' characteristics (cf. Ilzetzki et al. 2013), such as the degree of openness to trade and the size of public debt. Thus, in general, there is no reason to expect homogeneity of conclusions when studying countries which face different macroeconomic conditions.[15]

Our results, concerning the peripheral Euro-area countries, seem to point in exactly this direction. Nevertheless, there are some important differences with respect to the conclusion of Ilzetzki et al. (2013). For example we find that, at least for Greece and Italy, government spending shocks cause an expansion of the economy, i.e. in response to these shocks there is a decrease in unemployment and hence our results do not support the conclusion that fiscal multipliers in countries affected by high public debt exhibit (always and everywhere) a non-Keynesian sign.

On the other hand, we find that in Ireland, Portugal and Spain unemployment increases in response to a positive government spending shock. Thus we are led to infer that the conclusions reached by Ilzetzki et al. may require an integration: not only is sovereign debt a potential, relevant factor in explaining "perverse" effect of government spending shocks but private debt is also likely to play a significant role. Indeed, it is worth recalling that both countries had to face a steady increase in private debt compared to domestic GDP in the first decade of EMU. In particular, bubbles in real estate prices in the first part of 2000s exposed these countries to serious financial fragilities.

In order to further investigate the robustness of these results, in section 5 we will present a VAR analysis conducted at the country level in which the government spending shocks are identified by imposing sign restrictions.

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[15]On a more theoretical ground, Leeper et al. (2010) and Christiano et al. (2011) show that different strategies of fiscal financing or alternative stances of monetary policy may cause deep differences in the size of government spending multipliers.

4. The drivers of unemployment

The implicit assumption underlying the identified structural VAR model is that changes in the model's variables are driven by a set of innovations which include both Euro-area exogenous shocks, common to all countries, and national structural disturbances.
In particular, given the structural representation [4] and the orthonormality of the structural disturbances, the variance of the forecasting error can be expressed as:

$$Var(X_{t+s} - E_t X_{t+s}) = B_0 B_0' + B_1 B_1' + B_2 B_2' + ... + B_{s-1} B_{s-1}' \qquad [5]$$

The representation above is used to measure the relative importance of the various shocks that drive unemployment fluctuations at various horizons in each country.

We focus on unemployment since in recent years fiscal policy has often been called into question as a stabilization tool that governments can use to steer the domestic cycle, as opposed to the nominal interest rate and exchange rate which respond to area-wide aggregates in a monetary union.

In Table 3 we report the fraction of the forecast error variance of national unemployment which is ascribable to the common Euro area monetary policy shock. Further, in Tables 4 to 8 we have collected the contribution of each national structural shock in composing the variation of national unemployment at different horizons. The main takeaways from these tables are discussed below.

First, in all countries, unemployment appears to be a highly idiosyncratic phenomenon in the very short run, when the great part of its variation is usually ascribed to the shock itself. For example, the demand shock explains 96.2 percent of the forecast error variance in the first quarter in Italy, 92.8 in Greece, 92.2 in Spain, 91.7 in Portugal and 82.1 in Ireland.[16]

Second, fiscal policies have the largest effect on the dynamics of unemployment in the short and medium run. Such an effect looks quantitatively larger in Greece and Portugal: in these two countries at horizons from two to three years the government spending shock explains around 30 percent of the variability of unemployment rate. With respect to Greece and Portugal, in Ireland, Italy and Spain the overall importance of the government spending shock, though non-negligible, is smaller.

Instead, as shown in Table 3, the common monetary policy shock plays a relevant role as driver of national unemployment in all peripheral EMU countries. Its relative contribution grows steadily over the forecast horizon: if, for example, we look at the horizon of 24 quarters we find that this shock explains from a minimum of 9.5 percent in Portugal, to a maximum of 23.8 percent in Ireland. Although in Portugal the role of the monetary policy shock tends to be consistently smaller than in the other countries across horizons, it explains 11.8 percent percent of the forecast error variance in the 40th quarter.

Thus, according to our results, the short answer to whether fiscal policy is the appropriate tool to temporarily mitigate the unemployment problems in peripheral European countries

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[16]Although we do not separately investigate the role played by private consumption and investment, these results are consistent with the narrative that assigns a pre-eminent role to the collapse of aggregate demand in explaining the deep recession experienced in these countries in 2007 and beyond.

is yes, but conditionally on the domestic financial conditions, because it mostly affects the short-run dynamics of unemployment fluctuations. However, it is unlikely that fiscal policy can significantly curb unemployment, since factors pertaining to the domestic business cycle and labor market and the centralized conduct of monetary policy have a stronger role since the onset of the monetary union.

Turning to the financial shock[17], it is worth noting that its share in the forecast error decomposition exhibits quite sizeable values in Greece, Portugal and Spain, reaching a peak at 12 quarters in all the three countries. Of course, this is far from surprising in the light of the economic events of recent years concerning sovereign debt concerns. Maybe more surprising is the limited role played by the financial shock at all horizons in Ireland.

Insert Table 3 about here

Insert Tables from 4 to 8 about here

5. An alternative identification strategy of government spending shocks

In this section we aim to check the robustness of our previous conclusions on the macroeconomic effects of government spending shocks in the peripheral Euro-area countries. To this end, we recover the national government spending shocks by using an alternative identification strategy, based on sign restrictions. Moreover, the estimated VAR models allow full interaction between national and Euro-area variables. Indeed, the block exogeneity restriction underlying the near-VAR specification might be questionable for economies like Italy and Spain–small open economies but exhibiting a certain relative weight in the Euro area. Hence, the alternative approach used in this section may also be useful in order to evaluate the robustness of the econometric strategy, based on the structural near-VARs, adopted in this research.

It is worth stressing that the conclusion that, under certain conditions, fiscal consolidations may cause expansionary effects on the economic system is not new, since Giavazzi and Pagano (1990) found non-Keynesian effects of fiscal policy in two small European economies, i.e. Ireland and Denmark, in the 80s. More recently, evidence of increases in aggregate output in a group of OECD countries, following government spending cuts, has also been presented in Alesina and Ardagna (2010). Furthermore, the results presented in Ilzetzki et al. (2013) have shown that non-Keynesian effects of government spending shocks may characterize countries affected by high public debt.

As shown in table 1, the countries considered in the present investigation are affected by high public debt-to-GDP-ratio, as per Greece and Italy, or by high private debt-to-Gdp ratio, as per Ireland and Spain. Instead, Portugal has suffered from both high private and public debt over the EMU period. Let us recall that beside the time-honoured threshold of 60 percent for the public debt,[18] in recent years the European Commission has also

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[17]Mallick and Sousa (2013) study the macroeconomic impact of financial stress in the Eurozone. They emphasize the importance to identify both monetary policy shocks and financial stress shocks.

[18]In their empirical investigation, Ilzetzki et al. (2013) use the threshold of 60 percent in order to select countries affected by high public debt.

established a threshold for the private debt-to-GDP-ratio of 160 percent, within a set of indicators of potential macroeconomic imbalances. Over the EMU period, Greece, Italy and Portugal have had an average value for public debt well above 60 percent. Ireland, Portugal and Spain exhibited private debt-to-GDP-ratio well above 160 percent, on average in the case of Ireland and Portugal, and in the majority of years during the EMU in the case of Spain. On the other hand, Greece and Italy did not show worrying levels of private debt-to-GDP-ratio (relative to the established threshold) over the sample period and the same conclusion holds for Ireland and Spain as far as public debt is concerned.

According to the relevant literature, the emergence of non-Keynesian effects of fiscal shocks is related to the possibility that the private sector may increase expenditures in response to government spending cuts and that such increase offset the recessionary effects of spending cuts. Thus, the main conclusion reached by this strand of the literature is that credible fiscal consolidations are capable of raising the confidence of consumer and business sectors, which in turn induces an increase in aggregate consumption and investment. Moreover, if interest rates decrease in response to the government spending cut, this causes a further increase in private spending. The empirical results presented so far seem to point to the conclusion that these outcomes are more likely to occur in countries in which the private sector is heavily indebted.

Indeed, in these economies it is reasonable to expect a stronger reaction of both confidence and spending of the private sector to sizeable contraction of interest rates: government spending cuts, by decreasing the interest rates paid on government bonds, favor the diffusion of these contractionary effects to interest rates paid by consumers and businesses and thus stimulate an increase in private spending, at the same time improving the confidence on the sustainability of private debt.

5.1 Identification based on imposing sign restrictions

We estimate for each country a VAR model including eight variables and recover the government spending shock by imposing sign restrictions. More precisely, we impose a negative sign on government expenditures and leave free the response of the other variables, i.e. the consumer price index, the unemployment rate, an index of the domestic stock market, the spread between the yield on 10-years domestic government bonds and the 10-years German bond, Euro-area consumer price index and unemployment rate, the differential between the Eonia and the federal funds rate.

Note that, following the prediction of new-Keynesian models, it is quite common in fiscal VAR models to impose a negative (or positive) sign on both government spending and output or, alternatively, a positive sign on unemployment in response to contractionary fiscal shocks. However, in the context of the present investigation this strategy would have little sense, since we want to empirically discover the sign of the response of unemployment, i.e. since we adopt a let the data speak approach.

We must add that, by imposing sign restrictions, possible concerns regarding the predictability of fiscal shocks are mitigated since the identification scheme does not require contemporaneous exogeneity of fiscal variables. In other words, there are no lags between approval of fiscal packages and implementation of policy decisions.

Following Mountford and Uhlig (2009), in addition to the fiscal shock, we also identify a (national) business cycle shock, by imposing opposite signs on prices and unemployment, and a common Euro-area monetary policy shock, by imposing that an increase in the interest rate (more precisely, an increase in the differential between Eonia and federal funds rate) is associated with a negative sign in the Euro-area consumer price index.

We utilize the methodological approach proposed by Uhlig (2005) and extended by Mountford and Uhlig (2009), and estimate for each country the following reduced-form VAR model: $X_t = A_1 X_{t-1} + e_t$. Let $PP' = \Sigma_e$ be a factorization of the covariance matrix of error terms, Σ_e. We identify a set of impulse vectors, $p^1..p^n$, such that $p^i = P_i \alpha^i$, where $\|\alpha^i\| = 1$. Thus, each impulse vector, p^i, is a column of P. The number, r, of identified shocks, is smaller than m, the number of total shocks that is possible to recover. In the present context, given $m = 8$, $r = 3$ macroeconomic shocks are identified.

Figure 6 shows the response of domestic prices and unemployment rate to a domestic, contractionary government spending shock. We find a clear confirmation of the main results obtained in section 3: Greece and Italy show Keynesian effects associated with fiscal policy, since the unemployment rate increases for many quarters in response to the government spending cut, while in Ireland, Portugal and Spain in response to the fiscal contraction there is both a significant and persistent decrease in the unemployment rate.

The responses of prices are more heterogeneous and also less clear in their interpretation. For example, in Greece, Ireland and Italy the response of prices to the contractionary spending shock is almost non significant at all horizons, while in Portugal and Spain there is a significant decrease in the price level which lasts for around three years after the shock.

As far as the contractionary Euro-area monetary policy shock is concerned, the results are similar to those obtained in section 3. In particular, we want to draw the attention on the fact that, although we dot impose restrictions on the response of national prices, their response does not exhibit a wrong sign in any country. In other words, we do not face a price puzzle, since prices decrease in response to the monetary tightening in all countries.

Insert Figure 6 and 7 about here

6. Conclusion and some policy implications

The main contribution of this paper was to characterize how unemployment responses to national government spending shocks and to common, Euro-area monetary policy shocks vary across a group of peripheral European countries. Our findings can be summarized as follows.

To start with, the dynamic effects of government spending shocks on unemployment are fully consistent with the predictions of the New Keynesian economic theory only in Italy and Greece. In Ireland, Portugal and Spain we identify perverse, non-Keynesian effects of fiscal policy shocks on unemployment.

The bulk of these conclusions turned out to be robust to alternative identification strategies of the structural shocks.

On the whole, these results seem to point to the relevance of countries' financial fragility as an important factor capable of influencing the sign of the fiscal multipliers. Moreover,

given the results observed for Ireland, Portugal and Spain in comparison to Italy and Greece, it seems that even private debt plays an eminent role besides the public one, recently emphasized by Itzetki et al. (2013). It is worth stressing that our results seem also to point to the conclusion that in countries characterized by the presence of high indebtedness of the private sector a fiscal tightening is more likely to produce a significant reaction of private demand, i.e. an increase of private spending, which may counterbalance the public spending cut. At this stage, we believe this is a potential interesting empirical result in search of theory. Thus we are confident that our results may stimulate further research on this subject, both on the theoretical and the empirical side.

Turning to monetary policy shocks, we find that centralized monetary impulses, at the Euro-area level, exert significant effects on the national unemployment rates and, moreover, the responses have the expected sign: contractionary monetary policy shocks push the national economies into recession.

When we measure the relative importance of the identified structural shocks in driving unemployment changes at different horizons, we find that unemployment fluctuations are primarily idiosyncratic in the short run in all investigated countries. Government spending shocks seem to have played a sizeable role in explaining short and medium-run unemployment fluctuations in Greece and Portugal. As far as Greece is concerned, given the detected Keynesian sign of the response of unemployment to government spending shocks, the important implication is that the fiscal austerity, particularly strong in recent years, has produced quite costly consequences in the labor market.

As for Ireland, Italy and Spain, though statistically-significant, the relative importance of government spending shocks exhibits smaller amplitude. Instead, as far as the longer term is concerned, the Euro area-wide shocks are the dominant drivers, with an important role played by common monetary policy shocks.

If we take the empirical results obtained in this study as a good guide for macroeconomic policies, the most important implications are: (1) the expansionary policies undertaken by the ECB in recent years can help the labor market of peripheral economies to recover from the current downturn; (2) fiscal policy conducted at national level in the small Euro-area economies cannot be viewed as an efficient macroeconomic stabilization tool, first in the light of the uncertainty characterizing the sign of the response of unemployment to changes in fiscal policy, and second given the pre-eminent role played by other national and common Euro-area shocks in driving business cycle fluctuations in these economies.

Thus, if fiscal policy is a quite uncertain stabilization tool in Euro-area countries, we would conclude that the burden of macroeconomic stabilization should rest mainly on the ECB. However in recent years, researchers, some European governments (e.g. in France) and the European Commission, have pointed out the importance of a centralized Euro-area fiscal budget, even for purposes of macroeconomic stabilization, since in the presence of strong adverse shocks, as those experienced in the last decade, monetary policy tools may not be sufficient (see e.g. European Commission 2017).

Our results, although indirectly, give support to this strategy by showing that governments at the isolated national level face difficulties in using fiscal expenditures as an efficient countercyclical tool.

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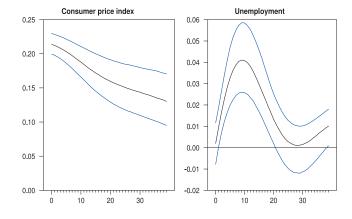
Figure 1: Responses of Euro-area CPI and unemployment to area-wide supply shocks

Consumer price index

Unemployment

Figure 2: Responses of Euro-area CPI and unemployment to area-wide demand shocks

Consumer price index

Unemployment

Figure 3: Responses of Euro-area CPI and unemployment to monetary policy shocks

Consumer price index

Unemployment

Notes. Impulse responses to a one standard deviation shock. Error bands set at 68th percent confidence interval.

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Figure 4. Responses of national variables to a monetary policy shock

Note. Responses of domestic prices and unemployment rate, to a contractionary common monetary policy shock. Errors bands set at the 16th and the 84th percentiles.

Figure 5. Responses of national variables to a government spending shock

Note. Responses to a domestic, government spending shock. Responses of prices and unemployment for the national economies. Errors bands set at the 16th and the 84th percentiles.

Figure 6. Responses of national variables to a government spending shock

Note. Responses to a domestic, contractionary government spending shock. Identification by sign restrictions. Responses of prices and unemployment for the national economies. Errors bands set at the 16th and the 84th percentiles.
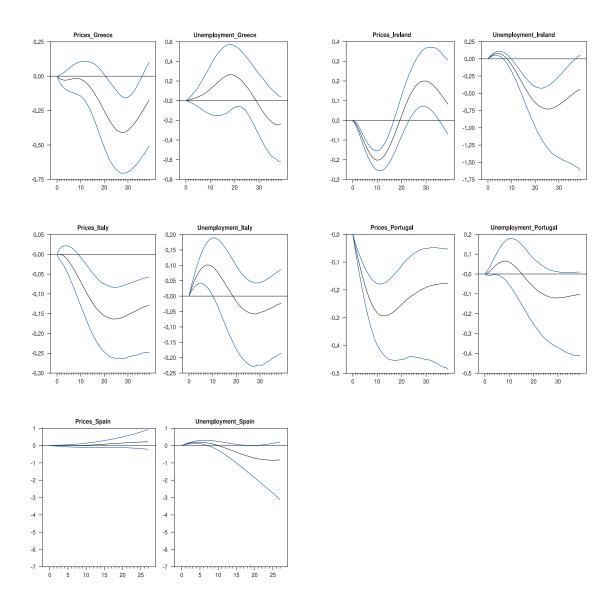
Figure 7. Responses of national variables to a contractionary monetary policy shock

Note. Responses of domestic prices and unemployment rate to a contractionary common monetary policy shock. Identification by sign restrictions. Error bands set at 68th percent confidence interval.
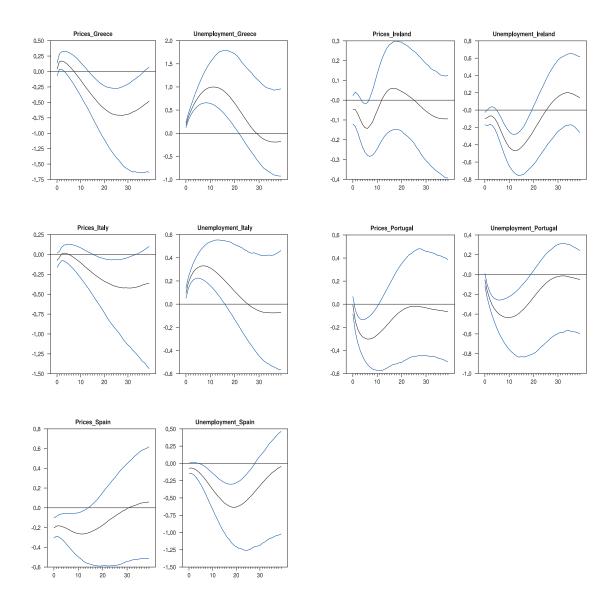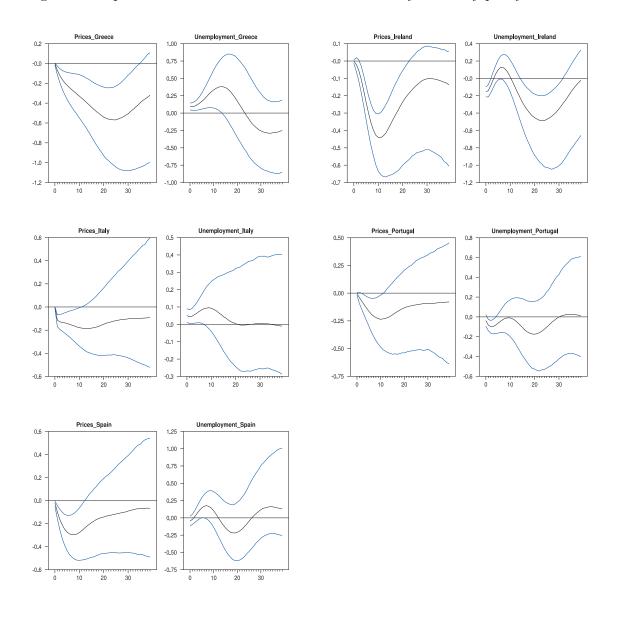
Table 1. Descriptive statistics for the national economies.

Variables	Greece	Ireland	Italy	Portugal	Spain
π_t	2.18 (1.92)	1.85 (1.99)	1.89 (1.07)	2.04 (1.46)	2.18(1.57)
u_t	15.0 (6.99)	8.53 (4.46)	9.46 (2.07)	9.55 (3.99)	16.04 (6.05)
$\frac{g_t}{y_t}$	24.58 (1.71)	19.79 (2.68)	21.78 (1.0)	23.10 (1.91)	22.0 (1.59)
$\frac{publ.debt_t}{y_t}$	130.2 (33.2)	59.3 (35.1)	111.13 (13.8)	84.9 (30.5)	62.1(22.1)
$\frac{priv.debt_t}{y_t}$	94.8 (33.0)	214.2 (56.1)	101.8 (19.8)	174.4 (29.1)	154.7(39.2)
$spread_t$	442.5 (581.4)	128.1 (192.32)	107.4 (114.2)	194.7 (273.8)	101.56 (137.79)

Note: The table presents for each series the mean and the standard deviation (in parenthesis). π_t is built as the annual rate of inflation based on the CPI. u_t is the unemployment rate. $\frac{g_t}{y_t}$ is the ratio of government spending to GDP. g_t is constructed as the sum of government consumption and government investment; $spread_t$ is constructed as the differential between the yield on 10-years domestic government bonds and the corresponding German bond. Private sector debt is given by the stock of liabilities held by the sectors Non-financial corporations and households.

Table 2. Unemployment multipliers to a government spending shock.

Horizon	Greece	Ireland	Italy	Portugal	Spain
1	-1.18	2.86	0.39	0.81	5.38
4	-5.41	0.02	-4.28	3.95	6.15
8	-6.40	-1.65	-5.50	3.54	8.46
12	-5.20	-0.94	-6.11	1.48	11,54
24	1.25	6.28	-5.16	-2.43	18.46

Note: The table presents the response of unemployment to a one percent positive shock in government spending at various horizons and for each country. The multiplier at horizon j is computed as $\frac{\Delta U_{t+j}}{\Delta G_t}$ where U denotes unemployment rate and G government spending.

Table 3. Fraction of the forecast error variance at various horizons of national unemployment attributable to the common, Euro-area monetary policy shock.

Horizon	Greece	Ireland	Italy	Portugal	Spain
1	0	0	0	0	0
4	0.4 (0.1,0.6)	3.6 (1.7,6.1)	3.3 (1.2,6.2)	2.1 (0.6,4.8)	10.4 (5.8, 16.1)
8	1.6 (0.2,6.2)	3.5 (1.1,8.2)	8.2 (2.3,17.0)	3.9 (0.8,10.8)	11.8 (3.6,26.5)
12	4.2 (0.7,13.7)	4.1 (2.3,6.8)	9.6 (2.6,23.0)	3.4 (1.2,10.4)	8.2 (4.2,19.3)
24	15.6 (4.3,31.5)	23.8 (14.6,31.9)	12.2 (4.8,26.1)	9.5 (2.9,21.0)	22.0 (7.9,39.4)
40	19.3 (6.7,34.8)	24.7 (15.1,33.2)	14.6 (5.7,28.4)	11.8 (3.9,24.5)	28.3 (12.9,44.5)

Note: The table presents the fraction of variability of unemployment at various horizons and for each country which is due to the Euro-area monetary policy shock. In parentheses are reported the error bands set to the 16th and the 84th percentiles.

Table 4. Fraction of the forecast error variance of unemployment attributable to government spending shocks and to other national shocks: Greece.

Horizon	Government Spending	Supply	Demand	Financial
1	5.0 (1.6,10.0)	1.4 (0.2,4.4)	92.8 (87.0,96.9)	0
4	29.2 (19.9,38.9)	0.9 (0.3,2.1)	51.2 (42.4,60.6)	12.3 (8.1,17.2)
8	28.0 (17.9,38.3)	1.7 (0.5,5.0)	28.0 (20.0,36.9)	25.4 (17.3,34.6)
12	22.6 (13.2,33.1)	3.2 (0.7,8.5)	17.9 (11.2,25.9)	28.8 (18.2,40.6)
24	14.6 (7.6,23.8)	5.8 (1.7,11.8)	11.0 (5.9.17.2)	21.3 (11.2,34.7)
40	12.6 (6.3,22.2)	5.0 (1.7,10.0)	8.9 (4.7,14.8)	20.4 (10.1,33.4)

Note: For each country, the total variance of the forecast error for unemployment is computed and then decomposed in the part attributable to each structural shock (cf. formula [4]). The table presents the fraction of variability at various horizons which is due to the five national macroeconomic shocks. In parentheses are reported the error bands set to the 16th and the 84th percentiles.

Table 5. Fraction of the forecast error variance of unemployment attributable to government spending shocks and to other national shocks: Ireland.

Horizon	Government Spending	Supply	Demand	Financial
1	13.6 (7.0 ,21.5)	3.0 (0.7,7.3)	82.1 (74.2,89.4)	0
4	6.0 (3.1,11.8)	2.5 (1.3,4.5)	71.7 (64.5,77.5)	0.7 (0.1,2.6)
8	5.2 (3.4,11.6)	4.0 (1.2,9.7)	43.6 (33.8,53.9)	1.4 (0.4,4.9)
12	4.5 (1.6,12.9)	3.0 (0.9,9.1)	32.3 (22.4,43.6)	2.2 (0.6,6.9)
24	4,1 (1.2,14.3)	3.9 (1.5,8.5)	26.4 (17.1,36.2)	2.0 (0.4, 6.4)
40	4.5 (0.9,16.0)	4.6 (1.5,10.3)	25.9 (16.5,36.0)	1.7 (0.5,5.3)

Note: See Table 4.

Table 6. Fraction of the forecast error variance of unemployment attributable to government spending shocks and to other national shocks: Italy.

Horizon	Government Spending	Supply	Demand	Financial
1	0.7 (0.1,2.9)	2.3 (0.4,6.5)	96.2 (91.7,98.8)	0
4	6.7 (2.5,13.6)	1.9 (0.4,5.9)	78.4 (70.5,85.0)	0.5 (0.1,1.9)
8	10.4 (3.6,20.2)	2.1 (0.5,6.8)	55.7 (43.4,67.9)	2.0 (0.3,8.6)
12	12.3 (4.2,23.7)	2.5 (0.6,7.7)	41.2 (27.3,55.8)	4.0 (0.5,16.5)
24	13.5 (1.0,25.7)	3.5 (0.9,10.2)	24.6 (13.6,39.5)	8.1 (1.2,26.3)
40	12.8 (5.0,22.7)	4.5 (1.3,11.8)	20.4 (10.5,34.2)	9.5 (2.1,23.0)

Note: See Table 4.

Table 7. Fraction of the forecast error variance of unemployment attributable to government spending shocks and to other national shocks: Portugal.

Horizon	Government Spending	Supply	Demand	Financial
1	2.8 (0.5,6.8)	4.5 (1.4,9.4)	91.7 (86.0,96.1)	0
4	33.8 (25.7,42.4)	3.8 (2.1,6.0)	40.2 (33.3,48.1)	15.6 (10.4,21.8)
8	28.1 (18.6,39.5)	8.4 (4.4,13.5)	14.0 (10.4,18.1)	29.5 (19.3,40.2)
12	15.6 (8.4,26.7)	9.1 (4.2,15.1)	10.3 (6.4,15.6)	30.4 (18.7,43.7)
24	8.1 (3.6,15.6)	4.5 (1.6,,10.1)	8.5 (3.7,14.7)	16.6 (16.5,29.5)
40	7.8 (3.1,15.4)	3.5 (1.3,7.9)	6.5 (2.6,12.4)	15.6 (7.5,27.8)

Note: See Table 4.

Table 8. Fraction of the forecast error variance of unemployment attributable to government spending shocks and to other national shocks: Spain.

Horizon	Government Spending	Supply	Demand	Financial
1	3.8 (1.0,8.5)	2,9 (0.5,7.1)	92.2 (88.6.,96.4)	0
4	4.8 (1.5,10.0)	1.7 (0.3,3.8)	64.0 (55.5,71.8)	8.8 (4.2,14.7)
8	4.1 (1.1,10.3)	1.5 (0.5,4.4)	29.7 (20.9,40.1)	22.1 (11.4,33.6)
12	3.9 (0.8,10.6)	1.5 (0.5,5.0)	18.4(10.9,28.9)	24.3 (12.5,37.5)
24	4.2 (0.6,12.9)	2.3 (0.5,7.5)	14.2 (6.3,24.6)	12.9 (5.0,25.5)
40	4.8 (0.8,11.8)	3.4 (0.7,9.6)	12.2 (4.6,22.3)	9.2 (3.0,20.2)

Note: See Table 4.

Data Appendix

Most data come from Eurostat and from FRED, Federal Reserve Bank of St. Louis. The list of the relevant series follow below:

- Euro-Area Variables

    - **Prices**: Euro Area (19 Countries) Harmonised Index of Consumer Prices is collected from European Central Bank at a quarterly frequency. The reference year is 2015.

    - **Unemployment rate**: Data on unemployment rate were taken from FRED's site, Federal Reserve Bank of St. Louis.

    - **Interest rate differential**: The variable is the difference between the European overnight interest rate (Eonia) and the US Federal Funds rate, both series have a quarterly frequency. The former is the short term interest rate collected from Eurostat by using the Money market interest rates database. The latter is retrieved from FRED, Federal Reserve Bank of St. Louis.

    - **Exchange rate**: The Euro/ECU exchange rate is collected from Eurostat. Data are quarterly and expressed as US dollars per currency unit.

- Countries Variables:
  The countries included in this investigation are Greece, Ireland, Italy, Portugal and Spain. For each country the following variables are used:

    - **Government expenditures**: The government expenditures variable is obtained, for each country, as the sum of government consumption and government investment. Data are collected from Eurostat, using the Quarterly non-financial account for general government. After collecting data at a quarterly frequency, firstly, they were seasonally adjusted and transformed in real terms using country GDP deflator; secondly, the sum of government consumption and government investment was made in order to obtain the government spending variable.

    - **Prices**: The Harmonised Index of Consumer Prices of each country is collected from European Central Bank at a quarterly frequency. The reference year is 2015.

    - **Unemployment rate**: Data on unemployment rate were taken from FRED's site, Federal Reserve Bank of St. Louis.

– **Output**: The nominal gross domestic product is collected, for each country, from Eurostat by using the GDP and main components database at a quarterly frequency.

– **Domestic stock market index**: Domestic stock market indexes are collected from Datastream at a quarterly frequency. In particular, for Greece we use the GR Athens Stock Exchange General Share Price Index; for Ireland we use the IR Price Index; for Italy we use the FTSE MIB INDEX, for Portugal we use the PSI 20 Index and for Spain we use the IBEX 35 Index. Data were adjusted for seasonality by using the moving average technique.

– **Private sector debt**: The Private sector debt, in consolidated terms, is the stock of liabilities held by the sectors Non-financial corporations and households. Data are collected from Eurostat by using the Financial Sheet database at a yearly frequency.

– **Public sector debt**: The Public sector debt, in consolidated terms, is the goverment gross debt. Data are provided, for each country, by Eurostat using the Quarterly government debt database.

– **Spread**: The spread is built as the difference between the yield on 10-years national government bond and the corresponding German bond. Data come from Eurostat by using EMU convergence criterion database at a quarterly frequency.