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Twin deficits and fiscal spillovers in the EMU's periphery. A Keynesian perspective☆

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ABSTRACT

The objective of this paper is to shed light on the twin deficit hypothesis in Southern Europe and the MENA region, taking into account fiscal spillovers from the core during the global crisis. Using Godley and Lavoie (2007)'s baseline model, we first show that fiscal shocks from a core region could aggravate macroeconomic imbalances in the periphery. We then gather data from the period 1977–2016 for ten MENA and peripheral EMU countries, and model the twin deficit hypothesis in the presence of fiscal spillover with a P-VARX methodology. Our results highlight that fiscal balance, current account, and GDP growth rates in the EMU's periphery are negatively affected by fiscal consolidations in the core. Fiscal discipline in surplus countries is tantamount to a 'beggar thy neighbor' effect on the periphery, in times of crisis. We discuss the implications of our results to propose further international coordination of macroeconomic policies.

1. Introduction

The Euro-Mediterranean region stands out as one of the world's most economically troubled areas. Indeed, the 2008 financial crisis, the 2011 European debt crisis and the subsequent triple dip worldwide recession that ensued have posed huge challenges to international macroeconomic policy in this region. Following a gradual deterioration of macroeconomic fundamentals, the 2011 speculative attack against the sovereign debt of Greece, Italy, Portugal, Spain, and Ireland brought these countries on the verge of bankruptcy, to which the *troika* (International Monetary Fund (IMF), European Commission, and the European Central Bank (ECB)) responded by recommending the adoption of fiscal austerity and internal devaluation policies. The adopted strategy aimed at lowering domestic prices (through aggressive wage and income cuts), increasing fiscal discipline (via tax hikes and cuts in public spending) and at implementing a set of structural reforms (through removal of 'market frictions' especially in the labor market).[1] At the time, concerns of a recessionary impact of such measures were shrugged off as the recommended fiscal discipline was supposed to bring back investor confidence and economic growth by virtue of a mechanism theorized as 'expansionary fiscal contraction' (Alesina, 2010). However, it soon became apparent that these macroeconomic policy packages had been ill

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[1] As rightly pointed out by one referee, prices typically react later than GDP to such policies. The reason is that wages and prices tend to be sticky in the short run: production adjusts to the new demand levels in the short run, whilst wages and prices take much longer to adjust. In the case of Greece, while domestic demand and GDP decreased significantly in 2010, the economy only entered deflation in March 2013 (Alexiou and Nellis, 2013; http://www.statistics.gr/en/home).

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calibrated.[2] In all crisis-stricken countries, a collapse of aggregate demand, a surge in the unemployment rate, and significant deflationary pressures ensued. The deteriorated macroeconomic context hampered efforts to grow out of the accumulated public debt through higher real Gross Domestic Product (GDP) growth rates.[3] In the meantime, the provision of public goods also declined, a situation which has certainly contributed to undermining the social contract and the political stability within the European Union (EU).[4]

One often-overlooked aspects of the crisis is that it has also significantly affected the Southern neighboring countries of the Middle East and North Africa (MENA) region.[5] Countries such as Egypt, Jordan, Lebanon, Morocco and Tunisia are signatories of the Euro-Mediterranean Association Agreements, and a large share of their non-oil exports goes to European markets.[6] Between 2010 and 2017, European demand for MENA's imports and tourism spending decreased, and the MENA countries' current account deficit rose to 9 percent of GDP on average (FEMISE, 2017). Such trends have negatively affected employment, household income, and ultimately public finances in this region, where budget deficits and public debts crept up to averages of 9 percent and 50 percent of GDP since 2010 respectively. This adverse context has worsened an already challenging macroeconomic situation, given that 80 million new job seekers have entered the region's labor market since 2000 in a context of endemically high unemployment rates.[7] Not surprisingly, the social contract in MENA countries has also come under pressure during recent years, adding significant geopolitical uncertainty.[8]

Economic management in this region is therefore "*under fire*" (FEMISE, 2017, p.1). How then can policy makers respond to this challenging context? In this paper, we aim to contribute to the formulation of a sound region-wide macroeconomic strategy. Our main hypothesis is that a lasting improvement in economic prospect would require a better international coordination of fiscal policies. This hypothesis is rooted in the Keynesian view on global macroeconomic imbalances. Prior to the 1944 Bretton Woods conference, Keynes (1941) indeed famously argued that "*the problems of the debtors can only arise if creditors are not choosing to make use of the purchasing power they have obtained*" (Keynes, 1941, p.211). In Keynes' view, the "*chief initiative*" should rest on creditor countries in order to avoid any "*contractionist pressure against the world economy and, by repercussion, against the economy of the creditor country itself*" (Keynes, 1941, p. 47). Creditor countries therefore have the responsibility to smooth international macroeconomic imbalances by increasing their domestic demand, by increasing the demand for the deficit countries' exports or by redirecting resources to these countries via foreign direct investment.[9] One practical implication for the formulation of economic policy is that further financial and fiscal integration both within the European Monetary Union (EMU) and between the EMU and its Southern neighbors) would be needed. Exiting the present crisis – and future ones - by the front door would require holistic thinking rather than the adoption of asymmetric fiscal adjustment measures in debtor countries.

It is in this context that the present study brings three main contributions to the literature. First, we look at the issue of macroeconomic imbalances in the EMU's periphery from a Keynesian perspective and link our empirical analysis of twin deficit to specific insights drawn from the baseline stock-flow consistent (SFC) open economy model of Godley and Lavoie (2007). Second, our paper is the first to examine empirically the impact of fiscal spillovers from the core region on twin-deficits in the periphery region. Third, our sample includes EMU periphery countries (Greece, Ireland, Portugal, Spain, Italy, Egypt, Jordan, Lebanon, Tunisia, and Morocco) over the long run (the 1977–2016 period) and uses robust panel econometric techniques. Given the importance, as well as the policy relevance of the twin deficit hypothesis, a voluminous empirical literature on the Southern EU and MENA countries has developed significantly over the years. A survey of the recent literature is presented in the Tables 1 and 2. Nonetheless, to the best of our knowledge, the present paper stands out as the first effort to look at the issue from a panel perspective, using the most comprehensive data to date, considering

Table 1
Twin deficit literature: MENA.

Author	Data Sample	Country	Methodology	Empirical Results
Neaime (2015b)	1970–2016	Lebanon	Johansen's cointegration and Granger Causality tests	Unidirectional causality between current account and budget deficit
Marinheiro (2008)	1974–2002	Egypt	Johansen's cointegration and Granger Causality tests	Rejected the twin-deficit hypothesis and found evidence in favor of reverse Granger-causality running from the external deficit to the budget deficit
Ahmad et al. (2015)	1980–2009	Nine African countries including Morocco, Tunisia and Egypt	Threshold cointegration and Hansen and Seo for testing cointegration	Egypt and Morocco exhibit a positive threshold cointegrating relationship between the current account deficit and the fiscal deficit
Helmy (2018)	1974–2014	Egypt	VAR and VECM	VAR analysis points to reverse granger causality running from the trade deficit to the budget deficit. Further, using VECM, the analysis corroborates the current account targeting hypothesis

[2] According to the IMF, the impact of fiscal consolidation on GDP growth was underestimated as the models used by policy makers relied on low pre-crisis values for fiscal multipliers. Pragidis et al. (2018) have also shown in the context of the US economy that the multiplier of a negative spending shock is higher during financially stressful periods. Their estimates based on quarterly data show that a reduction in government spending during these periods has a large, negative, and long-lasting effect on output with a long-run multiplier of −1.79.

[3] For instance, despite a haircut of the debt in 2012 and the adoption of harsh austerity measures, the Greek public debt is now estimated at 195% of GDP (Nikiforos et al., 2016; Neaime, 2015a).

[4] Events such as Brexit, the rise of populist political movements throughout Eastern Europe and increased rates of emigration from Southern European countries are recent examples.

[5] For a detailed discussion of the implications of the recent financial crisis on the NENA region see Neaime (2012, 2016) and Guyot et al. (2014).

[6] In 2007, the EU accounted for 72% of Maghreb countries non-oil exports (UN Comtrade database).

[7] In particular youth unemployment in the MENA region is the world's highest (about 30%; ILO, 2014).

[8] In particular, these trends explain the social and political unrest observed in the MENA region in the aftermath of the Arab revolutions that begun in Tunisia at the end of 2010, which have further contributed to the deterioration of regional growth prospects.

[9] Over the years, academic economists and international institutions have demonstrated continuing interest in this proposal. See for instance a 2009 report by the World Bank staff (Piffaretti, 2009).

Table 2
Twin deficit literature: Southern Europe.

Author	Sample Covered	Country	Methodology	Empirical Results
Beetsma et al. (2008)	1970–2004	Fourteen EU countries including Portugal, Ireland, Italy, Greece, and Spain	Panel SVAR and Impulse Response Functions	Evidence in favor of the twin deficit hypothesis, pointing to the potential relevance of the hypothesis for the European Union
Kalou and Paleologou (2012)	1960–2007	Greece	VECM	The two deficits are found to be positively linked through the Current Account Targeting Hypothesis
Trachanas and Katrakilidis (2013)	1971–2009	Portugal, Ireland, Italy, Greece and Spain	Cointegration tests following Granger and Yoon	Empirical evidence is in favor of the twin deficits hypothesis
Gosse and Serranito (2014)	1974–2009	Twenty-one OECD countries including Greece, Ireland, Italy, Portugal, and Spain	Cointegration analysis using Westerlund's panel cointegration test	Evidence of a long-run relationship between current account and budget balance
Chen (2011)	1970–2009	Eight OECD countries including Portugal and Spain	Mean-reversion of the current account balances using unit root tests	Conflicting Results, however, Markov switching unit root tests suggest that the current account deficits are not on a sustainable path
Litsios and Pilbeam (2017)	1980–2015	Greece, Portugal and Spain	Cointegration using ARDL	Existence of a significant statistical association between government fiscal balances and current account balances
Salvatore (2006)	1973–2005	G7 countries including Italy	Regression Analysis	Twin deficit hypothesis holds, and a unidirectional causality exists running from the budget deficit to the current account deficit

fiscal spillovers, and adopting a well-defined theoretical framework. We therefore contribute to the twin deficit literature by means of a sound empirical analysis grounded in an original theoretical discussion, and with the objective of offering policy alternatives to one of the world's most troubled economic areas.

The paper is structured as follows. We first outline the twin-deficit relationship and the impact of fiscal spillover from the core region on deficit and GDP growth in the periphery using Godley and Lavoie's (2007) baseline open economy stock-flow consistent theoretical framework. We then assess the sustainability of trade and public deficit in Southern EMU and MENA countries using panel unit root and co-integration techniques. Finally, we analyze the impact of fiscal consolidation policies in the surplus region (Germany and the EMU, respectively) on GDP growth, and the trade and public balances in the deficit region (Southern EMU and MENA countries, respectively). To do so, we use a panel VAR-X methodology and report SGMM estimation, panel Granger causality, global impulse response functions and global forecast variance error decomposition results.

Overall, our empirical results are in line with our theoretical discussion. We underline that the direction of causality between the two deficits is sample specific. We therefore suggest that fiscal targeting of the current account strategies should be considered with caution. We also highlight that fiscal spillovers in surplus countries do lead to a deterioration in GDP growth, the trade balance, and the public deficit in deficit countries. These results lead us to call for a better coordination of macroeconomic policies in the region, in the spirit of Keynes' (1941, 1942) proposal for an *International Clearing Union*.

The remainder of the study is structured as follows. Section 2 discusses the impact of fiscal consolidation in the North on twin deficit in the South using Godley and Lavoie' (2007) baseline model. Section 3 outlines the empirical methodology and highlights the dataset to be used. Section 4 presents the empirical results by analyzing the sustainability of trade and public deficits, and models the relationship between trade balance, public balance and GDP growth in the presence of fiscal spillovers. Section 5 discusses the policy implications of our results and section 6 brings together our conclusions.

2. Fiscal spillovers and the twin deficit hypothesis: a theoretical model

This section relies on the baseline open economy stock-flow consistent model developed by Godley and Lavoie (chapter 7, 2007) to illustrate our research hypotheses. Four key aspects of the model indeed stand out as particularly relevant for the present study. *First*, there is no reason a priori for economies to converge towards balanced trade. *Second*, while a government budget deficit is usually correlated with a trade deficit (the so-called 'twin deficit' situation), the causality between the two deficits is not obvious and needs to be elucidated at the empirical level.[10] *Third*, the only way for a country to reduce its trade deficit, assuming that exports and the propensity to import are exogenous, is to reduce government expenditure, which comes at the cost of a recessionary bias. *Fourth*, fiscal spillovers originating in the surplus country negatively impact current and public account in a deficit country.

We do not present the full model here for space-saving consideration; however, the full list of equations is given in Table 3 and the definition of variables can be found in Table 4. In what follows, we use the model to describe the 'twin deficit situation' and the impact of fiscal spillovers on the latter.

We first use equations (2), (8) and (12) in Table 3 to describe the change in wealth for Southern households:

$$\Delta V^S = \left(G^S + r_{-1}B^S_{-1}\right) + X^S - T^S - IM^S. \tag{1}$$

We then define total government expenditures as follows:

$$G^S_T = G^S + r_{-1}B^S_{-1} \tag{2}$$

In equation (2), total government expenditures (G^S_T) are the sum of pure government expenditures (G^S) and the cost of servicing the debt held by Southern households ($r_{-1}B^S_{-1}$). Substituting equation (2) in (1) yields the following equation:

$$\Delta V^S = \left(G^S_T + X^S\right) - \left(T^S + IM^S\right) = \left(G^S_T - T^S\right) + \left(X^S - IM^S\right) \tag{3}$$

At the stationary state (*i.e.* $\Delta V^S = 0$) the following condition holds:

$$\left(G^S_T + X^S\right) = \left(T^S + IM^S\right), \tag{4}$$

which can be rewritten as:

[10] Indeed, there is no a priori reason for the direction of causality to run from the current account to the public balance or the other way around (as showed in Godley and Lavoie, 2007, chap.7). Although fiscal targeting of the current account policies are often recommended by international institutions, the empirical literature on the link between fiscal and external deficits has so far produced inconclusive results. See Bernheim (1987), Roubini (1988), Bussière et al. (2005), Chinn (2005), Chinn and Ito (2005), Chinn and Lee (2005), Chinn and Steil (2006) and Kopcke et al. (2006).

Table 3
List of equations.

$Y^N = C^N + G^N + X^N - IM^N$	(1)
$Y^S = C^S + G^S + X^S - IM^S$	(2)
$IM^N = \mu^N . Y^N$	(3)
$IM^S = \mu^S . Y^S$	(4)
$X^N = \frac{IM^S}{xr}$	(5)
$X^S = IM^N . xr$	(6)
$YD^N = Y^N - T^N + r^N_{-1} B^N_{h-1}$	(7)
$YD^S = Y^S - T^S + r^S_{-1} B^S_{h-1}$	(8)
$T^N = \theta^N . (Y^N + r^N_{-1} B^N_{h-1}) 0 < \theta^N < 1$	(9)
$T^S = \theta^S . (Y^S + r^S_{-1} B^S_{h-1}) 0 < \theta^S < 1$	(10)
$V^N = V^N_{-1} + (YD^N - C^N)$	(11)
$V^S = V^S_{-1} + (YD^S - C^S)$	(12)
$C^N = \alpha^N_1 . YD^N + \alpha^N_2 . V^N_{-1} \ldots 0 < \alpha_1 < \alpha_2 < 1$	(13)
$C^S = \alpha^S_1 . YD^S + \alpha^S_2 . V^S_{-1} \ldots 0 < \alpha_2 < \alpha_1 < 1$	(14)
$H^N_h = V^N - B^N_h$	(15)
$H^S_h = V^S - B^S_h$	(16)
$\frac{B^N_h}{V^N} = \lambda^N_0 + \lambda^N_1 r^N - \lambda^N_2 \left(\frac{YD^N}{V^N}\right)$	(17)
$\frac{B^S_h}{V^S} = \lambda^S_0 + \lambda^S_1 r^S - \lambda^S_2 \left(\frac{YD^N}{V^N}\right)$	(18)
$\Delta B^N_s = (G^N + r^N_{-1} . B^N_{s-1}) + (T^N + r^N_{-1} . B^N_{cb-1})$	(19)
$\Delta B^S_s = (G^S + r^S_{-1} . B^S_{s-1}) + (T^S + r^S_{-1} . B^S_{cb-1})$	(20)
$B^N_{cb} = B^N_s - B^N_h$	(21)
$B^S_{cb} = B^S_s - B^S_h$	(22)
$\Delta or^N . pg^N = \Delta H^N_s - \Delta B^N_{cb}$	(23)
$\Delta or^S . pg^S = \Delta H^S_s - \Delta B^S_{cb}$	(24)
$H^N_s = H^N_h$	(25)
$H^S_s = H^S_s$	(26)
$pg^N = \overline{pg^N}$	(27)
$pg^S = pg^N . xr$	(28)
$xr = \overline{xr}$	(29)
$r^N = \overline{r^N}$	(30)
$r^S = \overline{r^S}$	(31)

$$\left(G^S_T - T^S\right) = \left(IM^S - X^S\right) \tag{5}$$

This equation shows that under a stationary state, a government budget deficit is necessary accompanied by an equivalent trade deficit (the so-called 'twin-deficit situation'). Therefore, while economic forces will eventually drive the economy to a point where the twin deficit situation holds, *nothing will lead the system towards balanced trade* (i.e. $IM^S = X^S$).

Inserting Table 3's equation (10) and equation (4) into equation (4) and defining total government expenditures net of taxes as $G^S_{NT} = G^S_T - \theta_S r_{-1} B^S_{h-1}$, yields the Harrod multiplier:

$$Y^S = \frac{G^S_{NT} + X^S}{\theta^S + \mu^S} \tag{6}$$

Equation (6) shows that GDP in the Southern country depends on government expenditures plus exports, divided by the sum of the general tax rate and the import propensity. With these elements in mind, one can discuss the interaction between fiscal policy in the North and the twin deficits and GDP growth in the South. Consider the case of a super stationary steady state in which wealth accumulation and both trade balances – and therefore government balances – are nil. In this situation $IM^S = X^S$ (i.e. $Y^S = \frac{X^S}{\mu^S}$, from Table 3 equation (4)) while $G^S_T = T^S$ (i.e. $Y^S = \frac{G^S_{NT}}{\theta_S}$).[11] The following equality thus holds:

$$Y^{S**} = \frac{X^S}{\mu^S} = \frac{G^S_{NT}}{\theta_S} \tag{7}$$

[11] The demonstration is as follows. Consider total government expenditures net of taxes as: $G^S_{NT} = G^S_T - \theta_S r_{-1} B^S_{h-1}$. Given equation (10), $G^S_T = T^S$ implies that $G^S_T = \theta_S (Y^S + r_{-1} B^S_{h-1})$, and therefore $G^S_{NT} = Y^S$.

Table 4
List of variables and parameters.

Variables	
B^N_{cb}	Bills held by the Central bank in Country N
B^S_{cb}	Bills held by the Central bank in Country S
B^N_h	Bills held by households, Country N
B^S_h	Bills held by households, Country S
B^N_s	Supply of government bills in Country N
B^S_s	Supply of government bills in Country S
C^N	Households consumption, Country N
C^S	Households consumption, Country S
G^N	Government expenditure, Country N
G^S	Government expenditure, Country S
H^N_h	Cash held by households, Country N
H^S_h	Cash held by households, Country S
H^N_s	Supply of cash in Country N
H^S_s	Supply of cash in Country S
IM^N	Imports, Country N
IM^S	Imports, Country S
or^N	Gold holding by Central bank in Country N
or^S	Gold holding by Central bank in Country S
$\overline{pg^N}$	Price of gold, set exogenously
pg^N	Price of gold in Country N
pg^S	Price of gold in Country S
r^N	Interest rate on bills in Country N
r^S	Interest rate on bills in Country S
$\overline{r^N}$	Interest rate on bills set exogenously in Country N
$\overline{r^S}$	Interest rate on bills set exogenously in Country S
T^N	Tax payments, Country N
T^S	Tax payments, Country S
V^N	Households wealth, Country N
V^S	Households wealth, Country S
X^N	Exports, Country N
X^S	Exports, Country S
xr	Exchange rate (units of currency S for one unit of currency N)
$\overline{xr}$	Exchange rate, set exogenously
Y^N	National income, Country N
Y^S	National income, Country S
YD^N	National disposable income, Country N
YD^S	National disposable income, Country S
Parameters	
α^N_1	Propensity to consume out of income in Country N
α^S_1	Propensity to consume out of income in Country S
α^N_2	Propensity to consume out of wealth in Country N
α^S_2	Propensity to consume out of wealth in Country S
λ^N_0	Parameter in asset demand function, Country N
λ^S_0	Parameter in asset demand function, Country S
λ^N_1	Parameter in asset demand function, Country N
λ^S_1	Parameter in asset demand function, Country S
λ^N_2	Parameter in asset demand function, Country N
λ^S_2	Parameter in asset demand function, Country S
λ^N_3	Parameter in asset demand function, Country N
μ^N	Import propensity, Country N
μ^S	Import propensity, Country S
γ_1	Parameter in fiscal policy reaction function, Country N
θ^N	Tax rate in Country N
θ^S	Tax rate in Country S
ρ_1	Proportion of South government bills held by Northern households

Note: the starting values and the parameter values used for estimating this model can be found on http://models.sfc-models.net/.

Which, using equations (6) and (3) is equal to:

$$Y^{S**} = \frac{(\mu^N Y^N) xr}{\mu^S} = \frac{G^S_{NT}}{\theta_S} \tag{8}$$

Given equation (6), a decrease in government spending (or an increase in overall taxes) in the Northern country will have a negative impact on Northern GDP. As shown in equation (8). This will also result in lower exports, a trade deficit, and a government deficit in the Southern country, as well as a decrease in income under the super stationary state ($\frac{X^S}{\mu^S} < \frac{G^S_{NT}}{\theta_S}$).

From the perspective of Southern countries' policy makers, the volume of Northern demand for Southern exports, the exchange rate,[12] as well as the consumers' propensity to import in both countries are exogenous. Therefore, the only way to revert back to the super stationary state is to reduce government expenditures (or to increase the tax rate) until the $\frac{G^S_{NT}}{\theta_S}$ ratio equalizes the $\frac{X^S}{\mu^S}$ ratio. However, such policies come at the cost of a recessionary bias as shown by the Harrod multiplier (equation (6)). An alternative, less costly adjustment would be, in line with the Keynesian proposal, for the Northern country to run a fiscal expansion program, which would reduce trade deficits in the South.

We illustrate these insights with a simple simulation exercise. After taking the model to a stationary state, we monitor the impact of a shock in the North on the economy of the South. Fig. 1 display the reaction of the current account, the public balance, and the GDP growth rate in the Southern economy following three shocks: a permanent sizeable fiscal consolidation in the North, a similar sized drop in the propensity to consume, and a drop in the propensity to import of Northern households. These shocks can be thought of as a drop of consumer confidence during the crisis period and increased fiscal discipline in the North.

Inspection of the figures points to the presence of a spillover effect as both the public and the trade balance, as well as GDP growth deteriorate in the South economy. The model therefore suggests that fiscal discipline in the North, although often viewed as indicative of 'virtuous' and 'prudent' economic management, can actually spillover and generate macroeconomic imbalances in the South. In this context, the Southern government may respond by increasing taxes or decreasing government spending, which would have a negative impact on GDP growth and an ambiguous impact on the trade balance. Note that we present this simplistic model for illustration purposes only: simulation results cannot be taken for granted. It is nonetheless with these useful insights in mind that the remainder of paper will investigate the twin deficit hypothesis in MENA and the peripheral EMU economies empirically using a comprehensive set of empirical methods.

3. Data and empirical methodology

3.1. Dataset

We retrieve data from the IMF's World Economic Outlook and the World Bank Global Development database covering the period 1977–2016 for five MENA countries (Egypt, Jordan, Lebanon, Tunisia, and Morocco) and five Southern EMU countries (Greece, Ireland, Portugal, Spain, and Italy). Figs. 1 and 2 display the long run correlation between the current account and the structural balance in all individual countries. As expected from the theory, the correlation (which of course does not imply causality) between the two series is positive in each country.

3.2. Sustainability analysis: panel unit root and cointegration

To control for cross sectional heterogeneity, we split our dataset in two samples: the MENA countries and the EMU countries. We begin by investigating the panel unit root and cointegration properties in each subsample. Stationarity analysis is a necessary step prior to PVAR modelling. It also provides information about the sustainability of current accounts and public deficits in each region.[13] Indeed, if the budget or current account deficit series were non-stationary, it would imply that they are growing without bound over time. By contrast, a stationary deficit would imply that the series is reverting to a mean overtime – the latter being in general close to zero. If that were the case, then fiscal policy and debt would be sustainable, given that deficits are under control. Empirical studies on developed economies using this methodology are numerous and were initiated by the paper of Hamilton and Flavin (1986).

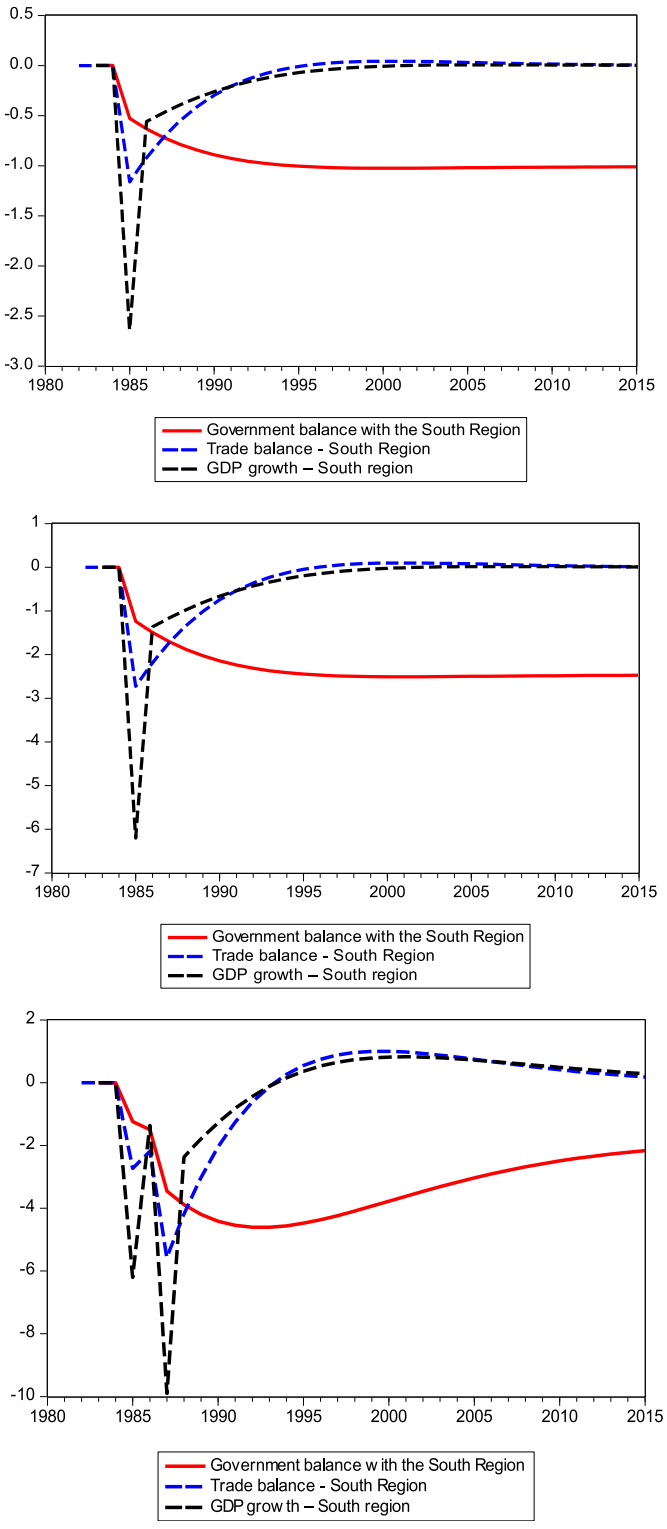

Fig. 1. Spillover effects from the north.

[12] The hypothesis of a fixed exchange rate is acceptable in our discussion given that EMU countries are members of the Eurozone, and that MENA countries exchange rate management has over the past forty years relied predominantly upon rigid exchange rates, though not necessarily "officially" fixed exchange rates.

[13] Panel data modelling is recommended as it brings out individual heterogeneity and permits to identify effects not easily detected with time series or cross-sectional data.

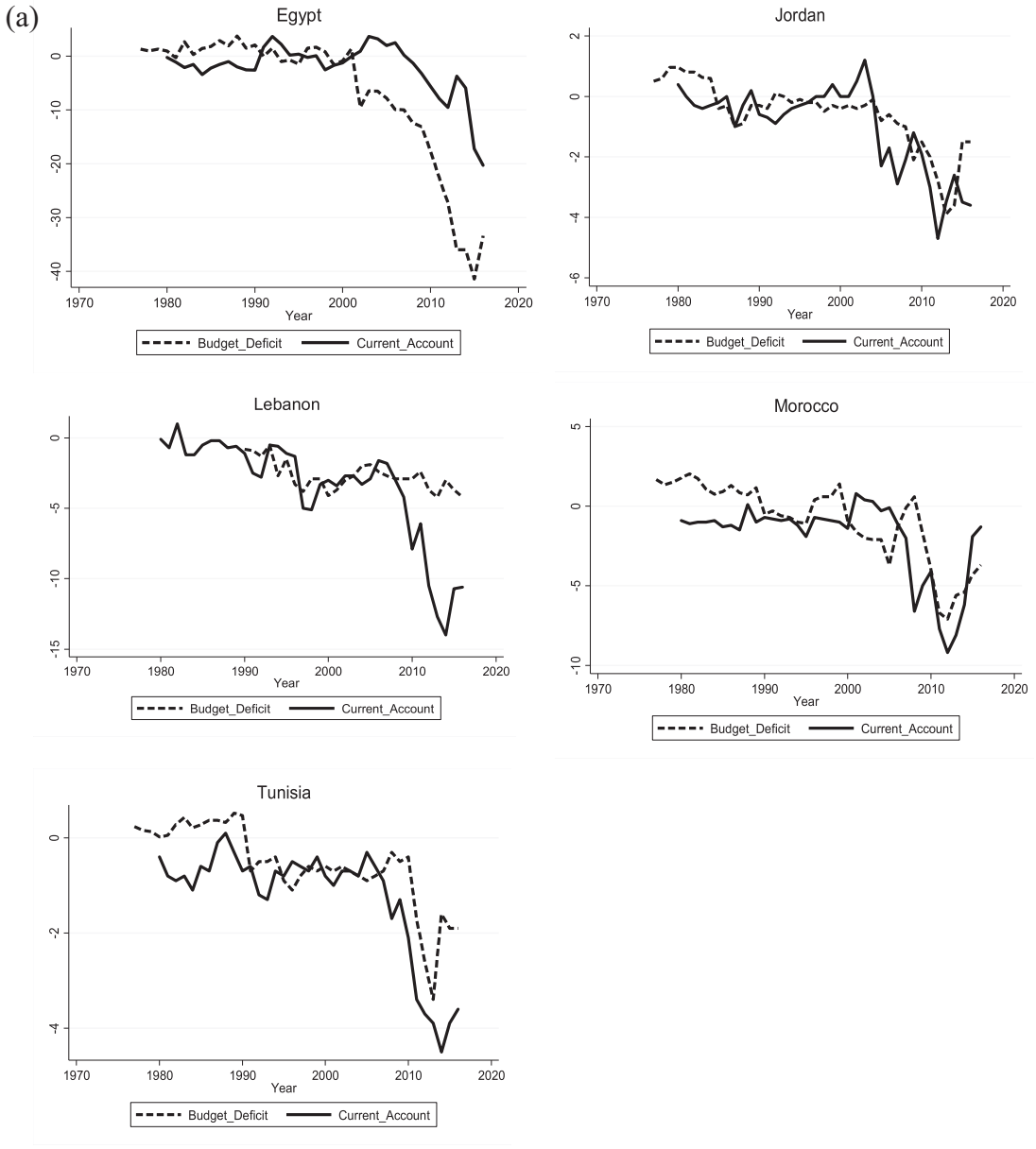

Fig. 2. a. Twin Deficits – MENA Countries b. Twin Deficits –Southern EMU Countries.
Source: World Bank's Global Development Database, and IMF World Economic Outlook database. Notes: The two series are the budget balance and the current account measured in USD billion.

We begin our empirical analysis by applying the panel unit root test of Pesaran (2007). This method consists in adding the cross-section averages of lagged levels and of first differences of the individual series to the Augmented Dickey–Fuller (ADF) regressions. This way, the common factor is proxied by the cross-section mean of $y_{i,t}$ and its lagged values. The Pesaran test uses the cross-sectional ADF statistics (CADF), which are given below:

$$\Delta y_{i,t} = \alpha_i + \beta_i y_{i,t-1} + \gamma_i \overline{y}_{t-1} + \delta_i \Delta \overline{y}_i + \varepsilon_{i,t} \tag{9}$$

where α_i, β_i, γ_i, δ_i are slope coefficients estimated from the ADF test for country ??, $\overline{y}_{t-1}$ is the mean of lagged levels, $\Delta \overline{y}_i$ is the mean of first-differences, and $\varepsilon_{i,t}$ are the error terms. Pesaran (2007) advances a modified IPS statistics based on the average of the individual CADF, which is denoted as a cross-sectional augmented IPS (CIPS):

$$CIPS = \frac{1}{N} \sum_{i=1}^{N} t_i(N,T) \tag{10}$$

where $t_i(N,T)$ is the t-statistic of the OLS estimate for the equation $y_{it} = \alpha_i + y_{it}^0$ (see Moon and Perron, 2004).

We then apply Pedroni's (1999) [14] and Westerlund (2007) and Persyn and Westerlund (2008) panel cointegration methodology on I(1) series. The tests check the absence of cointegration by determining whether Error Correction exists for individual panel members or for the panel as a whole. Assume the following error-correction relationship:

[14] This methodology is standard and therefore not presented in the paper for space-saving consideration.

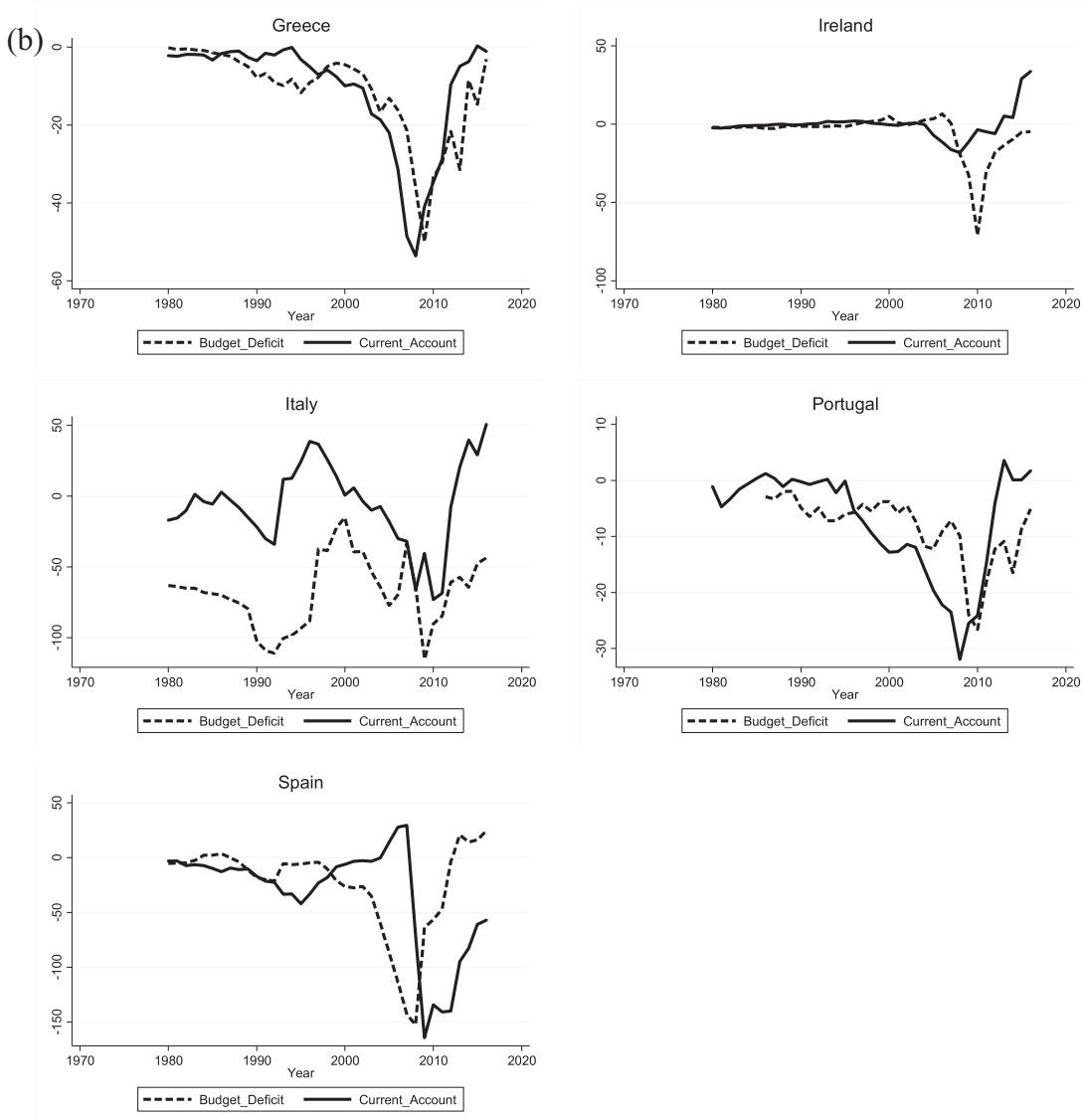

Fig. 2. (*continued*).

$$\Delta y_{it} = \delta' d_t + \alpha_i y_{i,t-1} + \lambda' x_{i,t-1} + \sum_{j=1}^{p_i} \alpha_{ij} \Delta y_{i,t-j} + \sum_{j=-q_i}^{p_i} \gamma_{ij} \Delta x_{i,t-j} + \varepsilon_{it} \quad (11)$$

where $\lambda' = -\alpha_i \beta_i'$, and α_i measures the speed of convergence to the equilibrium $y_{i,t-1} - \beta_i' x_{i,t-1}$ after an idiosyncratic shock. Two different classes of tests can be used to evaluate the null hypothesis of no cointegration $H_0 : \alpha_i = 0$ for all i. The alternative hypothesis depends on what is assumed regarding the homogeneity of α_i. Group-mean tests do not require α_i to be equal ($H_1^g : \alpha_i < 0$ for at leat one i); whereas panel tests assume that α_i are equal for all i ($H_1^p : \alpha_i = \alpha < 0$). The group-mean tests are based on weighted sums of the $\widehat{\alpha}_i$ estimated for individual countries, whereas the panel tests are based on the estimate of $\widehat{\alpha}$ for the panel as a whole. Two tests (G_t, P_t) are computed with the standard errors of α_i estimated in a standard way, while the other statistics (G_a, P_a) are based on Newey and West (1994) long run variance estimator and adjust for heteroscedasticity and autocorrelations. We let $d_t = (1, t)'$ so that y_{it} is generated with both a constant and a trend. In addition, we use the AIC to choose optimal lag and lead lengths for each series, and restrict the Bartlett kernel window to 2 in order to accommodate for our small sample, in line with Persyn and Westerlund (2008).

3.3. PVAR-X modelling

We model the linkages between GDP growth, trade balance, and the public balance in a framework that takes into account fiscal spillover from a core region. We focus on the impact of fiscal consolidations from the core (i.e. Germany and the EMU, respectively) on the growth rate of trade balance and public balance deficits in the periphery (i.e. Southern EMU and MENA countries, respectively). We measure fiscal spillovers from the core during the crisis by constructing the variables $\text{VESB}_{\text{debt}}$ and $\text{VGSB}_{\text{debt}}$. These variables correspond to the interaction between the variation of the government structural balance (i.e. variations that are not due to the economic cycle) in the core region (that is, the Eurozone (VESB) and Germany (VGSB)) and a sovereign debt crisis dummy which takes a value of 1 from 2009 to 2014[15]:

[15] See the IMF Independent Evaluation Office Report (2016, p.56–68) for a detailed timeline of the Eurozone crisis.

$$VGSB_{debt_{it}} = VGSB_{it} \times crisis_{it} \quad (12.1)$$

$$VESB_{debt_{it}} = VESB_{it} \times crisis_{it} \quad (12.2)$$

We then rely on a PVAR-X modeling approach with generalized impulse response functions (GIRF) and generalized forecast error variance decomposition (GFEVD) in order to model the linkages between the dynamics of the current account deficit, budget deficit, GDP growth, and fiscal spillovers from the core. First, we know that trade and public balances are jointly determined by the economic cycle (Kim and Roubini, 2008). For instance, during recessions the government balance deteriorates (due to the impact of automatic stabilizers) while the trade balance improves due to a lower demand for imports. We thus include annual GDP growth in all our model specifications.

We select the vector of exogenous variables based on the standard macroeconomic literature. We know that the current account is usually affected by changes in the external exchange rate (the usual terms of trade effects) and in the inflation levels (the 'internal depreciation effect'). The vector of exogenous variables thus includes the annual variation of the effective Purchasing Power Parity (PPP) exchange rate and annual inflation as additional control – exogenous – variables.

Important political events took place in the MENA sample during the study period. In order to control for structural breaks arising from such events (for instance the rise of political violence in the aftermath of the Arab Spring), we relied on the 'Political Stability and the Absence of Violence/Terrorism' variable of the World Bank's Worldwide Governance Indicators (WGI) dataset. We identified structural breaks in the relationship between GDP growth and political violence in each MENA country using the Bai and Perron (1998, 2003) test for multiple structural breaks. We then built a panel data variable taking the value of the 'Political Stability and the Absence of Violence/Terrorism' after the structural breaks and zero otherwise[16]:

$$Political\ violence_{break_{it}} = Political\ violence_{it} \times break_{it} \quad (13)$$

Our methodology can be outlined as follows. Assume the following system of n endogenous variables (y_{it}) and m exogenous variables (x_{it}). The reduced form PVAR-X includes lags of the endogenous variables and the contemporaneous values of the exogenous variables, and is represented in equation (14):

$$\begin{cases} y_{it} = A^*(L)y_{i,t-j} + \varphi x_{it} + \Gamma^{-1}\varepsilon_{i,t} \\ \varepsilon_{i,t} = v_i + v_t + v_{it} \end{cases} \quad (14)$$

In equation (14) above, y_{it} is the vector of four stationary endogenous variables, x_{it} is the vector of exogenous control variables, L is the lag operator and A*(L) is a transformed matrix of coefficients such as $A^*(L) = \Gamma^{-1}A(L)$. Γ is the matrix of contemporaneous parameters and A(L) is the initial matrix of VAR parameters. Fixed time and individual effects (v_i and v_t) are also included in the error term $\varepsilon_{i,t}$ in order to accommodate for unobserved individual heterogeneity. The slope and the variance of the shocks $\varepsilon_{i,t}$ may be unit specific so that the model allows for cross sectional heterogeneity.

Errors v_{it} have zero mean ($E(v_{it}) = 0$) and the variance-covariance matrix of reduced form shocks $E(v_{it}, v_{it}^{'}) = \Omega$ is assumed to be real, symmetrical and positive definite. Since the parameters ϕ and A(L) can be estimated from the reduced form VAR-X representation, only the parameters in Γ^{-1} are left to be identified. The inclusion of exogenous variables in the model, therefore, has no effect in the identification of structural shocks. To derive the impulse response functions (IRF) from the model, Ω is then rewritten as

$$\Omega = KDK^{'} \quad (15)$$

In equation (15), D is a diagonal matrix and K is an n x n invertible matrix, which needs to be estimated to identify the structural shocks. Defining $u_{it} = K^{-1}v_{it}$ as a vector of orthogonal residuals such as $E(\mu_{it}, \mu_{it}^{'}) = E(K^{-1}v_{it}, v_{it}K^{-1^{'}}) = K^{-1}(KDK^{'})K^{-1^{'}} = D$, the moving average representation of the model can then be written as:

$$y_{it} = \sum_{i=1}\sum_{h\geq 0}\phi_h KK^{-1}v_{i,t-h} = \sum_{i=1}\sum_{h\geq 0}\Phi_h\mu_{i,t-h} \ \ with\ \Phi_h = \phi_h K\,. \quad (16)$$

In order to estimate the model, we need to identify the n^2 elements of the K matrix. Given that our specifications include 4 endogenous variables, $n(n+1)/2$ (i.e. 19) orthogonality constraints are already set (since K is a symmetrical matrix). We set the other constraints by giving K a lower triangular structure.

In order to eliminate the compositional effects of the Choleski decomposition, we use a Generalized Impulse Response Functions (GIRF) and a Generalized Forecast Error Variance Decomposition (GFEVD) approach. Given that equation (11) is obtained by inverting the VAR model, all elements of Φ_h are functions of the initial VAR parameters. The orthogonal impulse response function (IRF) of y_{it} variables to various structural innovations $\mu_{is}, s \leq t$ can be derived using dynamic multiplicators: $IRF_{ih}(l) = \frac{\delta y_{i,t-h}}{\delta \xi_{it}}$ (Lütkepohl and Krätzig, 2005). GIRF are obtained by sequentially moving the variable of interest at the bottom of the vector of endogenous variables. In line with Sims and Zha (1999) and the subsequent empirical VAR literature, we estimate the IRF error margin through a bootstrap and report the recommended 16th and 84th percentile (Sims and Zha, 1999).[17]

In order to obtain the model's Generalized Forecast Error Variance Decomposition (GFEVD), we use the approach put forth by Lanne and Nyberg (2016):

$$\lambda_{ij,w_{t-1}}(h) = \frac{\sum_{t=0}^{h} GIRF(t, \delta_{it}, w_{t-1})^2 j}{\sum_{i=0}^{k}\sum_{t=0}^{h} GIRF(t, \delta_{it}, w_{t-1})^2 j} \quad (17)$$

The denominator in equation (17) measures the aggregate cumulative effect of all shocks, while the numerator is the cumulative effect of the i_{th} shock. By construction, $\lambda_{ij,w_{t-1}}(h)$ lies between 0 and 1, measuring the relative contribution of a shock to the ith equation to the total impact of all K shocks after h periods on the jth variable in y_{it}, and these contributions sum to unity. We compute the GFEVD as the average of $\lambda_{ij,w_{t-1}}(h)$ over shocks obtained by bootstrapping from the residuals of the estimated model.

Finally, the presence of lagged endogenous variables and individual fixed effects biases OLS and Within-Group Estimators (the Nickell bias). We, therefore, estimate the initial VAR parameters with system GMM after applying the usual Helmert transformation to our dataset (Love and Zicchino, 2006). This transformation renders error terms orthogonal to the untransformed variables - which can then be used as instruments - while preserving both the variance of the dataset and the absence of serial correlation in the error terms. The GMM estimations are based on lag 1 and deeper. Our PVAR models include one lag based on panel Akaike Information Criteria (AIC) criteria.[18]

4. Empirical results and discussion

4.1. Panel unit root and cointegration

Panel unit root results are shown in Table 5. Inspection of the table highlights that the MENA countries' budget balance and current account appear to be stationary (and are, therefore, in line with the No Ponzi

[16] We identified one break in Tunisia in 2011. Results are not shown for space-saving consideration but are available upon request.

[17] As pointed out by Sims and Zha (1999), 68% confidence intervals are often more useful than 95% ones, since they provide a more precise estimate of the true coverage probability.

[18] Corresponding tables are not shown for space-saving consideration but are available upon request.

Table 5
Panel unit root tests.

	Level				First difference			
	Test statistic	Critical values			Test statistic	Critical values		
		10%	5%	1%		10%	5%	1%
PANEL: EMU countries								
Expenditures	−4.078***	−2.070	−2.190	−2.410	−3.890***	−2.050	−2.160	−2.360
Revenues	−1.955	−2.070	−2.190	−2.410	−3.277***	−2.070	−2.190	−2.410
Exports	−0.947	−2.070	−2.190	−2.410	−4.491***	−2.070	−2.190	−2.410
Imports	−1.352	−2.070	−2.190	−2.410	−4.066***	−2.070	−2.190	−2.410
Government Balance	−2.355**	−2.070	−2.190	−2.410	−5.753***	−2.050	−2.160	−2.360
Current Account	−0.180	−2.070	−2.190	−2.410	−4.817 ***	−2.050	−2.160	−2.360
GDP growth	−2.571***	−2.070	−2.190	−2.410	–			
Variation of effective PPP exchange rate	−3.713***	−2.070	−2.190	−2.410	–			
Annual CPI inflation	−4.620***	−2.050	−2.160	−2.360	–			
PANEL: MENA countries								
Expenditures	−0.505	−2.220	−2.400	−2.760	−2.465**	−2.220	−2.400	−2.760
Revenues	−0.422	−2.220	−2.400	−2.760	−2.749**	−2.220	−2.400	−2.760
Exports	−1.345	−2.070	−2.190	−2.410	−4.767***	−2.050	−2.160	−2.360
Imports	−2.044	−2.070	−2.190	−2.410	−5.466***	−2.050	−2.160	−2.360
Government Balance	−2.572***	−2.120	−2.250	−2.510	−4.698***	−2.100	−2.220	−2.440
Current Account	−2.506***	−2.070	−2.190	−2.410	−5.271***	−2.070	−2.190	−2.410
GDP growth	−5.450***	−2.10	−2.220	−2.440	–			
Variation of effective PPP exchange rate	−3.497***	−2.070	−2.190	−2.410	–			
Annual CPI inflation	−2.745***	−2.070	−2.190	−2.410	–			

Note: *, **,*** denotes rejection of the null hypothesis of a unit root at 10% 5% and 1% levels of significance respectively.
Source: Authors' estimates.

Game (NPG) constraint). In EMU countries, the budget balance appears to be stationary; however, the current account is integrated of order 1, indicating that trade deficits may grow without bound. We also observe that for most panels, exports and imports, government revenues and expenditures, current account and government balance are all non-stationary I (1) series, with the exception of the EMU countries' government expenditures, which are stationary. Given the fact that EMU countries' budget balance is stationary (as indicated in Table 5), our results suggest that in spite of the consequences of the Great Recession on government spending (which is non stationary), Southern EMU countries have managed to keep fiscal policies on a sustainable path over the long run.

We then apply our cointegration tests to I(1) series in each sample. Results are shown in Table 6. Beginning with the export and import relationship, none of our tests indicate rejection of the null of no cointegration, in both Southern EMU and MENA countries. This indicates that countries in both panels have suffered a deterioration of their trade performance throughout the period under investigation. However, the deterioration of the trade balance can be interpreted differently in each sample.

In the EMU sample, our results are clearly in line with the 'core-periphery dualism' literature (Jaumotte and Sodsriwiboon, 2010; De Santis and Cesaroni, 2016). This literature argues that from beginning of the EMU, persistent current account deficits in the EMU's periphery went hand in hand with growing surpluses in some core countries. Explanations for this finding lie in the financial and in the real sector. Regarding the financial sector, Blanchard and Giavazzi (2002) noted that the Feldstein Horioka puzzle did not hold in the EMU, where capital flew from the core to the periphery. They interpreted this fact as indicating that increased financial integration was a natural cause of current account divergences among EMU countries. With respect to the real sector, Chen et al. (2012) put forth that peripheral euro countries have been left out of certain parts of the global value chain (they saw rising imports from emerging Asia, but were not substantial exporters to this region) which explains their sluggish export performance.

The causes of the deterioration of the trade balance in the MENA region are well known. These countries base their comparative advantage on products that are highly contested in global markets such as natural resources (agriculture, petroleum, other mineral products such as gas and fertilizers) and labor intensive (clothing, leather, and footwear)

Table 6
Cointegration analysis.

	PANEL A: EMU countries	PANEL B: MENA countries
Export-Import		
Pedroni (1999)		
Panel v-Statistic	0.820	1.600
Panel p-Statistic	0.280	1.270
Panel t-Statistics (non-Parametric)	0.510	2.650
Panel t-Statistics (Parametric)	0.040**	4.780
Group p-Statistics	1.240	0.740
Group t-Statistics	1.250	0.920
Group t-Statistics (Parametric)	0.540	2.210
Westerlund (2007)		
Group Gt statistics (standard)	−2.445	−0.824
Group Ga statistic (robust)	−8.494	−6.943
Panel Pt statistic (standard)	−4.383	−1.105
Panel Pa statistic (robust)	−9.283	−2.636
Expenditure-Revenue		
Pedroni (1999)		
Panel v-Statistic	–	−0.230
Panel p-Statistic	–	−0.950
Panel t-Statistics (non-Parametric)	–	−0.820
Panel t-Statistics (Parametric)	–	−0.950
Group p-Statistics	–	0.510
Group t-Statistics (non-Parametric)	–	−0.440
Group t-Statistics (Parametric)	–	−2.610
Westerlund (2007)		
Group Gt statistics (standard)	–	−1.721
Group Ga statistic (robust)	–	−9.591
Panel Pt statistic (standard)	–	−3.949
Panel Pa statistic (robust)	–	−5.697

Note: Reported Pedroni's (1999) test statistic can be compared to the N(0,1) distribution. Reported Westerlund (2007) statistics can be compared to the left tail of the normal distribution. A **,*** indicates rejection of the null hypothesis of no-co-integration at 5% and 1%, levels of significance respectively.
Source: Authors' estimates.

(World Bank, 2007a, b). In the meantime, food, fuel and manufactured imports constitute the bulk of their imports (World Development indictors, 2014). In this context, reversals in weak external demand and oil

prices affect their trade balance (World European Investment Bank, 2016). The MENA region is also considered as one of the most restrictive regions in services trade (Brochert et al., 2012). Inefficient backbone services (such as transport, telecommunications, storage and distribution) are provided mostly by the public sector, and their high cost contributes to raising the cost of MENA exports (both services and manufacturing) (Karan and Zaki, 2014).

Finally, our results reject the presence of a long-run relationship between I(1) government revenues and expenditures series in the MENA region (Table 6). This reflects the gradual progress in fiscal spending and tax collection. On the other hand, as indicated by Mansour (2015) MENA countries are in the process of reforming their taxation systems with a view to introducing flexibility to the sources of their earnings. This entails eliminating exemptions, addressing loopholes, strengthening administration, broadening the tax base, computerizing the collection mechanism. Several MENA countries have introduced public sector governance reforms with the support of OECD since 2005 (OECD, 2010). Moreover, public spending still needs to be qualitatively improved. This implies reforms on the structure (less spending on subsidies and wages, and more spending on social safety nets and infrastructure development) and transparency of fiscal spending (IMF, 2018).

4.2. Granger causality and SGMM analysis

The analysis of Granger causality and SGMM estimations allows us to discuss the static relationship between the variables in each panel. Starting with the EMU panel, we find that the public deficit Granger causes the trade deficit, while the opposite does not hold. These results indicate that the fiscal austerity strategies recommended by the ECB, the and the European Commission have helped stabilize the trade balance by cutting unit labour costs and depreciating real exchange rates (Belke and Dreger, 2013).

However, the success of these policies in fostering economic growth is unclear. We find no significant causality relationship running from the trade balance to economic growth (Tables 7 and 8). Finally, fiscal spillover from the core region Granger causes the government balance, the trade balance and GDP growth. The observed impacts are negative and significant (Table 7). This first set of results is clearly in line with our theoretical framework. Asymmetric fiscal austerity indeed allows one individual country to improve its trade balance. This strategy, however, comes at the cost of lower economic growth in the presence of fiscal spillovers from the core region.

As for the MENA sample, we do not find any evidence of direct Granger causality between the government balance and the current account. Fiscal targeting of the current account may thus not be an appropriate strategy. This result is not surprising given that MENA's trade performance depends mostly on swings in external demand and product specialization (World European Investment Bank, 2016). However, we find that the current account, the government balance and fiscal

Table 7
GMM PVAR estimations – EMU panel.

VARIABLES	Δ Current Account	Δ Government Balance	VGSB_Debt	GDP growth
Lagged Δ Current Account	0.006	0.008	−0.001	−0.003
	(-0.025)	(-0.021)	(-0.002)	(-0.018)
Lagged Δ Government Balance	0.182***	−0.018	0.0284***	0.202***
	(-0.032)	(-0.024)	(-0.003)	(-0.070)
Lagged VGSB_Debt	−1.085***	−1.312***	0.184***	−0.463**
	(-0.252)	(-0.112)	(-0.036)	(-0.189)
Lagged GDP growth	0.586***	−0.247***	0.0195***	0.834***
	(-0.055)	(-0.022)	(-0.004)	(-0.028)
Annual CPI inflation	39.27***	29.97***	−6.734***	−49.32***
	(-10.450)	(-3.427)	(-0.839)	(-3.707)
Δ EER	−137.6***	23.84***	−5.990***	4.747
	(-8.706)	(-2.956)	(-0.865)	(-4.322)
Observations	110	110	110	110

Source: Authors' estimates. Standard errors in parentheses. Note: **, *** indicate significance at the 5% and 1% levels, respectively. The p-value of Hansen's J statistic for the PVAR system of equations is 0.332. The VAR model's eigenvalues lie within the unit circle (results available upon request).

Table 8
Panel Granger causality tests– EMU panel.

Equation	Excluded	chi2	DF	P > chi2
Δ Current Account				
	Δ Government Balance	33.081	1	0.000***
	VGSB_Debt	18.562	1	0.000***
	GDP growth	113.080	1	0.000***
	ALL	257.344	3	0.000***
Δ Government Balance				
	Δ Current Account	0.168	1	0.681
	VGSB_Debt	137.277	1	0.000***
	GDP growth	129.702	1	0.000***
	ALL	209.905	3	0.000***
VGSB_Debt				
	Δ Current Account	0.078	1	0.780
	Government Balance	66.782	1	0.000***
	GDP growth	22.963	1	0.000***
	ALL	72.479	3	0.000***
GDP growth				
	Δ Current Account	0.028	1	0.867
	Δ Government Balance	8.490	1	0.004***
	VGSB_Debt	6.009	1	0.014**
	ALL	12.925	3	0.005***

Source: Authors' estimates. Note: **, *** indicate significance at the 5% and 1% levels, respectively.

Table 9
Global forecast error decomposition – EMU panel.

	GDP_growth	VGSB_Debt	Δ Current Account	Δ Government Balance
Response: Δ Government Balance Horizon				
0	0.035	0.020	0.000	0.944
1	0.061	0.050	0.000	0.889
2	0.091	0.048	0.000	0.861
3	0.107	0.049	0.000	0.844
4	0.115	0.050	0.000	0.834
5	0.120	0.051	0.000	0.829
6	0.122	0.051	0.000	0.826
7	0.124	0.051	0.000	0.825
8	0.125	0.051	0.000	0.824
9	0.125	0.051	0.000	0.823
10	0.125	0.051	0.000	0.823
Response: Δ Current Account Horizon				
0	0.004	0.004	0.992	0.000
1	0.044	0.013	0.930	0.013
2	0.062	0.017	0.904	0.016
3	0.072	0.019	0.891	0.018
4	0.078	0.020	0.884	0.019
5	0.081	0.020	0.879	0.020
6	0.082	0.020	0.877	0.020
7	0.083	0.020	0.876	0.021
8	0.084	0.020	0.875	0.021
9	0.084	0.021	0.874	0.021
10	0.085	0.021	0.874	0.021
Response: GDP growth Horizon				
0	0.945	0.016	0.004	0.035
1	0.859	0.035	0.002	0.103
2	0.828	0.051	0.002	0.119
3	0.816	0.059	0.002	0.123
4	0.811	0.063	0.002	0.125
5	0.808	0.065	0.002	0.126
6	0.806	0.066	0.002	0.126
7	0.806	0.066	0.002	0.126
8	0.805	0.066	0.002	0.127
9	0.805	0.067	0.002	0.127
10	0.805	0.067	0.002	0.127

Source: Authors' estimates. This table only reports the GFEVD of the variables of interest. Results for the other variables are available upon request.

Table 10
SGMM PVAR estimations - MENA countries.

VARIABLES	Δ Current Account	Δ Government Balance	VESB_Debt	GDP growth
Lagged Δ Current Account	0.093	−0.078	−0.031	0.276**
	(-0.095)	(-0.080)	(-0.060)	(-0.124)
Lagged Δ Government Balance	−0.067	−0.161**	0.037	0.371**
	(-0.091)	(-0.069)	(-0.075)	(-0.168)
Lagged VESB_Debt	0.036	−0.387	0.170	−1.473**
	(-0.454)	(-0.320)	(-0.130)	(-0.703)
Lagged GDP growth	−0.036	0.0623**	−0.041	−0.174**
	(-0.034)	(-0.031)	(-0.026)	(-0.079)
Annual CPI inflation	−18.57**	−8.112**	14.28***	−13.640
	(-7.897)	(-3.492)	(-2.503)	(-16.850)
Δ EER	−0.640	4.175	−8.117***	17.31*
	(-5.521)	(-3.595)	(-1.676)	(-9.192)
Political violence (break)	0.134	−0.387	−1.616	11.140
	(-5.580)	(-4.055)	(-2.678)	(-8.183)
Observations	110	110	110	110

Source: Authors' estimates. Standard errors in parentheses. Note: **, *** indicate significance at the 5% and 1% levels, respectively. The p-value of Hansen's J statistic for the PVAR system of equations is 0.358. The VAR model's eigenvalues lie within the unit circle (results available upon request).

Table 11
Panel Granger causality tests – MENA countries.

Equation	Excluded	chi2	DF	P > chi2
Δ Current Account				
	Δ Government Balance	0.541	1	0.462
	VGSB_Debt	0.006	1	0.937
	GDP growth	1.162	1	0.281
	ALL	3.894	3	0.273
Δ Government Balance				
	Δ Current Account	0.950	1	0.330
	VGSB_Debt	1.464	1	0.226
	GDP growth	4.033	1	0.045**
	ALL	36.624	3	0.000***
VGSB_Debt				
	Δ Current Account	0.264	1	0.608
	Government Balance	0.246	1	0.620
	GDP growth	2.443	1	0.118
	ALL	2.521	3	0.471
GDP growth				
	Δ Current Account	4.953	1	0.026**
	Δ Government Balance	4.844	1	0.028**
	VGSB_Debt	4.393	1	0.036**
	ALL	12.350	3	0.006***

Source: Authors' estimates. Note: **, *** indicate significance at the 5% and 1% levels, respectively.

spillovers from the core Granger cause the growth of GDP (Table 11). GDP growth indeed increases with the trade balance and decreases with public deficit and fiscal spillovers from the core (Table 10). This second set of results highlights the difficult trade-off confronted by policy makers in the MENA region in the absence of an international macroeconomic coordination. For instance, it has been established that improving the MENA region's trade competitiveness would require significant investment in public goods such as human capital and infrastructure.[19] This, however, may come at the cost of a higher public deficit. Such a strategy would thus be detrimental to economic growth, at least in the short run. The presence of significant and negative fiscal spillovers from the core on GDP growth further decreases the feasibility of such a policy.

[19] According to the World Economic Forum, the MENA region currently lacks $4.3 trillion investment in infrastructure (www.weforum.org).

4.3. Global impulse response functions and forecast error variance decomposition

We now switch to the analysis of response to orthogonal shocks in a higher order PVAR-X system. Beginning with the EMU panel, Fig. 3 shows that causality runs from the government budget to the trade deficit and not the other way round. In addition, fiscal consolidation episodes in the core during the crisis have had a negative and significant impact on the peripheral countries' trade balance and economic growth. Indeed, both the GDP growth rate, the trade balance and government balance decline significantly in Southern EMU countries following a fiscal consolidation shock in the core (Germany) during the crisis. These results confirm those described in the previous section.

Inspection of the impulse response yield two additional noteworthy results. First, the impact of fiscal spillovers on the government balance is non-linear (negative in the short run, and positive after two periods). Second, fiscal spillovers have a negative and significant impact on GDP growth. In the short run, fiscal spillover decreases GDP growth, which deteriorates the trade and public account of periphery countries via automatic stabilizers (i.e. lower tax income and higher fiscal spending). However, sound EMU macroeconomic management require countries to maintain the public deficit to GDP ratio below a 3% threshold. In this context, peripheral EMU countries had no choice but to respond to fiscal spillovers by tightening their own fiscal stance. Such policies were successful in stopping the deterioration of their own government balance and trade balance (the impact of fiscal spillovers on trade and public account turns positive after two periods). As noted previously the restoration of the public balance however had no impact on GDP growth: shocks to GDP growth and the government budget cancel each other out (Fig. 3 and Table 7).

Turning to the variance decomposition analysis (Table 9), we find that the variation of the government balance is mostly impacted by shocks to its own lags (up to 94% of the explained variance). This is followed by GDP growth (up to 12%) and fiscal consolidations in Germany (up to 5%). Finally, shocks to the current account have an insignificant impact which is close to zero. The variation of the current account appears to be driven by shocks to its own lags (up to 99% of explained variance). This is followed by GDP growth (up to 8%), German fiscal consolidation (up to 2%), and shocks to the government balance (up to 2%). Finally, GDP growth appears mostly driven by its own lags (up to 94% of explained variance), government balance (up to 12%), fiscal consolidations in Germany (up to 7%) and the current account (up to 0.4%).

Our results hence suggest that economic growth and spillover effects arising from fiscal consolidations in the core seem to play a relatively important role in determining macroeconomic equilibria in the EMU. This finding strikes us as important, given that much of the policy discussion during the crisis left these two factors aside to focus solely on enhanced fiscal discipline.

We uncover similar results in the MENA region. First, we find that fiscal spillovers from the core significantly decrease the trade balance, the government balance and GDP growth (Fig. 4). In line with our panel Granger causality and SGMM estimation, we find no lasting relationship between the current account and the trade balance overall in this sample. However, the trade balance appears to respond negatively to increases in the government balance in the short run (one period). There are two potential explanations for this finding. The first has to do with the structure of tax income: lower imports decrease the volume of government income related to tariffs, which remains high in the MENA region by international standards, hence leading up to a deterioration of the government balance. The second is of a more political nature: MENA governments are pressed to respond to social pressures by increasing public spending, and therefore tend to loosen their fiscal discipline when external conditions improve. Our results nonetheless suggest that fiscal targeting of the current account is not an optimal strategy in the MENA region.

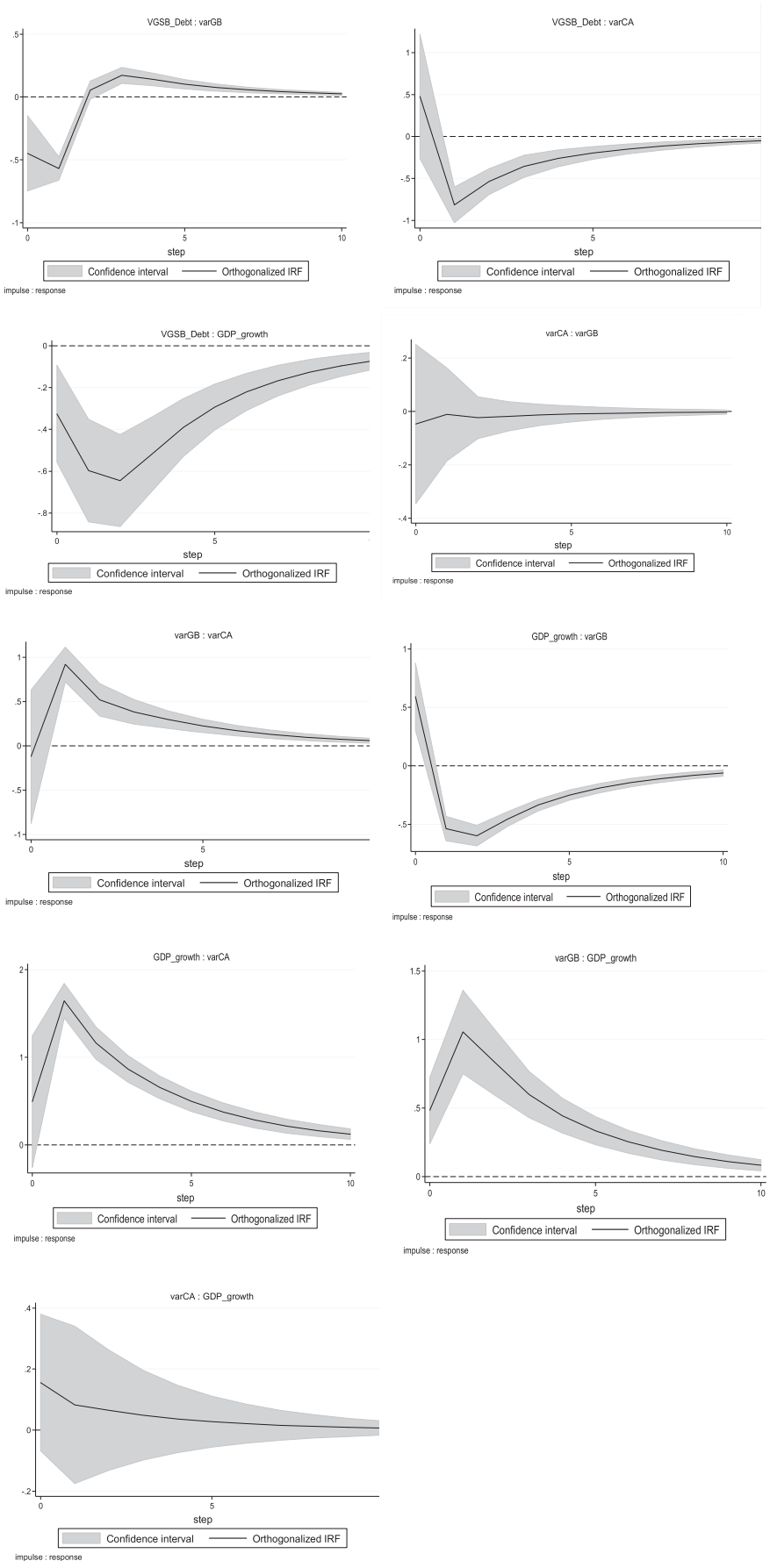

Fig. 3. Global impulse response function – Southern EMU panel.

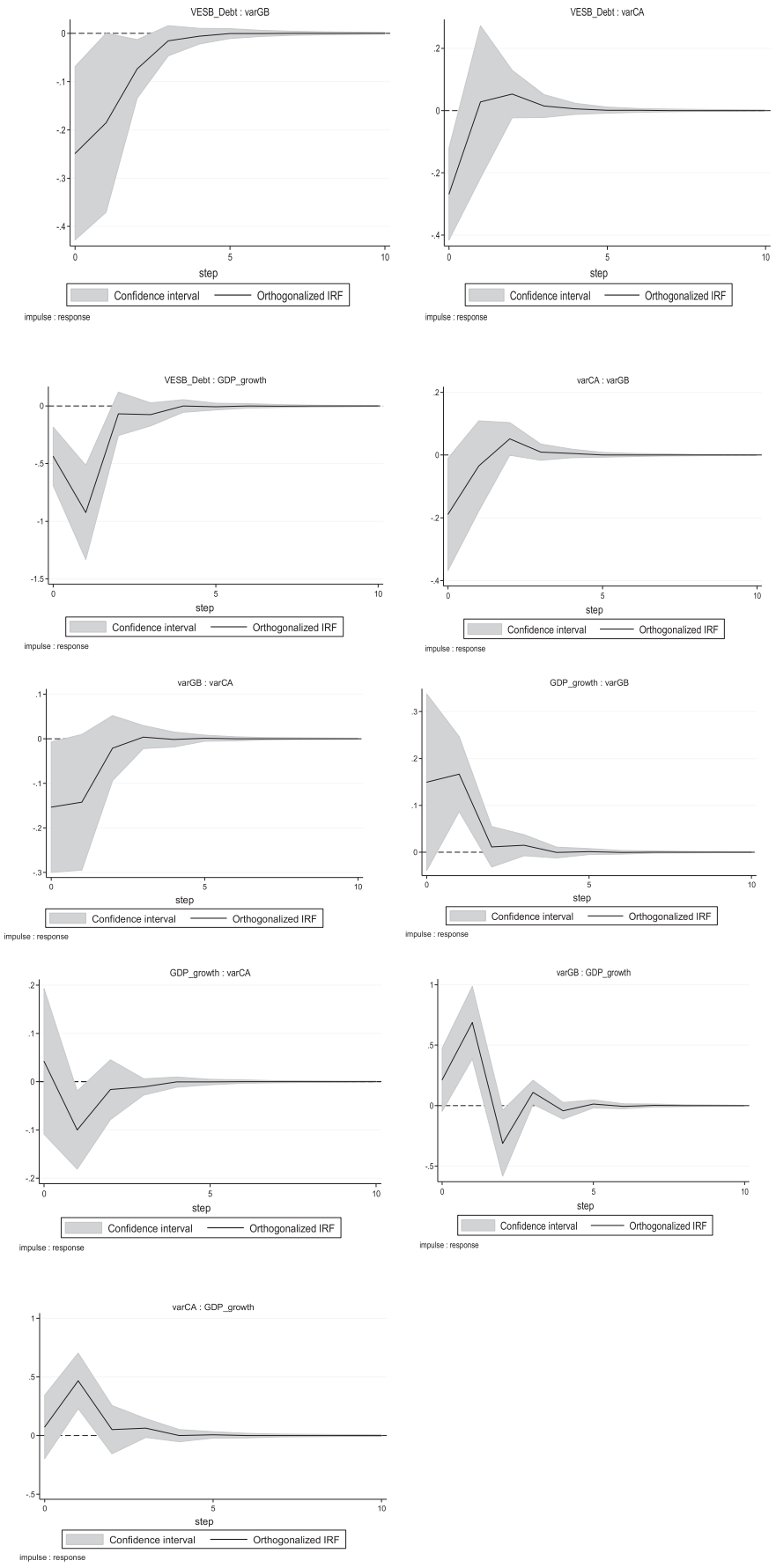

Fig. 4. Global impulse response function – MENA panel.

Finally, the public account reacts positively to a shock in GDP growth, while GDP growth responds positively to shocks in the current account and in the public account. Our results show that a better fiscal stance improves economic growth prospects in the MENA region. However, enhanced fiscal discipline is an inefficient strategy to improve export performance and the trade balance in this region. In line with a recent report by the European Investment Bank (2016), we suggest that structural policies (i.e. seeking to improve non-price competitiveness, access to finance and energy, and better management practices) be instead prioritized in order to improve the MENA region's global competitiveness.

Turning to the variance decomposition (Table 12) we find that the variation of the government balance is mostly impacted by shocks to its own lags (up to 96% of explained variance). This is followed by fiscal consolidation in the EMU (up to 3%), variations of the current account (up to 1%), and shocks to the GDP growth rate (up to 1.5%). The variation of the current account is driven by shocks to its own lags (up to 95% of explained variance), followed by fiscal consolidation in the EMU (up to 3.5%), government balance (up to 2%), and shocks to the GDP growth rate (up to 0.6%). Finally, GDP growth is mostly driven by its own lags (up to 96% of explained variance), followed by fiscal consolidation in the EMU (up to 12.7%), variations in the government balance (up to 8%) and in the current account (up to 2.8%). These results suggest that controlling for their own lags, government balance, trade balance and economic growth in the MENA economies are mostly responding to spillover effects arising from fiscal consolidations in the EMU. Policy makers seeking to design a regional strategy to overcome the many challenges presented in the introduction of this paper should not neglect the impact of international coordination of macroeconomic policies.

Table 12
Global forecast error decomposition – MENA panel.

	GDP_growth	VGSB_Debt	Δ Current Account	Δ Government Balance
Response: Δ Government Balance Horizon				
0	0.007	0.019	0.011	0.962
1	0.015	0.029	0.011	0.944
2	0.015	0.031	0.012	0.942
3	0.015	0.031	0.012	0.942
4	0.015	0.031	0.012	0.942
5	0.015	0.031	0.012	0.942
6	0.015	0.031	0.012	0.942
7	0.015	0.031	0.012	0.942
8	0.015	0.031	0.012	0.942
9	0.015	0.031	0.012	0.942
10	0.015	0.031	0.012	0.942
Response: Δ Current Account Horizon				
0	0.001	0.034	0.954	0.011
1	0.005	0.034	0.941	0.020
2	0.006	0.035	0.939	0.020
3	0.006	0.035	0.939	0.020
4	0.006	0.035	0.939	0.020
5	0.006	0.035	0.939	0.020
6	0.006	0.035	0.939	0.020
7	0.006	0.035	0.939	0.020
8	0.006	0.035	0.939	0.020
9	0.006	0.035	0.939	0.020
10	0.006	0.035	0.939	0.020
Response: GDP growth Horizon				
0	0.963	0.029	0.001	0.007
1	0.779	0.129	0.028	0.064
2	0.771	0.127	0.027	0.075
3	0.769	0.127	0.028	0.076
4	0.769	0.127	0.028	0.076
5	0.769	0.127	0.028	0.076
6	0.769	0.127	0.028	0.076
7	0.769	0.127	0.028	0.076
8	0.769	0.127	0.028	0.076
9	0.769	0.127	0.028	0.076
10	0.769	0.127	0.028	0.076

Source: Authors' estimates.

5. Policy implications: Keynes' revenge?

Our empirical models confirm three important insights from the stock-flow consistent model presented in section 2. First, nothing leads to balanced trade. Second, the causality mechanisms uniting the trade balance and the government balance are sample specific. Third, fiscal consolidation episodes in the core have an adverse impact on the trade balance, public deficit and economic growth in the periphery. One important implication from an applied policy perspective is that twin deficits are not only resulting from poor domestic macroeconomic management. They are also critically dependent on the international context, especially in the absence of a shared macroeconomic policy coordination framework. In other words, creditor countries have a direct responsibility in the accumulation of current account and public-sector deficit in peripheral countries.

What then, can we recommend from a policy perspective? Interestingly, our findings clearly echo Keynes' (1942, 1943) proposal for the postwar international financial architecture. Instead of holding reserves themselves, Keynes indeed proposed that countries hold accounts labelled in a new international currency (Bancor) with an International Clearing Union (ICU). The imaginary role for the ICU was to put a symmetrical *expansionist* pressure (i.e. measures for the expansion of domestic credit and domestic demand) of creditor countries and a *moderating* pressure (i.e. measures for the contraction of domestic credit and domestic demand) on debtor countries. According to Keynes' plan, both debtor and creditor countries would pay a charge to the ICU should their debit or credit balances in the ICU exceed their allowed *quota*. Keynes regarded this provision as "*a significant indication that the system looks on excessive credit balances with as critical an eye as on excessive debit balances*"(1942, p.173). One advantage of the proposed system was to avoid the deflationary bias caused by trapped reserves, which cannot turn into aggregate demand without a specific readjustment mechanism. For several political reasons, this proposal was eventually discarded at the 1944 Bretton Woods conference (Iwamoto, 1997). However, many prominent economists have argued in recent years that Keynes' plan might be worth revisiting given the global accumulation of macroeconomic disequilibria (Davidson, 2004; Stiglitz, 2006)[20].

Evidence in favor of fiscal spillover from the core on peripheral countries therefore lead us to put forth the creation of a "Euro-Mediterranean Clearing Union" as proposed recently by Whyman (2015) for the EMU. Such a project appears particularly timely given the social and economic costs of austerity, which are currently levied asymmetrically on debtor countries, and have come to endanger geopolitical stability in the region.

6. Conclusion

The objective of this paper was to to help develop policy responses to the EMU's periphery pressing economic challenges (FEMISE, 2017). Our first contribution was to document the dynamics of the 'twin deficits' in the Southern EMU and the MENA region. Our second contribution was to show that improving economic prospects in this region would require international coordination of fiscal policies.

Based on an initial theoretical discussion based on Godley and Lavoie (2007) we first underlined that fiscal shocks from a core region to its periphery could deteriorate macroeconomic imbalances in the latter. Simulations showed that fiscal consolidations in the North led to significant cross-country spillover effects and to a joint deterioration of the trade and public deficits in the South.

[20] One promising option would be to let a Clearing Union purchase 'impact bonds' tightened to infrastructure development and competitiveness-enhancing projects in periphery countries. This proposal would nonetheless entail an examination of the consequences of monetary policy coordination in the area, which we leave to future research.

We then gathered data from the IMF's World Economic Outlook and the World Bank Global Development database for the period 1977–2016 for five MENA countries (Egypt, Jordan, Lebanon, Tunisia, and Morocco) and five EMU countries (Greece, Ireland, Portugal, Spain, and Italy) and proceeded to an in-depth analysis of the twin deficit hypothesis.

We began by measuring the sustainability of public and trade deficits in both regions. Using panel unit root and co-integration analysis, we found that while public debt and trade deficit were overall sustainable in both samples, the absence of co-integration between exports, imports on the one hand and government income and revenue on the other pointed to the presence of an overall risky context. We then modelled the twin deficit hypothesis in the presence of fiscal spillover from the core using a P-VARX methodology with global impulse response functions and global forecast error variance decomposition.

In the Southern EMU sample, we found that causality ran from the government balance to the current account, suggesting that internal depreciation strategies have had the desired effect on macroeconomic imbalances. This stood in contrast with the empirical results observed for the MENA countries, where the econometric results did not reveal any direct causality between the two deficits. Our findings thus indicate that fiscal targeting of the current account may not be appropriate in the MENA region. In line with our theoretical intuition, these results also highlight that causality between the twin deficits is sample specific. Finally, we found that fiscal consolidation episodes in the core during the crisis have had an adverse impact on the trade balance, public deficit and economic growth in the periphery in both samples.

Overall these results lead us to reject 'one size fits all' policy recommendations of fiscal targeting of the current account. When it comes to improving export performance and the trade balance, structural policies (i.e. seeking to improve non-price competitiveness, the efficiency of the private sector and supporting entrepreneurship), rather than asymmetric fiscal consolidation, might be needed.

Our results have important policy implications as they suggest the presence of large welfare gains from policy coordination. Fiscal expansion in the core region combined with fiscal consolidation measures in the periphery could indeed help resorb macroeconomic imbalances at a low economic and social cost. Mitigating international imbalances and promoting growth are not mutually exclusive objective, if a proper coordination of international macroeconomic policies between the core and the periphery is put into place. In particular, we urge policy makers to reconsider Keynes' (1941, 1942) proposal for the creation of a Clearing Union framework. The advantage of this initiative would be to eliminate macroeconomic disequilibria through an automatic adjustment framework entailing simultaneous fiscal consolidation in deficit countries and fiscal expansion in surplus countries. This proposal would also minimize the well-documented adverse economic and social consequences of asymmetric fiscal adjustment programs in peripheral countries.

The feasibility of this proposal in the current political context of the EMU obviously remains to be investigated. Nevertheless, we hope that the present research will help raising policy awareness around the need to design international institutions and arrangements in order to respond to this region's numerous economic challenges.

Appendix A. Supplementary data

Supplementary data related to this article can be found at https://doi.org/10.1016/j.econmod.2018.07.023.

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