

# ClubMed? Cyclical fluctuations in the Mediterranean basin\*

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## Abstract

We investigate the similarities of macroeconomic fluctuations in the Mediterranean basin and their convergence. A model with three geo-political indicators, covering the West, the East and the MENA portions of the Mediterranean, characterizes well the historical experience since the early 1980. Convergence and divergence coexist in the region and are reversible. Except for the West, domestic cyclical fluctuations are still due to national and idiosyncratic causes. The outlook for the next few years looks rosier for the MENA and the East blocks than for the West.

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# 1 Introduction

The nature and the transmission properties of business cycles around the globe have dramatically changed since the early 1980s. On the one hand, emerging market economies now play an important role in the shaping world business cycles, previously determined by a handful of developed countries. On the other, trade and financial linkages have considerably increased, making international spillovers potentially much more relevant than in the past. While Latin America and Asia are leading examples of these new tendencies, it is still largely unexplored whether the Mediterranean basin conforms to these international trends. The issue is relevant from at least three different points of views.

First, the Union for the Mediterranean (see [www.eeas.europa.eu/euromed/index\\_en.htm](http://www.eeas.europa.eu/euromed/index_en.htm)) partnership, which started with the Barcelona process in 1995, seeks the establishment of free trade agreements in the area, wants to promote regional interdependences and intends to share the prosperity the new order generates. How so business cycles in the Mediterranean look like? Would increase trade and regional interdependencies change their nature and features? Second, Kydland and Zarazaga, 2002, Aguiar and Gopinath, 2008, have argued that business cycles in developed and developing countries are alike and that differences in the productivity process are sufficient to account for the existing cyclical differences. Garcia-Cicco et al., forthcoming, Chang and Fernandez, 2010, and Benczur and Raftai, 2010 have come to the opposite conclusion: heterogeneities are pervasive and cyclical differences in the two groups of countries have to do more with the structure of the economies than the productivity process. Are business cycles in the Mediterranean alike? Are cyclical fluctuations in less developed countries similar to those of the most advanced EU members? What role national and idiosyncratic factors play in explaining the differences?

Third, Hebling and Bayoumi, 2003, Kose et al., 2009, Walti, 2009, Altug and Bildirici, 2010 among others have studied whether business cycles around the world are converging or decoupling, in the sense that cyclical differences are becoming more profound. The conventional wisdom suggests that increased cross-border interdependences should lead to convergence of business cycle fluctuations. Greater

openness to trade and increased financial and migration flows, in fact, should make economies more sensitive to external shocks and increase the comovements of domestic and foreign variables by expanding or intensifying the channels through which shocks spill across countries. An alternative view, instead, indicates that increased economic integration could lead to more asynchronous output fluctuations as countries specialize in the production of goods for which they have comparative advantage and freely trade them in the world markets. Thus, production cycles could become completely idiosyncratic while consumption cycles are perfectly correlated (see e.g. Heathcote and Perri, 2004). While the evidence on the issue is contradictory, investigators have noticed that business cycles around the world have become distinctively different following the financial crisis of 2008: emerging market and less developed economies were only marginally affected by the recession hitting the developed world and quickly recovered from it. Are business cycles of the Mediterranean basin converging or decoupling? Will increased interdependences bring about cyclical convergence? What is the expected evolution of Mediterranean business cycles in the years to come?

This paper sheds some light on the nature and the evolution of cyclical fluctuations in the Mediterranean basin using annual real GDP, consumption and investment data from 1980 to 2009 for 15 different countries. As far as we know we are the first to study cyclical fluctuations in the region. The Mediterranean offers an interesting laboratory to study similarities and convergence and to distinguish hypotheses of interest since developed, emerging and frontier economies are in close regional proximity and share a number of common traits.

To answer the questions of interest, we employ a panel VAR model of the type developed in Canova and Ciccarelli, 2009, and Canova et al., 2007. The setup is useful for three reasons. First, it can handle large dynamic panels displaying unit specific dynamics and cross country lagged interdependencies. Second, it allows for time variations in the correlation structure across variables and countries. Third, it facilitates the construction of observable indicators capturing common, regional and national influences and permits us to measure their relative importance for cyclical fluctuations in the area. Relative to our earlier work, we explicitly allow for time variations in the variability of the reduced form errors of the model to capture

volatility shifts which may be present in the sample.

Our investigation proceeds in four steps. First, we construct and compare the fit of different models capturing the dynamics of the cyclical fluctuations in the Mediterranean basin either with one common indicator or with a number of regional indicators constructed using alternative geographical, political or economic characteristics. We then study the time series properties of the estimated indicators and assess whether convergence is taking place. Third, we examine how much of the fluctuations are common and how much country specific or idiosyncratic. Finally, we extrapolate existing regional tendencies and compare our out-of-sample predictions with those of the World Economic Outlook (WEO) of the IMF.

We reach four main conclusions. First, important heterogeneities are present and business fluctuations in eastern and southern countries of the Mediterranean differ from those of the major EU members in terms of volatility, persistence and synchronicity. Second, there are time variations in the structure of regional business cycles but these variations are not easily reconciled with either a pure convergence or a pure decoupling view. Both phenomena, in fact, are present in Mediterranean, but more importantly, both appear to be local in nature, temporary and revertible. Third, country specific and idiosyncratic influences matter for the dynamics of GDP, consumption and investment growth in several non-EU countries and, if we exclude the recent 2008 episode, there is little evidence that their relative importance has declined over time. Finally, if the current trends continue, our model predicts that GDP growth will be persistently below average in the major EU countries of the region. On the other hand, countries in the east side of the Mediterranean will quickly return to above average growth rates. Countries in the MENA region are instead expected to return to their average growth rates, thus ending the period of exceptional growth experienced in the last decade.

The rest of paper is organized as follows. The next section describes the empirical model and section 3 the data. Section 4 presents some results. Section 5 analyzes the dynamics of the estimated regional indicators. Section 6 studies the relative importance of common and country specific factors for the dynamics of the endogenous variables. Section 7 performs a forecasting exercise and section 8 reports some robustness analysis. Section 9 concludes.

## 2 The empirical model

The empirical model we employ in the analysis has the form:

$$y_{it} = D_{it}(L)Y_{t-1} + F_{it}(L)W_{it} + e_{it} \quad (1)$$

where  $i = 1, \dots, N$  indicates countries,  $t = 1, \dots, T$  time, and  $L$  is the lag operator;  $y_{it}$  is a  $G \times 1$  vector of variables for each  $i$  and  $Y_t = (y'_{1t}, y'_{2t}, \dots, y'_{Nt})'$ ;  $D_{it,j}$  are  $G \times NG$  matrices for each lag  $j = 1, \dots, p$ ,  $W_{it}$  is a  $M \times 1$  vector of exogenous variables,  $F_{it,j}$  are  $G \times M$  matrices each lag  $j = 1, \dots, q$ ;  $e_{it}$  is a  $G \times 1$  vector of random disturbances with variance  $\Sigma_i$ .

Model (1) displays three important features which makes it ideal for our study. First, the coefficients of the specification are allowed to vary over time. Without this feature, it would be difficult to study the evolution of cyclical fluctuations and one may attribute smooth changes in business cycles characteristics to once-and-for-all breaks which would be hard to justify given the historical experience. Second, the dynamic relationships are allowed to be country specific. Without such a feature, heterogeneity biases may be present, and economic conclusions could be easily distorted. Third, whenever the  $NG \times NG$  matrix  $D_t(L) = [D_{1t}(L), \dots, D_{Nt}(L)]'$ , is not block diagonal for some  $L$ , cross-unit lagged interdependencies matter. Thus, dynamic feedback across countries are possible and this greatly expands the type of interactions our empirical model can account for.

The ingredients (1) displays add realism to the specification, avoiding the “incredible” short-cuts that the literature has often taken (see Canova and Ciccarelli, 2009, for a discussion), but they do have a cost. To see why rewrite (1) in regression format as:

$$Y_t = Z_t \delta_t + E_t \quad E_t \sim N(0, \Omega) \quad (2)$$

where  $Z_t = I_{NG} \otimes X'_t$ ;  $X'_t = (Y'_{t-1}, Y'_{t-2}, \dots, Y'_{t-p}, W'_t, W'_{t-1}, \dots, W'_{t-q})$ ,  $\delta_t = (\delta'_{1t}, \dots, \delta'_{Nt})'$  and  $\delta_{it}$  are  $Gk \times 1$  vectors containing, stacked, the  $G$  rows of the matrix  $D_{it}$  and  $F_{it}$ , while  $Y_t$  and  $E_t$  are  $NG \times 1$  vectors of endogenous variables and of random disturbances. Since  $\delta_t$  varies in different time periods for each country-variable pair, it is impossible to estimate it using unrestricted classical methods. However, even if  $\delta_t = \delta, \forall t$ , its sheer dimensionality (there are  $k = NGp + Mg$  parameters in each equation) prevents any meaningful unconstrained estimation.

## 2.1 The factorization of the coefficient vector $\delta_t$

Rather than estimating the vector  $\delta_t$ , we estimate a lower dimensional vector  $\theta_t$ , which determines the features of  $\delta_t$ . For this purpose we assume that

$$\delta_t = \Xi\theta_t + u_t \quad u_t \sim N(0, \Sigma \otimes V) \quad (3)$$

where  $\Xi$  is a matrix,  $\dim(\theta_t) \ll \dim(\delta_t)$ , and  $u_t$  is a vector of disturbances, capturing unmodelled features of the coefficient vector  $\delta_t$ . For example, one specification we consider in the paper has  $\Xi\theta_t = \Xi_1\theta_{1t} + \Xi_2\theta_{2t} + \Xi_3\theta_{3t}$  where  $\Xi_1, \Xi_2, \Xi_3$  are loading matrices of dimensions  $NGk \times s, NGk \times N, NGk \times G$ , respectively;  $\theta_{1t}, \theta_{2t}, \theta_{3t}$  are mutually orthogonal factors capturing, respectively, movements in the coefficient vector which are common across  $s$  groups of countries and variables; movements in the coefficient vector which are country specific; and movements in the coefficient vector which are variable specific.

Factoring  $\delta_t$  as in (3) is advantageous in many respects. Computationally, it reduces the problem of estimating  $NGk$  coefficients into the one of estimating, for example,  $s + N + G$  factors characterizing their dynamics. Practically, the factorization (3) transforms an overparametrized panel VAR into a parsimonious SUR model, where the regressors are averages of certain right-hand side VAR variables. In fact, using (3) in (2) we have

$$Y_t = \mathcal{Z}_t\theta_t + v_t \quad (4)$$

where  $\mathcal{Z}_t = Z_t\Xi$  and  $v_t = E_t + Z_tu_t$ . Economically, the decomposition in (4) is convenient since it allows us to measure the relative importance of common and country specific influences for fluctuations in  $Y_t$  and to study their time evolution. In fact, when  $\theta_t$  has at least two dimensions,  $WLI_t = \mathcal{Z}_{1t}\theta_{1t}$  is a common indicator for  $Y_t$ , while  $CLI_t = \mathcal{Z}_{2t}\theta_{2t}$  is a vector of country specific indicators. Note that  $WLI_t$  and  $CLI_t$  are correlated by construction – the same variables enter in both  $\mathcal{Z}_{1t}$  and  $\mathcal{Z}_{2t}$  – but become uncorrelated as the number of countries becomes large.

To complete the specification we need to describe the evolution of  $\theta_t$  over time and the features of its (time zero) distribution. We let

$$\theta_t = \theta_{t-1} + \eta_t \quad \eta_t \sim N(0, B_t). \quad (5)$$

with  $B_t = \gamma_1 * B_{t-1} + \gamma_2 * \bar{B}$ , where  $\gamma_1, \gamma_2$  are scalars, and  $\bar{B}$  is block diagonal. We set  $\Sigma = \Omega$ ,  $V = \sigma^2 I_k$ ; and let  $E_t$ ,  $u_t$  and  $\eta_t$  be mutually independent.

In (5) the factors evolve over time as random walks. The spherical assumption on  $V$  reflects the fact that the factors have similar units, while setting  $\Sigma = \Omega$  is standard (see e.g. Kadiyala and Karlsson, 1997). The variance of  $\eta_t$  is allowed to be time varying to account for ARCH-M type effects and other generic volatility clustering in  $Y_t$ . Time invariant structures ( $\gamma_1 = \gamma_2 = 0$ ), and homoskedastic variances ( $\gamma_1 = 0$  and  $\gamma_2 = 1$ ) are special cases of the assumed process. The block diagonality of  $\bar{B}$  guarantees orthogonality of the factors, which is preserved a-posteriori, and hence their identifiability. Finally, independence among the errors is standard.

To summarize, our estimable empirical model has the state space structure:

$$Y_t = (Z_t \Xi) \theta_t + v_t \quad (6)$$

$$\theta_t = \theta_{t-1} + \eta_t \quad (7)$$

While the model (6)-(7) can be estimated both with classical and Bayesian methods, the latter approach is preferable since the exact small sample distribution of the objects of interest can be obtained even with relatively small  $T$  and  $N$  (see Del Negro and Schorfheide, forthcoming, for a hierarchical Bayes interpretation of the structure).

Substituting (7) into (6) clearly shows that our estimated structure allows for time variations in the variance of the reduced form errors, thus capturing potential volatility changes the endogenous variables of the model may display, even if  $\Sigma_i$  is time invariant. We prefer to employ this particular specification to model volatility variations rather than a more standard stochastic volatility model for two reasons: changes in the volatility of the endogenous variables are linked to changes in the volatility of the loading of the coefficient factors; the computational costs are dramatically reduced.

## 2.2 Prior information

To compute posterior distributions for the parameters of (7), we assume prior densities for  $\phi_0 = (\Omega^{-1}, \bar{B}, \theta_0)$  and let  $\sigma^2, \gamma_1, \gamma_2$  be known. We set  $\bar{B}_i = b_i * I$ ,  $i = 1, \dots, r$ , where  $b_i$  controls the tightness of factor  $i$  in the coefficient vector, and make

$p(\Omega^{-1}, b_i, \theta_0) = p(\Omega^{-1}) \prod_i p(b_i) p(\theta_0)$  with  $p(\Omega^{-1}) = W(z_1, Q_1)$ ,  $p(b_i) = IG\left(\frac{\varpi_0}{2}, \frac{S_0}{2}\right)$  and  $p(\theta_0 | \mathcal{F}_{-1}) = N(\bar{\theta}_0, \bar{R}_0)$  where  $N$  stands for Normal,  $W$  for Wishart and  $IG$  for Inverse Gamma distributions, and  $\mathcal{F}_{-1}$  denotes the information available at time  $-1$ . The prior for  $\theta_0$  and the law of motion for the factors imply that  $p(\theta_t | \mathcal{F}_{t-1}) = N(\bar{\theta}_{t-1|t-1}, \bar{R}_{t-1|t-1} + B_t)$ .

We collect the hyperparameters of the prior in the vector  $\mu = (\sigma^2, \gamma_1, \gamma_2, z_1, Q_1, \varpi_0, S_0, \bar{\theta}_0, \bar{R}_0)$ . Values for the elements of  $\mu$  are either obtained from the data (this is the case for  $\bar{\theta}_0, Q_1$ ) to tune up the prior to the specific application, a-priori selected to produce relatively loose priors (this is the case for  $z_1, \varpi_0, S_0, \bar{R}_0$ ) or chosen to maximize the explanatory power of the model (this is the case of  $\sigma^2, \gamma_0, \gamma_1$ ) in an empirical Bayes fashion. The values used are:  $\gamma_1 = 1.0, \gamma_2 = 0, z_1 = N \cdot G + 5, Q_1 = \hat{Q}_1, \varpi_0 = S_0 = 1.0, \bar{\theta}_0 = \hat{\theta}_0$  and  $\bar{R}_0 = I_r$ . Here  $\hat{Q}_1 = \text{diag}(Q_{11}, \dots, Q_{1N})$  and  $Q_{1i}$  is the estimated covariance matrix of the time invariant version for each country VAR;  $\hat{\theta}_0$  is obtained with OLS on a time invariant version of (1), over the entire sample, and  $r$  is the dimension of  $\theta_t$ . Since the in-sample fit improves when  $\sigma^2 \rightarrow 0$ , we present results assuming an exact factorization of  $\delta_t$ .

## 2.3 Posterior distributions

To calculate the posterior distribution for  $\phi = (\Omega^{-1}, b_i, \{\theta_t\}_{t=1}^T)$ , we combine the prior with the likelihood of the data, which is proportional to

$$L \propto |\Omega|^{-T/2} \exp \left[ -\frac{1}{2} \sum_t (Y_t - Z_t \Xi \theta_t)' \Omega^{-1} (Y_t - Z_t \Xi \theta_t) \right] \quad (8)$$

where  $Y^T = (Y_1, \dots, Y_T)$  denotes the available sample. Using Bayes rule,  $p(\phi | Y^T) = \frac{p(\phi) L(Y^T | \phi)}{p(Y^T)} \propto p(\phi) L(Y^T | \phi)$ . Given  $p(\phi | Y^T)$ , the posterior distribution for the elements of  $\phi$ , can be obtained by integrating out nuisance parameters from  $p(\phi | Y^T)$ . Once these distributions are found, location and dispersion measures for  $\phi$  and for any interesting continuous functions of them can be obtained.

For the model we use, it is impossible to compute  $p(\phi | Y^T)$  analytically. A Monte Carlo techniques which is useful in our context is the Gibbs sampler, since it only requires knowledge of the conditional posterior distribution of  $\phi$ . Denoting



$\phi_{-\kappa}$  the vector  $\phi$  excluding the parameter  $\kappa$ , these conditional distributions are

$$\begin{aligned}\theta_t | Y^T, \phi_{-\theta_t} &\sim N(\bar{\theta}_{t|T}, \bar{\mathbf{R}}_{t|T}) \quad t \leq T, \\ \Omega^{-1} | Y^T, \phi_{-\Omega} &\sim Wi\left(z_1 + T, \left[\sum_t (Y_t - Z_t \Xi \theta_t)(Y_t - Z_t \Xi \theta_t)' + Q_1^{-1}\right]^{-1}\right) \\ b_i | Y^T, \phi_{-b_i} &\sim IG\left(\frac{\varpi^i}{2}, \frac{\sum_t (\theta_t^i - \theta_{t-1}^i)' (\theta_t^i - \theta_{t-1}^i) + S_0}{2}\right)\end{aligned}\quad (9)$$

where  $\bar{\theta}_{t|T}$  and  $\bar{\mathbf{R}}_{t|T}$  are the smoothed one-period-ahead forecasts of  $\theta_t$  and of the variance-covariance matrix of the forecast error, respectively, calculated as in Chib and Greenberg (1995),  $\varpi^i = K + \varpi_0$ , and  $K = T$ , if  $i = 1$ ,  $K = Tg$ , if  $i = 2$ ,  $K = TN$ , if  $i = 3$ , etc.

Under regularity conditions (see Geweke, 2000), cycling through the conditional distributions in (9) produces in the limit draws from the joint posterior. From these, the marginal distributions of  $\theta_t$  can be computed averaging over draws in the nuisance dimensions and, as a by-product, the posterior distributions of our indicators can be obtained. For example, a credible 90% interval for the common indicator is obtained ordering the  $h = 1, \dots, H$  draws of  $WLI_t^h$  for each  $t$  and taking the 5th and the 95th percentile. We have performed standard convergence checks: increasing the length of the chain; splitting the chains in pieces after a burn-in period and calculating whether the mean and the variances are similar; checking if cumulative means settle to some value. The results we present are based on chains with 400000 draws: 2000 blocks of 200 draws were made and the last draw for each block is retained. Hence, 2000 draws are used for posterior inference at each  $t$ .

### 3 The data

The data we use comes from the WEO database at the IMF, it is annual, and covers 15 countries from 1980 to 2009. The countries for which consistent data over this sample is available are Portugal, Spain, France, Italy, Greece, Albania, Macedonia, Cyprus, Turkey, Israel, Syria, Egypt, Tunisia, Algeria and Morocco. In the sensitivity analysis section, we consider an extended data set which also includes Malta, Croatia, Bosnia, Serbia, Montenegro, Slovenia, Lebanon and Libya

but covers a shorter time span (from 1999 to 2009). Severe data limitations prevents us from using higher frequency data: a consistent quarterly data base for the region is in fact available only since the early 2000. The variables we consider are real GDP, real consumption and real investment growth, all converted into international standard via PPP adjustments. Other private sector variables (such as employment and the trade balance) or public sector variables (such as government expenditure or primary balance) are available either irregularly or for a too short sample to make estimation meaningful. Including output and consumption jointly in the model is important since the results can help us to distinguish which hypothesis put forward in the literature (consumption and output convergence vs. consumption convergence and output divergence) is more likely to hold in the data.

Given the frequency of the data, standard lag length selection criteria prefer just one lag in the original panel VAR model. The sole exogenous variable of the system is the world real GDP, provided by the WEO, which we use to filter out fluctuations which are not specific to the region. This variable also enters the VAR with just one lag. After some experimentation, we have decided to exclude oil prices from the model because they are highly correlated with the world GDP measure and their use would induce near-collinearity problems in the system. All variables are all demeaned and standardized prior to estimation. This makes the equal weighting scheme implicit in (6)-(7) and the resulting analysis coherent.

### **3.1 Some features of the Mediterranean economies**

Before proceeding to the analysis, it is useful to present some facts about the less known Mediterranean economies. Most of the information is obtained from the Euro-Mediterranean statistics compiled by Eurostat, from the EU site [www.eeas.europa.eu/euromed/index\\_en.htm](http://www.eeas.europa.eu/euromed/index_en.htm), and refers to 2009, if not otherwise noted.

In general, and if we exclude Israel, non-Euro area members of the Mediterranean are poor. Their per-capita income ranges from 2,161 US dollar in Egypt to 10,472 US dollars in Turkey and the poorest countries are all located in the Middle East-North African (MENA) region. In comparison, the income per-capita of the two non-EU European countries in the database (Albania and Macedonia) is almost twice as large as the one of Egypt or Morocco. Poverty ratios confirm the conclusion: between 20

and 30 percent of the population is considered poor in Morocco, Algeria, and Egypt.

Despite the existence of trade and tariff barriers, the majority of the economies of the Mediterranean region are open. For example, the trade to GDP ratio for the countries in the MENA region is above 80 percent and in Tunisia exceeds 100 percent (data refers here to 2007). Trade by non-EU countries of the region with EU members is about 10 percent of total EU trade and has consistently increased since 2004 at a rate of about 10 percent a year. Thus, North-South trade linkages have intensified over time but not dramatically so. Morocco, Algeria, Turkey and Israel are the countries which trade most with EU members. Trade is primarily concentrated in goods (in particular, fuel, manufacturing and clothing) while trade in services is low – less than 5 percent of total EU trade. Interestingly, bilateral flows among the non-EU countries of the region is low in absolute terms (less than 5 percent of the total) and relative to other regions of the world (e.g. bilateral trade in Asia accounts for roughly 30 percent of total trade). Infrastructural bottlenecks, trade restrictions and, most importantly, non-complementarity of the products of various countries could be responsible for this pattern.

FDIs from the richer to the poorer nations of the Mediterranean have roughly doubled since 2000 but their magnitude is still remarkably small. In absolute terms they account for less than one percent of the total FDIs of the EU. Lack of transparency and poor business environment are typically blamed for these low numbers but lack of infrastructures and absence of significant regional markets are also important factors to be considered. Financial linkages are not quantifiable, but they are likely to be limited due to legislation restrictions and the general riskiness of the region, often plagued by civil and religious conflicts.

Migrations from the East to the West of the Mediterranean were strong in the early 1990s but they have been progressively substituted by South to the North migrations. Remittances from the EU are important for many of the North African countries, despite the fact that migrations flows have been reduced in the last few years. For example, they account between 12-20 percent of the annual GDP in Morocco and 6-9 percent of annual GDP in Egypt. Thus, remittances, more than trade and FDIs, could be an important source of imported cyclical fluctuations in certain portions of the Mediterranean.

Finally, the role of tourism as a source of transmission of cyclical fluctuations needs to be emphasized. The Mediterranean region receives a considerable amount of tourists every year and the flow from the EU has been quite cyclical reflecting the cyclical conditions in the domestic economies. For example, the percentage of tourists entering Tunisia from the EU has suffered a 10 percent decline during the slowdown of 2001 and 2002 relative to the previous years. Also, given that the tourism industry accounts for a large fraction of employment and GDP in many of the poor countries in the region, fluctuations in tourist arrivals and expenditure could be an important source of disturbances in many countries. To give an idea of the importance of the sector, in Tunisia tourism accounts for almost 25 percent of GDP and more than 30 percent of employment and in Egypt around 15 percent of GDP and 18 percent of employment. Even in countries with less developed tourism industry, such as Albania, the sector has grown at a rate of about 15 percent a year in the last 5 years and now accounts for about 10 percent of total GDP.

In sum, trade in goods, remittances and tourism could be important channels through which fluctuations could be transmitted across countries in the region. Given the nature of the flows, cyclical conditions in the EU may be an important factor for domestic fluctuations in each of the non-EU Mediterranean countries, while the intra non-EU spillovers are likely to be small. An interesting question is whether remittances and tourism are sufficient to make cyclical fluctuations in countries facing different types of shocks alike. Similarly, one would like to know whether the increased interdependences displayed over the last decade have changed the nature of cyclical fluctuations in the area or whether regional and national factors still dominate.

## **4 Similarities or heterogeneities?**

To examine whether cyclical fluctuations in the Mediterranean basin are alike or not, we estimate a number of models, allowing for the common factor in the coefficient vector to have one, two, three or four dimensions. To be precise, all models we consider have 15 country-specific and 3 variable-specific factors in the coefficient vector but differ in the specification of the common factor structure. In model M1 we

have just one common factor – thus  $\theta_{1t}$  is a scalar; in model M2 we have two common factors – thus  $\theta_{1t}$  is a  $2 \times 1$  vector; in model M3 we have three common factors – thus  $\theta_{1t}$  is a  $3 \times 1$  vector – and in model M4 we have four common factors. Since there are many ways to split the 15 countries into groups when more than one common factor is used, we follow the approach of Canova (2004), informally try a number of different combinations and select the best grouping of countries for each specification of the vector of common factors using the marginal likelihood of the model, which we compute using an harmonic mean estimator. The marginal likelihood is akin to an  $\bar{R}^2$  and tells us which specification is more successful in explaining the in-sample fluctuations in the 45 endogenous variables of the model. Thus, the higher is the marginal likelihood, the better is the in-sample fit. To formally evaluate the goodness of fit across specifications featuring different dimensionality for  $\theta_{1t}$ , one needs a loss function. With a standard 0-1 loss function, models whose log marginal likelihood exceeds the one of the best model by a factor of 10 should be considered significantly worse. Table 1 reports marginal likelihood of the best grouping obtained for the four models we consider.

It turns out that the best specification obtained with two regional factors loads one factor on the coefficients of the variables of the countries currently adopting the Euro and one factor on the coefficients of the variables of the other countries; in a model with three common factors, factors are arranged according to a geographical patterns. Thus, one factor loads on the coefficients of the variables of West (Portugal, Spain, France, Italy and Greece), one on the coefficients of the variables of East (Cyprus, Albania, Macedonia, Turkey and Israel); and one on the coefficients of the variables of the MENA countries. In model with four factors, the factors load according to the income per-capita of the countries in 1980. Thus, the first factor loads on the coefficients of the variables of France, Italy, Spain, Portugal; the second on the coefficients of the variables in Greece, Cyprus, Israel, the third on the coefficient of the variables of Macedonia, Albania and Turkey and the fourth of the coefficients of the variables of the remaining countries. By comparing the marginal likelihood of these four specifications we can examine whether cyclical fluctuations are alike in the Mediterranean basin (in which case model M1 which features a single common indicator will have the best fit), or whether regional heterogeneity is important (in

which case one of the other three models will have the best fit). Furthermore, by comparing the fit of models M2, M3 and M4 may help to quantify the extent of the heterogeneities present in the data and indicate the factors that may contribute to generate them. Thus, the analysis may help to understand whether belonging to the Euro area, being located in geographical area or initially poor matters for the type of cyclical fluctuations a country experiences.

Two features of table 1 are of interest. First, the best fitting model is M3 where three common (geographical) factors are allowed in the vector of coefficients. Thus, heterogeneities appear to be important. However, the difference in the fit of models M1 and M3 is not large, making it difficult to draw firm statistical conclusion about the relative quality of the two specifications. Second, the fit of models M2 and M4 is significantly worse than the fit of the other two models. Thus, the wealth of a country possessed in the 1980 and the monetary arrangement a country selects has no influence on the cyclical dynamics it experiences.

One reason for why the marginal likelihood has hard time to distinguish between M1 and M3 is that the sample is characterized by somewhat distinct periods of convergence and divergence. To provide visual evidence of this fact, we plot in the first panel of figure 1 the estimated pairwise rolling correlation of the three regional indicators obtained with model M3. Rolling correlations are computed using 10 years of data ending at the date listed on the horizontal axis. If convergence takes place, we should see these correlation to uniformly increase with time. Instead, the estimated correlation between the indicators of the West and the East has a U-shaped pattern: the correlations was high in the 1980s, it dropped to zero in the middle of the 1990s and increased again dramatically in the last few years of the sample. The correlation between the indicators of the West and the MENA block is instead small up to the mid-1990s, it increased substantially up to the mid-2000s and then dropped significantly into the negative territory when the last two years of the sample. Finally, the correlation between the indicators of the East and of the MENA is irregularly fluctuating in the 1980 and 1990, becomes negative in the early 2000, turns positive around 2005 and again negative in 2008. In general, cyclical fluctuations in the region have gone through periods of increased and decreased synchronicity with the MENA indicator becoming generally more correlated and

the East generally less correlated with the West. A marked change appears to occur in the last two years of the sample: the MENA region is escaping the crisis while the West and the East are similarly and strongly hit by the recession it generates.

Clearly, model M1 can't capture these time varying features, since it forces one common indicator for the whole region at all times. Nevertheless, it has a relatively good statistical fit for two reasons. First, the recent divergence pattern receives little weight in the marginal likelihood relative to the rest of the sample; second, the information present in the early 1980s is noisy and the cross sectional pooling that model M1 induces, reduces information uncertainty. However, it should be clear that despite the good statistical fit, model M1 will distort the interpretation of the cyclical fluctuations in the region and will not be further considered.

The presence of important time variations in the dynamics of cyclical fluctuations in the region is also clear when we examine the dynamic effects of a shock common to the variables of the West on the indicators of the East and of the MENA region. Dynamic effects are computed orthogonalizing the covariance matrix of the reduced form shocks, assuming that the West block comes first – a natural choice given the patterns of trade, the remittance and tourism flows discussed in the previous section. The two lower panels of figure 1 reports responses at three selected dates: 1993, 2002, 2007. Black solid lines are the median estimates; blue dashed lines the 68 percent posterior interval. It is evident that shocks originating in the West had different effects on the East indicator and on the MENA indicator at different dates and that the changes over time are not uniform. For example, there is much less spillover to the East and a much stronger negative effect on the MENA indicators in 2002 and in 2007 than in 1993. Thus, interdependences are also changing over time, but the direction of the changes is region specific.

Two main conclusions emerge from the exercises conducted so far. First, business cycle dynamics in the Mediterranean basin are heterogeneous and there is little evidence that either a smooth convergence or decoupling process is taking place. Second, heterogeneities do not seem to depend on the wealth of a country in 1980 nor on the particular monetary arrangement a country may decide to adopt. Instead, geopolitical factors seems to matter.

## 5 The dynamic patterns of regional indicators

Next, we examine the dynamics of the three regional indicators obtained with model M3 to highlight some important facts about the structure and the evolution of cyclical fluctuations in the Mediterranean basin. Figure 2 plots the indicators. In each box there are three lines: the black solid line represents the median of the posterior distribution of the indicator at each point in time; the blue dashed lines represent a pointwise 68 percent posterior credible set.

The West indicator is relatively persistent, it displays three recessions located at the official CEPR dates for the whole of Euro area (represented by the shaded area), two relatively strong expansions culminating with peaks in 1988 and 1998, and a significant slowdown around 2001-2002. The synchronicity of the cyclical fluctuations for the countries in the region changes over time and, for example, is largest around 1996 and 2001 (the posterior credible sets are tighter at these dates). Finally, the current recession is deeper than the two previous ones – both the median value and the credible set are much lower than in other occasions. Thus, our model captures well what is known about business cycles of Southern members of the EU and this should increase our confidence about what it delivers for the cyclical fluctuations of less studied Mediterranean areas.

The East indicator is much less persistent than the West indicator but has numerous ups and downs. In particular, it displays significant recessions with troughs in 1981, 1985, 1991, 1997, 2001, 2009, roughly every 5 years, and visible expansions culminating with peaks in 1983, 1987, 1995, 2000, 2007. Thus, the relative frequencies of the ups and downs and the amplitude of the fluctuations make the indicator very similar to the one obtained for a selected number of developing economies in e.g. Kose and Prasad (2010). Three other features make the East indicator different from the West indicator: i) expansion and recession phases are, roughly, of similar length; ii) cycles are more symmetric in amplitude, and iii) downturns are somewhat synchronized with the downturns in the US economy (the shaded areas here represent NBER recession phases) in terms of timing, amplitude and duration. Thus, and excluding the last two years of the sample, business cycles in the East of the Mediterranean have very different characteristics from those in the West and



are more related to cyclical conditions prevailing outside of the EU. To restate this conclusions differently, the East appears to be affected more by the US business cycle than by the European business cycle. This is due, in part, to the fact that the two major players in the block (Turkey and Israel) have large trade and financial links with countries outside the EU.

The features of the MENA indicator are quite different. It displays important negative serial correlation, large volatility and a long upward trend starting in 2000, temporarily and mildly interrupted in 2008. Thus, over the last decade, the countries of this region display a generic process of growth convergence within the Mediterranean basin in the last decade, a process which is similar to the one experience by other frontier economies relative to the rest of the world (see Kose and Prasad, 2010). Since some countries in the region are oil and gas exporters, one may conjecture that the persistent increase in oil and natural gas prices in the 2000s has something to do with this pattern. However, since not all the countries in the region possess these resources and since, as mentioned, oil prices are highly correlated with the world GDP measure we use, we do not find such an explanation particularly compelling. Structural reforms, including more open access to internal markets, are more likely to be responsible for this pattern. Note also that the timing of the cyclical fluctuations of countries of this block is different from the timing of cyclical fluctuations in the EU and the US (shaded areas here are CEPR official recession dates): the indicator features three recessionary phases, with troughs in 1986, 1991-93 and 2000 and three expansion phases culminating in 1985, 1990 and 1998. Overall, the dynamics of business cycles in the MENA region are quite heterogeneous relative to rest of the Mediterranean and their geographical proximity with the EU has little influence, at least so far, on the way these economies behave over the cycle.

In sum, our statistical approach prefers to split Mediterranean business cycles according to regional characteristics because cyclical fluctuations in the basin are heterogeneous across space and time. Furthermore, it selects a geopolitical classification to group countries into regions because similarities in terms of amplitude, duration, phase length and symmetry can be found in these regions. In addition, while the features of regional cycles evolve over time, it is also clear that the regional

indicators do not display any tendency to become more similar as time passes. Finally, while the crisis of 2008 appears to represent an important landmark to understand the nature of cyclical fluctuations in the Mediterranean basin, many of the tendencies of the last two years are present also in various disguises also in the early part of the 2000s, making the crisis less of structural break than it is commonly thought.

## 6 What drives cyclical fluctuations?

The analysis we have conducted helps us to understand better the structure and the time variations of the cyclical fluctuations present in the Mediterranean basin. However, one would also like to know how important the regional indicators are for the dynamics of GDP, consumption and investment growth of the 15 countries in the region. It is in fact possible that, while statistically relevant, the indicators capture only a small portion of the cyclical fluctuations of the endogenous variables of the model. If this is the case, it is important to uncover what drives the dynamics of their business cycles.

In this section, we first ask how much of the fluctuations in each of the endogenous variables is accounted for by the regional factor and report in Table 2 the fraction of the volatility explained for each country-variable pair. We then perform an historical decomposition exercise, where the fluctuations in each variables, for each countries, and at each point in time are decomposed into the components due to the regional and the national indicators (blue and red bars, respectively). These decompositions, which we present in figures 3 to 5, are more informative than the percentages we report in table 2 since they allow to explain what drives fluctuations at each point in time rather than on average in the sample.

There are some interesting patterns we would like to comment upon. First, in the West and excluding Greece, the regional indicator explain a large proportion of domestic fluctuations in all the variables on average. The percentage is larger than the one obtained in e.g. Canova et al. (2007) or Kose and Prasad (2010) primarily because regional indicator here is very homogeneous. Had one constructed the indicator using, e.g. all the countries in the EU, these percentages would have been

considerably lower. Second, the pattern is maintained when we look at decompositions for individual years. However, one can notice that the importance of the regional indicator is time varying: it increases in France, Spain, Portugal in 1998 and 2008, while the national indicator becomes more relevant in Spain and Greece in the early 2000s. Third, while it makes a little difference which variable we look at, country specific influences are slightly more important for consumption growth than for the growth rate of output or investment. Interestingly, national influences tend to correlate negatively with regional influences, suggesting that national specificities play a somewhat countercyclical role in the Western region of the Mediterranean.

Second, for the East the regional indicator has limited importance in explaining cyclical fluctuations of real GDP, consumption and investment growth. GDP growth fluctuations are strongly dominated by country specific factors. For consumption and investment growth, country specific and variable specific movements drive a large portion of the fluctuations. Interestingly, the East regional factor is relatively more important for Turkey and Israel variables than for the variables of the other countries, confirming the supposition that these two countries drive most of the differences we have observed in the East and the West indicators.

Third, in the MENA block, the regional indicator explains little of the cyclical fluctuations of the three variables of interest. In general, GDP growth fluctuations are dominated by a combination of country specific and idiosyncratic influences but their relative importance changes considerably over time. Furthermore, a substantial portion of consumption growth fluctuations is due to idiosyncratic factors, especially since 2000, while investment growth fluctuations seem to be driven by all factors. In relative terms, the MENA indicator explains a larger portion of the fluctuations in Algeria and a tiny portion of the fluctuations in Syria.

What conclusions can one draw from these exercises? While geopolitical factors are identifiable, their importance in explaining cyclical fluctuations in GDP, consumption and investment growth varies with the region, the country and the period under consideration. Perhaps more interestingly from our point of view, national influences are important for many non-EU countries; they are as important as they were at the beginning of the sample and their dynamics tend to counteract, in part, regional patterns. Hence, not only business cycles in the Mediterranean are hetero-

geneous and show little evidence of convergence; idiosyncratic and national factors are crucial in explaining cyclical fluctuations in the basin. Thus, the Mediterranean resembles a miniature world economy. The West block looks like the developed world: it possesses a well defined common business cycle and the regional indicator explains a substantial portion of the real cyclical fluctuations of the countries in the region. The East block behaves very much like the developing world and national idiosyncrasies tends to dominate cyclical fluctuations in the region. Finally, in the MENA block cyclical fluctuations in the variables of interest are largely driven by idiosyncratic factors. Thus, the MENA region appears to have many similarities with other frontier economies: it displays business cycles that are somewhat variable specific, largely unsynchronized across countries belonging to the region, and quite idiosyncratic relative to the rest of the Mediterranean.

## 7 What should we expect to happen next?

How persistent are the patterns we have described? Should we expect them to continue? To shed some light on future business cycle developments in Mediterranean basin we conduct a simple forecasting exercise. Our empirical model, apart from helping us to characterize business cycle fluctuations and to interpret cyclical dynamics in terms of common, country and variable specific influences, is well suited for out-of-sample forecasting exercises. As shown in Canova and Ciccarelli, 2009, the specification can be used for interesting conditional and unconditional prediction purposes and has good properties when compared with existing approaches.

In this section we ask two simple questions: what would our model tells us about the length of the current recession? What path for real GDP one should expect in the years to come? To perform such an exercise, we use information up to 2009 to estimate the model and then forecast up to five steps ahead assuming that during the prediction sample no shocks will hit either the variables or the estimated coefficients of the 15 countries and that the world growth rate of GDP will take the values forecasted by the WEO.

Figure 6 reports the demeaned value of the real GDP growth for each country up to 2009 and the 90 percent posterior credible forecast interval (the blue dashed

lines). To have a sense of the quality of our predictions, we have also plotted WEO forecasts for the same horizons (red solid line). Our forecasts differ from those of the WEO in two important aspects: WEO forecasts include quarterly information up to the second quarter of 2010, which is not available in our annual model; WEO forecasts are based on country specific semi-structural models loosely derived from standard theory, while our is a purely descriptive statistical model.

Despite these differences, the forecasts of our model are close to those of the WEO and, for many countries, the qualitative features of the predictions coincide. For example, for the countries in the West region, the current recession is expected to last long and there may still be a non-negligible probability that the growth rate of real GDP in 2015 is below the mean in all five countries. The picture is slightly rosier for Italy and France than for Spain, Portugal, or Greece in 2011 but differences are eliminated by 2012. Notice also that our rosier predictions for Italy and France are slightly worse than those of the WEO for the first two years of the forecasting sample. For the countries in the East block, the recession is expected to last much less, on average, than in the West block and some countries, such as Cyprus and Israel, are expected to be in an above average expansion phase from 2012. Differences with WEO forecasts are larger for the countries of this region and, for example, our model is more bullish for Israel and Cyprus and more bearish for Albania and Macedonia than the WEO. Overall, it appears that for East Mediterranean countries the current difficulties are transitory and that real GDP is expected to revert to (above) normal growth rate quite soon.

The forecasts for the MENA region appear to be less upbeat than those of the WEO. In general, and excluding Egypt, our model predicts that the growth rate of real GDP for these countries will revert back to the average level and the long positive differential expansion that these countries have experienced in the last decade will end. One reason for why our model is more pessimistic about the real GDP developments of these countries is the strong negative correlation that the West and MENA indicators display at the end of the sample. Thus, as the West slowly reverts to its mean growth rate from below, Arab-North Africa countries will also revert to their mean growth rate but now from above. The sustained growth pattern predicted by the WEO for these countries up to 2015 must thus be due to

the inclusion of information that reduces the strong negative correlation between the two regional indicators over the forecasting period.

Thus, if the existing conditions continue unchanged into the future, the West will suffer longer from the current downturn than the East and the path of GDP growth in the West is expected to be below average for quite a while. In addition, because of the negative correlation existing with the West, the current extraordinary expansion phase experienced by the MENA region will terminate. Nevertheless, even when reverted back to the mean, the growth pattern of the region is likely to be higher than the one of the West or the East.

## 8 Some robustness analysis

Data of countries other than the 15 we consider are consistently available only since the late 1990. What would happen to the regional indicators we derive if a larger cross section (but a shorter time series) is used to select the specification of the model and to construct indicators? Would the tendencies we have described change? Would the heterogeneity we document become stronger or weaker?

To answer these questions we add Malta, Croatia, Bosnia, Serbia, Montenegro, Slovenia, Lebanon and Libya to the cross section of countries but use data from 1998 in the estimation of the model. Despite the short time series the presence of a sufficiently large cross section makes standard errors reasonable and estimation results interpretable.

We contrasted the fit of three potential specifications. The first one includes just one common indicator for the Mediterranean. The second has three regional indicators, where the West now captures fluctuations in Portugal, Spain, France, Italy, Greece, Cyprus and Malta, the East fluctuations in Albania, Croatia, Macedonia, Serbia, Montenegro, Slovenia, Bosnia, Turkey and Israel and the MENA common fluctuations present in Syria, Lebanon, Jordan, Egypt, Tunisia, Algeria, Morocco and Libya. The third specification has instead four regional indicators capturing the common features of business cycle fluctuations in the Euro area (Portugal, Spain, France, Italy, Greece, Malta and Cyprus), in Balkan Europe (Albania, Croatia, Macedonia, Serbia, Montenegro, Slovenia, Bosnia), in the East of the Mediterranean

(Turkey, Israel, Syria, Lebanon, Jordan) and in Africa (Egypt, Tunisia, Algeria, Morocco, Libya). The best fit is still obtained by a model with three factors (log marginal likelihood is -640) but the difference with the other two specifications is small (log marginal likelihoods are -642 for the model with one factor and -644 for the model with 4 factors). Thus, even with this dataset, a model with three regional indicators appears to be statistically preferable.

We plot in figure 7 the time path of the indicators this model delivers. Comparison with figure 2 reveals that over the common sample, the time series features of the East and of the MENA indicators changed little: the MENA indicator tells us that the region experienced a period of above-average growth in the 2000s, that this tendency suffered a temporary setback in 2008, partially reversed in 2009. The East indicator also displays a period of above average growth in the 2000, however, smaller than in the MENA countries. This period comes to an abrupt end in 2008 and in 2009 the indicator lies significantly below zero. For the West indicator, some differences exist primarily because Malta and Cyprus are idiosyncratic to the rest of the countries in the group. While this makes the big fall visible in figure 2 in 2008 and 2009 insignificant, the dynamics of the point estimate are pretty much the same in the two figures. This pattern thus confirms that being part of the Euro is not necessarily crucial to understand the nature of cyclical fluctuations in the region.

Hence, the dynamics of the indicators we construct are robust to the choice of countries and of the sample to take seriously both the facts we described in previous sections and the implications we derived. In particular, even with a larger cross section of countries, the Mediterranean basin seems to be geographically split into three main areas, where national and idiosyncratic factors matters a lot in non-EU countries, where local convergence and divergence coexist and where the 2008 crisis seems to have very unequally affected the countries in the region.

## 9 Conclusions

This paper investigates the nature of cyclical fluctuations in the Mediterranean region and its convergence process; studies the relative importance of regional and national factors in determining the magnitude and the duration of cyclical fluctu-

ations; and characterizes the features of cyclical fluctuations in 15 countries in the basin. The model we employ allows us, among other things, to construct observable indicators capturing regional, national and idiosyncratic influences and to assess their relative importance for cyclical fluctuations in the basin.

Our investigation unveils four major facts. First, heterogeneities are important and cyclical fluctuations in Eastern and Southern countries are distinct from those of the major European countries in the area in terms of features and structure. Second, the time variations we observe are not easily reconciled with either a pure convergence or a pure decoupling view of cyclical fluctuations. Both phenomena, in fact, are present in Mediterranean, but more importantly, both appear to be local in nature, temporary and potentially revertible. Third, country specific and idiosyncratic features matter for the dynamics of GDP, consumption and investment growth in several countries and, if we exclude the recent 2008 episode, their relative importance has been hardly reduced over time. Finally, if the current trends persist, our model predicts that GDP growth in the major European countries of the region will be below average for quite a while. On the other hand, countries in the east side of the Mediterranean will quickly return to above average growth rates, while MENA countries are instead expected to return to their average growth rates, terminating the exceptional growth process experienced since the early 2000s.

These facts have important implications for both theoretical discussions about the nature of cyclical fluctuations and practical policymaking activities. The heterogeneities in business cycle dynamics we uncover indicate the presence of important structural differences in the economies of the region. However, none of the traditional mechanisms emphasized by the literature (TFP differences, differences in the sensitivity to interest rate shocks, financial market frictions) is likely to be responsible for the patterns we document. Thus, further theoretical work appears to be generally needed. In addition, since convergence (or decoupling) is far from being a linear process, a combination of factors other than trade needs to be considered when analyzing the transmission of cyclical fluctuations in the region. In general, our investigation demonstrates that polarized views, where either business cycles become more similar or more different, are unlikely to capture the nature of cyclical fluctuations in the Mediterranean basin and probably also elsewhere in the world.



Finally, the fact that country specific features matter and they are not expected to wane in the near future is important for policy. Whether this is a good or a bad news depends on whether one has in mind some regional insurance mechanism (in which case cyclical heterogeneities are good) or a currency area mechanism (in which case cyclical heterogeneities are bad). In any case, the process of integration and shared prosperity, envisioned by the Euro-Mediterranean partnership, appears to have still a long way to go to materialize.

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Table 1: Log Marginal Likelihoods

| Model               | M1    | M2    | M3    | M4    |
|---------------------|-------|-------|-------|-------|
| Marginal Likelihood | -1452 | -1463 | -1450 | -1460 |

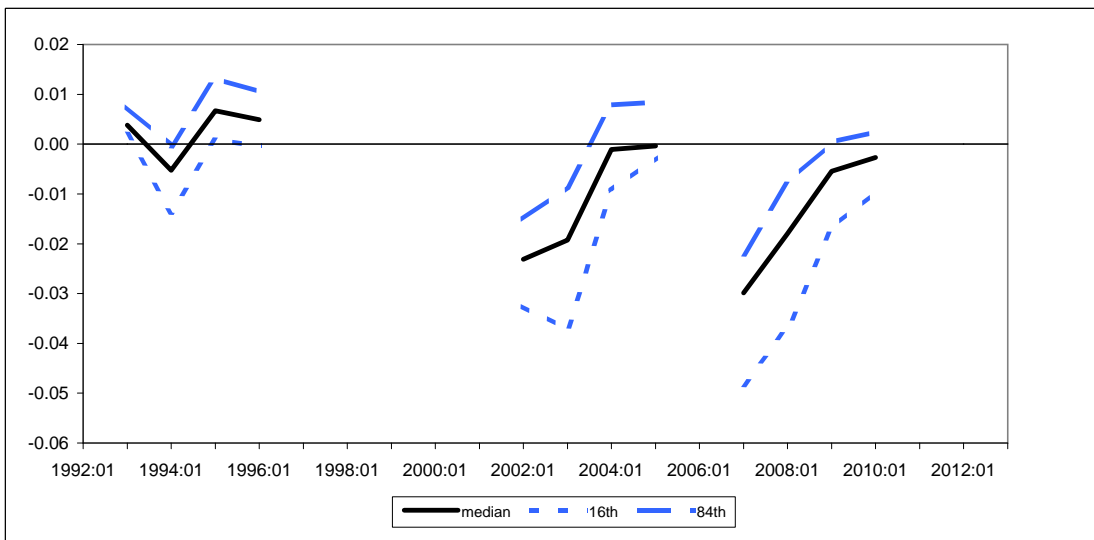
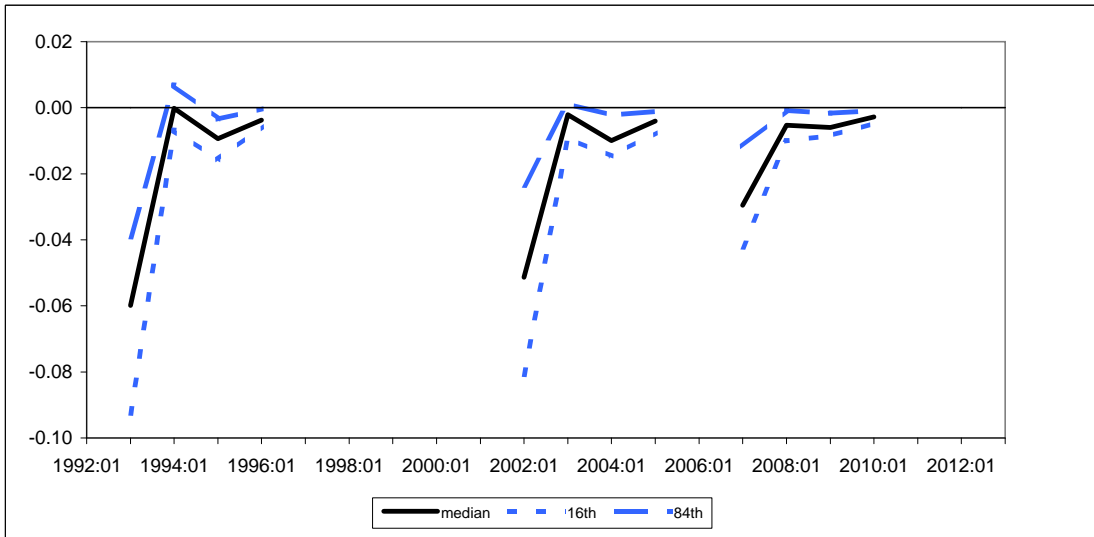
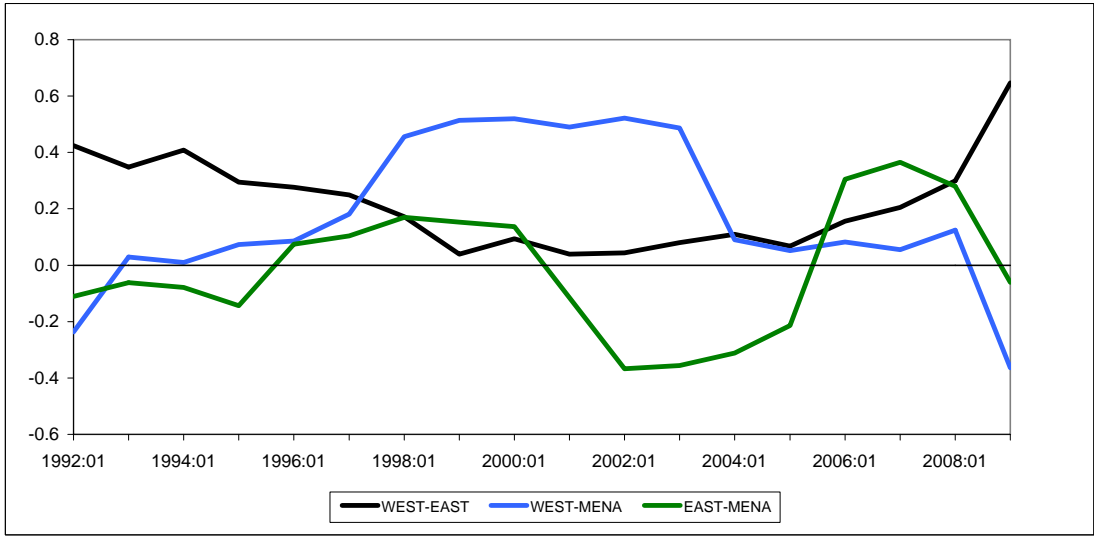
Model M1 has one common factor, Model M2 has two common factors, one for countries adopting the Euro and one for the others, M3 has three common factors, one for the coefficients of the variables of Portugal, Spain, France, Italy and Greece, one for the coefficients of the variables of Malta, Cyprus, Albania, Macedonia, Turkey and Israel; and one for the coefficients of the variables of the other countries; M4 has four common factors, one for the coefficients of the variables of France, Italy, Spain, Portugal, one for the coefficients of the variables of Greece, Cyprus, Israel, one for the coefficients of the variables of Turkey, Albania and Macedonia, and one for the coefficients of the rest of the countries.

Table 2: Percentage of the variance explained by the regional indicators

|      |           | Output growth | Investment growth | Consumption growth |
|------|-----------|---------------|-------------------|--------------------|
| West | France    | 0.85          | 0.81              | 0.55               |
|      | Italy     | 0.67          | 0.79              | 0.65               |
|      | Spain     | 0.94          | 0.93              | 0.92               |
|      | Portugal  | 0.61          | 0.51              | 0.43               |
|      | Greece    | 0.28          | 0.36              | 0.39               |
| East | Cyprus    | 0.33          | 0.09              | 0.21               |
|      | Turkey    | 0.40          | 0.31              | 0.24               |
|      | Israel    | 0.44          | 0.03              | 0.20               |
|      | Albania   | 0.08          | 0.03              | 0.08               |
|      | Macedonia | 0.05          | 0.21              | 0.11               |
| MENA | Syria     | 0.03          | 0.27              | 0.01               |
|      | Egypt     | 0.10          | 0.26              | 0.10               |
|      | Morocco   | 0.15          | 0.38              | 0.03               |
|      | Algeria   | 0.24          | 0.41              | 0.23               |
|      | Tunisia   | 0.13          | 0.20              | 0.06               |

Reported is a  $R^2$  of the regression of each variable in each country on the regional indicator.

Figure1: Rolling correlations and Impulse responses



**Figure 2: Estimated regional indicators**

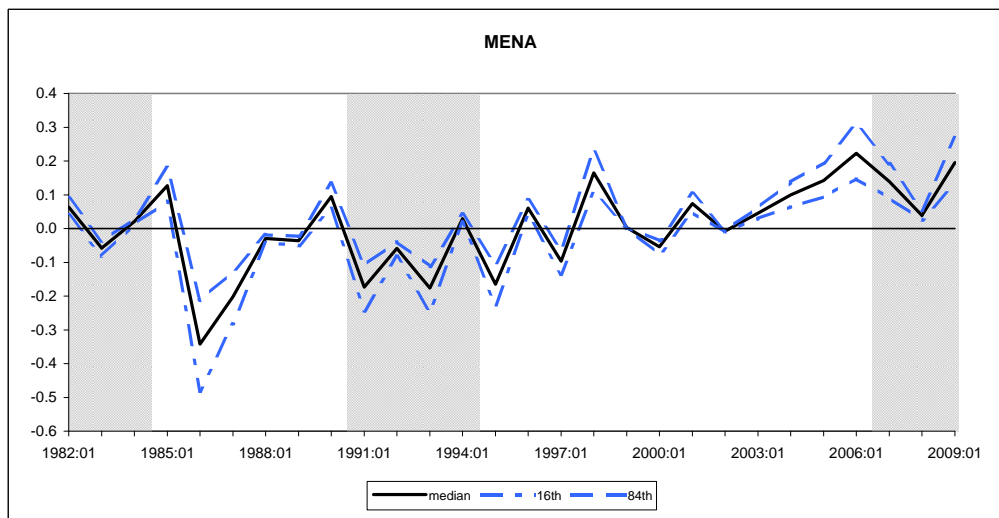
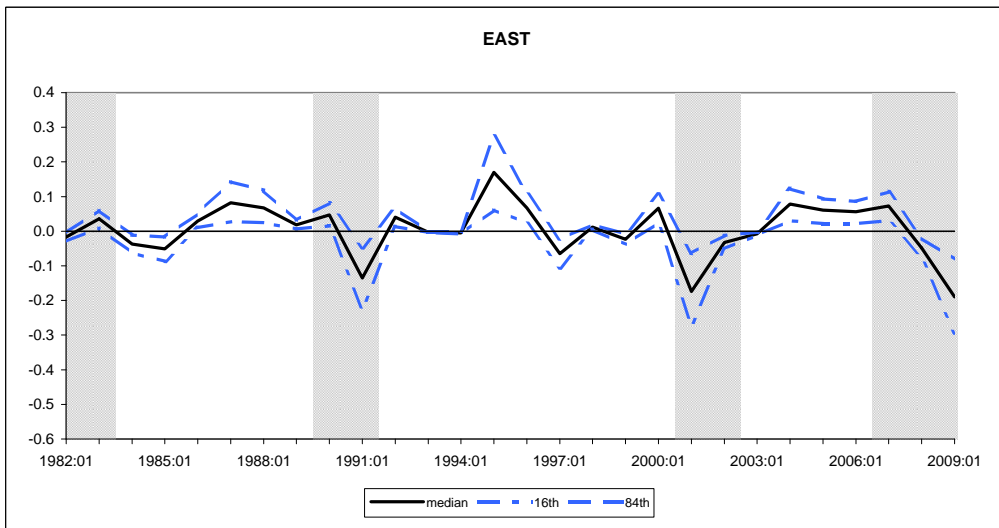
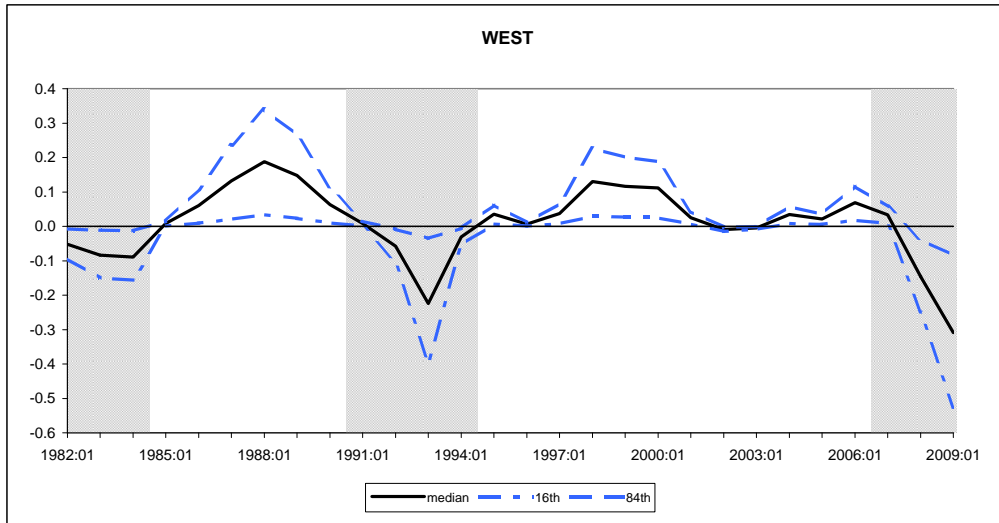


Figure 3: Historical decomposition, West

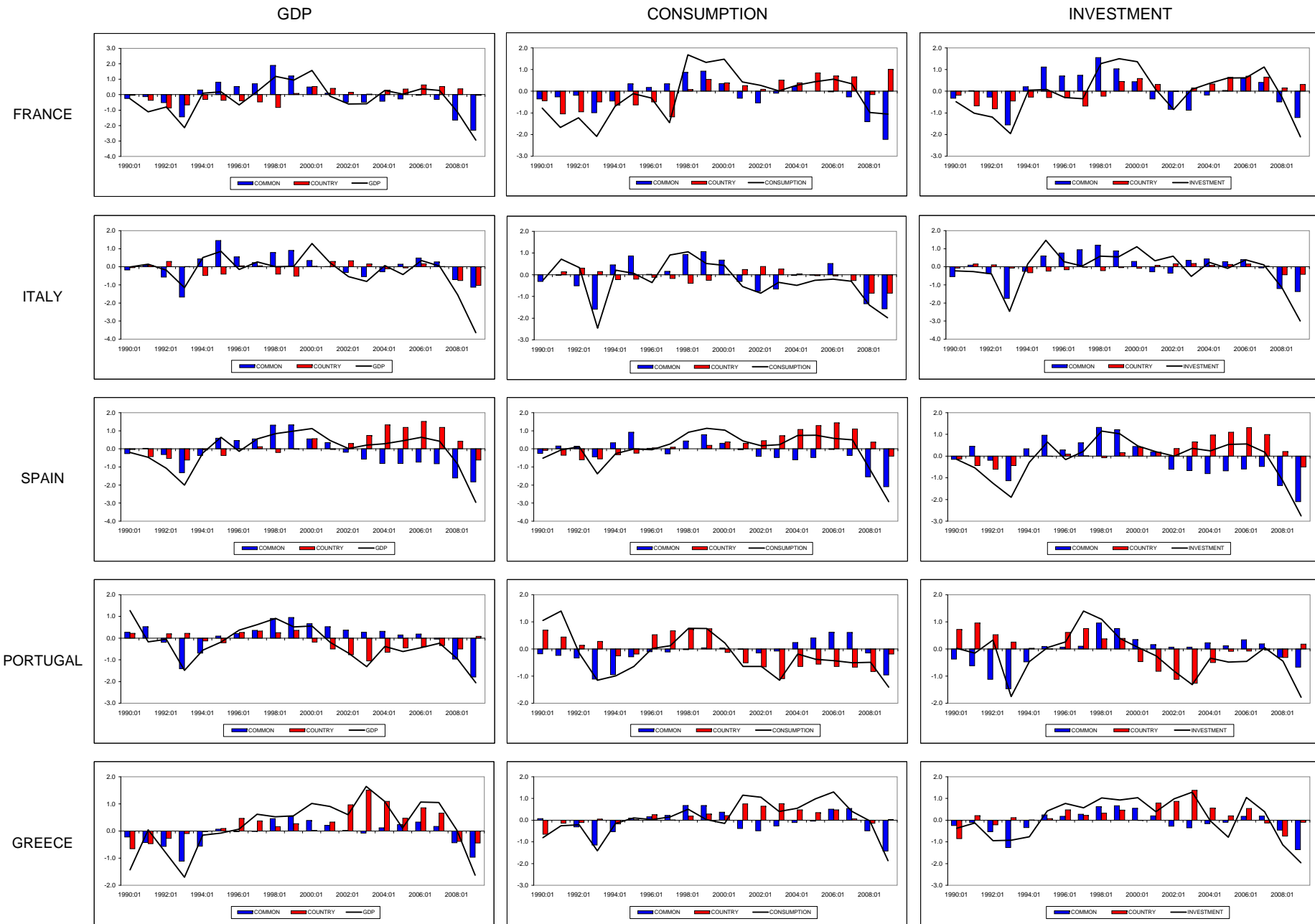


Figure 4: Historical decomposition, East

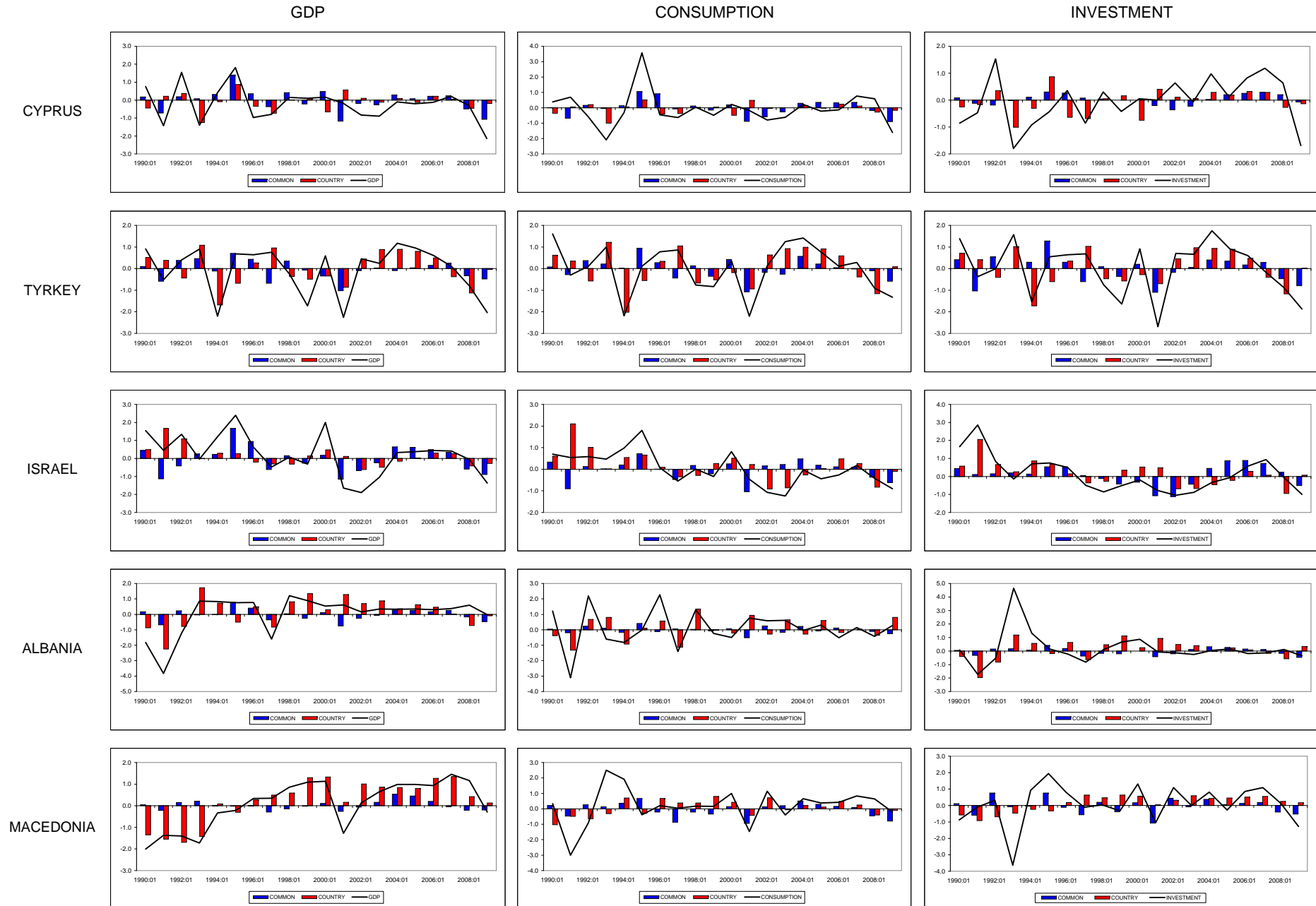


Figure 5: Historical Decomposition, MENA

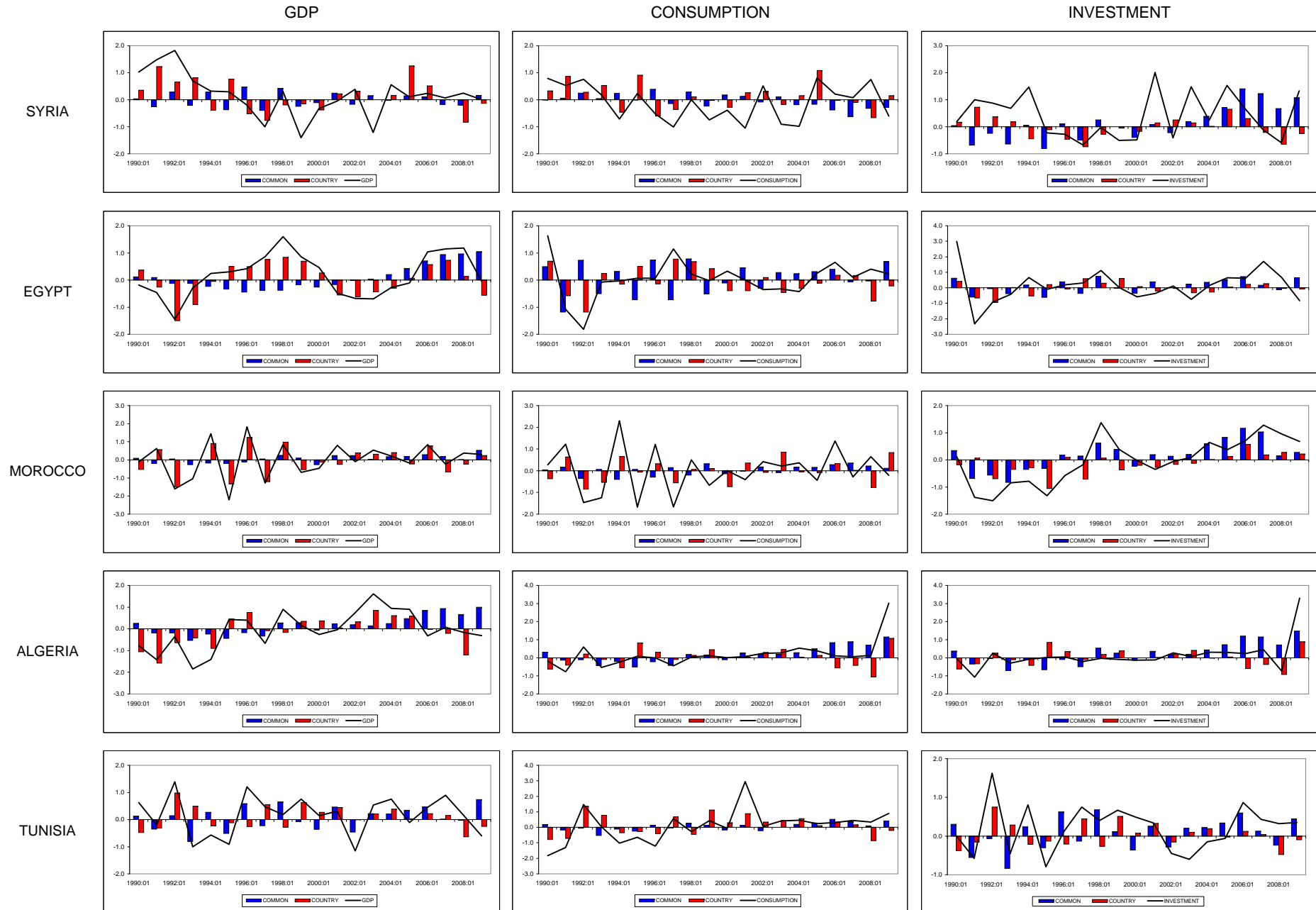
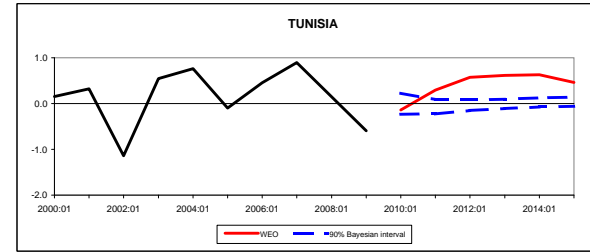
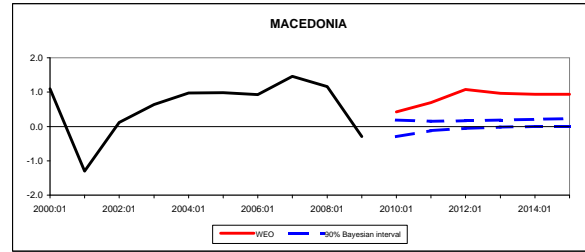
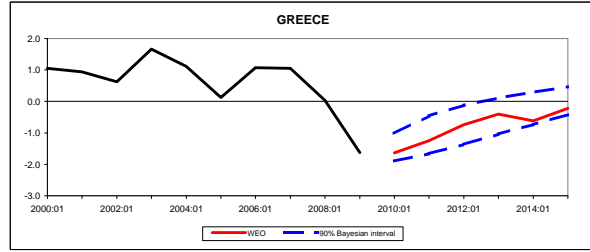
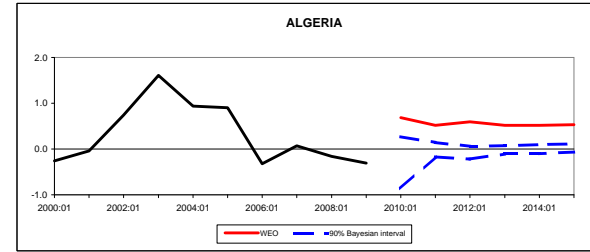
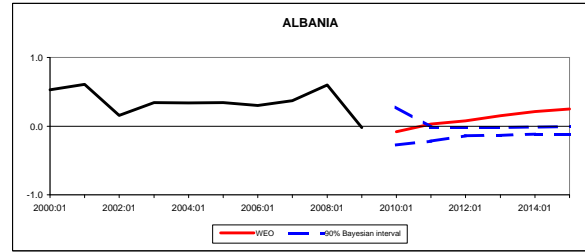
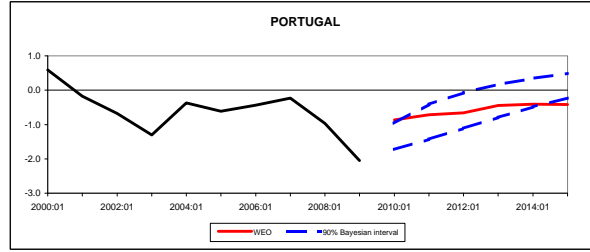
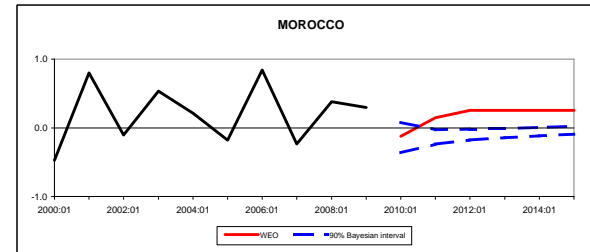
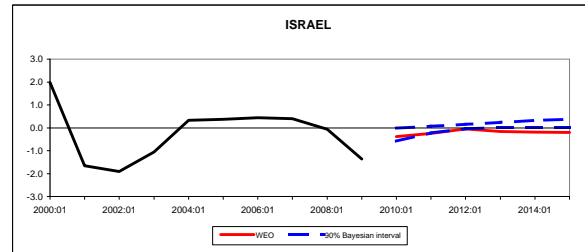
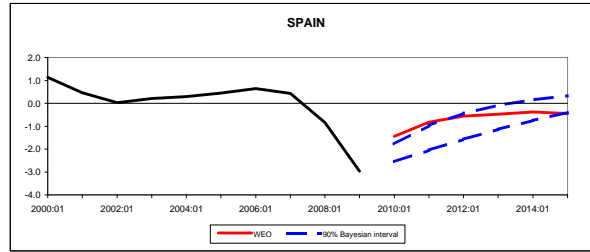
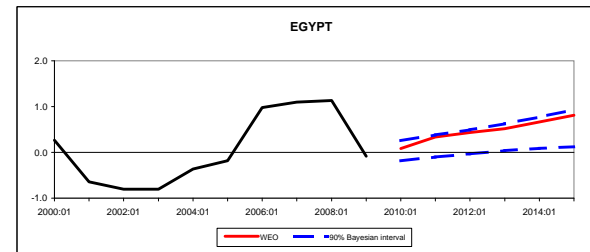
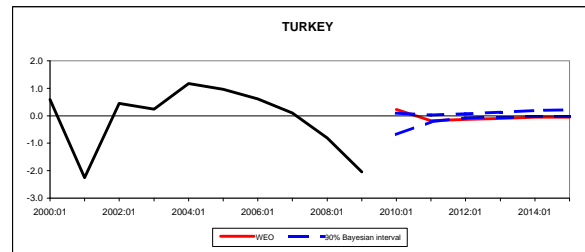
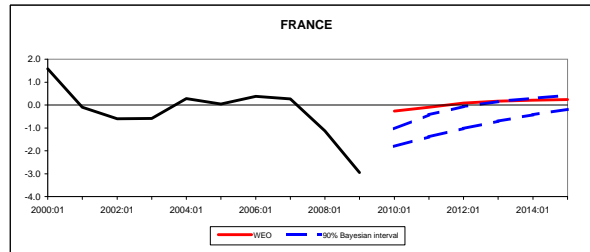
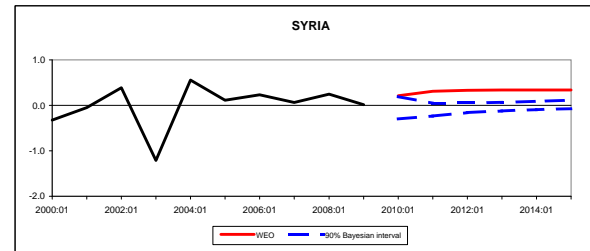
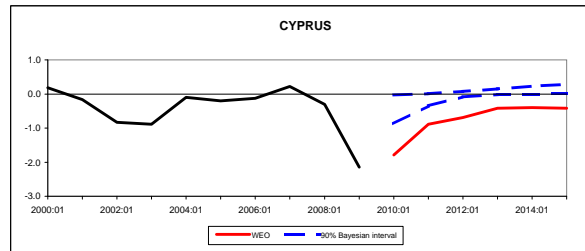
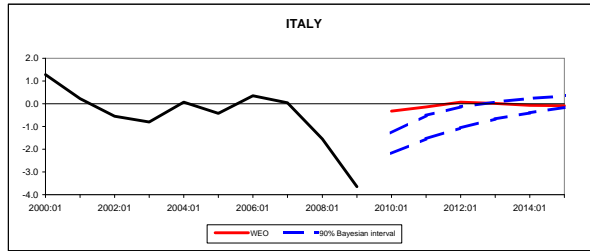




Figure 6: GDP Forecasts



**Figure 7: Regional indicators, extended dataset**

