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. We find that a model with three regional indicators, roughly covering the West, the East and the Arab-North Africa side of the Mediterranean, characterizes well the historical experience since the early 1980. Convergence and divergence coexist in the region, are temporary in nature and reversible. Domestic cyclical fluctuations are still largely due to national causes. The outlook for the next few years looks rosier for the Arab-North Africa and the East blocks than for the West.

JEL classification: C11; C33; E32

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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 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 unknown whether the Mediterranean basin conforms to these international trends. Knowledge on 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) 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 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 Gopinah, 2007, 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., 2010, Chang and Fernandez, 2010, and Benczur and Raftai, 2010, have come to opposite conclusions showing that heterogeneities are pervasive and that 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? In particular, are cyclical fluctuations in less developed countries similar to those of the most advanced Southern 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 have studied whether business cycles around the world are converging or decoupling, in the sense that cyclical differences are becoming more evident. The conventional wisdom suggests that increased cross-border interdependences should lead to convergence of business cycle fluctuations. Greater openness to trade and in-

creased 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 may 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. Heathcothe and Perri, 2004). While the evidence on the issue is contradictory, several 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 of cyclical fluctuations in the Mediterranean basin and on the time variations they displays 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 address these issues for the region. The Mediterranean basin offers an interesting laboratory to study similarities and convergence and to distinguish hypotheses of interest since developed, less developed and emerging market economies are in close regional proximity and share a number of common traits.

In the analysis, 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. None of these features is typically allowed for in conventional empirical models used in the literature on the subject. Third, it allows 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.

Our investigation proceeds in four steps. First, we construct and compare the fit of alternative 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 or not. Third, we examine how much of the fluctuations in the endogenous variables are common and how much country specific. Finally, to extrapolate existing tendencies, we perform a forecasting exercise and compare our prediction for the region with those of the World Economic Outlook (WEO) of the IMF.

We reach four main conclusions. First, important heterogeneities are present in the area: a model with three regional indicators better captures the dynamics of Mediterranean business cycles and fluctuations in Eastern and Southern countries differ from those of the major European countries in the area in terms of volatility, persistence and synchronicity. Second, the time variations in the regional indicators 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 easily revertible. Third, country specific and idiosyncratic influences matter for the dynamics of GDP, consumption and investment growth in several countries and, if we exclude the recent 2008 episode, there is very little evidence that their relative importance has been reduced over time. Finally, if the current trends persist, our model predicts that GDP growth will be persistently below average in the major European countries of the region. On the other hand, countries in the East side of the Mediterranean will quickly return to above average growth rates. Arab and North Africa countries are instead expected to return to their average growth rates over the next few years, thus ending the period of exceptional GDP growth rates experienced in this decade.

The rest of paper is organized as follows. The next section describes the empirical model and section 3 the data. Section 4 presents specification searches. 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 an out-of-sample forecasting exercise. Section 8 presents some sensitivity analysis. Section 9 concludes.

2 The empirical model

The empirical model we employ has the form:

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

where $i = 1, ..., N$ indicates countries, $t = 1, ..., T$ 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.

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. We do not allow the variance of e_{it} to be time varying but, as it will be evident below, the model we estimate permits changes in the volatility of reduced form disturbances.

While 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), they do have a cost. To see why rewrite (1) as:

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

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 δ_{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 δ_t varies in different time periods for each country-variable pair, it is impossible to estimate it using unrestricted classical methods. However, even if δ_t were time invariant, its sheer dimensionality (there are $k = NGp + Mq$ parameters in each equation) prevents any meaningful unconstrained estimation.

2.1 The factorization of the coefficient vector δ_t

Rather than estimating the vector δ_t, we estimate a lower dimensional vector θ_t, which determines the features of δ_t. That is, assume that

$$\delta_t = \Xi\theta_t + u_t \qquad\qquad u_t \sim N(0, \Sigma \otimes V) \tag{3}$$

where Ξ is a matrix, $dim(\theta_t) << dim(\delta_t)$, and u_t is a vector of disturbances, capturing unmodelled features of the coefficient vector δ_t. For example, one specification we consider has $\Xi\theta_t = \Xi_1\theta_{1t} + \Xi_2\theta_{2t} + \Xi_3\theta_{3t}$ where $\Xi_1,\ \Xi_2,\ \Xi_3$ are matrices of dimensions $NGk \times s$, $NGk \times N$, $NGk \times G$, respectively and $\theta_{1t}, \theta_{2t}, \theta_{3t}$ 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 δ_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

$$Y_t = \mathcal{Z}_t\theta_t + v_t \tag{4}$$

where $\mathcal{Z}_t = Z_t\Xi$ and $v_t = E_t + Z_t u_t$. 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 evolution over time. In fact, when at least two factors are specified, $WLI_t = \mathcal{Z}_{1t}\theta_{1t}$ 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 in the panel becomes large.

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

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

and assume $B_t = \gamma_1 * B_{t-1} + \gamma_2 * \bar{B}$, where γ_1, γ_2 are scalars, and $\bar{B}$ is a block diagonal matrix. We set $\Sigma = \Omega$, $V = \sigma^2 I_k$; and let E_t, u_t and η_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 η_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:

$$\begin{aligned} Y_t &= (Z_t\Xi)\theta_t + v_t \\ \theta_t &= \theta_{t-1} + \eta_t \end{aligned} \tag{6}$$

While the model (6) 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.

2.2 Prior information

To compute posterior distributions for the parameters of (6), 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 $\bar{B}_i = b_i * I$, $i = 1, \ldots, r$, where b_i controls the tightness of factor i in the coefficients, 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 $p\left(\theta_0 \mid \mathcal{F}_{-1}\right) = N\left(\bar{\theta}_0, \bar{\mathsf{R}}_0\right)$ 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 θ_0 and the law of motion for the factors imply that $p\left(\theta_t \mid \mathcal{F}_{t-1}\right) = N\left(\bar{\theta}_{t-1|t-1}, \bar{\mathsf{R}}_{t-1|t-1} + B_t\right)$.

We collect the hyperparameters of the prior in the vector $\mu = (\sigma^2, \gamma_1, \gamma_2, z_1, Q_1, \varpi_0, S_0, \bar{\theta}_0, \bar{\mathsf{R}}_0)$. Values for the elements of μ 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 $z_1, \varpi_0, S_0, \bar{\mathsf{R}}_0$) or chosen to maximize the marginal likelihood of the model (this is the case of σ^2, γ_0, γ_1). 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 $\bar{\mathsf{R}}_0 = \mathrm{I}_r$. Here $\hat{Q}_1$ is a block diagonal matrix $\hat{Q}_1 = diag\left(Q_{11}, ..., Q_{1N}\right)$ 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 θ_t. Since the fit improves when $\sigma^2 \to 0$, we present results assuming an exact factorization of δ_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

$$L \propto |\Omega|^{-T/2} \exp\left[-\frac{1}{2} \sum_t \left(Y_t - Z_t \Xi \theta_t\right)' \Omega^{-1} \left(Y_t - Z_t \Xi \theta_t\right)\right] \tag{7}$$

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

For the model we use, it is impossible to compute $p\left(\phi \mid Y^T\right)$ 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 ϕ. Denoting

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

$$\begin{aligned}
\theta_t \mid Y^T, \phi_{-\theta_t} &\sim N\left(\bar{\theta}_{t|T}, \bar{\mathsf{R}}_{t|T}\right) \quad t \leq T, \\
\Omega^{-1} \mid Y^T, \phi_{-\Omega} &\sim Wi\left(z_1 + T, \left[, \sum_t \left(Y_t - Z_t \Xi \theta_t\right)\left(Y_t - Z_t \Xi \theta_t\right)' + Q_1^{-1}\right]^{-1}\right) \\
b_i \mid Y^T, \phi_{-b_i} &\sim IG\left(\frac{\varpi^i}{2}, \frac{\sum_t \left(\theta_t^i - \theta_{t-1}^i\right)'\left(\theta_t^i - \theta_{t-1}^i\right) + S_0}{2}\right)
\end{aligned} \tag{8}$$

where $\bar{\theta}_{t|T}$ and $\bar{\mathsf{R}}_{t|T}$ are the smoothed one-period-ahead forecasts of θ_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 (8) produces in the limit draws from the joint posterior of interest. From these, the marginal distributions of θ_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 draws of WLI_t^h for each t and taking the 5th and the 95th percentile of the distribution. 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 to conduct posterior inference at each t.

3 The data

The data we use comes from the WEO database at the IMF and covers annual data for 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 the shorter time span 1999-2009. Severe data limitations prevents us from using higher frequency data in the exercise: 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. Data for other private sector variables (such as employment and labour market variables) 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.

Given the frequency of the data, standard lag length selection criteria prefer just one lag in our original panel VAR model. We use as sole exogenous variable the world real GDP, provided by the WEO. This variable also enters the VAR with just one lag. Variables are all demeaned and standardized prior to estimation. This makes the equal weighting scheme implicit in (6) and the resulting analysis meaningful.

3.1 Some features of the Mediterranean economies

Before proceeding to the empirical analysis, it is useful to present some facts about the less known Mediterranean economies. Most of the information we provide is obtained from the Euro-Mediterranean statistics compiled by Eurostat and from the EU site 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 are poor. Their income per capita ranges from 2161 US dollar in Egypt to 10,472 US dollars in Turkey and the poorest countries are all located in the North Africa-Middle East region. In comparison, the income per-capita of two non-Euro area European countries in the database is almost twice as large as the one of Egypt and Morocco. These numbers are also confirmed by poverty ratios: for example, 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 North Africa- Middle East 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 the last ten year 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 then 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 various economies 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 small. In absolute terms they account for less than one percent of their 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 an important factors to be considered. Financial linkages are not quantifiable, but they are likely to limited due to legislation restrictions and the general riskiness of the region, plagued by civil and religious conflict.

Migrations from the East to the West of the Mediterranean were strong in the early 1990s and 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 are 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 important source of imported cyclical fluctuations in certain parts 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 cyclical reflecting the 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 output 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 massified tourism industry, such as Albania, the sector has grown at a rate of about 15 percent 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 could be responsible for an important portion of the 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. Furthermore, despite the increased interdependences over the last decade, it is important to know whether regional and national factors still dominate the cyclical fluctuations in the area.

4 Similarities or heterogeneities?

We specify four alternative models, which we label M1 to M4, and compare their in-sample fit using the marginal likelihood, which we compute using an harmonic mean estimator (see Canova, 2007). The marginal likelihood is akin to an $\bar{R}^2$ and tells us which specification is relatively more successful in explaining the joint fluctuations in the 45 endogenous variables of the model. To interpret the results, however, one needs to select a loss function. With a 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.

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 - that is, θ_{1t} is a scalar; in model M2 we have two common factors, one for the coefficients of the variables in the countries currently adopting the Euro and one for the coefficients of the variables of the other countries - here θ_{1t} is a 2×1 vector; in model M3 we have 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 Cyprus, Albania, Macedonia, Turkey and Israel; and one for the coefficients of the variables of the other countries - thus θ_{1t} is a 3×1 vector; and in model M4 we have again two common factors: one for the variables of the countries whose real per-capita GDP in 1980 was above the mean (France, Italy, Spain, Portugal, Greece, Cyprus, Israel and Macedonia) and one for the variables of those countries whose real per-capita GDP was below the mean (the rest). These specifications allow us to examine whether a single indicator is sufficient to explain the fluctuations in the entire Mediterranean region (in which case model M1 will have the best fit), or whether regional heterogeneity is important. Differences in the fit between models M2, M3 and M4 will indicate the factors that may contribute to generate heterogeneities. In particular, we would like to know whether belonging to the Euro area matters for the type of cyclical fluctuations a country experiences; whether the initial conditions of the country matters for grouping cyclical fluctuations of the region and whether there are identifiable geographical patterns in the dynamics of Mediterranean business cycles. Table 1 reports the results of our exercise.

Two features of the table are worth discussing. First, the two best fitting models are M1, where there is just one common factor, and M3 where there are three regional factors and the worse ones are M4, where factors are constructed using information about initial conditions of real GDP per-capita and M2, where the factors reflect participation or not to the Euro. Thus, the wealth of a country in the 1980 and the monetary arrangement a country selects has no influence on the cyclical dynamics experienced by a country. Second, in terms of fit, models M1 and M3 are similar and no firm conclusion can be drawn about the relative quality of the two specifications just using statistical criteria.

Table 1: Log Marginal Likelihoods

Model	M1	M2	M3	M4
Marginal Likelihood	-1452	-1463	-1451	-1464

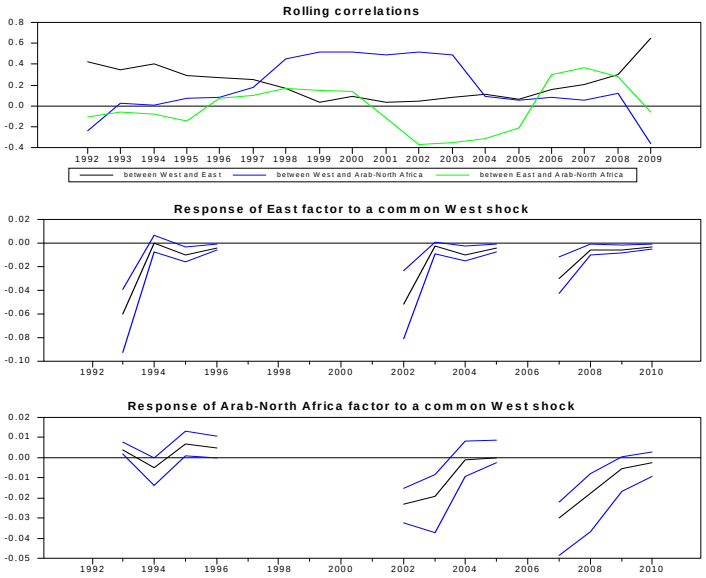
Model M1 has one common factor, Model M2 has two common factors, one for countries adopting the Euro and one for the others, M3 has three factors, one for the coefficients of the variables of Portugal, Spain, France, Italy and Greece, one for the coefficients of the variables of Malta, Cyprus, Albania, Macedonia, Turkey and Israel; and one for the coefficients of the variables of the other countries; M4 has two common factors which depend on whether the initial real GDP of the country was above or below the mean (above the mean are France, Italy, Spain, Portugal, Greece, Cyprus, Malta, Israel and Macedonia, below the mean the rest).

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. In particular, while the late 1980s were a period of increased convergence, the mid 1990s displayed a reversal of that tendency and the late 2000s show marked divergence pattern in the cyclical properties of various regions in the Mediterranean. To show that this is indeed the case, we plot in figure 1 the estimated pairwise rolling correlation of the three regional indicators obtained with model M3 and the dynamic effects of a shock common to the variables of the main European countries (the "West") on the indicators of the other two blocks (the "East" and the "Arab-North Africa") at three different dates: 1993, 2002, 2007. Rolling correlations are computed using 10 years of data ending at the date listed on the horizontal axis. Dynamic responses 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 estimated correlation between the indicators of the West and the East has an inverted 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 Arab-North African blocks is small up to the mid-1990s, it increases substantially up to the mid-2000s and then drops significantly into the negative territory when

the last two years of the sample are used. It is also evident that shocks originating in the West had different effects on the East indicator and on the Arab-North African indicator at different dates. For example, there is much less spillover to the East and a much stronger negative effect on the Arab-North African indicator in 2007 and in 2002 than in 1993.

Figure 1. Rolling correlations and impulse responses



While model M1 can't capture these time varying transmission features, since it forces one common indicator on the whole region for all times, it may have a 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 produces, reduces information uncertainty. However, even though model M1 has a reasonably good statistical fit, it seems preferable to focus on model M3 which has a clearer economic interpretation. Thus, in the next sections we will examine the regional indicators and the dynamics for the endogenous variables as captured by this specification.

Two main conclusions emerge from our model comparison exercises. First, business cycle dynamics do not seem to depend on initial conditions nor on the particular

monetary arrangement a country may decide to adopt. Thus, for example, the depth or the length of recessions are not necessarily linked to poverty or improvements in the monetary policy stance. Second, business cycles in different regions of the Mediterranean have different dynamics. Their relationship has gone through periods of increased and decreased synchronicity, with Arab-North Africa becoming generally more correlated and the East generally less correlated with the West. A marked change also appears to occur in the last two years of the sample: the Arab-North Africa region is escaping the crisis while the West and the East are similarly and strongly hit by the recession it generates.

5 Convergence? The dynamic patterns of regional indicators

Next, we study the dynamics of the three regional indicators we construct to assess their reasonableness and to highlight some important facts about the evolution of cyclical fluctuations in the Mediterranean basin. Figure 2 presents the indicators. In each box there are three lines: the central black line represents the median of the posterior distribution of the indicator at each point in time; the blue lines represent a pointwise 68 percent posterior credible set.

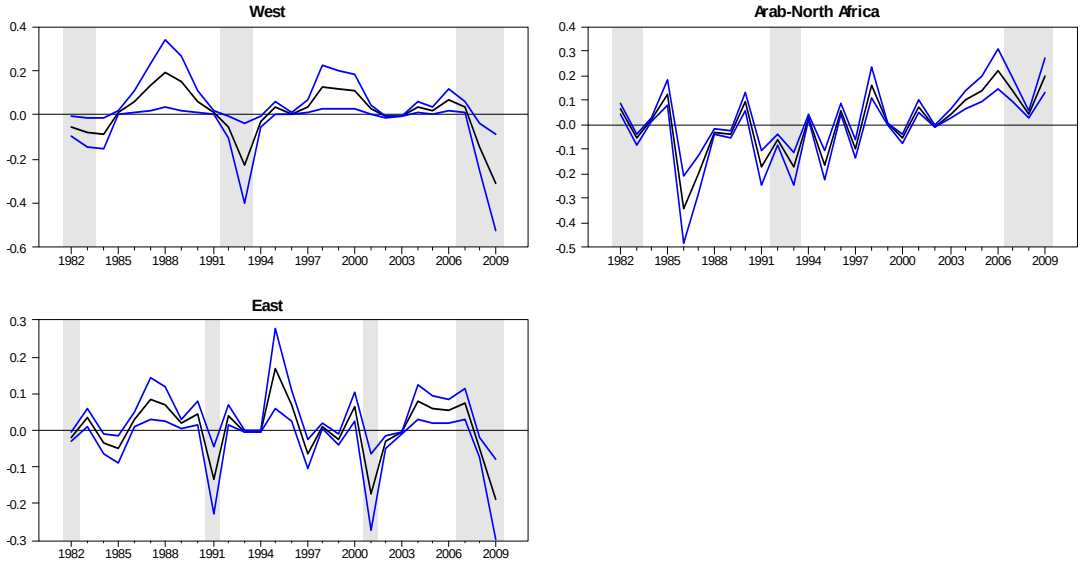
The West indicator is relatively persistent, it displays three recessions located at the official CEPR dates for the whole of Euro area (represented by the shaded area), two relatively strong expansions culminating with peaks in 1988 and 1998, and a significant slowdown around 2001-2002. The synchronicity 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 Euro area 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 and slightly more volatile than the West indicator and has numerous ups and downs. In particular, it displays signif-

icant 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. Three additional 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 if we exclude the last two years of the sample, business cycles in the East of the Mediterranean are decoupled from those in the West and more related to cyclical conditions prevailing outside of the EU. To restate this conclusions differently, the East is more affected by the US business cycle than the European business cycle. This is in part due 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.

Figure 2. COMMON FACTORS

posterior median and 68% Bayesian credible interval



The Arab-North Africa indicator is more difficult to characterize. It displays

important negative serial correlation, large volatility and a long upward trend, indicating a generic process of growth convergence within the Mediterranean basin. It features three recession phases, with troughs in 1986, 1991-93 and 2000, three expansion phases culminating in 1985, 1990 and 1998 and a long period of higher than average growth in the 2000s, temporarily and mildly interrupted in 2008. Thus, the cyclical fluctuations of countries of this block are different from those in the EU and the US (shaded areas here are CEPR official recession dates) and better represented as transitional dynamics rather than well identified fluctuations around a given trend growth path. In general, the business cycle dynamics of this block resemble those of other emerging market economies and their proximity with the EU has little influence on the way these economies behave over the cycle.

In sum, business cycles in different regions of the Mediterranean are different in terms of volatility, serial correlation and regional synchronicity. Perhaps more importantly, the regional indicators we construct do not show any clear tendency to become more similar over time nor to diverge.

6 What drives cyclical fluctuations?

The analysis of the previous section is useful to understand the structure and the time variations of the cyclical fluctuations present in the Mediterranean region. However, one would also like to know how important these indicators are for the dynamics of GDP, consumption and investment of the 15 countries we consider. It is in fact possible that, while statistically and economically relevant, the regional indicator captures only a small portion of the cyclical fluctuations in certain countries, in which case, it is important to study what factors drive the dynamics of their business cycles. To examine this possibility we first ask how much of the fluctuations in each of the endogenous variables are accounted for by the regional factor and report in Table 2 the fraction of the volatility explained for each country-variable pair.

Second, we perform an historical decomposition exercise, where the fluctuations of each of the variables for each of the countries at each point in time are decomposed into the components due to the regional indicators, the national indicators, the variable indicators and to an indicator that captures the remaining unexplained

fluctuations. These decompositions, which we present in figures 3 to 5, are more informative, in general, since they examine fluctuations at each point in time rather than on average.

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

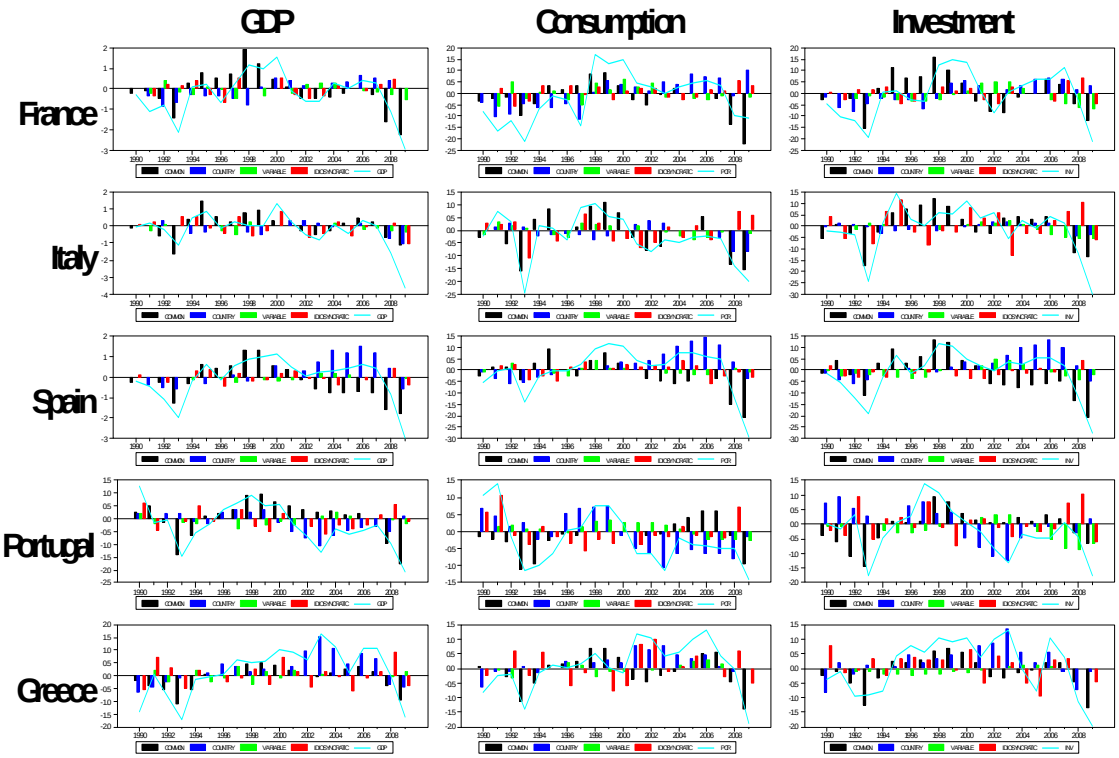
		Output growth	Investment growth	Consumption growth
West	France	0.85	0.81	0.55
	Italy	0.67	0.79	0.65
	Spain	0.94	0.93	0.92
	Portugal	0.61	0.51	0.43
	Greece	0.28	0.36	0.39
East	Cyprus	0.33	0.09	0.21
	Turkey	0.40	0.31	0.24
	Israel	0.44	0.03	0.20
	Albania	0.08	0.03	0.08
	Macedonia	0.05	0.21	0.11
Arab- North Africa	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

There are some interesting patterns we would like to comment upon. First, in the West and excluding Greece, the regional indicator explain a larger proportion of domestic fluctuations than the national indicator on average. When we look at individual years, the importance of the regional indicators is clear in France, Spain, Portugal in e.g. 1998 and 2008, while national indicators are relevant in the early 2000s in Spain and Greece. Second, 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 the two other variables and, as figure 3 indicates, tend correlate negatively with the regional influences.

Second, for the East block the common indicator has limited importance in explaining 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 factor loads more heavily on Turkey and Israel variables, confirming the supposition that these two countries drive the differences in the East and the West indicators.

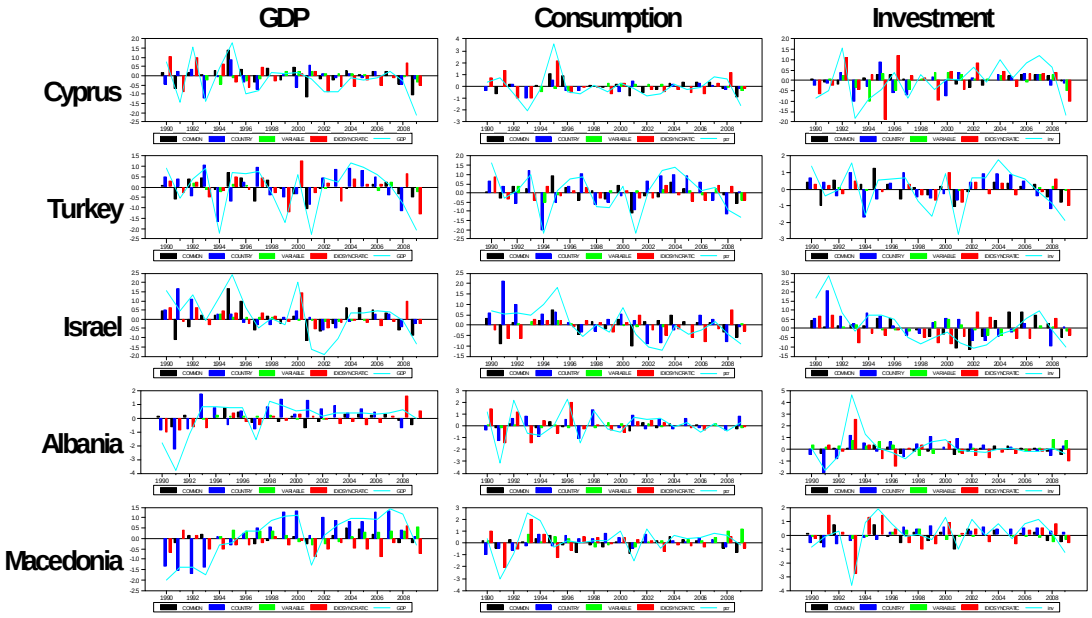
Figure 3. Historical decomposition. West



Third, in the Arab-North Africa block, and if we exclude the last two years of the sample, 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 equally driven by all factors.

Among the countries in the block, the one that contributes most to the dynamics of the regional indicator is Algeria; the one that contributes less is Syria.

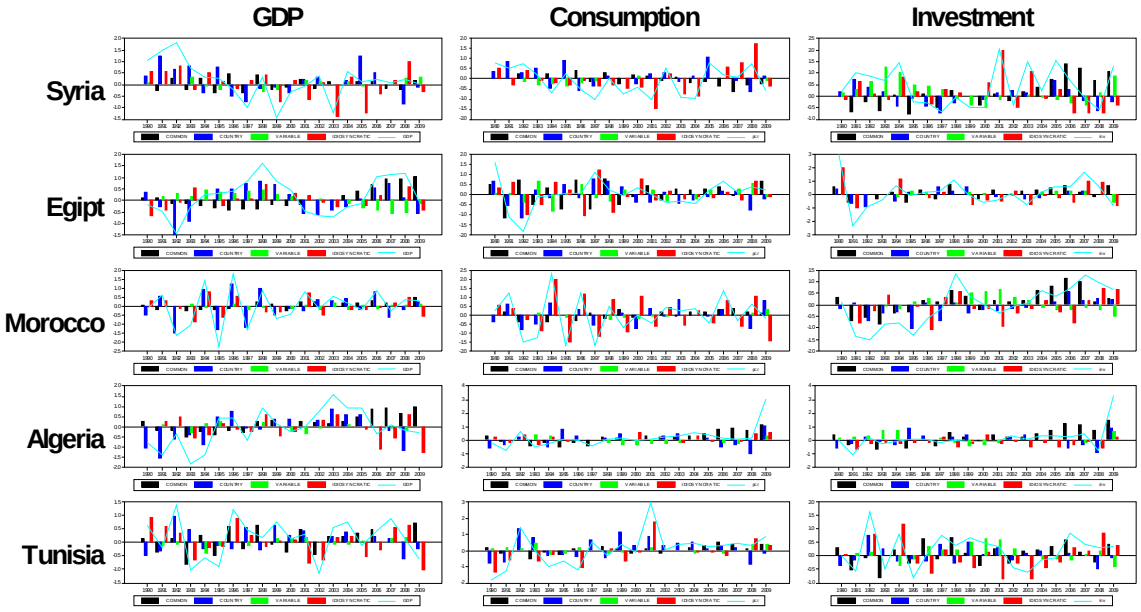
Figure 4. Historical decomposition. East



Hence,, while regional factors are identifiable, their importance in explaining cyclical fluctuations in GDP, consumption and investment growth varies with the region, the country and, to some extent, the period under consideration. Perhaps more interestingly from our point of view, national influences are important for many non-Euro countries in the area, they are as important as they were at the beginning of the sample and tend to counteract the regional patterns we have previously described. Hence, not only the dynamics of business cycles in the Mediterranean basin are heterogeneous and show little evidence of convergence; idiosyncratic and national factors are crucial to explain cyclical fluctuations. Thus, the Mediterranean basin looks quite peculiar relative to the rest of the world: there is one area with a well defined regional business cycle (which includes Portugal, Spain, Italy and France) and 10 or 11 independent national business cycles, largely unsynchronized

among each others and with a lot of idiosyncratic features relative to the main regional block. To shed some light on the future business cycle developments in Mediterranean basin we conduct next a simple forecasting exercise.

Figure 5. Historical decomposition. Arab-North Africa



7 What should we expect to happen next?

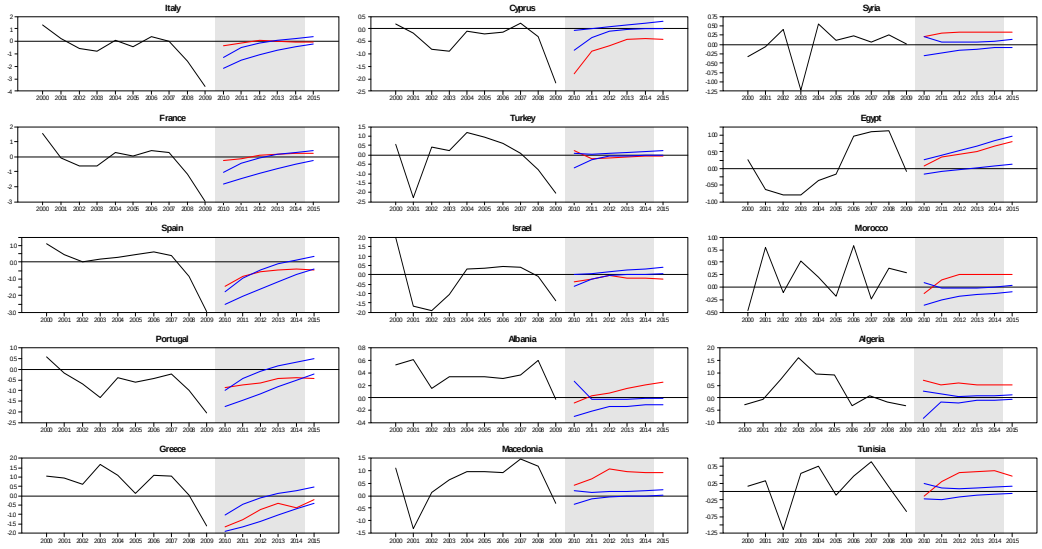
Apart from characterizing business cycle fluctuations and helping us to interpret cyclical dynamics in terms of common, country and variable specific influences, our model is well suited for out-of-sample forecasting exercises. As shown in Canova and Ciccarelli, 2009, the specification can be used for interesting conditional and unconditional prediction purposes and has good properties when compared with existing specifications.

In this section we ask what would our model tells us about the length of the current recession and the path for real GDP one expect to materialize for 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.

The results of our exercise are in figure 6: we report the actual value of the real GDP growth for each country up to 2009 and, within the shaded area, the 95 percent posterior credible interval for the forecasts (the blue lines). To have a sense of the quality of our predictions, we have also plotted the forecasts produced by the WEO for the same horizons. Our forecasts differ from those of the WEO in two important aspects: WEO forecasts include quarterly information up to the first 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.

Figure 6. Forecasting GDP: comparison with the WEO



red line = WEO; blue line = 95% bayesian credible interval

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 block, the current recession is expected to last long and there may still be a non-negligible probability that the growth rate of real GDP is below the mean (normalized to zero here) in all five countries in 2015. 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 expansion phase from 2012. Differences with WEO forecasts are larger for the countries of this block and, for example, our model is more bullish for Israel and Cyprus and more bearish for Albania and Macedonia than the WEO. Overall, the conclusion seems to be that for East Mediterranean countries the current difficulties are transitory and that real GDP is expected to revert to the normal growth rate quite soon.

The forecasts for the Arab-North Africa block 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 expansion that these countries have experienced 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 Arab-North Africa 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 must thus be due to the inclusion of information that reduces the strong negative correlation between the two regional indicators over the forecasting period.

The punchline seems to be clear: if the existing conditions continue unchanged into the future, the West will suffer longer from the current downturn than the East. In addition, because of the negative correlation existing between the north and the south of the Mediterranean at the end of sample, the current expansion phase for

the Arab-North African block will terminate and its growth pattern will revert back to its mean.

8 Some sensitivity analysis

Data from 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 short 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 disappear?

To answer these questions we add Malta, Croatia, Bosnia Serbia, Montenegro, Slovenia, Lebanon and Libya to the cross section of countries but using data from 1998 on 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.

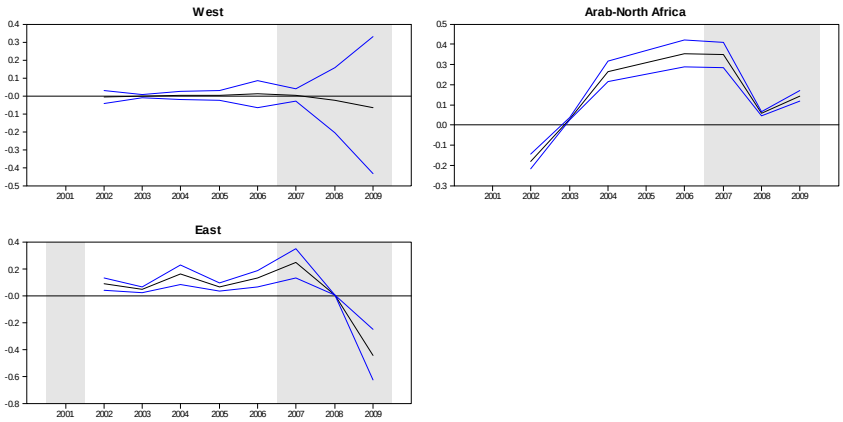
We examine the fit of three potential specifications. The first one includes just one common indicator for the Mediterranean. The second has three regional indicators, where the West now includes Portugal, Spain, France, Italy, Greece and Malta, the East includes Cyprus, Albania, Croatia, Macedonia, Serbia, Montenegro, Slovenia, Bosnia, Turkey and Israel and the Arab-North Africa group captures the common features of 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 Balcanic 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 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). Differences among specifications are more evident when we look at the residuals: those of a model with just one factor tend to be heteroskedastic while those of a model with four factors display stronger serial correlation. Thus, even

with this dataset, a model with three regional indicators is preferable.

We plot figure 7 the time path of the indicators we construct. Comparison with figure 2 reveals that over the common sample, the time series features of the East and the Arab-North Africa indicators changed little: the Arab-African 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 Arab-African 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 emerge primarily because Malta and Cyprus seem idiosyncratic to the rest of the countries in the group and this makes the big fall visible in figure 2 in 2008 and 2009 insignificant. Nevertheless, the dynamics of the point estimate are pretty much the same in the two figures.

Figure 7. COMMON FACTORS

posterior median and 68% Bayesian credible interval



Hence, the dynamics of the indicators we construct are sufficiently robust to the choice of countries and of the sample to take seriously the facts we have described and the implications we have 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 factors matters a lot in non-EU countries and where local convergence and divergence coexist.

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

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. Both phenomena, in fact, are present in Mediterranean, but more importantly, both appear to be local in nature, temporary and easily 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 is 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 Arab and North Africa countries are instead expected to return to their average growth rates after the exceptional GDP growth rates experienced since the early 2000s.

These four facts have important implications for both theoretical discussions and practical policymaking activities. The heterogeneities in business cycle dynamics we uncover are consistent with the idea that various economies display structural differences. However none of the traditional mechanisms emphasized by the literature (TFP differences, differences in the sensitivity to interest rate shocks, financial mar-

ket frictions) is likely to be responsible for the heterogeneities we document. The results also show that convergence (or decoupling) is far from being linear process. Thus, a combination of factors other than trade could matter. 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. Finally, the fact that country specific features matter and they are not expected to wane in the near future is an important news is important for policy. Whether this is good or a bad depends on whether one has in mind regional insurance mechanisms (in which case cyclical heterogeneities are good) or currency area mechanisms (in which 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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