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ON THE OPTIMALITY OF THE MAGHREB AREA:
AN ANALYSIS OF
THE MACROECONOMIC SHOCKS

Mohamed Ben Abdallah & Zouheir Bouchaddakh

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Corresponding Author:
Mohamed Ben Abdallah, FSEG Tunis, University of El Manar.
E-mail: benmoha@univ-paris1.fr

Abstract

This paper studies the possibility of a monetary union in the Maghreb using the traditional criteria of the optimal currency areas theory. Firstly, we examine the degree of shocks correlation in order to see whether the shocks affecting Maghreb countries are symmetrical or asymmetrical. The analysis of the growth rates reveals dispersions and that of the inflation rates shows that essential efforts remain to be made with regards to monetary cooperation. By developing a structural VAR model based on the methodology of Blanchard and Quah (1989), we show that the macroeconomic shocks are rather heterogeneous in this area supporting the assumption of a relatively high dispersion of economic growth rates. However, our results reveal a relative symmetry of the supply shocks between Morocco and Tunisia.

ملخص

تدرس هذه الورقة إمكانية إنشاء عملة موحدة في المغرب العربي باستخدام المعايير التقليدية في نطاق نظرية العملة الأفضل. أولاً نختبر درجة ارتباط الأزمات لكي نرى هل الأزمات التي تصيب بلاد المغرب العربي متكافئة أم غير متكافئة. يبين تحليل نسب النمو أن هناك تشتت كذلك تكشف معدلات التضخم ضرورة بذل الجهود فيما يتعلق بالتعاون في مجال العملة الموحدة. فبتطوير نموذج موزع القيمة المضافة التي تعتمد على منهج بحث بلانكارد و كواه (1989)، نستطيع أن نبين أن صدمات الاقتصاد الشامل متباينة في هذه النطاق و ذلك يدعم قبول التشتت المرتفع نسبياً في معدلات النمو الاقتصادي. ألا أن نتائجنا تبين تناظر نسبي لصدمات العرض بين المغرب و تونس.

Introduction

The end of the 20th century was marked by an increasing integration of economies. Whether it was in the form of bilateral or multilateral trade agreements, of economic union or free trade areas, the economies concerned become increasingly integrated.

The developing countries were not left out of this movement — of integration based on free trade. Indeed, after having tried policies based on imports substitution and the protection of national industry, today most developing countries are engaged in processes of economic integration. Developing countries chose to adhere to the world trade organization or to join regional blocks already created by more advanced countries. It is within this framework that we can place the agreements signed by the majority of the southern Mediterranean countries with the European Union.

On the northern side of Mediterranean, economic integration was realized by the creation of a single market and followed by a complete monetary integration boasting a single currency. Further still, the European block continues to expand. In January 2007, the European Union included 27 members with the addition of Romania and Bulgaria.

However, in the southern Mediterranean states, we detect no progress of the integration process. Since signing the treaty of Marrakech which initiated the creation of the Arab Maghreb Union (AMU) in February 1989 two decades have passed and we are still far from a unified economic area in the Maghreb.

The purpose of this paper is to try to reanimate the debate on Maghreb integration. We specifically want to stress on monetary integration as a better engine of integration in the Maghreb. Rather than debate whether the Maghreb countries should form an optimal currency area or not, this article will focus on symmetry (or asymmetry) shocks in the economies of the Maghreb.

To that effect, the paper will proceed as follows. The first section studies monetary integration between Maghreb countries in the light of developments in the theory of optimal currency areas. In the second section we analyze the macroeconomic shocks inside the Maghreb area from a static as well as a dynamic point of view. We offer our conclusion in the third section.

1. The Maghreb and Traditional Criteria of Optimality

When we evoke monetary integration between a group of countries we are raising the question whether the group constitutes an optimal currency area or not.

The first works on the optimal monetary areas sought to define the structural characteristics of an economy which could make the variation of the exchange rate with respect to the other currencies useless or ineffectual. The works of Mundell (1961), Ingram (1962), McKinnon (1963) and Kenen (1969) constitute the approach known as "traditional" theory of optimal currency areas.

The Mobility of the Factors of Production

It is the article of Mundell (1961) that jump-started the debate on the concept of "optimal currency area". The criterion suggested by Mundell to define an optimal currency area is the mobility of factors of production. Thus, an optimal currency area is characterized by a strong mobility of factors within the area and a low mobility between the area and the rest of the world. For Mundell, the mobility of labor could replace the variation of the exchange rate as the means of adjustment to shocks affecting the regions of the area. The typical example is

the USA where labor mobility is relatively strong and plays an important role in the absorption of asymmetric shocks between regions.¹

In the case of the Maghreb countries, the mobility of labor is not very high and remains especially prone to the diplomatic relations. The immigrant workers in other Maghreb countries, on several occasions, paid the price of diplomatic tensions between their country of origin and the host country. However, the mobility of labor inside the Maghreb area can be easily stimulated given the relative homogeneity of socio-cultural conditions.

In the same line as Mundell, Ingram (1962) presents the criterion of capital mobility as a shock absorber of the asymmetrical shocks affecting the countries. Thus, if the area's financial market is strongly integrated, the flexibility of the exchange rate is useless. It is the flow of capital that ensures the adjustment of any payment imbalances between regions of the area. Thus, "the problems of balance of payments between the American States would be regulated easily: the mobility of the capital is indeed perfect that a credit is held on all the territory of the United States area as soon as it is emitted."²

According to this criterion of financial integration, the Maghreb is far from representing an optimal currency area. Indeed, no form of financial integration can be detected between the Maghreb countries. Control of capital flows is applied across the board, not differentiating between the Maghreb and non-Maghreb countries³. Certainly, Morocco and Tunisia have recently engaged in a process of financial liberalization, but this process does not bring in the other countries (Algeria, Libya and Mauritania). At this level, no comparison can be made with the case of Europe where the liberalization of capital movements was established at the beginning of 1993.

With both Mundell (labor factor) and Ingram (capital factor), it is the quality of adjustment to asymmetrical shocks that makes it possible to delimit the optimal currency area. The mobility of factors of production is thus presented like a remedy for the rigidity of the prices and as better substitute for the flexibility of the exchange rate which was sacrificed by adhering to a currency area. However, to establish their criteria, the authors rule out the occurrence of asymmetrical shock. Neither Mundell nor Ingram wonders about the origin of the asymmetry. However, this was the concern of McKinnon (1963) and Kenen (1969).

The Degree of Openness of the Economy

For McKinnon (1963), an economy is open if the ratio of traded goods/non-traded goods is high (i.e. foreign trade represents a high percentage of national income). In the extreme case where the economy is completely open (i.e. where all the consumed and invested goods would be imported and all the produced goods would be exported), the interior prices would be necessarily given outside. In this case, it becomes impossible to cause any monetary illusion by means of exchange rate depreciation. Thus, "the competitive advantage" that a currency depreciation is supposed to give will not work since in this very open economy, the prices in terms of foreign currency are constant. The national prices are aligned on the external prices so that the prices in terms of national currency increase in the exact proportion

¹See, for example, works of Blanchard and Katz (1992) and De Grauwe (1992).

²Salin (1974), p.102.

³A light reduction of this control is to be noted in Morocco and Tunisia with the introduction of partial convertibility of the dirham and the dinar.

of monetary depreciation. The flexible exchange rates are not efficient to stabilize an economy subjected to external fluctuations.⁴

On the empirical level, the degree of openness of an economy is estimated by the share of foreign trade in the GDP. To use McKinnon's criterion, we must consider the trade (exports and imports) of the country in question with other countries of the area to which it belongs. Indeed, it is only with these countries that the instrument of the exchange rate would not be usable in the event of constituting currency area.

The Maghreb area is characterized by a very weak intra regional trade. Indeed, the intra Maghreb trade does not exceed 3% of the Maghreb's total exports. Compared with the other areas, the Maghreb is very late in the process of regional integration (Figure 1).

Actually, the Maghreb countries seem to have a true preference for European goods and services rather than those "made in the Maghreb ". Thus, whereas the Maghreb intra trade represented, in the year 2005, less than 2% of total Maghreb countries exports, their trade with the European Union represented more than 62% of their total trade.⁵

The Diversification of the Economy

Kenen (1969) presented the degree of diversification of the economy as a criterion of optimality of a currency area. Indeed, if an economy is truly diversified, it will not be affected by changes of the external demand which will constitute only on a small part of its exports. If there is a decrease in the demand for one of the exported products, resulting unemployment should be less significant than in the case of a less diversified economy. Thus, for a well diversified economy there is no need to modify the relative prices by an exchange rate action.

Kenen's criterion assumes that the diversification of intra trade minimizes the probability of major external shocks and thus the need for a corresponding adjustment. If they do occur, the sectoral shocks are likely to cause weak macroeconomic effects. When the number of sectors concerned with regional trade is very high, the positive shocks compensate, in general, the negative shocks.

Among the indices used to measure diversification, the index of Grubel-Lloyd makes it possible to estimate the share of the intra-industry trade in total trade.

$$GL=1- \left| \frac{M_j - X_j}{M_j + X_j} \right|,$$

where M_j and X_j are imports and exports of sector j . The index is initially calculated at the sectoral level, and the second time at the total level by accounting for the weight of each sector in total trade.⁶ An index close to the unit reflects specialization within intra-sectors reflecting an exchange of similar products. On the other hand, the index of Grubel-Lloyd is close to zero in the case of inter-sectors exchanges; the countries are specialized in different sectors of activity. Figures 2, 3 and 4 show the evolution of the index of Grubel - Lloyd for the three Maghreb countries over the period 1988-2002.⁷

⁴Thus, "if one moves along the spectrum which goes from closed economies towards open economies, the flexible exchange rates become at the same time less effective as a mean of controlling the external balance and more detrimental to the internal prices stability," McKinnon (1963, p. 226).

⁵ UNCTAD Handbook of Statistics.

⁶ 72 sectors were used for the calculation of the Grubel-Lloyd index. We note that for a higher level of aggregation, the Grubel-Lloyd indicator comprises a bias towards higher values (see Fontagné and Freudenberg 1999).

⁷ Fault of data details on the exchanges of Libya and Mauritania, the index of Grubel-Lloyd could not be calculated for these countries.

Figure 2 depicts the evolution of the index of Grubel-Lloyd for each of the three countries (Algeria, Morocco and Tunisia). It gives the share of the intra-branches exchanges of each country in its total trade. A great disparity clearly appears between Tunisia and Morocco on the one hand and Algeria on the other hand. Indeed, Algeria is characterized by a Grubel-Lloyd index close to zero which means that the share of intra-branches exchanges in the Algerian foreign trade is very weak. This result is predictable since Algerian foreign trade is largely dominated by the hydrocarbon sector (more than 90% of Algerian exports relates to the oil sector). On the contrary, the Tunisian and Moroccan economies seem more diversified. Thus the share of intra-branches trade is more significant as well in total trade as in intra-Maghreb trade (figure 3).

The strong predominance of the hydrocarbon sector in the Algerian foreign trade explains why the Grubel-Lloyd index calculated for the trade between Algeria and its Maghreb partners is very close to zero. With Morocco or Tunisia, the Algerian trade is inter-branch and relates to little diversified products. A clear improvement of the Grubel-Lloyd index is recorded when we consider the Tunisian-Moroccan trade. The two countries exchange a more diversified range of products. This is likely to minimize the probability of major external shocks and the need for a corresponding adjustment. However, this improvement could be insufficient to state that the two countries constitute an optimal currency area. Indeed, in the existing currency areas, the indicator of intra-branches exchanges is generally close to the unit. Thus, the countries of the euro zone have a Grubel-Lloyd index near to 60 % with a certain disparity between "hard-core" and "periphery" countries.⁸

In summary, intra-Maghreb trade is mainly inter-branches as opposed to Europe-Maghreb trade (Figure 4).

Over the period 1988-2002, the share intra-branches exchanges increased for the three Maghreb countries. Particularly, the indicator of Morocco-Europe exchanges recorded a clear improvement. Morocco's foreign trade with the euro zone is heading to be more and more intra-branches with a share which increased from 43% in 1988 to 60% at the beginning of 2000. In spite of this increase, Morocco remains in second position after Tunisia in terms of importance of the trade intra-branches. As expected, because of the high weight of the hydrocarbon sector, Algeria recorded the weakest index.

In sum, the Maghreb economies do not appear to satisfy all of the criteria for an optimum currency area (OCA). It follows that the Maghreb is an area within which the optimal adjustment is done by changing the exchange rate. However, before a final decision on the non-optimality of the Maghreb area, we need to study the degree of symmetry of shocks affecting the Maghreb economies. Indeed, changing the exchange rate becomes particularly unhelpful if the shocks affecting the economies of the area are symmetrical. In these circumstances it is highly likely that the supply and demand shocks affect, in the same way, the economies concerned. A symmetrical transmission of shocks does not imply a change of terms of trade and countries can easily maintain fixed exchange rates between their currencies.

2. An Analysis of Macroeconomic Shocks in the Maghreb

The previous section showed that the Maghreb is far from being an OCA because of the absence of any criterion making it possible to deal with asymmetrical shocks. However, before confirming the non-optimality of the Maghreb area, we must verify the nature of asymmetric shocks within the area. Indeed, a symmetrical transmission of shocks between two countries leaves the terms of trade unchanged and both countries can easily maintain a fixed exchange rate between their currencies. The two countries can constitute an OCA.

⁸See, for example, Suardi (2001).

To study the symmetry of shocks in the Maghreb countries, we will, as a first step, make a descriptive analysis of the convergence of inflation and economic growth in the Maghreb. The study of real convergence is supplemented by studying the correlation of business cycles. In a second step, a dynamic analysis with a SVAR model will be conducted to determine the nature of macroeconomic shocks in the Maghreb.

A Static Analysis

The observation of growth rates and inflation rates could give a first indication of real and nominal convergence between the Maghreb economies. Figure 5 considers the evolution of the real GDP in the 5 countries of the UMA from 1970 to 2004.

The figure shows a strong divergence of the evolution of the growth rates in what could be interpreted as the sign of existence of asymmetrical shocks. The dispersed evolution of the growth rate is even more pronounced when considering the case of Libya compared to other countries of the Arab Maghreb Union. However, a relative convergence of growth rates could be detected in the Maghreb area from the early 1990s. The result is a low real convergence in the Maghreb. In sum, there is a weak real convergence in the Maghreb, but what about nominal convergence?

Beyond the high value of inflation rates in the Maghreb, what we retain is the strong divergence of the evolution of these rates. This is most obvious when considering the case of Algeria and Libya. Inflation rates seem as dispersed as rates of economic growth. However, it is noteworthy that the dispersion is once again less marked at the end compared to the beginning of the period. (Figure 6)

To complement the static analysis of economic convergence in the Maghreb, we study the cross-correlations of business cycles and economic growth rates. Indeed, a positive correlation indicates that the cyclical part of these cycles is more synchronized. The higher the correlation is, the more the economies are so-called synchronized and prone to symmetrical shocks.

In most cases, the cross-correlation coefficients of economic growth rates are very low and insignificant. The only significant correlation to note is between Algeria and Tunisia but it is of low-intensity. (Table 1)

The business cycles are extracted using the Hodrick-Prescott filter (HP). The correlation coefficients of business cycles confirm the results found with economic growth rates; the coefficients are very weak and non-significant. Again, the only significant correlation coefficient is the one linking the business cycles of Algeria and Tunisia. Although it is significantly different from zero, this ratio is relatively low.

In total, the static study detects neither real nor nominal convergence between the Maghreb countries. However, the static study should be complemented by a dynamic analysis to determine the nature of macroeconomic shocks faced by North African economies.

A Dynamic Analysis: Structural VAR Model

We identify the impact of supply and demand shocks (real and nominal) and assess their influence on macroeconomic variables for the countries of the AMU. We assume that each member country i of the AMU is subjected, at every moment t , to different kinds of shocks: supply shocks (ε_t^S), real demand shocks (ε_t^D) and nominal demand shocks (ε_t^M).

The identification of these shocks is obtained from a Structural VAR model (SVAR), which is a privileged framework in the treatment of these kinds of problems. The SVAR model that we estimate includes real GDP (GDP), the real effective exchange rate (TCR), and the money supply (MON). Note that all variables are expressed in logarithms. We use annual data

covering the period from 1970 to 2004. It is derived from the CHELEM databases of the CEPII and WDI of the World Bank.

Observations relating to the three macroeconomic variables (production, real exchange rate and money) make it possible to identify the shocks affecting the economies. We suppose that the growth rates series of real GDP ($\Delta \ln \text{PIB}_t$), real exchange rate ($\Delta \ln \text{TCR}_t$) and money ($\Delta \ln m_t$) result directly from the supply and demand shocks (real and nominal) which could affect the economy in the past or continue to affect it at the present.

Let $\Delta x_t = \begin{pmatrix} \Delta \ln \text{PIB}_t \\ \Delta \ln \text{TCR}_t \\ \Delta \ln m_t \end{pmatrix}$ and $\varepsilon_t = \begin{pmatrix} \varepsilon_t^s \\ \varepsilon_t^d \\ \varepsilon_t^m \end{pmatrix}$, where Δ represents the first-difference operator, and ε_t^s , ε_t^d and ε_t^m denote supply, demand and monetary shocks, respectively.

The structural model can be written as:

$$\Delta x_t = A_0 \varepsilon_t + A_1 \varepsilon_{t-1} + A_2 \varepsilon_{t-2} + \dots = A(L) \varepsilon_t \quad (1)$$

$$\text{where } A(L) = \begin{pmatrix} A_{11}(L) & A_{12}(L) & A_{13}(L) \\ A_{21}(L) & A_{22}(L) & A_{23}(L) \\ A_{31}(L) & A_{32}(L) & A_{33}(L) \end{pmatrix},^9$$

It is assumed that the structural shocks $\varepsilon_t = (\varepsilon_t^s, \varepsilon_t^d, \varepsilon_t^m)'$ are serially uncorrelated and have a covariance matrix normalized to the identity matrix.

Model (1) cannot be estimated directly since the structural shocks are not directly observable and are required to be estimated.

Model (1) admits the following reduced form:

$$\Delta x_t = B(L) \Delta x_{t-1} + \mu_t \quad (2)$$

where μ_t is a vector reduced-form disturbance.

The theorem of representation of Wold implies that any process VAR admits an infinite moving average representation (MA) as:

$$\Delta x_t = C(L) \mu_t \quad (3)$$

where $C(L) = (1 - B(L)L)^{-1}$ and the lead matrix of $C(L)$ is, by construction, $C_0 = I$. By comparing equations (1) and (3) we obtain the relationship between the structural and reduced form disturbance as:

$$\mu_t = A_0 \varepsilon_t \quad (4)$$

We deduce from expression (4) that

$$E(\mu_t \mu_t') = A_0 E(\varepsilon_t \varepsilon_t') A_0' = \Sigma \quad (5)$$

However by assumption we have

$$E(\varepsilon_t \varepsilon_t') = I \quad (6)$$

This implies that:

$$A_0 A_0' = \Sigma \quad (7)$$

⁹A(L): represents matrices of impulse response functions to shocks affecting variables of the vector X_t .

As $\mu_t = A_0 \varepsilon_t$, the structural shock matrix that we must estimate has the following expression:
 $\varepsilon_t = A_0^{-1} \mu_t$.

A problem remains: identifying the structural shocks (ε) from the VAR reduced-form residuals (μ) and their variance. From (4), it is known that the solution depends on the identification of the matrix A_0 , which entails n^2 elements (where n is the number of dependent variables in the model in this particular case 3). Since Σ is a symmetrical matrix,¹⁰ equation (5) gives $\frac{n(n+1)}{2}$ restrictions on the matrix A_0 . Therefore, $\frac{n(n-1)}{2}$ extra restrictions must be imposed which in this model means three restrictions. Following Blanchard and Quah (1989), long-run economic restrictions are applied to identification.

Identification

We can potentially identify three shocks from our three variables: a supply or productivity shock (ε_t^s), a real demand shock (ε_t^d) and finally a nominal demand shock (a monetary policy shocks) (ε_t^m).

In order to identify the structural shocks, the following long-run restrictions are imposed:

H₁: The domestic supply shock has no effect on the real exchange rate (a small open economy assumption). Besides, the statistic tests accept the hypothesis of an exogenous real exchange rate on the 5% threshold.

H₂: both supply and real demand shocks affect real GDP in the long run.

H₃: monetary shocks have no long-run effect on either output or real exchange rates.

It follows that the three elements of matrix A (1) representing the sum of coefficients of impulse response functions are equal to zero. These long run restrictions amount to $A_{13}(\mathbf{1}) = A_{21}(\mathbf{1}) = A_{23}(\mathbf{1}) = 0$, which are sufficient to identify the A_1 matrix, and hence, the series of structural shocks.

Tests of Specification

Estimating parameters of the model requires the stationarity of the variables.¹¹ In this study, an Augmented-Dickey-Fuller (ADF) test is employed to investigate the nature of the series. Three specifications of the test are tested with no regressors, with an intercept, with both an intercept and a trend. When results for the different specifications are mixed, we turn to Phillips-Perron (PP) and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) tests to decide on the times-series nature. We have retained the Schwarz information criterion to decide on the number of lags to consider. Since we are using annual data, we consider it plausible to assume that we cannot go beyond five lags. The results allows us to conclude that all of the variables may be considered integrated of order one (I(1)) in all countries.

With the variables integrated of order one, we proceed to the study of the long-term relation between them (cointegration tests of Johansen [1988]).¹² These tests show that, for all Maghreb countries, the studied variables are not cointegrated.¹³

Under these conditions, we calculate the supply and demand shocks (real and nominal) starting from the residuals of the VAR model with one lag. This number of lags is given by using the test of exclusion of Wald (LR)¹⁴. This test is khi-deux carried out step by step to

¹⁰ The observed reduced-form residuals permits determining the matrix Σ .

¹¹ Indeed, the long-term constraints make sense only if the dynamics have a persistent component due to the presence of unit roots.

¹² The latter proposes two types of tests: the test of the Trace and the test of the maximum eigenvalue (lmax).

¹³ Indeed, the estimation of SVAR model requires, as a preliminary, the absence of cointegration between the series.

¹⁴ This test is that of the ratio of probability proposed by Sims (1980) and Doan (1992).

detect if the reduction of a unit of lag changes the results significantly. In all the cases, the optimal number of lags is one. Lastly, the choice of one VAR with one lag is consolidated by the criterion of information of Akaike (AIC) and the test of FPE.¹⁵

Results

The supply shocks — that are mostly due to technology shocks — have permanent effects on production. Thus, changes in production resulting from persistent supply shocks reflect the structural asymmetries between economies. These fluctuations would be independent of economic policies. Thus assessing the degree of asymmetry of supply shocks becomes a crucial element in assessing adjustment costs arising from a monetary union.

As shown in Table 2, the correlation coefficient of supply shocks between Morocco and Tunisia is around 65% and significantly different from zero, reflecting the symmetry of supply shocks between these two countries. This result is consistent with the results found with diversification criterion. Thus, based on the criterion of correlation of supply shocks, a currency area comprising the two countries could be optimal.

The correlation coefficient between Mauritania and Libya is significantly different from zero but relatively low. Only the correlation coefficient between Libya and Algeria is significantly negative which suggests the asymmetry of supply shocks between these two countries. Overall, the structural asymmetry of supply shocks in the Maghreb is less pronounced than suggested by the static study.

In addition, demand shocks have a temporary effect on production. These shocks are usually induced and can be corrected by economic policies. Therefore, evaluating the degree of asymmetry of these shocks gives an indication of the degree of coordination of monetary and fiscal policies.¹⁶

The correlations of real demand shocks are not, in the majority, significant and when they are significant, they are the negative direction. We can also notice that the correlations of the monetary shocks are not significant.

The lack of correlation of demand shocks reflects the absence of any form of coordination between Maghreb leaders to follow convergent policies.

However, the results found in our study are inherent in the identification restrictions used. In other words, if the “true” model of the economy is a model where the real demand shocks do not have long-term effects on economic growth and where the real exchange rate is not exogenous, then our identification of shocks is not correct.

Forecast Error Variance Decomposition

Table 3 below shows the results of the decomposition of the variance of considered variable. For the five countries, fluctuations in the real GDP's growth rate are explained largely by supply shocks. Indeed in the first period the supply shocks contribute to 85% of forecast error variance of real GDP growth rate. This effect persists over the long-term. As for the real exchange rates, it is the real demand shocks that dominate their fluctuations.

The fluctuations of the monetary growth rate are dominated by the monetary shocks except for Mauritania and Libya where, on average, 60 % of the fluctuations of the growth rate of money are explained by real demand shocks. These results seem to confirm the identification of shocks found and are comparable with those found in the empirical literature on the subject.

¹⁵ Final prediction error.

¹⁶ See for example Bayoumi and Eichengreen (1992).

Conclusion

Based on the traditional OCA criteria, our analysis suggests that it is difficult to defend any proposed monetary integration in the Maghreb. On the contrary, any form of monetary integration could cause considerable economic costs. Maghreb countries have witnessed a low degree of trade integration and asymmetric shocks.

As shown by the European example, any attempt to stabilize exchange rates between economies likely be affected by asymmetric shocks involves significant economic costs that may lead to the questioning of the initial agreements. The experience of European Monetary Snake (EMS) in the early 1970s and the setbacks that affected the EMS in the early 1980s and 1990s demonstrate the difficulty of supporting of exchange stabilization agreements in the event of divergence of economic structures of countries concerned.

Notwithstanding, economic and monetary union with single currency is at present a reality in Europe, but it was a strong political will that made the project of monetary integration successful. Yet it was necessary to support the inherent costs in the passage to the single currency.

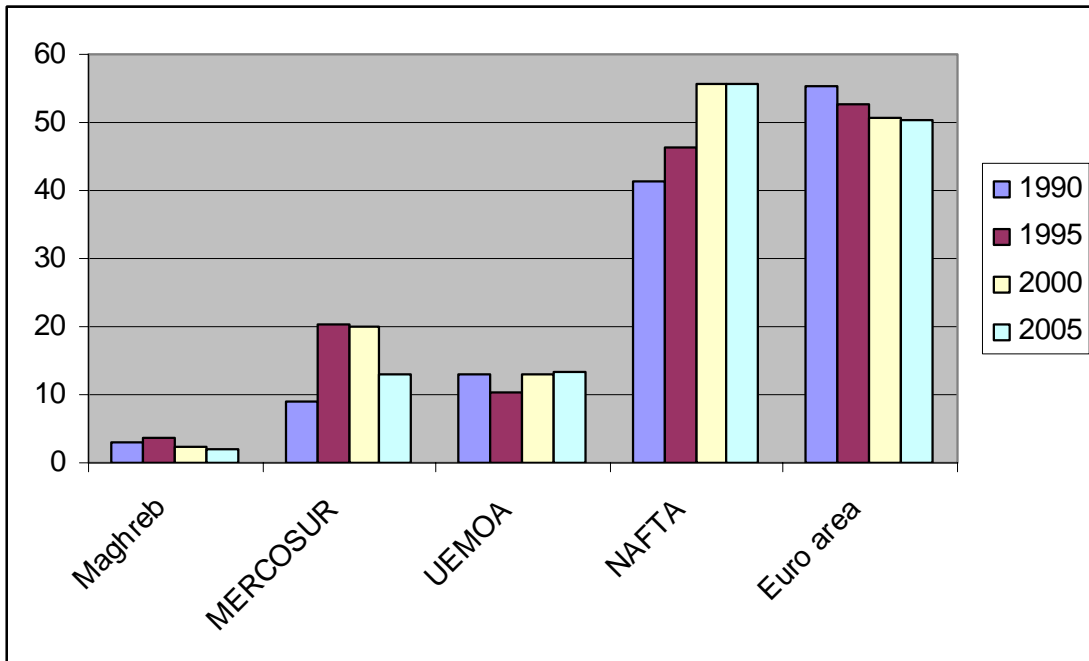
Indeed, the monetary integration project is characterized by a strong temporal asymmetry on the level of the costs and advantages. While the costs are immediate and perceptible in the early stages of monetary integration, the benefits in terms of monetary stability are particularly noticeable in the long term once the credibility of monetary integration is established. These benefits tend to increase as the project of monetary integration progresses. In this sense, Frankel and Rose (1998) argued that a currency area would create, ex-post, the conditions for its optimality. Thus, monetary integration has a significant stimulating effect on trade. The potentiality to develop intra-Maghreb trade is important and monetary integration can be very helpful. The area of the Maghreb will be an optimum currency area provided that the monetary integration project is initiated.

Finally, our analysis of macroeconomic shocks suggests a relative symmetry of shocks between Tunisia and Morocco. These two countries could constitute the "hard core" of a currency area in the Maghreb. A "two-speed" Maghreb could be a better alternative to the lack of enthusiasm that has met the idea of a monetary union grouping the five countries of the UMA.

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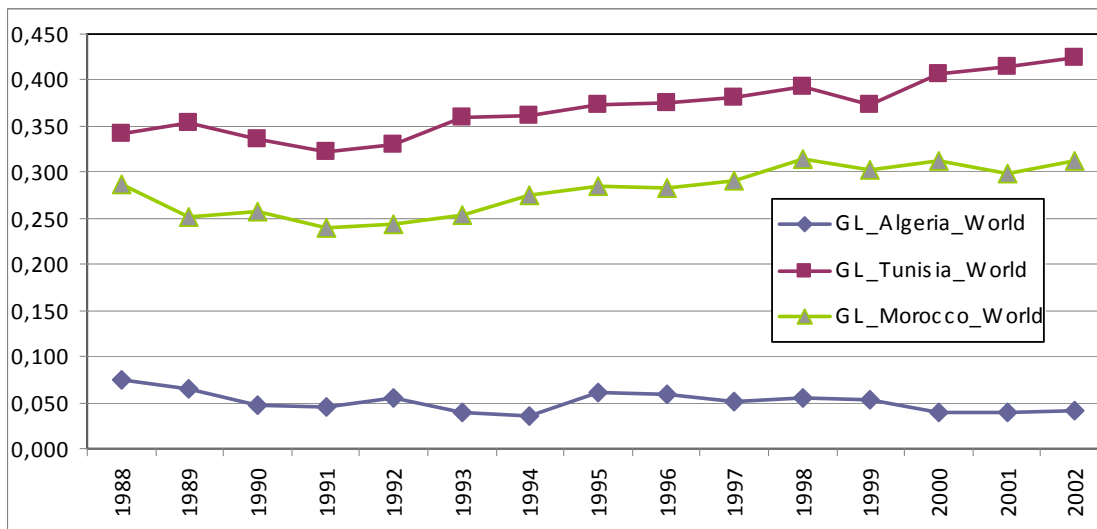
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Figure 1: Intra Trade of the group in % of exports of the grouping



Source: UNCTAD Handbook of Statistics, calculation of the authors

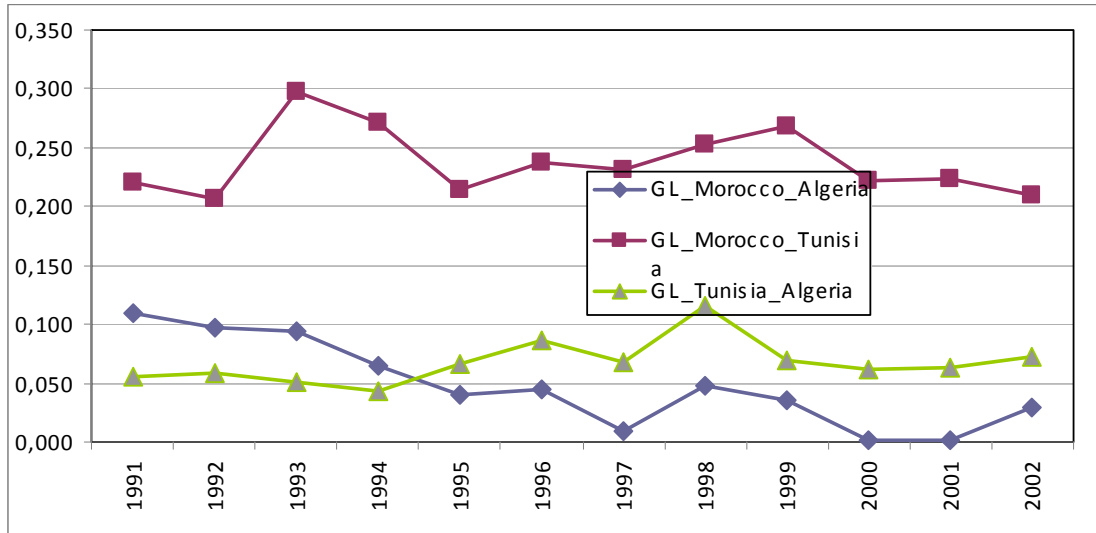
Figure 2: Evolution of the intra-branches exchanges in the total trade.



Source: CHELEM, calculations of the authors.¹⁷

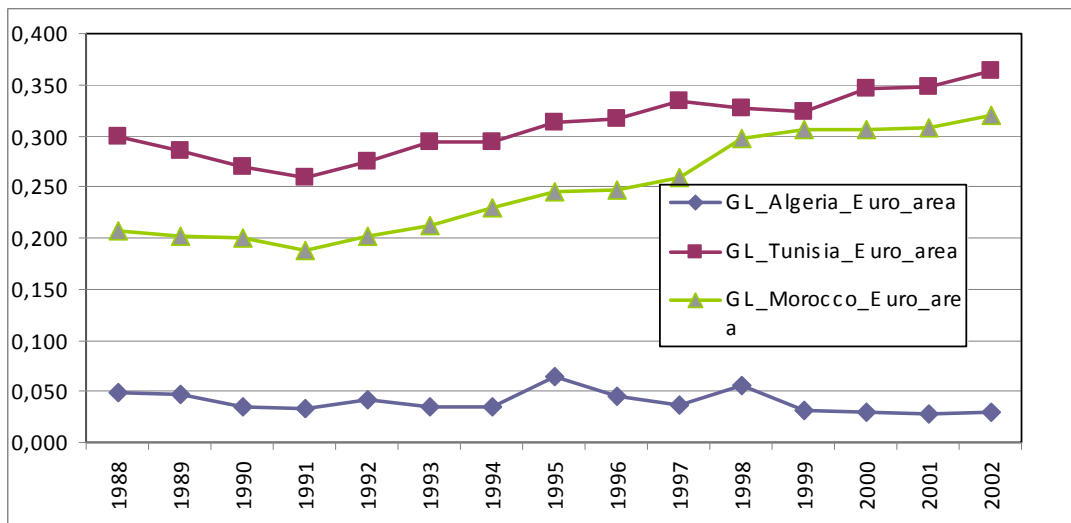
¹⁷ Calculations are carried out using CHELEM data (Comptes harmonisés sur les échanges et l'économie mondiale), database of the CEPII (Centre d'études prospectives et d'informations internationales).

Figure 3: Evolution of intra-branches exchanges in the intra-Maghreb trade.



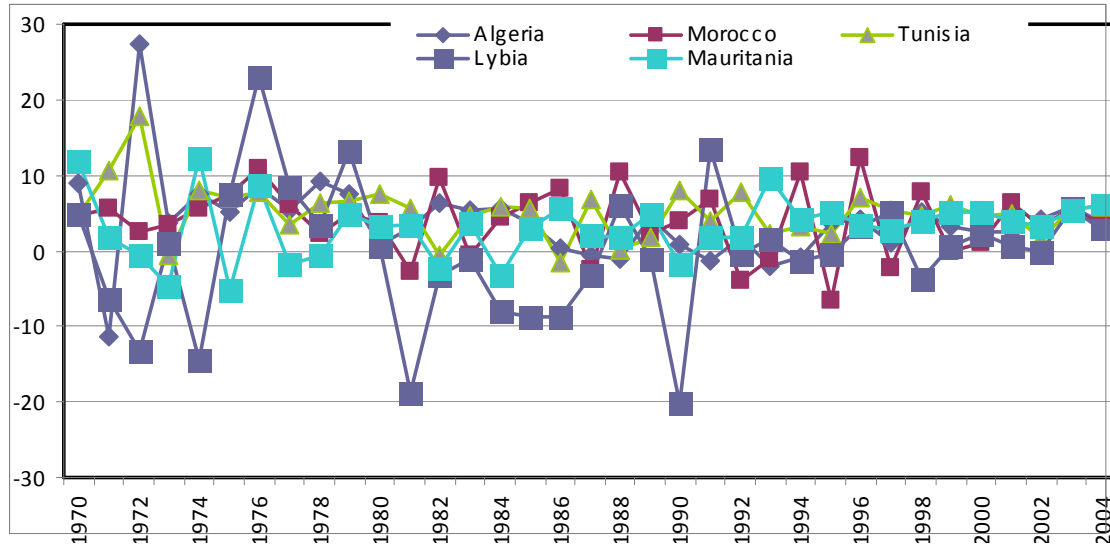
Source: CHELEM, calculations of the authors.

Figure 4: Evolution of intra-branches exchanges in the Europe-Maghreb trade.



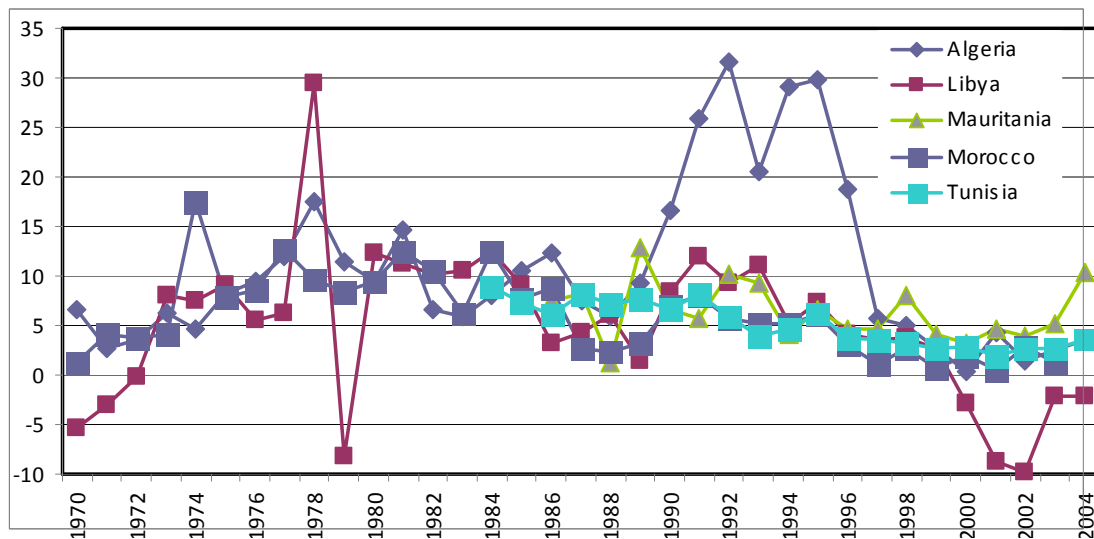
Source: CHELEM, calculations of the authors.

Figure 5: Evolution of GDP growth rates in constant dollars in the Maghreb.



Source: CHELEM.

Figure 6: Evolution of inflation rates in the Maghreb



Source: CHELEM.

Table 1: Cross-correlations of business cycles and economic growth rates

Cross-correlations of business cycles					
	Algeria	Libya	Morocco	Mauritania	Tunisia
Algeria	1				
Libya	0.037	1			
Morocco	0.181	0.146	1		
Mauritania	-0.014	0.282	-0.093	1	
Tunisia	0.296	-0.109	-0.084	-0.134	1
Cross-correlations of economic growth rates					
Algeria	1				
Libya	0.034	1			
Morocco	0.046	0.198	1		
Mauritania	-0.086	0.358	-0.163	1	
Tunisia	0.316	-0.011	-0.080	-0.018	1

Source: CHELEM, calculations of the authors

Notes: In fat, correlation coefficients significantly different from zero

Table 2: Cross correlations of structural shocks

Cross correlations of supply shocks					
	Algeria	Libya	Morocco	Mauritania	Tunisia
Algeria	1				
Libya	-0.464	1			
Morocco	0.030	0.090	1		
Mauritania	0.018	0.304	0.033	1	
Tunisia	0.212	-0.212	0.649	-0.247	1
Cross correlations of real demand shocks					
Algeria	1				
Libya	0.249	1			
Morocco	-0.057	0.213	1		
Mauritania	-0.328	0.051	0.163	1	
Tunisia	0.064	-0.129	0.088	0.056	1
Cross correlations of monetary shocks					
Algeria	1				
Libya	0.177	1			
Morocco	0.122	0.036	1		
Mauritania	-0.120	0.118	0.204	1	
Tunisia	0.133	0.024	0.195	-0.036	1

In fact, coefficients of correlation significantly different from zero.

Table 3: Forecast Error Variance Decomposition

	Real GDP Growth Rate			Real Exchange Rate		
	Supply Shocks	Demand Shocks	Monetary shocks	Supply Shocks	Demand Shocks	Monetary shocks
Algeria	81.77/69.95	4.42/6.02	13.81/24.03	21.05/31.63	77.69/62.65	1.26/5.72
Lybie	94.45/91.96	5.18/5.93	0.37/2.11	2.21/5.41	89.95/85.05	7.84/9.54
Morocco	85.28/73.94	10.41/18.35	4.31/7.71	3.18/3.76	96.06/95.29	0.77/0.95
Mauritania	97.26/87.37	2.53/11.90	0.21/0.73	40.85/40.85	53.41 / 51.18	5.74/7.98
Tunisia	88.11/79.04	11.2/20.02	0.69/0.91	18.72/18.22	81.14/81.58	0.14/0.21
	Monetary growth rate					
	Supply Shocks	Demand Shocks		Monetary shocks		
Algeria	48.13/38.30	3.14/7.14		48.73/54.12		
Lybie	0.27/34.23	71.25/46.17		28.48/19.60		
Morocco	22.83/24.67	0.66/0.68		76.51/74.65		
Mauritania	0.76/5.70	60.64/63.84		38.60/30.46		
Tunisia	17.59/15.08	0.44/2.28		81.98/82.64		

This table indicates for each variable on line the proportion of the variance of the error of forecast, at the horizon of 1 year and 10 years, ascribable to the structural shocks.