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CO-MOVEMENTS OF BUSINESS CYCLES IN THE MAGHREB: DOES TRADE MATTER?*

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Abstract

Over the past two decades, the Maghreb Countries have initiated a liberalization process characterized by increasing trade flows and they have strengthened economic and financial linkages between their economies.
In this paper, we demonstrate how co-movements of outputs would respond to this integration process. The nature of this relationship seems to be important for these countries because the decision to join an economic and monetary union would depend on how the union affects trade and co-movements.
To this end, we estimate a panel model describing the effect of trade intensity on business cycles correlation over the period 1980-2005. Thereafter, to check the robustness of the results, we add many control variables commonly described in the literature. We use three estimation techniques: pooled OLS, fixed vs. random effects as well as 2SLS estimations.
Our main results suggest that while trade intensity may help to harmonize business cycles in Maghreb countries, the magnitude of this harmonization is lower than for industrial countries. Moreover, intra-industry trade causes a reverse –counterintuitive- effect. Many lessons are thereby learned.

Keywords: Business Cycles, Trade Intensity, Intra-Industry Trade, Maghreb.
JEL classification: E32, F15, F41, F43.

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INTRODUCTION

The Maghreb Countries (MCs) share many similarities other than geographical proximity. In particular, the five North African countries (Algeria, Libya, Mauritania, Morocco and Tunisia) face similar economic and political challenges arising from threatening poverty, high unemployment and limited integration.

In recent years, the countries of this region have made important strides in the direction of future prosperity. Stability in macroeconomic conditions and some progress in economic reforms have been achieved. Besides, trade integration – either at European level or, more recently, at Maghrebian and Arab levels – has been established.

Indeed, the creation of the Arab Maghreb Union (AMU) in 1989 has aimed at coordinating economic policy among the five member states, gradually ensuring free trade among them and strengthening economic and financial linkages across all sectors in the region (Darrat and Pennathur 2002). Moreover, a number of regional initiatives have taken place in order to push trade facilitation and boost intra-regional economic integration. In this vein, the Greater Arab Free Trade Area (GAFTA), established in 1997, has intended to progressively remove tariff and non tariff barriers in intra Arab trade (notably in manufacturing) and improve efficiency gains. Within the same context, the Agadir agreement that was signed in 2004 between Egypt, Jordan, Morocco and Tunisia has as its main purposes the creation of a free trade area. Also, many conferences have been taking place, notably the conference on "trade facilitation in Algeria, Morocco and Tunisia" that was held in Algiers in November 2005 and the Conference on "the Role of the Private Sector in Economic Development and Regional Integration in the Maghreb" that was held in Tunis in November 2007.

These progress towards further integration may contribute in the long run to the creation of a common market and a common currency between the countries of this region. [1]

We address here the following question: how would co-movements of outputs respond to this process characterized by increased interest toward developing trade flows between MCs?

Our motivation to answer this question is strengthened by the fact that many empirical works have studied this question for many groups of developed and developing countries but the results have been mixed. Moreover, to our knowledge, no works have dealt with this issue for the MCs. Besides, the answer to the above-mentioned question is important because the decision to join an economic and monetary union would depend on how acceleration of trade would reduce co-movements variability in these countries. The answer will then offer a vision for them as to whether the integration process will help to harmonize the cycles of their economies and if so, a decision to remain in the same economic and monetary area in the medium and long term will be reliable.

The rest of the paper is structured as follows: Section 1 reviews the theoretical and empirical effect of trade on the synchronization of business cycles. It also mentions the other determinants of business cycles co-movements. Section 2 states the empirical methodology. Section 3 presents the main estimation results. Finally, section 4 concludes and offers some policy recommendations.

[1] It is useful to mention that since 2002, the creation of a single currency and a common central bank for the Maghreb has always been the main concern of the union of Maghreb banks. Moreover, during the Arab banks-summit in Paris in June 2008, the project of monetary integration in the Maghreb was discussed again. In the same context, the general secretary of AMU is trying to put in place a Maghreb economic community project via detailed research done in collaboration with the African Development Bank (BAD).

Section 1-On the determinants of business cycles synchronization

The foremost candidate expected to influence business cycle synchronization is trade. But, the literature has identified many other potential determinants such as currency union, similarity of industrial structure and financial integration. [2]

1.1.The effect of trade:

Optimum Currency Area (OCA) theory considers that countries or regions exposed to symmetric shocks or holding mechanisms for the absorption of asymmetric shocks may adopt a common currency. Mundell (1961), Mc-Kinnon (1963) and Kenen (1969) were the first to define the criteria that allow a country to belong to the same currency area. Among the key criteria considered is the degree of trade integration among the potential members, as well as the symmetry of their business cycles. Labour mobility, fiscal transfers, financial integration and similarity of inflation rates were also considered. [3]

On the contrary, the endogeneity hypothesis of OCA considers the process of monetary integration as endogenous and does not impose prerequisites. Trade integration and cycle synchronization, however, are not in fact exogenous. The underlying idea is that genuine economic integration between countries strengthens the degree of cyclical correlation and thus the advantages of adopting a single currency. The monetary integration process will then create ex-post the conditions of its success.

Frankel and Rose (1998) were the first to raise the question of endogeneity of OCA criteria. They estimated a single-equation model based on a large sample of developing and industrialised countries and found a strong and robust positive relationship between bilateral trade and cycle synchronisation.

Inversely, for Krugman (1993), intensified trade relations lead to a higher degree of specialisation, due to the exploitation of comparative advantages. As a result, business cycles become more asynchronous and the relationship between bilateral trade and cycle synchronization prove to be negative.

It follows that the most determinant factor is trade specialization rather than the volume of trade. So, the underlying question is whether bilateral trade occurs mainly in similar or different sectors. If trade flows are predominantly intra-industry, then we would expect the first effect to materialize. Inversely, if bilateral trade is, or increasingly becomes, inter-industry, the second prediction may hold true.

Fidrmuc (2004) tries within this framework to re-examine the specification of Frankel and Rose for many OECD countries. His results show that it is the intra-industry trade that help explain the harmonization of business cycles rather than the inter-industry one. Also, Imbs (2004) tries to estimate for 24 developed and emerging countries a system of simultaneous equations to disentangle the complex interactions between trade, finance, sectoral specialization and business cycle synchronization. His results indicate that the overall effect of trade on business cycle synchronization is strong, but a sizeable portion is found to actually work through intra-industry trade. Estimates of the link between interindustry trade and cycle correlations are smaller in magnitude, and not inconsistent with existing models.

[2] Other determinants can be stated such as factor endowments, domestic policies and structural factors. These determinants are beyond the scope of this paper.

[3] For a review, see Beine (1998).

1.2.The other determinants of business cycles synchronization:

The endogeneity hypothesis of OCA has been examined from another angle. In fact, many works have tried to determine the effect of monetary union on trade by resorting to the gravity model. So, in such case, monetary union is the main determinant of business cycles correlation of their members.

Rose (2000) tries to test the relationship between monetary union and international trade for 210 developed and developing countries over the period 1960-1996. He finds that bilateral trade between members of a monetary union is three times that of countries which preserve their own currencies and that this importance is the consequence of large trade intensity. Also, Baldwin (2005) presents an analysis which measures the effects of the lunching of the euro on trade. He finds that the creation of the European Monetary Union increases trade from 70% to 112%, while this effect varies from 21% to 108% by considering a sectoral analysis.

Similarly, for Africa, few works have tested the endogeneity hypothesis by measuring the effect of the creation of monetary union on trade. For example, Nitsch (2002) uses the gravity model to test the effect of the creation of the CFA franc zone (as well as the East Caribbean monetary union) on trade and finds that a monetary union increases trade by almost 55% (while the effect is negligible in the East Caribbean area). Also, Masson and Patillo (2004) apply the same methodology for African Countries and conclude that the effect on trade is the same as found in Rose (2000): a monetary union triples trade. Finally, the same result was also found in Carrère (2004) by resorting to the gravity model in order to examine the effect on bilateral trade of two African monetary unions (ECOWAS and ECCAS).

Stockmann (1988) emphasizes the importance of sectoral shocks for the business cycles. He states that two countries will be hurt similarly by sector-specific shocks if they have economic sectors of similar nature and size. In other words, he considers that the more similar the economies, the more correlated their cycles.

However, for Imbs (2004), specialization patterns play an independent role in cycle correlation which renders the evidence regarding the economic specialization effect ambiguous.

Kalemli-Ozcan et al. (2003) argue that countries with a high degree of financial integration tend to have more specialized industrial patterns and less synchronized business cycles. They consider that, with higher integration in both international financial markets and goods markets, countries should be able to insure against asymmetric shocks through diversification of ownership and can afford to have a specialized production structure. In this case, better opportunities for income diversification induce higher specialization in production, which are associated with more asymmetric business cycles.

However, evidence from the financial crises and contagion literature indicates a direct positive effect of capital flows to business cycle synchronization. In this frame, Kose et al. (2003) point out that financial integration enhances international spillovers of macroeconomic fluctuations leading to more business cycle synchronization.

Section 2- Empirical methodology

2.1-Basic objectives:

As stated above, our aim here is to test the effect of trade intensity on the correlation of business cycles for the MCs. To this end, we estimate the Frankel and Rose (1998) endogeneity hypothesis over the period 1980-2005. We run the following panel regression equation:

$$Corr(i,j)t = \alpha + \beta Trade(i,j)t + \varepsilon(i,j)t \qquad \textbf{(1)}$$

Where $Corr(i,j)t$ is the degree of correlation of economic activity between countries i and j over period t; $Trade(i,j)t$ is the measure of bilateral trade intensity over period t and $\varepsilon(i,j)t$ are factors other than trade which influence the correlation degree during period t.
Our coefficient of interest is β. If it is positive, trade intensity increases cycle synchronization whereas if it is negative, it causes desynchronization.
However, given that this basic relation omits many other variables that would explain the evolution of business cycles correlation, we check the robustness of this relationship by adding control variables. Therefore, our extended equation is as follows:

$$Corr(i,j)t = \alpha + \beta Trade(i,j)t + \gamma Z(i,j)t + \varepsilon(i,j)t \qquad \textbf{(2)}$$

Where $Corr(i,j)t$ and $Trade(i,j)t$ represents the same parameters as in equation (1) while $Z(i,j)t$ is the vector of control variables over period t.

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2.2-Definition of variables and data:

2.2.1-The benchmark model

Our empirical analysis relies on measures of two key variables: correlation of business cycles and bilateral trade intensity.
The correlation of business cycles in the MCs is computed after detrending the annual real GDP series using both Hodrick-Prescott (HP) and Band Pass (BP) filters. [4] It is calculated by computing the correlation coefficient between the cycles of pair countries. Besides, we privileged here a five years' moving correlation[5] for detrended bilateral real GDP instead of a static one. [6] Data for real GDP were extracted from the "Chelem Database".
As for trade intensity, it is constructed by reporting bilateral trade to the total trade: [7]

$$Trade(i,j) = \frac{(Xij + Mij)}{(Xi + Xj + Mi + Mj)}$$

Where Xij denotes total nominal exports from country i to country j, Mij denotes total nominal imports from country i to country j, Xi denotes total global exports from country i and Mi denotes global imports of country i. We also use a five years' moving average for this variable. The data were extracted from the «*Direction of Trade Statistics of IMF*».

2.2.2-The extended model:

In addition to the two variables mentioned above, our extended regression includes the vector of control variables made up of intra-industry trade, similarity of economic structures as well as financial integration indicators (see Table A1).

[4] We apply here the full length asymmetric filter of Christiano-Fitzgerald (2003).
[5] The usefulness of this correlation is twofold: capturing some dynamics in the co-movement and allowing gains of many observations.
[6] Note that other proxies can be used in order to compute the correlation of real activity such as industrial production, total employment and the unemployment rate. Shortness of data for MCs prevents us to use these indicators.
[7] Another measure of trade intensity can also be stated where bilateral trade is normalized by nominal GDP in two countries instead of total trade.

For intra-industry trade variable (IIT), it is measured using the nine commodity products[8] defined in the "Chelem Database" and is constructed according to the *Grubel-Lloyd index* :[9]

$$IITij = \sum_{k} \frac{(Xij + Mij) - |Xij - Mij|}{(Xij + Mij)} = 1 - \left[\frac{\sum_k |Xij - Mij|}{\sum_k (Xij + Mij)}\right]$$

Where Xij and Mij denote exports and imports of commodity products k. It follows that an index of 0 represents a complete specialization in different products for each country, whereas an index of 1 means that all trade is intra-branch (Xij equals Mij).

As for the similarity of economic structure indicator *(ESij)*, we look at the composition of each sectoral value-added share of GDP between pairs of country. We construct this indicator according to the Krugman (1991) index:[10]

$$ESij = \sum_{p=1}^{3} |spi - spj|$$

Where spi and spj stand for the value-added share of sector p in country i's and j's aggregate GDPs, respectively. It stands that, the higher the value of this indicator, the greater the difference in industry shares between countries i and j and, therefore, the lower the similarity in structures or production. Data for spi and spj were extracted from the "World Development Indicator" (WDI) database (2008).

Finally, concerning the financial integration variable *(FIij)*, it is computed according to Eric (2010) where, for each country-pair, we sum pair-wise individual Chinn & Ito (2008) index.[11]

Notice that, for these three variables, as is the case for cyclical component of real GDP and trade intensity, we use a five years' moving average in order to be compatible with the regression framework.

2.3-Estimation techniques:

We use three different techniques to estimate Eqs 1 and 2. The first one is pooled OLS estimate. This estimation is especially useful when the groups to be pooled are relatively similar or homogenous.[12] This may be the case for MCs since, as stated before, these countries share many similarities and face common challenges.

However, there are strong reasons to suppose heterogeneity between pair of countries which can justify the usefulness of the fixed and random effects estimation techniques. For example, the divergence between Algeria and Libya on the one hand and Morocco, Tunisia and to a lesser extent Mauritania on the other hand in terms of economic structure and institutional framework can justify the use of these methods. So, including country pair fixed effects allows us to control for all the time-invariant, country pair-specific variables which may have

[8] These products are: Building materials, steel industry, textile, mechanics, chemicals, ores, energy, agriculture and food products.

[9] Mauritania is excluded here because of data shortage.

[10] Libya is excluded given the absence of the data.

[11] This index refer to the four measures of capital flows restrictions reported in the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER): (1) presence of multiple exchange rates, (2) restrictions on current account transactions, (3) restrictions on capital account transactions, and (4) requirement of surrender of export proceeds. The index of capital account openness is created by computing the first standardized principal component of these four measures.

[12] Econometrically, this hypothesis implies that the parameters of the model are homogeneous for all country pairs.

an impact on output correlation. [13] The choice between fixed effects versus random effects model is performed via a Brush-Pagan LM test.[14]
Finally, we resort to 2SLS technique to estimate our equations. Generally, recourse to this technique is explained by the fact that the OLS may be out of place, since the increase of bilateral trade intensity may be the result of a bigger correlation of business cycles.
To handle this problem of the endogeneity bias, we use the instrumental variable (IV) technique by drawing from the gravity model of trade. The instruments chosen from this model suppose that they are correlated with trade intensity, but can reasonably be unaffected by other conditions which alter the co-movements of business cycles in MCs.[15]
Basically, we often find that countries that share a common border, that are closer in distance and have trading partners that are farther away from the rest of the world, are members of the same region, speak the same language, have the same colonial origin and the same common main trading partner, higher population and engage in regional free trade agreement, trade more intensively (Calderón et al 2007).
In our work, to get valid instruments and consistent estimation, we proceed in the following way. First, we run an OLS estimation of the gravity model for MCs and retain the significant variables (or instruments).[16] Then, we run many 2SLS estimations by using two approaches: the Anderson (1984) approach that takes into account multiple endogenous regressors and instruments and the Hansen (1982) approach which perform the exogeneity of the instruments. We finally retain the 2SLS estimation that contains the most valid instruments (p-values below 1% for instrument relevant test and above 10% for over-identification test).

Section 3- Estimation results

Before stating our results, we should present some main descriptive statistics for the key variables. Table A2 summarizes these statistics. From this table, we note much more variability for the dependent variable than the regressors (except for the financial integration indicator). In fact, bilateral GDP correlation has variability with the range between -0.87 to 0.99 using HP filter and -0.96 to 0.95 using the BP one while bilateral trade intensity has small variability with the range between 0 and 0.02. Also, intra-industry trade and similarity of economic structure indicators have variability with the range between 0.006 to 0.49 and 0 to 1 respectively.
Moreover, the dependant variable has a larger standard deviation than the independent ones (except for the financial integration variable). Indeed, it is about 0.4 for GDP correlation and financial integration while it is respectively about 0.003, 0.1 and 0.2 for bilateral trade intensity, intra-industry trade and similarity of economic structure.

3.1-Trade intensity and correlation of business cycles:

Table B1 summarizes the effect of trade intensity on the correlation of business cycles in MCs (Eq 1). It shows first that our coefficient of interest β is positive, thus suggesting that higher bilateral trade intensity generates more synchronized business cycles. Such results are robust to changes in the de-trending technique used to compute the cyclical fluctuations of output. Indeed, an increase of one standard deviation in bilateral trade intensity raises the output

[13] Note that the results coming from the first two estimation techniques should be considered with caution since there is an endogeneity bias which we control it later by using 2SLS.
[14] We can also apply the Hausman test, but heteroscedasticity robust t-statistics cannot be reported.
[15] For more details, see Table A1.
[16] The results are available upon request.

correlation from 0.04 to 0.09 using the HP filter and from 0.05 to 0.1 using the BP filter. [17] Probably, the progress of these countries toward trade liberalization and the signing of many bilateral agreements may explain the role of increasing trade on the synchronization of business cycles. Moreover, high trade intensity with European partners seems to be a catalyst for this harmonization process in these countries (see Table A3).
However, from the same Table B1, we can note that the magnitude of the effect in MCs is smaller compared to the result found in existing literature for industrial countries. In fact, Frankel and Rose (1998) and Calderón et al (2007) found that an increase in bilateral trade intensity by one standard deviation leads to an increase in business cycle correlation from 0.22 to 0.35 and from 0.25 to 0.39 respectively.
There are two important explanations to this result. On the one hand, in MCs, patterns of specialization prompt us to expect a small (even a negative) correlation between trade integration and business cycle correlation. The reason is that inter-industry trade is dominant in these countries while intra-industry trade prevails in industrial countries. Algeria and Libya are net oil-exporters whereas Tunisia, Mauritania and Morocco are net oil-importers. Moreover, Algeria and Libya, like many other resource-abundant countries, have a very small share of non oil-exports while Tunisia, Mauritania and Morocco display greater trade openness but have been import biased. Non-oil exports have been increasingly falling short of imports, implying increasing trade balance deficits (World Bank 2006).
On the other hand, inter-industry trade is probably not sufficient in itself to explain the dynamic correlation of business cycles between two or many countries. In fact, as we already pointed out, there are many other determinants of business cycles. So, adding other variables in the model allows us to check the robustness of the aforementioned results.

3.2-Trade intensity, control variables and correlation of business cycles:

Table B2 states the effect of trade intensity as well as control variables on the correlation of business cycles in MCs (equation 2). It shows that our above-mentioned results are robust since bilateral trade intensity has a positive effect on co-movements of business cycles.[18] This effect is even more important than found in Table B1. In fact, an increase of one standard deviation in bilateral trade intensity raises the output correlation from 0.1 to 0.17 using the HP filter and from 0.07 to 0.15 using the BP filter. Moreover, as also found, this effect remains less significant than in industrial countries.
As regards the intra-industry trade variable, it is significant but with the opposite sign. The interaction between intra-industry trade and correlation of business cycles in MCs prove to be negative. Indeed, an increase of one standard deviation in bilateral intra-industry trade causes a decrease of the output correlation from 0.13 to 0.16 using HP filter and from 0.16 to 0.19 using the BP filter.
Two main explanations can enlighten these results: the nature of intra-industry trade itself and the trade patterns in MCs. In fact, intra-industry trade in these countries consists especially of trading varieties of products. Most of the traded (intra-industry) goods are substitutes and not complements. The development of this horizontal intra-industry trade (as opposed to vertical intra-industry trade) can be explained by the fact that main merchandise exports in MCs are labor-intensive. Moreover, a weakness of spending in Research and Development and the lack of workforce qualifications seems to explain this fact. As a result, the development of horizontal intra-industry trade can generate a specialization of the producing companies trying

[17] The final correlation reported in this paper is equal to the product of one standard deviation of trade intensity and its coefficient estimate. For example, for pooled regression, the final correlation is equal to 15.971*0.003 (for HP filter) and 17.674*0.003 (for BP filter).
[18] Random effects specification provides non-significant results.

to make economies of scale and prevents in turn the diversity of production (Fontagné and Freudenberg 1999). In that case, business cycle correlations can be hampered.
It follows that further commercial ties can then probably result in countries becoming more specialized in trading one type of product such as energy in Algeria and Libya, textile, agriculture and food products in Morocco and chemicals and mechanics in Tunisia. Such specialization can render these countries more sensitive to specific shocks and does not help to harmonize business cycles in this region.
On the other hand, the low (high) openness of each country vis-à-vis the other Maghrebian partners (European partners) as well as the low (high) shares of intra-industry trade in bilateral relations seems to decrease (increase) the harmonization of business cycles in these countries (compared with Europe). Incidentally, *Grubel-Lloyd index* has been low and sometimes close to 0 (except for the pair Morocco-Tunisia), showing quasi complete specialization and a weakness of intra-industry trade (see Table A4). So, asymmetries in trade structure as well as dissimilarity of shocks across these countries can explain this result.
As for the economic structure variable, the expected negative relation to cycle correlation is not confirmed and the interaction between the two variables is rather positive. Indeed, an increase of one standard deviation of the Krugman index causes an increase of the output correlation by 0.08 using HP filter and 0.05 (0.06 for IV regression) using the BP ones. This result can be ascribed to the fact that, economic growth and exports in MCs depend heavily on foodstuffs, semi-finished products and consumer goods (except for Algeria). Moreover, the economic structure of these economies is more or less diversified (see Table A5). So, industry-specific shocks tend to have similar effects on aggregate fluctuations across national borders.
Finally, concerning the financial integration, we observe a positive relationship between this variable and business cycles co-movements. According to our results, an increase of one standard deviation in the bilateral financial openness index causes an increase of the output correlation from 0.06 to 0.11 using HP filter and from 0.02 to 0.11 using the BP ones. This result is consistent with Kose & al. (2003) research where financial integration enhances international spillovers of macroeconomic fluctuations and lead to more business cycle correlation. The actions taken by the authorities of MCs in term of capital transactions, foreign direct investments, credit operations…[19]seem to be a catalyst for business cycles harmonization in these countries.

Section 4- Conclusion and some policy implications

This paper examines the effect of the current economic integration process on the correlation of business cycles in MCs. For that purpose, we test the Frankel and Rose (1998) endogeneity hypothesis of OCA which shows the effect of trade intensity on the co-movement of business cycles. Our results suggest that trade intensity has positive effects on business cycles harmonization in these countries.
Moreover, by introducing control variables made up of intra-industry trade, similarity in economic structure and financial integration, we show that our primary result is robust. So, the nature of the relationship between trade intensity and business cycles synchronization is maintained.
However, we assume that, given the patterns of trade among these countries, the impact of trade intensity on cycle correlation is lower compared to industrial countries.

[19] For an overview, see Tahari & al (2007).

We also show that, in contrast to theoretical literature, the empirical relationship between intra-industry trade and the correlation of business cycles is negative. We admit that the nature of intra-industry trade itself and the trade patterns in MCs can offer suitable arguments. Finally, we prove that economic structure and financial integration play a positive role on the synchronization of business cycles.

From these results, some recommendations can be stated. Firstly, we can consider that anchoring the currency of these Countries to the euro will be more useful than adopting a common currency. The reason is that an important share of Maghrebian trade is made with the European Union and such an importance can offer better allocation of resources and ensure business cycles synchronization between the two Mediterranean rims.

Secondly, many other steps towards a successful economic and monetary integration process in the long run are worth making. In fact, further liberalization of trade and adoption of complementary economic policies such as liberalizing trade in services, increasing trade facilitation initiatives and reinforcing the business climate will improve trade diversification and increase the harmonization process in this region. Within the same context, the acceleration of the financial integration process and the improving of coordination of financial, monetary and exchange rate policies will reduce uncertainty and improve efficiency gains and resources allocation.

Finally, turning away from political conflicts and further considering the economic benefits of the integration process will be very useful for these countries, notably in terms of improving convergence.

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APPENDIX A

Table A1: Data definitions and sources

Variables	Definitions	Sources
$\mathbf{Corr(i,j)t}$	Moving bilateral GDP correlation. Two filters are used for de-trending GDP: HP filter and Band-Pass filter.	Chelem Database
$\mathbf{Trade(i,j)t}$	Moving average of the quotient bilateral trade /total trade	Direction of Trade Statistics of IMF
$\mathbf{IIT(i,j)t}$	Moving average of the Grubel-Lloyd index	Chelem Database
ES (i,j)t	Moving average of the absolute value of Krugman (1991) index	WDI (2008)
FI (i,j)t	Moving average of pair-sum of capital account openness index	Chinn & Ito (2008)
Instrumental variables		
GDP difference	Log of GDP difference in absolute value	Chelem Database
GAFTA	Dummy variable set equal to 1 if a pair of countries belong to Greater Arab Free Trade Area	
WTO	Dummy variable set equal to 1 if a pair of countries is member of the World Trade Organization	
EUA	Dummy variable set equal to 1 if a pair of countries is signatory of European Union Agreement	
Distance	Log of the distance between capitals	CEPII Database
Border	Dummy variable: 1 if a pair of countries share a common border; 0 otherwise.	CEPII Database
Border	Dummy variable set equal to 1 for landlocked countries.	CEPII Database
Com-lang	Dummy variable: 1 if a pair of countries share a common language; 0 otherwise.	CEPII Database
Com-col	Dummy variable: 1 if a pair of countries share a common colonizer; 0 otherwise.	CEPII Database
Col-45	Dummy variable: 1 if a pair of countries has had a colonial relationship after 1945; 0 otherwise.	CEPII Database
Cur-col	Dummy variable: 1 if a pair of countries is currently in a colonial relationship; 0 otherwise.	CEPII Database
Smctry	Dummy variable: 1 if a pair of countries is/was the same country; 0 otherwise	CEPII Database
Comlang-ethno	Dummy variable set to 1 if a language is spoken by at least 9% of the population in both countries; 0 otherwise	CEPII Database

Table A2: Descriptive statistics for key variables

	Obs	Mean	SD	Min	Max
Corr_HP	420	-.0598432	.4538135	-.8791472	.9942284
Corr_BP	420	-.0569074	.4944022	-.9661928	.951875
Trade	420	.0027338	.0037689	0	.0206008
IIT	252	.2086745	.1409119	.0061295	.4960866
ES	252	.4669312	.2093645	0	1
FI	420	-2.273444	.4209486	-3.662374	-1.047054

Table A3: Overview of trade orientation in MCs (1980-2004)

	Export share (%)					Import share (%)				
	80-84	85-89	90-94	95-99	2000-04	80-84	85-89	90-94	95-99	2000-04
Africa	0.4	0.18	0.05	0.01	0.00	0.08	0.21	0.19	0.06	0.00
Asia	0.14	0.09	0.04	0.00	0.00	0.07	0.24	0.12	0.02	0.00
EU	62.4	71.99	72.61	68.36	69.1	64.7	64.91	64.34	62.55	63.59
EE, USRR	0.17	0.24	0.07	0.06	0.34	1.15	0.88	0.39	0.13	0.08
MENA	1.42	3.12	5.28	4.23	3.43	5.52	4.47	6.51	5.33	6.28
Maghreb	0.44	1.48	2.35	1.57	1.21	0.51	1.42	2.15	1.24	1.38
USA	23.35	11.54	10.27	8.92	11.31	7.27	8.15	8.76	7.06	5.41
Others	12.12	12.83	11.68	18.4	15.83	21.19	21.15	19.69	24.86	24.64

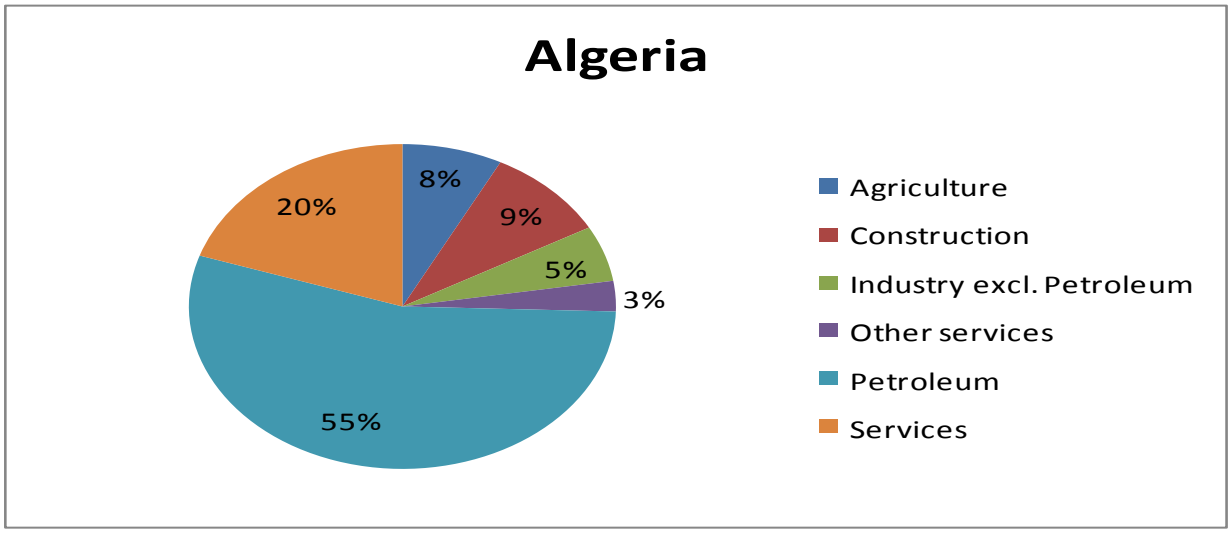
Source: World Bank (2006)

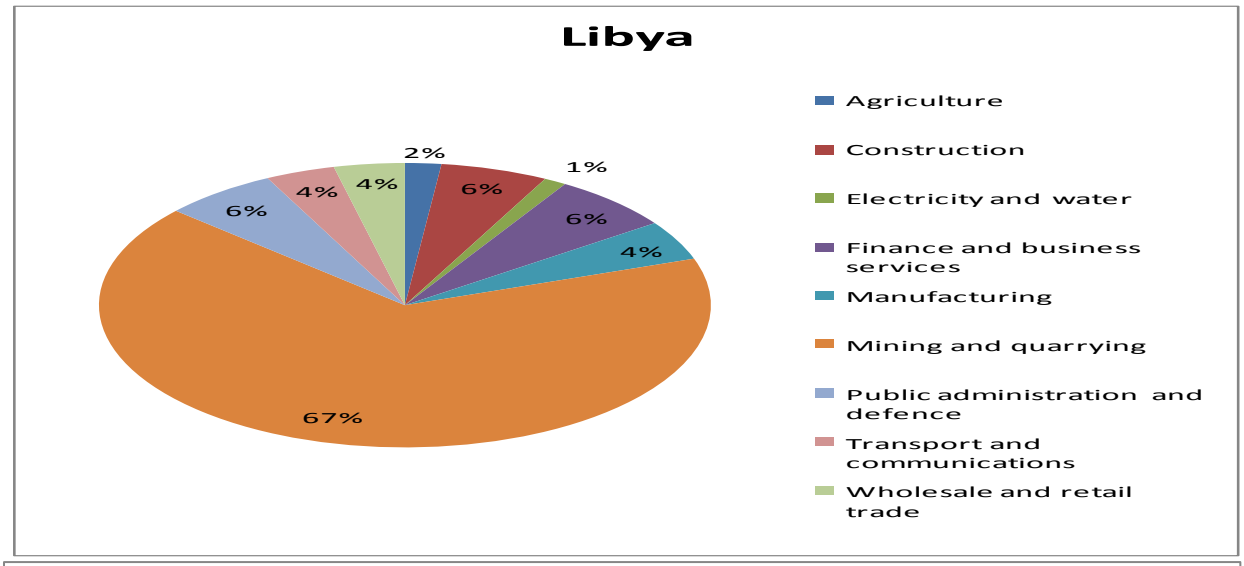
Table A4: *Grubel-Lloyd index* (*GL*) average in MCs (1980-2005)

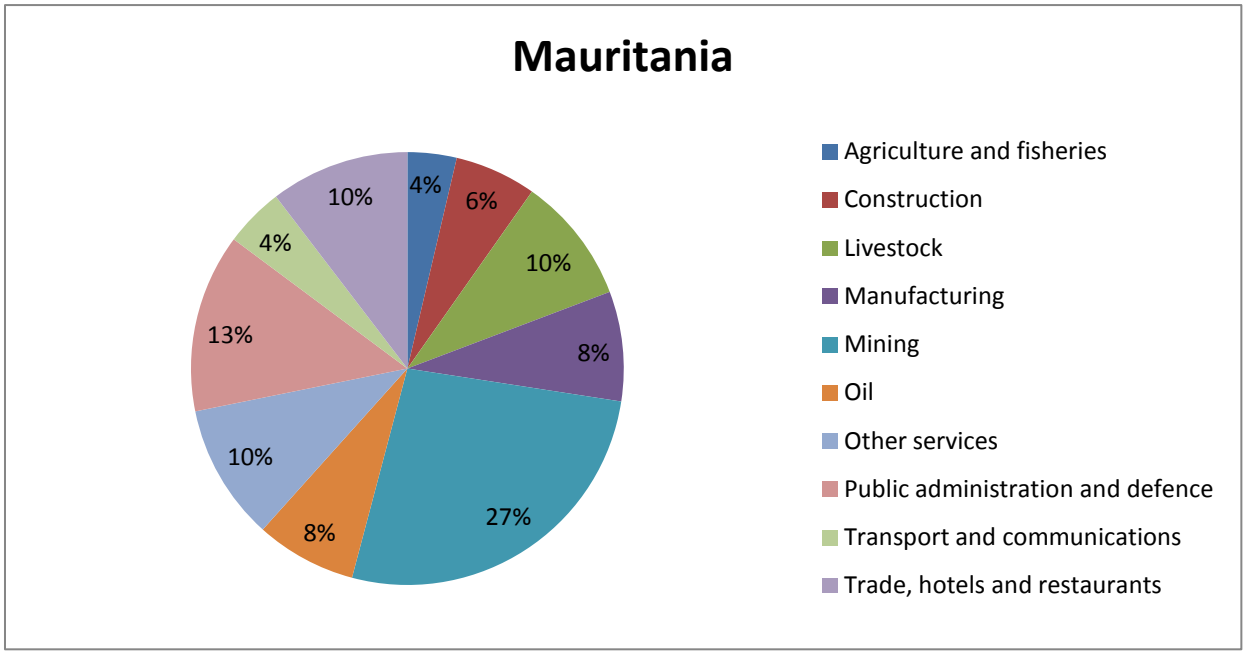
	Algeria	Libya	Morocco	Tunisia
Algeria	-	0.21	0.09	0.14
Libya	0.21	-	0.09	0.22
Morocco	0.09	0.09	-	0.37
Tunisia	0.14	0.22	0.37	-

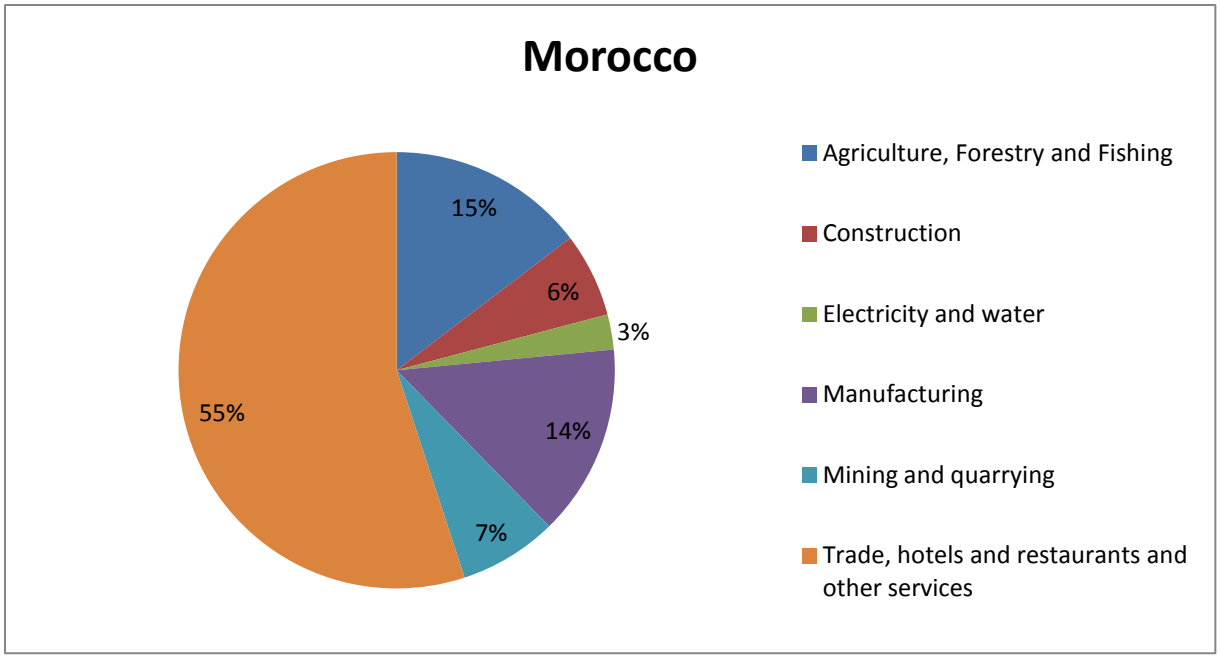
Source: Chelem, authors' calculation

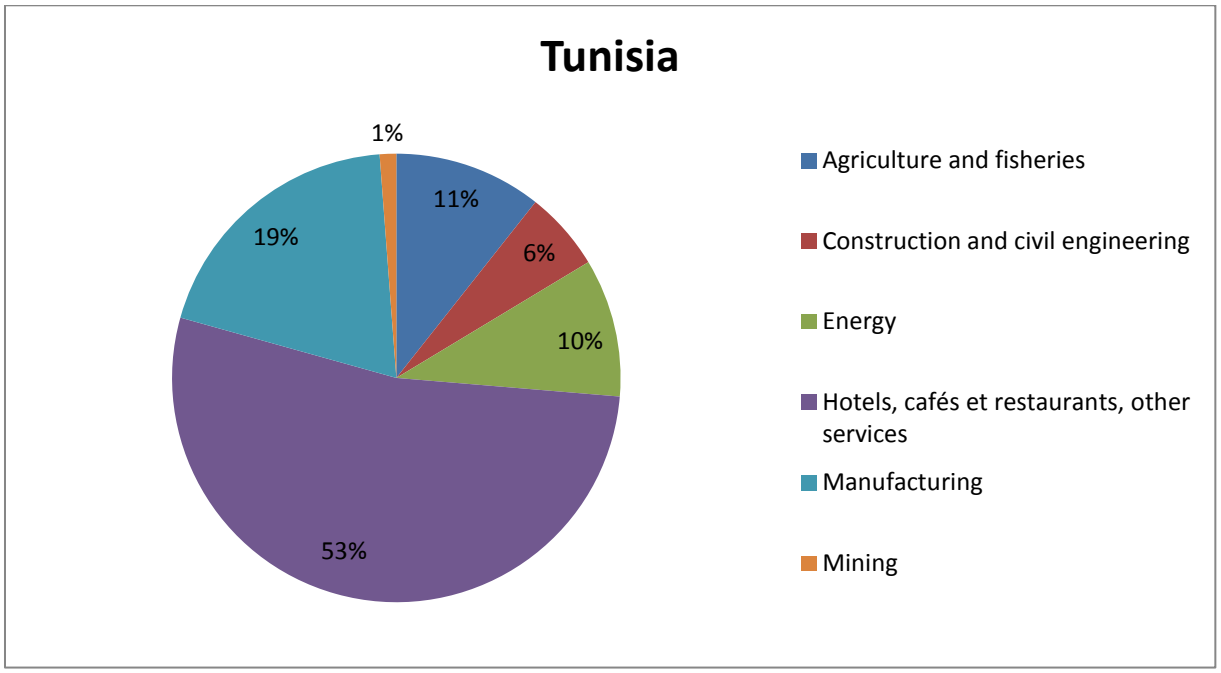
Table A5: GDP by sector in MCs (in %)











Source: African Economic Outlook (2008)

APPENDIX B

Table B1: Trade intensity and correlation of business cycles in MCs

	Pooled regression		Panel regression				2SLS regression	
Filter	**HP**	**BP**	**HP**	**BP**	**HP**	**BP**	**HP**	**BP**
			Fixed effects		**Random effects**			
Intercept	**-0.103**	**-0.105**	**-0.121**	**-0.122**	**-0.113**	**-0.117**	**-0.148**	**-0.182**
	(0.028)* **	**(0.031)*** **	**(0.028)*** **	**(0.03)*** **	**(0.043)*** **	**(0.064)***	**(0.035)*** **	**(0.037)*** **
Trade	**15.971**	**17.674**	**22.694**	**23.938**	**19.73**	**22.002**	**32.391**	**45.977**
	(5.491)* **	**(5.538)*** **	**(7.618)*** **	**(7.909)*** **	**(4.822)*** **	**(3.995)*** **	**(9.503)*** **	**(10.664)*** **
Number of Obs	**420**	**420**	**420**	**420**	**420**	**420**	**420**	**420**
R-squared	**0.017**	**0.018**	**0.185**	**0.259**	**0.015**	**0.016**	**0.016**	**0.014**
Breusch Pagan LM test[a]					**0.0000**	**0.0000**		
Instrument relevance test Anderson's LR test (P-value)							**0.0000**	**0.0000**
Over-identification test Hansen J statistics (P-value)							**0.694**	**0.106**

Robust standard errors are in parentheses.

****, ** and * are respectively the 1%, 5% and 10% significance level.*

[a] *Breusch Pagan LM test corresponds to P-values.*

Table B2: Trade intensity, control variables and correlation of business cycles in MCs

	Pooled regression		Panel regression				2SLS regression	
Filter	**HP**	**BP**	**HP**	**BP**	**HP**	**BP**	**HP**	**BP**
			Fixed effects		**Random effects**			
Intercept	**0.635**	**1.038**	**0.396**	**1.241**	**0.635**	**1.038**	**0.097**	**0.138**
	(0.264)* **	**(0.159)*** **	**(0.3)**	**(0.156)*** **	**(0.471)**	**(0.317)*** **	**(0.299)**	**(0.276)**
Trade	**34.348**	**25.983**	**-18.765**	**-114.536**	**34.348**	**25.983**	**58.61**	**51.619**
	(24.198)*	**(11.546)** **	**(28.209)**	**(17.861)*** **	**(27.336)**	**(18.662)**	**(31.387)*** **	**(29.007)*** **
IIT	**-1.192**	**-1.427**	**0.934**	**-0.023**	**-1.192**	**-1.427**	**-1.026**	**-1.15**
	(0.202)* **	**(0.159)*** **	**(0.717)**	**(0.429)**	**(0.257)*** **	**(0.188)*** **	**(0.216)*** **	**(0.194)*** **
ES	**0.385**	**0.282**	**0.382**	**0.262**	**0.385**	**0.282**	**0.414**	**0.33**
	(0.115)* **	**(0.103)*** **	**(0.119)*** **	**(0.092)*** **	**(0.103)*** **	**(0.068)*** **	**(0.119)*** **	**(0.117)*** **
FI	**0.266**	**0.244**	**0.288**	**0.33**	**0.266**	**0.244**	**0.152**	**0.053**
	(0.073)* **	**(0.48)*** **	**(0.068)*** **	**(0.04)*** **	**(0.153)***	**(0.1)** **	**(0.079)** **	**(0.066)**
Number of Obs	**126**	**126**	**126**	**126**	**126**	**126**	**126**	**126**
R-squared	**0.373**	**0.451**	**0.443**	**0.619**	**0.18**	**0.798**	**0.339**	**0.436**
Breusch Pagan LM test[a]					**0.23**	**0.0003**		
Inst relevance test Anderson's LR test (P-value)							**0.0000**	**0.0000**
Over-ident test Hansen J statistics (P-value)							**0.009**	**0.921**

Robust standard errors are in parentheses.

****, ** and * are respectively the 1%, 5% and 10% significance level.*

[a] *Breusch Pagan LM test corresponds to P-values.*