THE NEXUS AMONG FINANCIAL DEVELOPMENT AND POVERTY REDUCTION: AN APPLICATION OF ARDL APPROACH FROM THE MENA REGION

Leila Chemli[1]

Abstract

The objective of this paper is to examine the relationship between financial development and poverty reduction in 8 MENA countries (Algeria, Egypt, Iran, Jordan, Mauritania, Morocco, Tunisia and Yemen) over the period of 1990-2012 by using an "ARDL approach". Our empirical results show that the financial development favors the poor. The ratio to domestic credit to the private sector as % of GDP is significant and positive for Algeria, Iran, Jordan, and Tunisia. This country represents a sample of the upper-middle-income economies. While the ratio to liquid liabilities (M3) as % of GDP is significant and positive for our entire sample. This result suggests that access to credit for the poor remains a challenge.

Keywords: *financial development, poverty reduction, ARDL approach*

JEL Codes*: I32, O1,O5*

1. INTRODUCTION

Among the eight Millennium Development Goals (MDGs), is to eradicate extreme poverty and hunger. Indeed, the poverty represents a major challenge for all countries and specifically for developing countries. Our study is interested in the relationship between the financial development and the poverty. This link has not been widely explored over the past few decades. Through literature, this relationship can be classified by two channels. The first channel shows that financial development affects the poverty directly by improving the access of the poor to financial services such as (Odhiambo (2009), Pradhan (2010) and Akhter, Liu and Daly (2010)).

According to Kpodar (2004), the provision of financial services is prominently in order to reduce poverty. These programs adopted by developing countries focus on microcredit. Indeed, the microfinance is recognized as a means that can lead to the reduction of poverty in order to diversify their sources of income through self-employment. Financial development can contribute by improving credit facilities and deposits for the poor. However, if the poor have access to financial services, they can increase their productive assets; improve productivity and therefore their income. Kpodar (2004) distinguishes between two effects: the effect of the capital conduit of Mc Kinnon (1973) and the threshold effect. The first effect is developed by McKinnon (1973) based on the assumption that money and capital are complementary. It states that in the absence of deep and broad financial market for financial intermediation, the money holdings must be accumulated before the relatively costly and indivisible investment projects can be undertaken. McKinnon (1973) argued that even if the financial instruments do not provide credit to the poor, it nevertheless provides profitable

[1] Faculty of Economics and Management, University of Sousse, Riyadh City, LP 307, Sousse 4023, Tunisia, Tel.:+216 23 939 645, E-mail: chemli.leila@yahoo.fr

financial opportunities for savings. In developing countries the financial sector should be reformed to encourage savings to eliminating financial repression and releasing the interest rate. Therefore, the channel of financial intermediation through savings and credit favors the poor. Indeed, financial institutions can help the poor to invest in physical capital or human resources. « *For many people, they only source of credit is a pawnshop or money lender who many charge stag gerinly high interest and beat up clients who fail to pay on time* » (Easton (2005)). This confirms that financial services are expensive for the poor. The latter cannot have the means to get them. The hypothesis of McKinnon is that the mobilization of the savings establishes the prerequisite for any investment. The lack of access to the external finance places the poor in a situation where the accumulation of the capital is compromised. The second effect is concerning the effect on threshold of Kpodar (2006). When the financial system develops, it is possible that financial services propagate to the poor people. Indeed, it is necessary to reach a certain threshold so that the development can assure a profitable way the financial services to the poor. Besides, according to Kpodar (2004) as well as Boukhatem and Mokrani (2012), there are factors which limit the access of the poor people to the formal credit market is the lack of guarantee which is centered on the asymmetry of information, the distance between the housing and the banks, and the absence a formal financial institution specialized in financial services for the poor people. The underlying assumption is that as the financial system develops, it may extend its services to the poor. But otherwise, if the financial system is not enough developed, there is a situation where banks are in the incapacity to evaluate applications for credit and to assure the surveillance of the performance of the borrowers. We also attend the lack of the bank which prevent the poor people from having access to the financial system as well as lack of financial services for the poor. Therefore, the poor are away from the formal financial sector and are in front of not formal financial sector such as the hoarding and the self-funding. This leaves the poor in an unfavorable situation through which inequalities are widening. Indeed, the financial system has a positive impact on the average income of the poor. Moreover, from a certain threshold, if the evolution of the financial system is not controlled, it can cause adverse effects that are unfavorable to the poor.

The second channel shows that financial development affects poverty indirectly by stimulating economic growth through increased investment rates and by improving the capital to the most productive projects. The indirect link between the financial development and the poverty reduction passes by the effect of the finance on the economic growth. The positive effects expected from the financial development on the economic growth were described for a long time (Schumpeter (1912), Keynes (1930), Gurley and Shaw (1955), McKinnon (1973), Shaw (1973), Galbis (1977), World Bank (1989), Pagano (1993), Gibson and Tsakalatos (1994), Levine (2005)). One of the ways in which the financial development favors the economic growth by the mobilization from bottom to effective use. The financial intermediaries are able to efficiently channel funds from savers to investors in a cheap and effective way. The improvement of the functioning of the financial intermediaries is able to attract more saving. The increase of this saving allows more capital to be forwarded to the investment. A developed financial sector also facilitates the business, the protection and the diversification of the risk, what allows the implementation of big projects which would not have been possible without him. Another way by which the development of the financial systems leads to a faster growth consists in creating of the liquidity of their actions of the loan with the savers on a short-term base and the loans to the investors on a long-term base. By bringing the savers and the investors, the financial intermediaries are able to reduce transaction costs and information. This positive relationship between the economic growth and the financial development is supported by a large number of empirical studies (King and

Levine (1993), Arestis and Demetriades (1997), De Gregorio and Guidotti (1995), Levine, Loayza and Beck (2000), Beck, Levine, and Loayza (2000), Ghirmay (2004)). These studies report a positive and significant coefficient for the different indicators of the financial development. If the financial development favors the economic growth, it follows that the economic growth reduces the poverty. The financial development then leads, indirectly, a reduction of the poverty.

Pradhan (2010), through his article, insists on "*The hypothesis here is that once economic growth has been achieved it would unambiguously lead to poverty alleviation*»[2] . According to this author, when the hypothesis of the economic growth is achieved, it will be without ambiguity the result in the reduction of poverty. But in reality, the economic growth cannot be a sufficient condition to reduce the poverty. For example, if the financial development increases the disparity of income, the country can take advantage of the positive economic growth, without any profit for its poorest households. In this process, the group with high income will be richer whereas the low-income group will be poorer.

On the empirical front, very few studies have examined the relationship of causality between financial development and poverty reduction. Among these studies Odhiambo (2009), Pradhan (2010), Uddin and Kyophilavong Sydee (2012) and Uddin, Shahbaz, Arouri and Teulon (2014).

Odhiambo (2009) estimates the relationship between the financial development and the poverty, through a time series study covering the period 1960-2006. These results show that an increase in economic growth leads to an increase in financial development. This conclusion is consistent with the demand-following hypothesis, which postulates that the development of the financial sector is largely influenced by the growth of the real sector, creating a demand for new financial services. Furthermore, the results show both that financial development and economic growth Granger cause the reduction of poverty. Also, an increase in financial development reduces poverty. Similarly, there is a causality of economic growth to reduce poverty. Hence, an increase in economic growth reduces poverty. It recommends that policies aimed at increasing economic growth must be intensified in South Africa to have a more monetized economy and reduce high levels of poverty.

While Pradhan (2010) considers the relationship between financial development economic growth and poverty reduction in India through time series data covering the period 1951-2008. It emphasizes the existence of long-term equilibrium between financial development, economic growth and poverty reduction relationship. It also concludes the existence of unidirectional causality of poverty reduction to economic growth, economic growth to financial development, economic growth to reduce poverty and financial development to poverty reduction. It concludes that financial development and economic growth have a substantial contribution to reducing poverty in the economy.

Through the study, Uddin and Kyophilavong Sydee (2012) estimate the relationship between financial development and poverty in Bangladesh during the period from 1976 to 2010 through an approach of autoregressive distributed lag model (ARDL). They conclude that the existence of long-term between the development of the banking sector and poverty reduction relationship. They also concluded that there is a bidirectional causality between banking sector development and poverty reduction. Therefore, this finding implies that policy makers can influence the reduction of poverty by encouraging financial development in the

[2] Pradhan, R.P., 2010. The nexus between finance, growth and poverty in India: The cointegration and causality approach. *Asian Social Science*, Vol.6, N°.9. DOI: 10.5539/ass.v6n9p114

long term. Indeed, the development of the financial sector will enable better access to institutional credit to the poor. Put a retrieval system organized and efficient loan might encourage microcredit that the poor could be used as a step out of poverty. On the other hand, measures of poverty reduction would the economy on a higher growth trajectory, which will facilitate the continuation of reforms in the financial sector development.

Uddin, Shahbaz, Arouri and Teulon (2014) use an approach of autoregressive distributed lag model (ARDL) to study the relationship between financial development, economic growth and poverty reduction in the case of Bangladesh for the period 1970-2011. They conclude that the political leaders of Bangladesh can influence the reduction of poverty through financial sector development. Thus by providing loans to SMEs that will be useful to reduce poverty by creating jobs in the country.

Finally based in the previous works, we can see that financial development is beneficial to the poor. Therefore, the objective of this study is to examine the link between the financial development and the poverty through two indicators, the ratio of domestic credit to the private sector as % of GDP (Lcgdp) and the ratio of liquid liabilities (M3) as % of GDP (Lm3gdp) for 8 MENA countries by using an Autoregressive Distributed Lag approach (ARDL approach) during the period 1990 to 2012. Our study is different compared to the previous work in the following ways. First this study employed an autoregressive distributed lag model approach (ARDL) for 8 countries in the MENA region through a study by country and compares them. Second, two indicators of financial development are used to study the link between finance and poverty.

The paper is organized as follows. The section 2 represents a data sources and the underlying methodology. The results and discussions are being presented in the section 3. Finally the section 4 draws the conclusion and implications in this study.

2. DATA SOURCES AND METHODOLOGY

In this paper, we study the link between the financial development and the poverty reduction for 8 MENA countries, namely Algeria, Egypt, Iran, Jordan, Mauritania, Morocco, Tunisia and Yemen. This study covers the time period of 1990-2012. The data have been obtained from the World Development Indicators by the Word Bank. The Ln denote the logarithm. $hfce$ represents the household final consumption expenditure per capita $.cgdp$ denote the ratio of domestic credit to the private sector as % of GDP.$m3gdp$ denote the ratio to liquid liabilities (M3) as % of GDP. gdp denote the GDP per capita growth. $gini$ denote the Gini index. $trade$ denote the trade openness.

The ARDL approach developed by Pesaran, Shin and Smith (2001) as an alternative to test cointegration Engel and Granger (1987) and Johansen (1988, 1991). This technique allows the use of variables which differ from order integration I (0) and I (1). It is also better suited to small samples. In this article, we use the ARDL approach to estimating two specifications. The first is dependent on poverty by the ratio domestic credit to the private sector (% of GDP) and the second is dependent on the poverty by the ratio Liquid liabilities to GDP or M3 / GDP.

Our model shows that the first specification is as follows:

$$\Delta Ln\ hfce_t = \alpha_0 + \sum_{i=1}^{q} \beta_i \Delta Ln\ hfce_{t-i} + \sum_{i=0}^{q1} \gamma_i \Delta Ln\ cgdp_{t-i} + \sum_{i=0}^{q2} \delta_i \Delta Ln\ gdp_{t-i} + \sum_{i=0}^{q3} \mu_i \Delta Ln\ gini_{t-i} + \sum_{i=0}^{q4} \sigma_i \Delta Ln\ trade_{t-i} + \theta_1 Ln\ hfce_{t-i} + \theta_2 Ln\ cgdp_{t-i} + \theta_3 Ln\ gdp_{t-i} + \theta_4 Ln\ gini_{t-i} + \theta_5 Ln\ trade_{t-i} + \varepsilon_t \quad (1)$$

Our model shows that the second specification is as follows:

$$\Delta Ln\ hfce_t = \alpha_0 + \sum_{i=1}^{p} \beta_i \Delta Ln\ hfce_{t-i} + \sum_{i=0}^{p1} \gamma_i \Delta Ln\ m3gdp_{t-i} + \sum_{i=0}^{p2} \delta_i \Delta Ln\ gdp_{t-i} + \sum_{i=0}^{p3} \mu_i \Delta Ln\ gini_{t-i} + \sum_{i=0}^{p4} \sigma_i \Delta Ln\ trade_{t-i} + \theta_1 Ln\ hfce_{t-i} + \theta_2 Ln\ m3gdp_{t-i} + \theta_3 Ln\ gdp_{t-i} + \theta_4 Ln\ gini_{t-i} + \theta_5 Ln\ trade_{t-i} + \varepsilon_t \quad (2)$$

Where Δ denotes the first difference operator, while $\theta_1, \theta_2, \theta_3, \theta_4, \theta_5$ represent the long-run coefficient, $\beta_i, \gamma_i, \delta_i, \mu_i, \sigma_i$ represent the coefficient of the short-run dynamics, p, q represent the number of lags to the endogenous variable and $p1, p2, p3, p4, q1, q2, q3, q4$ denote the number of lags to the exogenous variable.

We study the possibility of the existence of the long-run relationship between the variables through the value of the Fisher test by the approach of Pesaran et al (2001) for the ARDL model. The test is based on two alternatives:

$$\begin{cases} H_0: \theta_i = 0 \\ H_1: \theta_i \neq 0 \end{cases} \text{ with } i = 1,2,3,4,5$$

The hypothesis H_0 implies the absence of long-run equilibrium relationship and the hypothesis H_1 imply the presence of long-run equilibrium relationship.

At the Fisher statistic (F-statistic) or the Wald statistic, Pesaran et al (2001) presented two critical values, with I (0) representing the lower bound values and I (1) representing the upper bound values with various possible cases (with or without constant models and / or trend). Three decisions are possible:

-If the F-statistic exceeds the upper bound values then we reject the hypothesis H_0, hence the existence of co-integrating relationship.

- If the value of F-statistic belongs to the two bound values so we cannot conclude.

-If the F-statistic is less than the lower bound values then we reject the hypothesis H_1, and we accept H_0 where the lack of co-integrating relationship.

Once validated the long-term relationship, we estimate by ordinary least square (OLS) our ARDL model.

3. RESULTS AND DISCUSSION

3.1. The unit root test

Before proceeding to the ARDL approach we tested the stationary of each series, we used the Dickey-Fuller (1981). The **table 1** reports the results of this test. The results obtained indicate that the variables are stationary in first differences and integrated of order I (I (1)). Indeed, in terms of results in the first difference ADF statistic appears below the critical value at the 1%, 5% and 10%. Indeed, the situation that arises and that all our variables are integrated of order one I (1), hence the use of auto-regressive model approach to delay spread (ARDL) developed by Pesaran, Shin and Smith (2001) is possible. It examines both the long-run equilibrium between the variables and dynamics of short-term through the method of error correction.

3.2. Determining the number of lag

The optimal number of lag to the ARDL model that ensures minimization criteria selected information is presented in the **table 2** for different countries; this applies to Eq. (1) and Eq. (2). Based on the criteria information, is retained for the optimal model Eq. (1) Eq. (2) shown in the table below.

3.3. The procedure to ARDL approach

We study the possibility of the existence of the long-run relationship between the variables through the value of the Fisher test by the approach of Pesaran et al (2001) for the ARDL model. Statistics Fisher test exceeds the upper bound values at 5% for both specifications and for the entire sample. So we reject the hypothesis H_0 and confirm the existence of the long-run relationship between the variables.

3.4. The relationship of long-run equilibrium

The long term equilibrium relationships derived of ARDL models are shown in the **table 3**.The estimation results confirm that the long-run elasticity of the lhfce relative to the first specification for the ratio of domestic credit to the private sector as % of GDP (Lcgdp) is positive and significant for Algeria, Iran, Jordan and Tunisia. While, an increase of 1% of the ratio of domestic credit to the private sector as % of GDP (Lcgdp) causes an increase of the household final consumption expenditure per capita (Lhfce) in these countries. While Egypt, Mauritania, Morocco and Yemen results are positive but not significant. However, the results relative to the second specification of the ratio to liquid liabilities (M3) as % of GDP (Lm3gdp) are positive and significant for all samples. Indeed, an increase of 1 % of the ratio of the ratio to liquid liabilities (M3) as % of GDP (Lm3gdp) leads respectively an increase of 66 %, 44 %, 88 %, 99 %, 26 %, 36 %, 63 %, 29 % for Algeria, Egypt, Iran, Jordan, Mauritania, Morocco, Tunisia and Yemen. This result suggests that the access to the credit for the poor remains a challenge. Moreover, this difference in the two indicators for financial development is explained by the fact that having the effect of conduit, Mc Kinnon considered the overnight deposits and the quantity of money circulating together with term deposit and savings deposit. This effect is reinforced where the poor access to saving deposits as well as term deposit. Comparing the two indicators of financial development, we find that the ratio to

liquid liabilities (M3) as % of GDP (Lm3gdp) supports the hypothesis of the conduit of Mc Kinnon. This is confirmed by Akhter and Daly (2009). They argue that if the ratio CGDP is not significant, this implies that bank credits does not reach the poor. Moreover, the positive sign of the two indicators: the ratio of domestic credit to the private sector as % of GDP Lcgdp and the ratio to liquid liabilities (M3) as % of GDP (Lm3gdp) implies the household final consumption expenditure per capita (Lhfce) increases as the level of financial development believes, resulting eventually in a decrease of poverty. Boukhatem and Mokrani (2012) also confirm the positive effect of financial development.

Besides we notice that the growth rate of the GDP per capita (Lgdpg) measuring the effect of the economic growth on the indicator of poverty, we can reveal a positive and significant sign for all our samples and for our two specifications. What is translated by an increase of 1 % of the growth rate of the GDP per capita is translated by an increase of the household final consumption expenditure per capita (Lhfce). These results show the existence of a beneficial effect of the economic growth. The latter shows the channel through which the financial development affects the poverty indirectly. This is confirmed by a number of authors such as Guillaumont and Kpodar (2004), Odhiambo (2009), Akhter and Daly (2010). Furthermore, Inoue and Hamori (2012) argue that the economic growth is an effective instrument for the reduction of the poverty. However, this positive effect of economic growth may be impeded by the presence of inequalities. Indeed, we note that the financial development and the economic growth go together to increase the household final consumption expenditure per capita (Lhfce) and thereafter reduce the poverty. On the other hand the results show the existence of negative and significant effect of the household final consumption expenditure per capita (Lhfce) for our two specifications.

This result allows to notice that that a reduction in inequality through the Gini index, will lead to an increase of the household final consumption expenditure per capita (Lhfce) and subsequent a deterioration of the situation of the poor. This result is conforming to the work of Ravallion (2005), and Mchiri Moudden (2011). In view of the long-term results, we note that the coefficients relative to Egypt, Mauritania, Morocco and Yemen are proving higher than Algeria, Iran, Jordan and Tunisia. Indeed, to reduce the poverty it is necessary to act not only on the increase of the economic growth, but also on the reduction on reducing inequalities. This confirms the idea that the economic growth is necessary, but not sufficient in the reduction of the poverty.

Besides, at the level of the results concerning the rate of trade openness presented by (Ltrade) we notice a positive and significant coefficient by all our samples. Inoue and Hamori (2012) assert that the openness contributes to the reduction of the poverty in developing countries.

3.5. The dynamics of the short-run

From the results of the **table 4**, the correction error term (ECM 1 and ECM 2) reflects the adjustment of the short-run adjustment of the indicator of poverty due to changes in exogenous variables. Indeed, they indicate the adjustment speed of the equilibrium to the poverty indicator. Moreover, ECM 1 and ECM 2 appears with a negative and significant sign, this confirms the existence of co-integration and after a long-term relationship. This coefficient is estimated for the first specification to 53%, 97%, 65%, 41%, 75%, 92%, 15%, and 77% respectively for Algeria, Egypt, Iran, Jordan, Mauritania, Morocco, Tunisia and Yemen. While for the second specification, the coefficient is estimated at 69%, 44%, 71%, 34%, 81%, 28%, 23%, and 88% respectively for Algeria, Egypt, Iran, Jordan, Mauritania, Morocco, Tunisia and Yemen.

Our results in the short-run almost identical to those of the long-run with less impact. In view of our results for the first specification, we note that the household final consumption expenditure per capita (Lhfce) depends positively on its past values for all our samples.

3.6. Robustness Test

To estimate the robustness of the various models of the tests of diagnoses were made. It is about the test of Breusch-Godfrey Serial Correlation LM Test of residues, the test of Heteroskedasticity Test: Breusch-Pagan-Godfreyand the test of jarque Bera for the Normality Test of residues. In view of the results presented in the table all the residues present a property. Indeed, it is concluded that there is no autocorrelation, non-existence of heteroscedasticity and absence of residues normally distributed.

4. CONCLUSION AND IMPLICATION

While the literature on the link between the financial development and the poverty has not been explored too much for the MENA region, there are no studies that examine this link using an autoregressive distributed lag approach (ARDL) and compare the results for the country. The objective of this paper is to fill this gap by examining the relationship between the financial development and the poverty for 8 countries in the MENA region over the period 1990-2012. The estimation results show the existence of an error correction mechanism that allows catching up to equilibrium at both specifications. Indeed, the results of the estimation of the long term equilibrium show that the ratio of domestic credit to the private sector as % of GDP is positive and significant for Algeria, Iran, Jordan and Tunisia while we note a positive and non-significant sign for Egypt, Mauritania, Morocco and Yemen. The first sample represents a number of countries to upper middle income, while the second is a number of countries in lower middle Income. For the second indicator of financial development, the results are positive and significant for the entire sample. The difference between these two indicators of financial development is explained by the effect of duct Mc Kinnon. Besides we conclude that the growth rate of the GDP per capita and the rate of trade openness affect positively the household final consumption expenditure per capita for the all samples. While the indicator for the Gini index affect negatively the indicator of poverty. Note that financial development is conducive to poverty reduction. There by encourages financial development through improved access to financial services and credit to the poor.

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Table1. Summary of the test of stationary for the MENA countries

Variables	Algeria					Iran					Jordan					Tunisia				
	First difference (none)					First difference (none)					First difference (none)					First difference (none)				
	Test ADF	1%	5%	10 %	Order of integration	Test ADF	1%	5%	10 %	Order of integration	Test ADF	1%	5%	10 %	Order of integration	Test ADF	1%	5%	10 %	Order of integration
Lnhfce	-5.17	-2.67	-1.95	-1.60	I(1)	-5.06	-2.67	-1.95	-1.60	I(1)	-5.97	-2.67	-1.95	-1.60	I(1)	-5.66	-2.67	-1.95	-1.60	I(1)
Lncgdp	-3.84	-2.67	-1.95	-1.60	I(1)	-4.15	-2.67	-1.95	-1.60	I(1)	-3.33	-2.67	-1.95	-1.60	I(1)	-4.17	-2.67	-1.95	-1.60	I(1)
Lnm3gdp	-4.12	-2.67	-1.95	-1.60	I(1)	-6.06	-2.67	-1.95	-1.60	I(1)	-4.85	-2.67	-1.95	-1.60	I(1)	-2.82	-2.67	-1.95	-1.60	I(1)
Lngdp	-8.66	-2.67	-1.95	-1.60	I(1)	-6.89	-2.67	-1.95	-1.60	I(1)	-5.16	-2.67	-1.95	-1.60	I(1)	-9.06	-2.67	-1.95	-1.60	I(1)
Lngini	-4.58	-2.67	-1.95	-1.60	I(1)	-4.47	-2.67	-1.95	-1.60	I(1)	-4.47	-2.67	-1.95	-1.60	I(1)	-4.47	-2.67	-1.95	-1.60	I(1)
Lntrade	-4.51	-2.67	-1.95	-1.60	I(1)	-2.94	-2.67	-1.95	-1.60	I(1)	-4.01	-2.67	-1.95	-1.60	I(1)	-5.48	-2.67	-1.95	-1.60	I(1)

Variables	Egypt					Mauritania					Morocco					Yemen				
	First difference (none)					First difference (none)					First difference (none)					First difference (none)				
	Test ADF	1%	5%	10 %	Order of integration	Test ADF	1%	5%	10 %	Order of integration	Test ADF	1%	5%	10 %	Order of integration	Test ADF	1%	5%	10 %	Order of integration
Lnhfce	-5.27	-2.67	-1.95	-1.60	I(1)	-5.42	-2.67	-1.95	-1.60	I(1)	-7.11	-2.67	-1.95	-1.60	I(1)	-6.19	-2.67	-1.95	-1.60	I(1)
Lncgdp	-1.89	-2.67	-1.95	-1.60	I(1)	-4.28	-2.67	-1.95	-1.60	I(1)	-4.60	-2.67	-1.95	-1.60	I(1)	-5.19	-2.67	-1.95	-1.60	I(1)
Lnm3gdp	-4.10	-2.67	-1.95	-1.60	I(1)	-6.96	-2.67	-1.95	-1.60	I(1)	-3.68	-2.67	-1.95	-1.60	I(1)	-4.86	-2.67	-1.95	-1.60	I(1)
Lngdp	-6.27	-2.67	-1.95	-1.60	I(1)	-4.57	-2.67	-1.95	-1.60	I(1)	-9.94	-2.67	-1.95	-1.60	I(1)	-6.06	-2.67	-1.95	-1.60	I(1)
Lngini	-4.47	-2.67	-1.95	-1.60	I(1)	-4.47	-2.67	-1.95	-1.60	I(1)	-4.47	-2.67	-1.95	-1.60	I(1)	-4.47	-2.67	-1.95	-1.60	I(1)
Lntrade	-3.32	-2.67	-1.95	-1.60	I(1)	-4.13	-2.67	-1.95	-1.60	I(1)	-6.21	-2.67	-1.95	-1.60	I(1)	-2.86	-2.67	-1.95	-1.60	I(1)

Table 2. Determination of the number of lag

Pays	Eq. 1	Eq. 2
Algeria	ARDL(1,0,1,0,0)	ARDL(1,0,1,0,0)
Egypt	ARDL(1,1,1,0,1)	ARDL(3,0,1,0,3)
Iran	ARDL(4,0,0,0,4)	ARDL(4,0,0,0,4)
Jordan	ARDL(1,4,0,1,0)	ARDL(1,0,0,1,0)
Mauritania	ARDL(1,0,0,0,0)	ARDL(1,1,0,0,0)
Morocco	ARDL(1,0,1,0,0)	ARDL(1,0,1,0,0)
Tunisia	ARDL(1,4,2,1,0)	ARDL(1,0,1,0,0)
Yemen	ARDL(1,0,1,0,0)	ARDL(1,0,4,0,0)

Table 3. Estimation of long-run

	Algeria		Egypt		Iran		Jordan		Mauritania		Morocco		Tunisia		Yemen	
Variable	**coefficient**		**coefficient**		**coefficient**		**coefficient**		**coefficient**		**coefficient**		**coefficient**		**coefficient**	
C	0,80***	0,39***	0,51***	0,81***	0,22***	0,59***	0,01**	0,71***	0,83***	0,91***	0,49***	0,09***	0,65***	0,23***	0,93***	0,48***
	(0,06)	(0,05)	(0,09)	(0,12)	(0,03)	(0,08)	(0,004)	(0,1)	(0,12)	(0,08)	(0,1)	(0,01)	(0,15)	(0,05)	(0,15)	(0,07)
LnCGDP	0,34***		0.37		0,05**		0,51***		0.87		0,11		0,53***		0,81	
	(0,05)		(0.55)		(0,01)		(0,09)		(2.20)		(0,02)		(0,12)		(0,14)	
LnM3GDP		0,66**		0,44***		0,88***		0,99**		0,26***		0,36**		0,63**		0,29**
		(0,18)		(0,13)		(0,15)		(0,29)		(0,09)		(0,1)		(0,09)		(0,14)
LnGDP	0,39*	0,38*	0,18**	0,15***	0,09***	0,16**	0,18***	0,23***	0,40**	0,12**	0,13***	0,07***	0.28***	0,38***	0,05**	0,03**
	(0,22)	(0,12)	(0,06)	(0,03)	(0,02)	(0,04)	(0,05)	(0,04)	(012)	(0,51)	(0.04)	(0,01)	(0.06)	(0,08)	(0,01)	(0,01)
LnGINI	-0,08*	-0,03*	-0,89***	-0,39**	-0,52**	-0,65**	-0,54**	-0,56**	-0,82*	-0,71**	-0,35***	-0,64**	-0,52***	-0,2**	-0,25**	-0,60**
	(0,04)	(0,006)	(0,2)	(0,08)	(0,15)	(0,2)	(0,22)	(0,14)	(0,28)	(0,53)	(0.07)	(0,23)	(0,13)	(0,07)	(0,06)	(0,12)
LnTRADE	0,44**	0,22**	0,58**	0,04**	0,82**	0,55***	0,36***	0,24**	2.48***	0,55**	0,05***	0,09**	0,21**	0,77**	0,07**	0,46**
	(0,18)	(0,09)	(0,22)	(0,01)	(0,25)	(0,13)	(0,09)	(0,07)	(0.77)	(0.92)	(0.01)	(0,03)	(0,06	(0,2)	(0,02)	(0,14)

Table 4. Error correction model

	Algeria		Egypt		Iran		Jordan		Mauritania		Morocco		Tunisia		Yemen	
Variable	**coefficient**		**coefficient**		**coefficient**		**coefficient**		**coefficient**		**coefficient**		**coefficient**		**coefficient**	
C	0,17*** (0,02)	0,14*** (0,02)	0,02*** (0,003)	0,03*** (0,004)	0,38*** (0,05)	0,33*** (0,04)	0,29*** (0,04)	0,13*** (0,01)	0,05*** (0,007)	0,18*** (0,02)	0,04*** (0,006)	0,08*** (0,01)	0,1*** (0,015)	0,05*** (0,007)	0,12*** (0,01)	0,27*** (0,04)
D(LnHFCE (-1))	0,15*** (0,03)	0,05*** (0,01)	0,33** (0,08)	0,17** (0,04)	0,2*** (0,03)	0,35** (0,07)	0,18*** (0,04)	0,17*** (0,04)	0,07** (0,01)	0,45* (0,09)	0,13* (0,03)	0,07* (0,01)	1,36** (0,2)	0,61*** (0,09)	0,17** (0,02)	0,22* (0,06)
D(LnHFCE (-2))				0,28** (0,09)	0,22*** (0,06)	0,32*** (0,08)										
D(LnHFCE (-3))				0,41* (0,12)	0,2** (0,05)	0,08** (0,02)										
D(LnHFCE (-4))					0,13** (0,03)	0,04** (0,01)										
D(LnCGDP)	0.65*** (0,14)		0.16 (2.73)		0.51*** (0,10)		0.53*** (0,12)		0.52 (2.38)		0.10 (2.86)		0.51*** (0.09)		0,04 (0.02)	
D(LnM3GDP)		0,43*** (0,08)		0,12** (0,02)		0,56*** (0,12)		0,81*** (0,15)		0,19** (0,06)		0,16** (0,03)		0,85*** (0,25)		0,95** (0,22)
D(LnGDP)					0.56** (0.18)	0.67*** (0.18)	0,26*** (0,08)	0,22*** (0,05)	0,18*** (0,04)	0,27*** (0,07)						
D(LnGDP (-1))	0,09*** (0,01)	0,05*** (0,01)	0,39** (0,1)	0,65** (0,16)							0,52*** (0,1)	0,01** (0,003)	0,29** (0,07)	-0.36** (0.13)	0,34** (0,07	0,28** (0,05
D(LnGINI)	-0,02*** (0,006)	-0,04** (0,01	-0,46** 0,15)	-0,58** (0,14)	-0,54** (0,12)	-0,49** (0,11)	-0,49** (0,15)	-0,51** (0,16)	-0,15** (0,04)	-0,21** (0,05)	-0,41** (0,1)	-0,07** (0,01)	-0,48** (0,14)	-0,17** (0,04)	-0,14** (0,04)	-0,31** (0,07)
D(LnTRADE)	0,4** (0,07)	0,23*** (0,05)	0,24** (0,07)	0,05** (0,01)	0,33*** (0,08)	0,09*** (0,02)	0,03** (0,009)	0,05** (0,01)	0,8*** (0,17)	0,75*** (0,16)	0,05** (0,01)	0,03*** (0,007)	0,42** (0,12)	0,42*** (0,09)	0,29** (0,09)	0,05*** (0,012)
ECM1 (-1)	-0,53** (0,15		-0.97** (0.39)		-0,65*** (0,13)		-0,41*** (0,08)		-0.75** (0.31)		-0,92** (0,29)		-0,15** (0,04)		-0.77*** (0.25)	
ECM2 (-1)		-0,69*** (0,15)		-0,44** (0,11)		-0,71*** (0,16)		-0,34** (0,08)		-0,81** (0,21)		-0,28*** (0,06)		-0,23*** (0,05)		-0.88** (0.30)

Table 5. Test of robustness

	Algeria		Iran		Jordan		Tunisia		Egypt		Mauritania		Morocco		Yemen	
	Eq.1	**Eq.2**	**Eq.1**	**Eq.2**	**Eq.1**	**Eq.2**	**Eq.1**	**Eq.2**	**Eq.1**	**Eq.2**	**Eq.1**	**Eq.2**	**Eq.1**	**Eq.2**	**Eq.1**	**Eq.2**
Breusch-Godfrey Serial Correlation LM Test																
F-statistic	1.89	0.93	0.77	0.74	0.03	2.73	0.36	1.05	0.40	1.43	1.29	0.01	1.06	0.67	0.34	0.18
Prob	0.19	0.41	0.53	0.54	0.96	0.10	0.71	0.37	0.67	0.30	0.30	0.98	0.37	0.53	0.71	0.83
Heteroskedasticity Test: Breusch-Pagan-Godfrey																
F-statistic	0.49	1.16	0.4	0.46	0.32	0.33	0.54	2.02	0.21	0.61	1.78	0.47	0.32	2.34	1.25	0.96
Prob	0.80	0.37	0.86	0.86	0.94	0.90	0.81	0.12	0.98	0.7693	0.1738	0.81	0.91	0.09	0.33	0.52
Normality test																
Jarque-Bera	0.89	0.00	9.13	6.98	0.31	0.76	0.55	0.18	2.80	0.65	0.57	27.83	16.34	1.18	0.75	0.37
Prob	0.63	0.99	0 .01	0.03	0.85	0.68	0.75	0.90	0.24	0.71	0.74	0.00	0.00	0.55	0.68	0.82