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RESEARCH ARTICLE

FINANCIAL DEVELOPMENT, ENVIRONMENTAL QUALITY, TRADE OPENNESS AND ECONOMIC GROWTH: EMPIRICAL STUDY IN MENA COUNTRIES

Sawssen Nafti

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Abstract

In this paper, we empirically investigate the causal relationship between financial development, environmental degradation (CO2 emissions), trade openness and economic growth (GDP), using Panel data (the theory of cointegration Pedroni (1999,2004)) for 12 MENA countries (Middle East and North Africa) during the period 1990-2014.The long-term relationships estimated by the modified least squares technique proposed by Pedroni (1996). Our results indicate that there is evidence for a bidirectionel causality between CO2 emissions and economic growth. Economic growth and trade openness are interdependent, it exist a bidirectionel causality. Also, we confirm a bidirectional causality among trade openness and financial development. The unidirectional causality of financial development on economic growth and openness to CO2 emissions trading is identified. Our empirical results also verified the existence of the environmental Kuznets curve hypothesis by the causal link between GDP and environmental polution. Finally, panel causality verifies the existance of bidirectional relationship between economic growth(GDP), environmental degradation(CO2 emissions), financial development and trade openness. This empirical knowledge is of particular interest to policy makers as it helps us create sound economic policies to support economic development and improve environmental quality.

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Introduction:-

Over the past two decades, the topic of fundamental link between energy consumption and macroeconomics variables has been examined by many researchers (Fodha & Zaghdoud, 2010; Jamel & Derbali, 2016; Jaunky, 2010; Kahia, Ben Aïssa, & Charfeddine, 2016, 2017; Ozturk & Acaravci, 2010; Saboori, Sulaiman, & Mohd, 2012). Numerous studies have analyzed the causal relationship between energy consumption and several independent variables such as economic growth, financial development, employment, and population (Jamel & Derbali, 2016; Kahia et al., 2016, 2017). Then, energy is considered to be the fandamental line of each economy, the most vital mechanism of socioeconomic development and renowned as one of the most important strategic commodities.

In this context, the main idea of this study is to examine empirically the causal relationship between GDP, CO2 emissions, financial development, and trade openness. For the econometric method, we use the theory of cointegration (Pedroni (1999,2004) in Panel Data Models to analysate this relationship for a yearly panel data of 12 MENA countris during 1990 to 2014. The empirical findings indicate the existing of bidirectional causality among GDP and financial development, between GDP and environmental pollutants, between GDP and trade openness,

Corresponding Author:- Sawssen Nafti

between financial development and trade openness, and among trade openness and environmental pollutants. Finally, panel causality verifies that bidirectional causal connection is found between economic growth, environmental degradation (CO_2 emissions), financial development, and trade openness.

This region MENA was chosen as the focus of this study because empirical analysis of countries in this region is relatively scarce. In addition, the characteristics of the countries in the MENA region are very suitable to the case of the present study, for example, this region has some of the largest energy reserves in the world. Yet, while the region is trying to industrialize and modernize its economies, there are the challenges of the carbon emissions. Moreover, energy consumption is the most significant source of pollution and, in terms of particulate matter concentrations, MENA represents the second most polluted region in the world – after South Asia – and the highest CO_2 producer per dollar of output.

This study is organized as follow: Firstly, we show a review of previous literature on the nexus between GDP, financial development, CO_2 emissions, and trade openness. Secondly, we explore the econometric method utilized in our paper and we present the empirical results. Thirdly, we give interpretation of resulrts and concluding remarks.

Literature Review:-

The relationship between energy consumption and economic growth has been the subject of considerable academic research over the past few decades (Omri, 2013). Various studies have focused on different countries, time periods, modeling techniques and different proxy variables which have been used for energy consumption and economic growth nexus(e.g., Apergis and Payne, 2009, Baranzini et al., 2013,Ghosh, 2010, Stern, 1993, Wolde-Rufael, 2005 and Yuan et al., 2007), but in general the empirical results are mixed and have not reached a unique consensus (Chen et al., 2007 and Omri, 2014). From the existing studies, one can observe that the Granger causality test has been widely carried out to study the direction of causality between the two variables (Farhani et al., 2014). However, it is clear that the literature on energy consumption–growth nexus produced inconclusive results and there is a consensus neither on the existence nor on the direction of causality (Farhani et al., 2014). A major reason for the absence of consensus is that the Granger causality test in a bivariate framework is likely to be biased due to the omission of relevant variables affecting energy consumption and economic growth nexus (Stern, 1993).

This problem has led some recent Granger causality based-studies investigating the causal links between energy consumption and economic growth to incorporate capital and labor in the multivariate models (e.g.,Apergis and Payne, 2010a, Bartleet and Gounder, 2010, Zhixin and Xin, 2011, Sadorsky, 2012 and Shahbaz and Lean, 2012). Recently, some other studies have incorporated trade openness in the production function in order to investigate the relationship between economic growth, capital, labor and trade (e.g., Lean and Smyth, 2010a and Narayan and Smyth, 2009; and Sadorsky, 2012). In addition to energy and trade, some of the recent studies such as Islam et al. (2013) and Ozturk and Acaravci (2013)have included financial development in the production function. Financial development, which refers to a country's decision to allow and promote activities like increased foreign direct investment (FDI), increases in banking activity, and increases in stock market activity, presents one possible avenue for which economic growth can be increased (Sadorsky, 2010).

Several existing studies in energy economics have argued that energy consumption and economic growth may generate considerable pressure on the environment quality(e.g., Apergis and Payne, 2010b, Arouri et al., 2012, Omri et al., 2014, Shahbaz et al., 2013b and Tiwari et al., 2013). As often mentioned in the environmental Kuznets curve (EKC) literature, as output increases, carbon dioxide emissions increase as well until some threshold level of output was reached after which these emissions begin to decline.

Economtric methodology

To examine the different relationships between the different variables, we use a Cobb-Douglas function, whose GDP depends on capital, labor, energy consumption which is directly correlated with CO_2 emissions (Ang (2008), Sharma (2010); Stern (2000)). The Cobb-Douglas function is written as follows;

$$Y = AK^{\alpha} E^{\lambda} L^{\beta} e^{u} \quad (1)$$

With, Y : real GDP, K : physical capital, E : energy consumption, L : labor power. The term A is the technology factor and e it is the error term. α, λ, β denote the respective elasticities of capital, energy consumption and labor power, with respect to GDP. For a given technological level, we can write energy consumption as a function of CO2 emissions : $E = bC$ (Pereira and Pereira (2010). Equation (1) will be as follows:

$$Y = b^{\lambda} A K^{\alpha} C^{\lambda} L^{\beta} e^{u} \quad (2)$$

Like many works such as Shahbaz's paper and lean (2012), technology will be endogenously determined by trade and financial development. Indeed, financial development encourages foreign direct investment and technology transfer. Likewise, international trade allows better technological diffusion. Therefore we have::

$$A(t) = \theta . FDI(t)^{\alpha} OUV(t)^{\beta} \quad (3)$$

With : θ its constant term, FDI it is foreign direct investment and it is trade openness.
By substituting (3) in (2), we get:

$$Y = \theta . C(t)^{\lambda_1} FDI(t)^{\lambda_2} OUV(t)^{\lambda_3} K(t)^{\alpha} L(t)^{(1-\alpha)} \quad (4)$$

By dividing (4) by the labor force, and by making the logarithm, we obtain: :

$$LnY_t = \alpha_1 + \alpha_2 LnC_t + \alpha_3 LnFD_t + \alpha_4 LnOUV_t + \alpha_5 LnK_t + \varepsilon_t \quad (5)$$

Since we are working with panel data, equation (5) takes the following form; ;

$$LnY_{it} = \alpha_{1i} + \alpha_{2i} LnC_{it} + \alpha_{3i} LnFD_{it} + \alpha_{4i} LnOUV_{it} + \alpha_5 LnK_{it} + \varepsilon_{it} \quad (6)$$

With (i) denotes the countries (i = 1… ..12) and T denotes the time dimension (T = 1990… .2014), LNYit denotes the logarithm of real GDP, LNCO2 denotes the logarithm of CO2 emissions, LNFD represents the level of financial development measured by the share of credits granted to the private sector in GDP, LNOUV is the logarithm of trade openness, and LNK is the stock of capital. This last variable is replaced by the logarithm of gross fixed capital formation expressed in real terms (LNFBCF).

Based on theoretical and empirical studies that have dealt with the subject, we will estimate four equations to take into account any interactions between the different variables.

In this wake, we will test the existence of the interaction betwen Economic Growth-Environment-Trade opening-Financial development. To do this, we will end up with the following four equations

$$\begin{cases} LnY_{it} = \alpha_{1i} + \alpha_{2i} LnC_{it} + \alpha_{3i} LnFD_{it} + \alpha_{4i} LnOUV_{it} + \alpha_5 LnFBCF_{it} + \varepsilon_{it} & (7) \\ LnCO2_{it} = \alpha_{1i} + \alpha_{2i} LnY_{it} + \alpha_{3i} LnFD_{it} + \alpha_{4i} LnOUV_{it} + \alpha_{5i} LnY^2{}_{it} + \alpha_{6i} LnENER_{it} + \alpha_{7i} LnURB_{it} + \varepsilon_{it} & (8) \\ LnFD_{it} = \alpha_{1i} + \alpha_{2i} LnY_{it} + \alpha_{3i} LnCO2_{it} + \alpha_{4i} LnOUV_{it} + \alpha_{5i} LnINFL_{it} + \varepsilon_{it} & (9) \\ LnOUV_{it} = \alpha_{1i} + \alpha_{2i} LnY_{it} + \alpha_{3i} LnCO2_{it} + \alpha_{4i} LnFD_{it} + \alpha_{5i} LnFDI_{it} + \varepsilon_{it} & (10) \end{cases}$$

Equation (7) has to test the impact of the following variables on economic growth: (i) CO2 emissions (LnCO2) (ii) the level of financial development (LnFD), (iii) Domestic investment (LFBCF) and (iv) trade openness (LnOUV).

Equation (8) shows that CO2 emissions can be influenced by economic growth (LnY), the level of financial development (LnFD), trade openness (LnOUV), the square of GDP (LnY2), the energy consumption (LnENER) and urbanization (LURB).

Equation (9) shows that the level of financial development (LnFD) can be affected by economic growth (LnY), CO2 emissions (LnCO2), trade openness (LnOUV) and the rate of inflation (LINFL).

Equation (10) traces the factors that can affect trade openness; economic growth (LnY), CO2 emissions (LnCO2), the level of financial development (LnFD) and foreign direct investments (LnFDI).

All variables were taken from the World Bank WDI database: world developmentindicator.

The estimation will be made by the modified least squares technical (FMOLS below) which is a method allowing to correct the long-term endogeneity bias of the regressors. Thus they produce error terms which have good orthogonality properties.But before moving on to testing long-term relationships, it is appropriate to test for the presence of a unit root of the different variables.

Empirical results

Results of the tests of the Unit root

The proposed tests are the test of Im, Pesaran and Shin, 2003 (hereafter, IPS) and Levin, Lin and Chu (2002) (hereafter, LLC)). The first test is more powerful than the second given that it makes it possible to take into account a heterogeneous unit root rather than a homogeneous one in the model.

The IPS test is based on the following regression:

$$\Delta y_{it} = \alpha_i + \rho_i \, y_{it-1} + \gamma_i t + \sum_{j=1}^{P_i} \beta_{ij} y_{it-j} + \varepsilon_{it} \, , \; i = 1,2,...,N \text{ et } t = 1,2,...,T \qquad (11)$$

The null hypothesis of the test is ($H_0 : \rho_i = 0$) for everything (i), against ($H_a : \rho_i \langle 0$) for at least one (i).

IPS (1997) relax the hypothesis that the parameter (ρ_i) est is the same for all individuals. They proposed a separate unit root test for each of the (N) individual. Stationarity can be tested using the Student statistic (hereinafter, t-bar). The t-bar statistic is written as follows:

$$t_{bar} = \frac{\sqrt{N}\left(\bar{t}_{N,T} - E(\bar{t}_{N,T})\right)}{\sqrt{V(\bar{t}_{N,T})}}$$

With,

$\bar{t}_{N,T}$ is the average of the individual (t-stat) obtained from a usual ADF test on time series for each individual; ;

$E(\bar{t}_{N,T})$ and $V(\bar{t}_{N,T})$ denote respectively the mean and the variance of $\bar{t}_{N,T}$.

(t_{bar}) converges in probability to a normal distribution under the null hypothesis of nonstationarity and when (N) et and (T) tend to infinity i.

The results of the two tests are summarized in the following tables :

Table 1:- LL and IPS tests on level series.

SÉRIES	LL(2002)	IPS(1997)	VC 5%(1)
LGDP	**-0.73**	**1.63**	**-1.65**
LCO2	**1.54**	**0.80**	**-1.65**
LFD	**2.91**	**1.03**	**-1.65**
LINV	**-0.59**	**3.61**	**-1.65**
LTRADEOP	**0.28**	**0.55**	**-1.65**
LENERG	**1.64**	**2.73**	**-1.65**
LUR	**-1.23**	**4.53**	**-1.65**
LINF	**-1.31**	**0.20**	**-1.65**
LFDI	**-0.53**	**-2.79**	**-1.65**

(1) Critical value at a 5% threshold)

Table 2:- LL and IPS tests on the First Difference series.

SÉRIES	LL(2002)	IPS(1997)	VC 5%(2)
DLGDP	**-7.50**	**8.55**	**-1.65**
DLCO2	**-5.62**	**-7.77**	**-1.65**
DLFD	**-9.12**	**-8.81**	**-1.65**
DLINV	**-2.07**	**-4.39**	**-1.65**
DLTRADEOP	**-15.76**	**-3.00**	**-1.65**
DLENER	**-2.81**	**-5.27**	**-1.65**
DLUR	**-1.84**	**-5.11**	**-1.65**
DLINF	**-15.854**	**-13.75**	**-1.65**
DLFDI	**-11.27**	**-10.82**	**-1.65**

(2) Critical value at a 5% threshold)

The LLC (2002) and IPS (2003) tests reject the null hypothesis of the presence of a unit root at a significance level of 5%. Indeed, all the values are lower than the critical values (-1.65). On the other hand, for level series, all the values are greater than the critical values (-1.65). Therefore, the variables can be considered as integrated of order one (it exist a unit root for level series).

Cointegration test

In this work we will use the cointegration test of Pédroni (1997) which is used in the panel data. This test is based on seven statistics which fall into two categories:

The first category contains four tests which are based on the intra-individual dimension and in which three obey a non-parametric type correction.(v-statistic panel, rho-statistic panel, pp-statistic panel), and only one which obeys a parametric correction (adf-statistic panel).

The second category contains three tests which are based on the inter-individual dimension and in which there are two tests which use a non- paramétric correction (group rho-statistic, group pp-statistic) and a test uses parametric correction (group adf-statistic).

The results of this test are summarized in these tables.

Table 3:- Pedroni cointegration test: equation (7).

statistics Test	Panel v-stat	Panel rho-stat	Panel pp-stat	Panel adf-stat	Group Rho-stat	Group pp-stat	Group adf-stat
VALUE	**-0.17**	**0.63**	**-2.54**	**-2.31**	**2.06**	**-3.38**	**-2.23**
VC à 5%	**1.64**	**-1.64**	**-1.64**	**-1.64**	**-1.64**	**-1.64**	**-1.64**

Table 4:- Pedroni cointegration test: equation (8).

statistics Test	Panel v-stat	Panel rho-stat	Panel pp-stat	Panel adf-stat	Group Rho-stat	Group pp-stat	Group adf-stat
VALUE	**-0.73**	**0.38**	**-7.84**	**-6.37**	**1.83**	**-8.32**	**-5.72**
VC à 5%	**1.64**	**-1.64**	**-1.64**	**-1.64**	**-1.64**	**-1.64**	**-1.64**

Table 5:- Pedroni cointegration test: equation (9).

statistics Test	Panel v-stat	Panel rho-stat	Panel pp-stat	Panel adf-stat	Group Rho-stat	Group pp-stat	Group adf-stat
VALUE	**-4.74**	**0.71**	**-14.60**	**2.87**	**2.73**	**-3.89**	**-1.50**
VC à 5%	**1.64**	**-1.64**	**-1.64**	**-1.64**	**-1.64**	**-1.64**	**-1.64**

Table 6:- Pedroni cointegration test: equation (10).

statistics Test	Panel v-stat	Panel rho-stat	Panel pp-stat	Panel adf-stat	Group Rho-stat	Group pp-stat	Group adf-stat
VALUE	**-4.75**	**-4.10**	**-67.18**	**-27.46**	**1.56**	**-12.56**	**-7.45**

VC à 5%	1.64	-1.64	-1.64	-1.64	-1.64	-1.64	-1.64

Equation 7: With the exception of Panel-V-Statistic, Panel-rho-stat and group rho-stat all statistics developed by Pédroni reject the null hypothesis of non-cointegration. So there is a cointegrating relationship between the variables in equation 7.

Equation 8: With the exception of Panel -V-Statistic, Panel-rho-stat and group rho-stat all the tests developed by Pédroni reject the null hypothesis of non-cointegration. So there is a cointegrating relationship between the variables in equation 8.

Equation 9: Only two statistics (Panel-pp-stat and Group-pp-stat) that accept the existence of a cointegrating relationship .

Equation 10: All statistics accept the existence of a cointegration relationship with the exception of Panel v-stat and Group-rho-stat.

The cointegrating vectors will be estimated by the FMOLS method.

Estimation results

The estimation of the cointegrating vectors, were made using the technique of FMOLS, which provide efficient estimators in the presence of regressorsI (1)

Table 7:- Results of Estimation of Equation 7 Dependent variable: LGDP.

	Methode : FMOLS			
	LCO2	LFD	LOUV	LFBCF
Algeria	-0.079 (-1.46)	0.03 (3.86)	0.12 (2.71)	0.04 (3.41)
Bahrain	-0.30 (-11.79)	0.229 (0.55)	0.189 (5.58)	0.01 (2.22)
Egypt	-0.01 (-0.56)	0.02 (6.36)	0.00002 (0.0004)	0.09 (15.83)
Iran	-0.104 (-2.66)	0.119 (0.70)	0.11 (6.09)	0.135 (9.68)
Jordan	-0.123 (-2.17)	0.162 (5.69)	0.02 (1.40)	0.232 (17.3)
Kuwait	-0.02 (-0.11)	0.121 (1.71)	0.49 (1.74)	0.178 (3.46)
Morocco	-0.189 (-1.73)	0.09 (3.34)	0.167 (2.57)	0.202 (8.55)
Oman	-0.121 (-2.17)	0.164 (5.30)	0.04 (0.27)	0.009 (0.27)
Qatar	-0.215 (-2.80)	0.185 (8.16)	0.126 (2.07)	0.087 (4.45)
Saudi Arabia	0.01 (0.83)	0.17 (6.97)	0.04 (1.72)	0.38 (22.27)
Syria	-0.06 (-1.95)	0.06 (0.025)	0.098 (0.99)	-0.03 (-1.89)
Tunisia	-0.189 (-8.97)	0.10 (7.30)	0.07 (4.83)	0.18 (13.39)
Panel	-0.11 (-2.30)	0.07 (11.30)	0.162 (2.60)	0.12 (28.28)

** and * denote significance at respective thresholds of 1.5 and 10%.

Table 8:- Results of Estimation of Equation 8 Dependent variable: LCO2

	Methode : FMOLS					
	LGDP	LFD	LOUV	LGDPSQUARE	LENER	LURB
Algeria	0.228 (6.69)	0.08 (2.44)	0.275 (2.86)	-0.17 (-6.66)	0.568 (1.43)	0.28 (2.76)
Bahrain	0.181 (3.89)	0.169 (6.54)	0.29 (1.89)	-0.112 (-3.91)	0.28 (1.87)	0.42 (1.80)
Egypt	0.278 (2.56)	0.31 (1.92)	0.142 (2.29)	-0.16 (-2.53)	0.04 (0.20)	-0.335 (-1.12)
Iran	0.278 (3.44)	0.06 (0.78)	0.175 (2.87)	-0.19 (-3.35)	0.36 (5.21)	0.35 (3.68)
Jordan	0.283 (9.11)	-0.007 (-0.17)	0.06 (2.23)	-0.159 (-9.04)	0.297 (4.53)	0.075 (0.43)
Kuwait	0.274 (2.30)	0.05 (0.98)	0.34 (2.32)	-0.23 (-2.27)	0.354 (2.21)	0.309 (2.49)
Morocco	0.294 (3.62)	0.151 (4.39)	0.09 (1.73)	-0.12 (-5.71)	0.07 (5.56)	-0.07 (-0.13)
Oman	0.251 (2.69)	0.001 (0.01)	0.87 (2.19)	-0.12 (-2.71)	0.26 (5.37)	0.48 (1.82)
Qatar	0.219 (3.60)	0.171 (0.94)	0.931 (6.17)	-0.128 (-3.55)	0.20 (5.12)	0.33 (5.59)
Saudi Arabia	0.328 (1.13)	0.18 (2.06)	-0.29 (-0.56)	-0.199 (-1.13)	0.33 (2.19)	0.59 (1.75)
Syria	-0.49 (-0.19)	0.61 (0.17)	-0.09 (-0.96)	-0.274 (-0.13)	0.70 (0.009)	0.42 (0.78)
Tunisia	0.219 (3.15)	-0.05 (-0.91)	0.06 (2.07)	-0.114 (-3.17)	0.278 (2.71)	0.37 (5.43)
Panel	0.231 (2.58)	0.118 (0.97)	0.13 (4.05)	-0.149 (-2.61)	0.304 (6.98)	0.45 (3.78)

***, ** and * denote significance at respective thresholds of 1.5 and 10%.

Table 9:- Results of Estimation of Equation 9 Dependent variable: LFD.

	Methode : FMOLS			
	LGDP	LCO2	LOUV	LINFL
Algeria	0.263 (4.72)	-0.03 (-1.92)	0.29 (1.81)	-0.16 (-2.25)
Bahrain	0.304 (11.47)	-0.213 (-2.05)	0.03 (8.16)	-0.26 (-9.85)
Egypt	0.252 (2.49)	-0.09 (-1.96)	0.148 (0.65)	-0.37 (-4.96)
Iran	0.17 (5.41)	-0.14 (-5.20)	0.201 (8.57)	-0.13 (-3.49)
Jordan	0.179 (1.94)	-0.14 (-1.28)	0.42 (2.10)	-0.09 (-3.56)
Kuwait	0.287 (2.68)	-0.21 (-5.57)	0.30 (0.41)	-0.02 (-0.51)
Morocco	0.22 (2.57)	-0.167 (-1.08)	0.338 (5.44)	-0.195 (-6.95)
Oman	0.29 (14.65)	-0.04 (-0.95)	0.248 (10.3)	-0.10 (-12.61)
Qatar	0.288 (0.40)	-0.12 (-9.39)	0.269 (1.87)	-0.12 (-10.68)
Saudi Arabia	0.288	-0.261	0.59	-0.11

	(2.30)	(-1.35)	(4.33)	(-3.03)
Syria	0.06 (0.77)	0.08 (0.31)	0.17 (1.23)	-0.13 (-2.98)
Tunisia	0.20 (4.02)	-0.103 (-1.10)	0.51 (2.89)	-0.063 (-1.48)
Panel	0.217 (7.18)	-0.19 (-1.61)	0.382 (8.03)	-0.03 (-2.91)

***, ** and * denote significance at respective thresholds of 1.5 and 10%

Table 10:- Results of Estimation of Equation 10 Dependent variable: Louv.

	Methode : FMOLS			
	LGDP	LCO2	LFD	LFDI
Algeria	0.404 (9.11)	-0.33 (-9.30)	0.13 (3.63)	-0.03 (-1.53)
Bahrain	0.498 (6.90)	-0.275 (-4.13)	0.35 (4.57)	0.06 (6.65)
Egypt	0.41 (0.59)	-0.45 (-0.39)	-0.12 (-0.65)	0.03 (1.101)
Iran	0.24 (4.25)	-0.83 (-3.12)	0.65 (2.09)	0.03 (1.101)
Jordan	0.32 (1.60)	-0.32 (-4.38)	0.17 (5.56)	0.223 (1.91)
Kuwait	0.31 (3.49)	-0.24 (-3.32)	0.218 (0.22)	0.263 (0.60)
Morocco	0.23 (2.22)	-0.42 (-2.49)	0.21 (2.98)	0.10 (2.15)
Oman	0.58 (2.61)	-0.18 (-4.10)	-0.06 (-1.34)	0.003 (0.50)
Qatar	0.42 (4.64)	-0.35 (-3.53)	0.30 (6.09)	0.154 (5.53)
Saudi Arabia	0.39 (3.05)	-0.27 (-3.42)	0.33 (2.48)	0.39 (8.33)
Syria	-0.70 (-0.62)	-0.28 (-0.32)	0.69 (1.90)	0.11 (0.79)
Tunisia	0.335 (36.61)	-0.03 (-0.03)	0.207 (3.18)	0.14 (1.104)
Panel	0.301 (2.95)	-0.30 (-5.76)	0.247 (7.41)	0.212 (9.35)

.***, ** and * denote significance at respective thresholds of 1.5 and 10%.

The tables presented above show the estimation of the different equations, which trace the four possible connections between CO2 emissions, financial development, trade openness and economic growth.

The results of the estimations of equation (7) are summarized in Table 7: it is clear that CO2 emissions have negative impacts and statistically significant on per capita GDP for Bahrain, Iran, Jordan, Tunisia, Oman, Qatar, Syria and Morocco. This implies that economic growth is elastic by compared to CO2 emissions. Such elasticity is found in an interval which extends from 0.11 to 0.30. For the remaining countries, the impact of this variable on economic growth is' nt statistically significant.

For all 12 countries, the impact is positive and statistically significant. The magnitude is 0.11 which implies that an increase in CO2 emissions of only 1% reduced economic growth by 0.11%. This result seems to go hand in hand with the results obtained by Jayanthakumaran et al. (2012).

The coefficient relating to financial development shows a positive impact and statistically significant for 8 countries: Algeria, Egypt, Jordan, Kuwait, Morocco, Oman, Saudi Arabia and Tunisia. Economic growth appears to be an elastic variable at the level of financial development. The elasticity ranges from 0.02 to 0.18. For all countrys, the coefficient is 0.07 which is statistically significant: an increase in the level of 1% in financial development, generates a 0.07% increase in economic growth. ndeed, a developed financial system give the possiblity to attract more foreigners investment, improve dung markets and boost economic growth. (Shahbazand Lean,2012)

Likewise, trade openness exhibits a positive and statistically significant effect on the economic growth of 9 countries: Algeria, Bahrain, Iran, Kuwait, Morocco, Oman, Qatar, Saudi Arabia and Tunisia. For other countries, the impact remains not statistically significant. For all 12 countries, openness seems to have a positive and statistically significant impact. The magnitude is 0.162: an increase in the commercial opening rate of 1%, generates an increase in economic growth of 0.162%. These results corroborate with the results obtained by Omri (2013).

The results of the estimations of equation (8) are summarized in table 8: it seems that the GDP per capita is involved in the explanation of CO2 emissions by positive and statistically significant coefficients, and this for most of the countries in the exception of Syria, and Saudi Arabia. The elasticity remains in an interval that runs from 0.18 to 0.29,For all countries, the coefficient is 0.231, which turns out to be statistically significant: an increase in GDP per capita of 1%, generates an increase in CO2 of 0.23%. This implies that an increase in economic growth automaticly degrades the environment. These results corroborate with the results obtained by Halicioglu (2009) for Turkey, Fodha and Zaghdoud (2010) for Tunisia, Wang et al (2012) for China, Jayanthakumaran et al. (2012) for chnia and India, Saboori et al. (2012) for Malaysia, and Lee (2013) for the G20 group.

Regarding the variable relating to financial development, it turns out to have a positive impact for only four countries: Algeria, Bahrain, Morocco and Saudi Arabia. These results seem to be in the same line with the results obtained by Tamazian et al. (2009), Sadorsky (2010) and Zhang (2011).

For all countries, the coefficient is positive but not statistically significant. This result is similar to that obtained by Ozturk and Acaravci (2013) for Turkey. For the variable measuring trade openness, it is involved in the explanation of CO2 emissions by positive and statistically significant coefficients for 8 countries: Algeria, Egypt, Iran, Jordan, Kuwait, Oman, Qatar and Tunisia.

For the rest of the countries, the impact is'nt statistically significant. It turns out that trade openness increases CO2 emissions. This result seems to go hand in hand with the results of Managi et al (2009). They stressed the importance of foreign trade in determining the level of CO2 emissions. The authors suggest that CO2 emissions are generated by the transport sector. The coefficients assigned to the square of the variable relating to GDP are negative and statistically significant, for all countries except Syria. This validates the hypothesis of EKC (Kuznet environmental curve).

For the Panel as a whole, the coefficient is found to be negative and statistically significant. Beyond threshold (stabilization point), any increase in GDP only reduces CO2 emissions. These results corroborate those obtained by Sabooriet al. (2012), Ozturk and Acaravci (2013). The affected coefficient of energy consumption is positive and statistically significant for Iran, Jordan, Kuwait, Morocco, Oman, Qatar and Tunisia.

This implies that CO2 emissions are sensitive to variations in energy consumption. The elasticity remains in an interval that runs from 0.20 to 0.36. For the whole panel, the elasticity is equal to 0.30. A 1% increase in energy consumption causes a 0.3% increase in CO2 emissions. This implies that a significant energy consumption leads to environmental degradation. These results are compatible with those found by Soytas et al. (2007) for the United States, Soytas et al. (2007) for Turkey, Zhang and Cheng (2009) for China. Finally, the variable relating to urbanization seems to have a positive and statistically significant coefficient for 5 countries: Algeria, Iran, Kuwait, Qatar and Tunisia.

This result indicates that urbanization tends to increase CO2 emissions for these countries. For all 12 countries, the elasticity remains around 0.45. Table 9 reports the estimation of Equation 9. The results show a positive and statistically significant impact on financial development for all countries except Syria and Qatar. The elasticity remains in an interval that runs from 0.17 to 0.30. For the coefficient assigned to the whole sample, it is positive and statistically significant. It remains around 0.217. Regarding the variable relating to CO2 emissions, it has a negative and statistically significant effect on financial development for the following countries: Algeria, Qatar, Egypt., Iran, Kuwait and Bahrain. The elasticity ranges from 0.18 to 0.35.

For the remaining countries, there is no significant impact. For the overall coefficient, it remains negative but insignificant. This result is analogous to that of Shahbaz et al. (2013). In addition, trade openness appears to be having a positive and statistically significant impact for all countries except Syria, Kuwait and Egypt. For the entire panel, the impact remains positive and statistically significant. The elasticity remains around 0.382:

An increase in the opening rate implies an increase in the level of financial development by 0.38. This result corroborates that of Yücel (2009), for the case of Turkey. Finally, the inflation rate exhibits a negative and statistically significant impact for all countries except Kuwait and Tunisia. The coefficient ranges from -0.37 to -0.02. The overall model shows a statistically significant coefficient at around -0.03. An increase in the rate of inflation causes a drop in the share of loans to the private sector in GDP by 0.03%. This result seems to go in the same direction with the results obtained by Dehesa et al. (2007) and Zoli (2007).

Table 10 shows the results of the estimates of equation 10. It seems that the GDP per capita positively impacts trade openness for the case with the exception of Syria, Jordan and Egypt. The elasticity remains at 0.23 to 0.49. For all countries, the elasticity is positive and statistically significant. It is equal to 0.301: an increase in GDP per capita of 1% generates an increase in the openness rate of 0.301%.

A high-economic growth country is more open than a low-economic growth country. The coefficient relating to CO2 emissions shows negative and statistically significant impacts for all countries except for the case of Tunisia and Syria. The overall coefficient, in turn it remains negative and significant. It is around -0.30. Financial development has a positive and statistically significant impact on trade openness for all countries except Egypt, Iran, Kuwait and Syria.

For all countries, the impact remains positive and statistically significant. The elasticity is around 0.247. An improvement in the level of financial development of 1% leads to an increase in the openness rate of 0.24%. This result corroborates with the results found by Menyah et al. (2014). Finally, direct foreign investment shows a positive and statistically significant effect for only the case of Saudi Arabia, Qatar, Morocco, Jordan and Bahrain. For all countries, the coefficient remains positive and statistically significant. The elasticity is around 0.212: an increase in foreign investment of 1%, generates an increase in the opening rate of 0.212%.

Our results suggest a bidirectional relationship between the environmental degradations (CO2 emissions) and the economic growth (GDP per capita), whitch are positively and extremely associated for the case of Bahrain, Iran, Jordan, Qatar, and Tunisia. Unidirectional relationship between CO2 emissins and GDP per capita for the case of Morocco, Oman and Syria.

Bidirectional relationship between foreign development and GDP per capita for the case of Algeria, Egypt., Jordan, Morocco, Saudi Arabia, and Tunisia. Unidirectional relationship between financial development and GDP for the case of Oman and Qatar.

Bidirectional between CO2 and financial development for the Bahrain case, Algeria, Egypt. and Morocco. Unidirectional relationship between CO2 and financial development for the case of Saudi Arabia ,Kuwait, bidirectional relationship between CO2 and trade opening for the case of Algeria, Bahrain, Iran, Jordan, Kuwait, Morocco, Oman and Qatar . Unidirectional relationship between CO2 and trade openness in the case of Saudi Arabia, and Egypt, Qatar and Iran.

Conclusion:-

In this paper, we have empirically investigated the causal connection between financial development, economic growth, CO2 emissions and trade opness. In this way, we have used the theory of cointegration (Pedroni (1999,2004) in Panel Data Models for 12 MENA countries during the period 1990- 2014.The long-term relationships estimated by the modified least squares technique proposed by Pedroni (1996).

The main empirical findings of our paper is that economic growth and environmental degradations are positively and extremely associated. The GDP per capita predicts a positive linkage with CO2 emissions. Furthermore, GDP per capita promotes the financial development. However, GDP can prevent trade openness. The increase in financial development can increase trade openness. We, also, find a positive connection between CO2 emissions and trade liberalization. A developed financial system, helps attract more foreign investment, improve stock markets and boost growth. Trade openness increases CO_2 emissions (generated by the transport sector), an improvement in the level of financial development leads to an increase in the opening rate. An increase in the openness rate implies an increase in the level of financial development. A high-growth country is more open than a low-growth country.

In conclusion, reconciling economic growth, financial developement and environmental protection with trade liberalization is not an easy task, these three concerns can be contradictory. On the one hand, the majority of economic activities have a negative impact on the environment: either by the use of natural resources in the production process or by the reduction of natural capital. On the other hand, the various objectives of environmental protection can threaten economic development. We must therefore think of green growth, which is the concern of our next paper.

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38. Les tableaux présentés ci-dessus, exposent les estimations des différentes équations, qui retracent les quatre connexions Annexe 6 Liste des pays retenus 12 pays de MENA 1 Algérie.