International Journal of Econometrics and Financial Management, 2019, Vol. 7, No. 1, 20-26
Available online at http://pubs.sciepub.com/ijefm/7/1/3
Published by Science and Education Publishing
DOI:10.12691/ijefm-7-1-3

A Dynamic Panel Data Analysis for Relationship between Energy Consumption, Financial Development and Economic Growth

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Received April 07, 2019; Revised May 24, 2019; Accepted June 10, 2019

Abstract The purpose of this work is to investigate the cointegration and Granger causal relationship between economic growth and total energy consumption as well as the relationship between economic growth and financial development in the MENA region by using a panel data analysis the period over 2000-2018. Different from limited existing provincial studies on the MENA region, an advanced panel econometric methodologies such as dynamic Panel data techniques consider the question of the energy use-economic growth-financial development nexus. Our results suggest that energy consumption exerts a positive and significant impact on economic growth. Furthermore a positive relationship between financial development and economic growth was detected. Thereby it is important to examine the causal effects of both the total energy use and the financial system before local governments make specific energy and economic policies.

Keywords: *economic growth, energy use, financial development*

Cite This Article: Tarek Sadraoui, Hamid Hamlaoui, Zine Youness, and Imen Ben Sadok, "A Dynamic Panel Data Analysis for Relationship between Energy Consumption, Financial Development and Economic Growth." *International Journal of Econometrics and Financial Management*, vol. 7, no. 1 (2019): 20-26. doi: 10.12691/ijefm-7-1-3.

1. Introduction

As a key of economic growth and a pillar of financial development, the subject of energy consumption occupied the previous literature because it give a seriously results that can touch the economic and financial system's country. Although the vastly number of empirical works that focused in this relation, no clear consues was elaborated.

For these, give value to those types of studies is important, in order to explain the chain connecting them, Mantu [1], mentions that understanding the determinants of energy demand and its modeling is essential in several reasons.

First, the energy-growth literature has emphasized the importance of energy in helping emerging economies to grow and prosper.

Second, as the space for economic prosperity by many emerging economies intensifies, it also requires a lot of energy as key to the production of almost all goods and services [2,3].

Third, many emerging economies are growing very rapidly that has created a spurt in the demand for energy and compelled us to manage global emissions of greenhouse gases in the future [2].

In this context, the aim of this paper is to empirically investigate links between energy consumption, economic growth and financial development, in the Middle East and North Africa region. Indeed, the MENA region includes some of the largest fossil fuel producing countries in the world, and played an important role in supplying energy (oil and natural gas) around the world. The countries of this region benefit from several assets: a privileged geographical position at the crossroads of Europe, Africa, and Asia; a young and increasingly educated population with great potential in sectors such as renewable energies, industry, and tourism and business development services. Hence it presented the typical choice to investigate in this topic.

Our research attempts to fills the gap about the dynamic relationship between economic growth, financial development and energy consumption. To be more specific we concentrated mainly with examining the short and long-run relationship between them. Using a more advanced econometric technique, which is named generalized method-of-moments (GMM) dynamic panel estimations, this econometric technique has been recently used in the growth literature as an alternative to cross-sectional

estimators. The advantage of this GMM methodology is that it takes care of that econometric problems caused by unobserved country-specific effects and endogenity of the independent variables in lagged-dependent-variable models such as economic growth regressions. And, thus, helps us get more precise results.

The remainder of this paper is organized as follows: Section 2 provides a literature review on energy demand, economic growth and financial development. Section 3 present empirical methodology to this study. The empirical results are summaries in section 4. Finally, Section 5 states the main conclusion and policy implications.

2. Literature Review

One of the topics that have been well-studied in the energy economics literature, this who treats the causal relationship among energy consumption, economic growth and financial development. Indeed, the literature on energy-economics-finance nexus highlights the ways by which energy consumption can potentially affects economic growth in one hand, and a well developed financial system improve the economic performance country's in the other hand.

Following the studies of [4,5,6,7], who defend the existence of a causality relationship that emerges from the development finance to the economic growth. Based at the argument of a well developed financial system provides efficient financial services for foreign banking markets and improved the access of foreign and domestic companies to financial goods and services that are usually lead to an improvement in the country economically.

[3], suggested adding the energy demand variable into the economy-finance relationship, and argued that, likely a developed financial system will have a positive impact on economic growth and hence on energy demand. The logic presented by [3], supports the idea that consumers and businesses find it easier and cheaper to borrow money in order to buy goods and services and invest more easily if the financial system is well developed.

Add Sadorsky that these loans are generally used by consumers for the purchase of luxury goods, such as automobiles or homes that directly increases the energy consumption and this is because automobiles are fueled by petroleum products as well as houses are cooled or heated by energy products.

Also, a developed financial system is a wish for businesses because it facilitates for them the access to finance capital, thanks to either: lower borrowing costs, or new sources of financing such as actions to make new investments. This, in turn, increases the demand for energy in the construction of new infrastructure.

In the past few years, the causal linkage between economic growth, financial development and energy use has received an increasing attention in the recent literature.

As presented in the following table, the findings of these studies are ambiguous and inconclusive. The majority of these studies confirmed the existence of a long run relationship among the variables.

Among the first studies that focused on the three-way relationship that reliant each of growth, finance and the demand of energy, we can cite the [8] study that argues this topic in Tunisia during the 1972 to 2010 period. The causal relationship between energy consumption, per capita GDP and credit to the private sector as a proxy of financial development was examined by using the VECM models and Granger causality tests.

The main empirical results show that in the long term there is bidirectional causality between the energy demand and GDP, as well as a unidirectional causality going of energy demand to the financial development variable. On the short term, the study found that only the demand of energy causes financial development which demonstrates the interest to include the financial development variable in the relation energy-growth, according to [8].

Also, [3] study have concentrated on investigating the relationship between energy use and economic growth by incorporating financial development, international trade and capital in China case over the period of 1971 to 2011. The long-run relationship between the variables was testing by applying the ARDL bounds testing approach to cointegration that confirmed the existing of a long-run relationship among the variables.

The results indicate that energy use, financial development, capital, exports, imports, and international trade have a positive impact on economic growth. Also, a unidirectional causal relationship running from energy use to economic growth was revealed. Financial development and energy use Granger cause each other. There exists also a bidirectional causality relationship between financial development and economic growth.

In another study, [9] were confirmed that economic growth, financial development, and energy consumption are cointegrated, The VECM causality analysis has shown that financial development Granger-causes CO2 emissions, when they focused in examinating the linkage among economic these three variables in the case of Indonesia during the period of 1975Q1-2011Q4.

More recently, and in order to capture the impact of financial development on energy consumption through economic growth channel. [10] explored the growth-finance-energy nexus for Pakistan during the period 1972-2012, by applying the GMM system estimation technique and using Intermediary development and stock market development as a proxy of financial development. The results obtained show a positive and significant impact of financial development on energy consumption through the economic growth channel; also the study finds a positive and significant impact of economic growth and urbanization on energy consumption.

Supporting this argument, the research elaborated by [11] that tried to identify the relationship among the economic growth and two financial development indicators such as domestic credit provided by the banking sector and domestic credit to private sector in SAARC countries. The Panel cointegration test pointed that a long-run relationship between economic growth, financial development, and energy consumption exist. Also, the using of the fixed effect model indicates that there is a significant relationship among these three variables.

More recently, another study that aims to search the nature of the relationship that can reliant all of the CO2

emissions, financial development, energy consumption and economic growth in Gulf Cooperation Council (GCC) countries over the period 1980 to 2011 was published by [12]. In this one, the ARDL bounds testing approach emphasize the existence of a long-run equilibrium relationship among energy consumption and financial development in all GCC countries except UAE.

Focused in India economy, [13] choose to examine the energy, growth relation by incorporating financial development, capital, and labor into the function of production over the 1960Q1-2015Q4 period. In this study, the nonlinear autoregressive distributed lag bounds testing approach and the asymmetric causality test are applied to examine the asymmetric cointegration and the causal association between the considered variables. The findings of this research indicate that only negatives shocks to both energy consumption and financial development have an impact on economic growth.

Table 1. Summary of studies on energy-growth-finance Nexus

Author	Period	Country	Methods	Result
Slim Chtioui (2012)	1972-2010	Tunisia	the VECM Granger causality test. Decomposition of the variance of ENC.	Bidirectional causality between ENC and GDP. A unidirectional causality going of ENC to CSPV
Shahbaz et al. (2013a)	1965–2008	South Africa	The ARDL bounds testing approach, ECM and Structural break unit root test.	long run relationship among the variables A rise in EG increases energy emissions. A rise in financial development reduces energy emissions.
Islam et al. (2013)	1971-2009	Malaysia	ARDL approach; and VECM	EC is influenced by FD, both in the short and the long run. EC is influenced by FD and EG.
Shahbaz et al. (2013)	1975Q1–2011Q4	Indonesia	Zivot–Andrews unit root test, the ARDL approach, VECM Granger causality and IA approach	EG and EC increaseCO2 emissions. FD Granger causesCO2 emissions.
Shahbaz et al. (2013b)	1971-2011	China	The ARDL bounds testing approach and the structural break test.	Long-run relationship between the series is found. Unidirectional causal relationship running from energy use to EG. FD and energy use Granger cause each other. Bidirectional causality between international trade and energy use.
Komal and Abbas (2015)	1972-2012	Pakistan	GMM estimation technique	A positive and significant impact of FD on EC through the EG Channel. A positive and significant impact of EG and urbanization on EC.
Hafiz Muhammad et al. (2015)	1980-2010	South Asia	The panel co-integration and PMG estimation approaches	FD, energy and trade positively affect the EG. In long run a bidirectional relationship exists among EG and EC. A unidirectional causality running from trade and FD to EG.
Ronald Ravinesh Kumar et al. (2015)	1971–2011	South Africa	The ARDL bounds , the Bayer and Hanck cointegration techniques	A unidirectional causality detected runs from FD to EG. A unidirectional causality running from trade openness to EG.
Alam et al.(2015)	1975-2011	SAARC countries	Panel cointegration test	A long-run relationship between FD, EC and EG. The fixed effect model shows that there is a significant relationship among EC, EG and FD.
Mohammad Salahuddin et al. (2015)	1980-2012	Gulf Cooperation Council Countries	DOLS, FMOLS and the dynamic fixed effect model	No significant short-run significant relationship was observed. A bidirectional causal link between EG and CO2 emissions. No causal link between FD and CO2 emissions.
Abdulkadir et al. (2015)	1970 -2012	Japan	structural break unit root test ARDL test, the Johansen cointegration test and VECM approach	FD has positive and significant impact on EC. EG and FD are totally reliant on electricity consumption.
Bekhet et al. (2017)	1980-2011	GCC Countries	the ARDL bounds testing approach	The existence of a long-term equilibrium relationship among EC and FD in all Gulf Cooperation Council (GCC) countries except UAE.
Farah Hayat et al. (2017)	1974 -2014	Pakistan	Granger's OLS regression and correlation Eagle Granger approach	In short run Financial Development Index, and energy price have significant relationship with EC.
Shahbaz et al. (2017)	1960Q1–2015Q4	India	The NARDL approach and asymmetric causality test	Only negative shocks in EC have negative impacts on EG. A negative shock in FD hampers domestic economic output.
Bassem Kahouli (2017)	1995-2015	South Mediterranean Countries (SMCs)	ADF and PP unit root tests, Bound tests ARDL approach and VECM method	EC, FD, and EG are cointegrated. Short-run unidirectional causal relationships exist at least once for each country (except Egypt).
Maryam Moradbeigi and Siong Hook Law (2017)	1980-2010	63 oil-producing countries	Panel unit root test and the common correlated effect mean group estimator	EC cause EG. FD enhances EC.

EC, EG and FD denote Energy Consumption, Economic Growth and Financial Development respectively.

Also in 2017, [14] has realized a work that attempts at examining the short and long run relationship causal link among economic growth, financial development, and energy consumption in the case of southern Mediterranean countries for the 1995-2015 periods. The results based on ADF and PP unit root tests, Bound tests ARDL approach and VECM method and using real domestic credit to private sector as a share of GDP as a proxy of financial development confirmed the existence of a long run relationship among growth, energy and finance. The short-run causal relationship was also detected a unidirectional causal relationship at least once for each country (except Egypt).

3. Data and Methodology

Here the presentation of the model to be estimated as well as the different methods of estimation most suitable for our study will be shown in the first part. The different application of stationarity and cointegration tests while highlighting the importance of these tests for the empirical analysis framework for dynamic panel models will be presented in the second part.

And we will finalize by the interpretation of the estimated model results.

3.1. Data description

Our empirical study uses panel data for the MENA countries during the period 2000-2018 by using a dynamic panel data analysis. The choice of the starting period is constrained by the availability of data. World Development Indicators (WDI, 2018) is combed to collect the data for total energy consumption per capita, real GDP per capita, real domestic credit to private sector and two additional variables, real per capita gross fixed capital formation (constant 2010 US$) as a proxy of capital stock and urbanization (% of population).

3.2. Methodology

Following the work of [14] and [15,16], we employ the Cobb–Douglas production function to investigate the three-way linkages between total energy consumption per capita, real GDP per capita, real domestic credit to private sector as a proxy of financial development including capital and labor as controls variables.

The functional form of the model is as follows:

$$GDP_{it} = A_{it} EC_{it}^{\alpha 1} FD_{it}^{\alpha 2} K_{it}^{\alpha 3} L_{it}^{\alpha 4} y_{it-1}^{\alpha 5}. \quad (3.1)$$

It should be noted that we have converted all the series into logarithms because the simple linear specification does not seem to provide consistent results. So, this transformation facilitates the interpretation of the estimated coefficients which are read as elasticities. Also, it can control the heteroscedasticity problem. Indeed, the logarithmic transformation makes it possible to solve or reduce the differences between the variables linked to the differences in their units of measure.

The logarithmic transformation of equation (3.1) is given by:

$$\begin{aligned} LnGDP_{it} &= \alpha_0 + \alpha_1 \ln EC_{it} + \alpha_2 \ln FD_{it} \\ &\quad + \alpha_3 \ln K_{it} + \alpha_4 \ln L_{it} + \alpha_5 \ln y_{it-1} \varepsilon_{it} \end{aligned} \quad (3.2)$$

The subscript i denotes the country (i=1,…,20) and t indicates the time period (t = 2000,…,2018). $Ln\ GDP_{it}$ refers natural log of real GDP per capita as a proxy of economic growth, $\ln EC_{it}$ reveals natural log of energy consumption (kg oil equivalent) per capita, $\ln FD_{it}$ shows natural log of domestic credit to private sector (per capita) as a proxy of financial development, $\ln K_{it}$ implies a natural log of real capital use and urbanization is measured by urban population per capita ($\ln L_{it}$) while ε_{it} is error term. α_1 , α_2 , α_3 and α_4 are the output elasticities respectively with respect to energy consumption, financial development, domestic capital and labor force.

In this study, a dynamic Panel data analysis will be used to test the three way relationship. The first step of our analysis is to make sure of the stationarity of the series or of the order of integration of each of them. Therefore, the study of the stationarity of each series is based on two types of tests. First-generation tests [7], Madalla & Wu (1999) and second-generation tests Pesaran (2003). Both of tests is based on two hypotheses the null hypothesis of the presence of a unit root (non- stationary) against the alternative hypothesis of absence of unit root (stationary) the results of the test are given in Table 2 bellow for a sample of 20 countries of the MENA region.

After getting assumed about order of integration of the different series, we apply the Perdoni cointegration test, which allows studying the existence of a long-term relationship between economic growth, energy consumption and financial development for the MENA region. Then, In order to complete the cointegration test, we proceed to estimate by the method "FMOLS" Full Modified Ordinary Least Square.

Table 2. Unit Root Tests Results

Variable	LIC		IPS		MW			
					ADF -Fisher		PP - Fisher	
	Level	First. Déférence	Level	First. Déférence	Level	First. Déférence	Level	First. Déférence
PIB	-5.456 (0.000)***	-3.499 (0.0002)***	1.157 (0.8766)	-2.656 (0.0040)**	32.354 (0.799)	71.633 (0.0016)**	22.767 (0.9870)	116.94 (0.0000)***
EC	-3.273 (0.0005)***	-3.670 (0.0001)***	0.91861 (0.8209)	-4.343 (0.0000)***	28.933 (0.902)	85.907 (0.0000)***	32.700 (0.7870)	20273 (0.0000)***
FD1	-0.964 (0.1673)	-3.389 (0.0004)***	-0.34312 (0.6342)	-3.448 (0.0003)***	37.607 (0.4875)	79.229 (0.0001)***	44.960 (0.2033)	166.854 (0.0000)***
K	-2.054 (0.0200)**	-4.013 (0.0000)***	1.03030 (0.8486)	-3.282 (0.0001)***	20.938 (0.745)	53.296 (0.0012)**	28.774 (0.3214)	77.019 (0.0000)***
L	4.215 (1.0000)	-0.850 (0.1975)	-7.66157 (1.0000)	2.711 (0.9967)	25.584 (0.9627)	43027 (0.3333)	1349.4 (0.0000)***	58.096 (0.0320)**

*, ** and *** show stationnarity at 1, 5 and 10% level respectivel.

4. Results of Econometric Modeling

In this section, we will present the results of the estimates made for 20 MENA countries. The first step is to present the unit root test to determine the stationarity of the variables. The second step is to implement the Perdoni cointegration test to check for cointegration between variables. Once relationships are determined, we can estimate a Vector error correction model.

4.1. Results of Unit Root Tests

The table below gives the results of the unit root tests according to LIC (1992), IPS (1997) and Maddala & Wu (1999) respectively.

Since Levin's test, [16] proposes the dependence between individuals under the alternative hypothesis; the IPS test intervenes to lift this hypothesis and proposes independence between individuals under the alternative hypothesis. The fact that we have data missing the test [15] and especially the PP-Fisher test is more adequate.

Typically, the results in Table 2 indicate that most of variables used are integrated of I (1). On the one hand, the PP-Fisher test, do not allow to reject the null hypothesis of the presence of a unit root. The GDP per capita, financial development, energy consumption per capita and capital are not stationary in level. On the other hand, the null hypothesis of the presence of a unit root is rejected, unanimously for all series in the first difference.

4.2. Results of Cointegration Tests of Perdoni (1999)

The [6] test was employed to determine the presence of cointegration among variables. The results showed in Table 3 reveals that the probability of the majority of tests is less than 1%, which allows us to reject the null hypothesis of the absence of cointegration and to accept the alternative hypothesis of the presence of cointegration. So the variables energy consumption, financial development, and GDP are cointegrated. And subsequently, the hypothesis of a long-term relationship between these variables was confirmed.

Table 3. Perdoni cointegration test result (1999)

	Statstic	Probability
Panel v-Statistic	0.767132	0.2215
Panel rho-Statistic	1.497040	0.9328
Panel PP-Statistic	-5.593669	0.0000***
Panel ADF-Statisic	-4.106413	0.0000***
Group rho-Statistic	3.748375	0.9999
Group PP-Statistic	-4.704730	0.0000***
Group ADF-Statistic	-3.942900	0.0000***

***; ** and *, variables are cointegrated to 1%; 5%; 10%.

4.3. Results of VECM Model

VECM Granger causality approach makes it possible to determine the meaning as well as the intensity of short-term relationships and to indicate the rate of long-term adjustment.

We start with the long-term causality study. Indeed, we are talking about a long-term causality between economic growth and the energy consumption and financial development variables when c (1) has a negative coefficient and a significant p-value, that is to say, less than 0.05, which is our case. Indeed, the result of our estimation of the VECM model of the long-term relationship presents a negative coefficient (-0.001025) and significant p-value (prob = 0.0226 <0.05). This allows us to conclude that both energy consumption and financial development which are explanatory variables in this specification causes economic growth, by the way, so the process converges in the long run;

Table 4. Long run cointegration test results

	Coefficient	Std.Error	t-Statistic	t-Statistic
C(1)	-0.00102	0.00044	-2.2962	0.022**

*, ** and *** show stationnarity at 1, 5 and 10% level respectively.

For the short-term causality test, the procedure is based on Wald's test and subsequently the interpretation of the probability associated with the chi-square test. Indeed, when the probability of chi-square testing is greater than 0.05, we notice that there isn't a short-term causality between the explanatory variable en question and the dependent variable.

Table 5. Wald test result on the short-term causality between economic growth and energy consumption

Wald Test:			
Equation: Untitled			
Test Statistic	Value	df	Probability
Chi-square	5.216	2	0.073
Null Hypothesis: C(4)=C(5)=0			
Null Hypothesis Summary:			
Normalized Restriction (= 0)		Value	Std. Err.
C(4)		0.031	0.046
C(5)		-0.106	0.0479
Restrictions are linear in coefficients.			

The Wald's test results showed a probability of chi-square (0.073) less than 0.1, which allows us to conclude the existence of a short-term relationship between economic growth and energy consumption.

Table 6. Wald test result on the short-term causality between economic growth and financial development

Wald Test:			
Equation: Untitled			
Test Statistic	Value	df	Probability
F-statistic	3.842805	(2, 215)	0.0229
Chi-square	7.685610	2	0.0214
Null Hypothesis: C(6)=C(7)=0			
Null Hypothesis Summary:			
Normalized Restriction (= 0)		Value	Std. Err.
C(6)		0.0451	0.0234
C(7)		-0.0271	0.0218
Restrictions are linear in coefficients.			

The Wald's test results showed a probability of chi-square (0.0214) is less than 0.05, which allows us to accept the alternative hypothesis that stimulates the

existence of a short-term relationship. This allows us to conclude the existence of a short-term relationship between economic growth and financial development.

4.4 GMM Test Results

Estimation Equation:

LOG(GDP) = C(1) + C(2)*LOG (GDP(1)) + C(3)*LOG(EC) + C(4)*LOG(FD1) + C(5)* LOG(K) + C(6)* LOG(L) + ε it

Substituted Coefficients:

LOG(GDP) = 0.01868 + 0.99976*LOG (GDP(1)) + 0.01619*LOG(EC) + 0.00730*LOG(FD1) + 0.016305* LOG(K) + 0.02348* LOG(L).

Table 7. GMM Regression Test

Dependent Variable: LOG(GDP)				
Method: Panel Generalized Method of Moments				
Sample (adjusted): 2000 2014				
Periods included: 15				
Cross-sections included: 13				
Total Panel (unbalanced) observations: 183				
2SLS instruments weighting matrix				
Instrument specification: C LOG(GDP(1)) LOG(FD1) LOG(K(2)) LOG(EC)				
Variable	**Coefficient**	**Std.Error**	**t-Statistic**	**Probability**
c	0.018690	0.094884	0.196976	0.8441
Log(PIB(1))	0.999765	0.001074	931.2038	0.0000***
Log(Ec)	0.016194	0.008883	1.822991	0.0700*
Log(Fd1)	0.007300	0.013939	0.523728	0.6011
Log(K)	0.016305	0.009258	1.761111	0.0799*
Log (L)	0.023478	0.012051	1.948301	0.0530*
R-squared	0.999	**Mean dependent var**		27.343
Adjusted R-squared	0.999	**S.D. dependent var**		3.699
S.E. of regression	0.0361	**Sum squared resid**		0.230
Durbin-Watson stat	1.4063	**J-statistic**		2.07E-13
Instrument rank	6			

*, ** and *** show significance at 1, 5 and 10% level respectively.

The results in table show a robust Adjusted R-square of about 0.9999 indicating that about 99.99% change in dependent variable (GDP) is jointly explained by the explanatory variables (EC, FD, K and L), while only 0.01% present change in the dependent variable, that is, economic growth fluctuation, can be said to be explained by factors outside the model. The result indicates also, that EC, K and L are statistically significant in explaining real economic growth evolution in the MENA region with the t-statistic value of 1.8229, 1.7611, and 1.9483 for EC, K and L respectively.

Furthermore, our estimates show that both Energy consumption and financial development are important sources of economic growth in the MENA region. To be more specific, the energy consumption variables have a positive and significant coefficient (0.016) which implies that 1% increase in energy consumption leads to 0.016% increase in economic growth in the long run.

This result, confirms that the energy consumption contributes to the improvements of the economic growth that is in line with the recent empirical studies, for example, [3,10] which have a stance that energy led to growth. We can conclude so that, the energy policy implemented influences the level of production. In this context [14], affirmed that energy is considered as a factor of production complementary to the usual factors of capital and labor and add that it plays a crucial role both directly and indirectly in the production process. This result lends support to [17,18] and [19] who reported the two-way linkages between natural gas consumption and economic growth.

However, our results show that the impact of the financial development variable present also a positive (0.0073) but insignificant (0.6) coefficient, that can indicate its small, but positive, relationship with the economic growth in the long-run in the MENA region. For more detail, a 1% increase in the financial system will increase the economic performance by 0.007%. This positive linkage ensures that where there is a development in the financial system an offering affordable credit increases economic and investment activities of companies, which raises significantly the Economic Growth.

In this case, the studies of [20,21] underline the idea that the financial development opens opportunities for entrepreneurial talent allows human capital formation. The enhancement of physical and human capital in the country not only enhances the confidence of foreigners but also encourages local investors. These together create synergy for enhanced domestic output and hence economic growth. Concerning the control variables, the coefficient of urbanization implies that a 1% increase in the labor will lead to a 0.02% rise in real per capita GDP. On the other hand, capital has a positive and significant long-run impact on economic growth, its coefficient implies that a 1% increase in the capital stock will lead to a 0.016% rise in economic performance. Then the results of the present study are consistent with the neoclassical school of thought [6].

5. Conclusion and Policy Implication

The interest of this research paper was to examine the impact of financial development and energy consumption on economic growth, capital and urbanization were taken as a control variable. In order to achieve this goal, we use an annual data during the period from 2000 to 2018. Econometric modeling was performed using dynamic panel techniques: stationarity, cointegration, error correction model: Vector Error Correction Model (VECM) and Generalized Method of Moments (GMM). Our sample consists of 20 countries from the Middle East and North Africa (MENA) region.

The empirical evidence show that both energy consumption and financial development increases economic growth and financial development is a major contributor to economic growth in short and long run. Overall, the empirical results show a strong implication in the MENA region, more precisely, the control of the financial policy, and the rationing of the global energy consumption will surely have positive effects on the economic growth and the country's real production.

As a result, politicians in the MENA region must work on the culture of the rational use of energy, the diversification of energy supply and the promotion of clean and/or renewable energies (wind, solar, geothermal).

For the control of financial policies, activities such as, the development of financial arrangements adapted to the profile and profitability of investments in the field of energy, the creation of financing by the local banking system in the economy of energy, investment in the objectives of improving technical skills in the field of energy management as well as the development of access to energy, and more particularly to renewable energies, must be carried out.

For its part, global energy consumption, must also be revised and this in the context of job creation by investment in energy saving, the reduction of rural exodus and also an activity of awareness of local people on the installation and use of local resources must be, and then the creation of activities.

Acknowledgements

We are thankful to all reviewers for comments and for all good remarks.

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