International Academic Institute for Science and Technology

International Academic Journal of Economics
Vol. 5, No. 1, 2018, pp. 16-24.

ISSN 2454-2474

International Academic Journal of Economics

www.iaiest.com

Economic Growth and removable energy In a MENA countries panel

Ali Walid[a], Krit Makram[b]

[a]*PhD in Economics, Faculty of Economics and Management of Sfax (Tunisia)*
[b]*Assistant Prof, Higher Institute of Business and Administration of Gafsa Tunisia*

Abstract

In this article, we shall deal with evolution and origin of energy of MENA countries .For insistence, literature studies on the subject can be arranged in so far as specific or as multi-countries.

Relativity, results of these studies are almost contradictory, and roughly there does not exist any kind of harmony nor agreement with the existence or direction of causality between renewable energy consumption and Economic growth. Those results of specific –countries study back up (support) conservative hypotheses.

In the same time, ARDL results essays ;empirically trailed, often prove that renewable energy consumption have a negative impact on economic growth ,besides those essays related to causality ,adjust that there is a continual causal relationship between economic growth and renewable energy consumption. Our task, then, seems to experiment (testify) there effect of renewable energy on total productivity factors (TPF) of a countries (MENA) by implementing (ARDL- bounds testing approach) of co –integration.

Keywords: Renewable Energy, Economic Growth, Causality, MENA

Introduction:

Water and wind energy, solar rayon also geothermic firewood and other resources of biomass; all those besides vegetal fuels and garage waste en han cement take multiple forms as renewable energies. Their development forms a powerful stoke in a context of growing of a petite resources in the international ladder to potential depletion (reduction) of fossil resources, and to necessary reduction of gaz emissions of greenhouse effect.

The MENA region have an approximately 57% and 41% of international deposits of petrol and natural gaz respectively. This region disposes equality resources of unique solar energy to the world .there exist,

Received:09 Jan 2018/Accepted:16 April 2018/Published:28 June 2018

then, powerful regional disparities between countries rich with natural resources and those countries dependent to these resources. In addition, there exist in numerous countries distortions in the price of petrol products, re -covering rates of electricity costs offer efficiency leaves a lot to be desired , an d an energetic intensity seems relatively higher .This is becomes an-averoget higher than it is in the majority of industrialized countries . Moreover ,offered possibilities by renewable energies are under-exploited .Furthermore demographic growth , rapid urbanization and economic expansion all exert pressions on existent infrastructure and a call for more demand of new investments serious . The rise goes on and volatility of combustility prices exerts pressions on financial resources of numerous importing countries of net both on the state level and on public utility services on the other side in exporting countries those phenomena a bring about an augmentation of subsidized energy cost .

Actually, the region is one of the less integrated economically in the world, especially when we exclude exports of petrol and gaz.

Equally, it shows off the most decreased foreign investment rates in the world .Thus it tackles economic growth. One of the strategic priorities is to support and maintain MENA region enterprises to develop in both neigh boring countries and those in development .This processes let enterprises superior staff to brad en their sphere of knowledge and competence in new markets, create more job recruitments , stimulate development and to ameliorate local standards .Energy consumption of a country depends by order of importance , on the following four factors: Gross domestic products ,level of final energy prices ,climate, and impact of energetic efficiency polices. For every object, then, an energy quantity is associated, such a quantity that is actually spent to produce.

Literature review:

Renewable energy plays a central role in the economic dimension of lasting development so far as a key element of economic growth (Payne 2010) .Renewable energy is considered as a principal element of richness generation ,also as an important factor in the economic development (Apergis and Payne 2011).

Renewable energy is used to make raw materials in the form of goods a services .In this way; it is not globally astonishing that there could be a strong relationship between energy quantity used by a nation and its economy size.

Consequently, the most industrialized countries (USA, China, Japan etc…….) considerably use more renewable energy than those of smaller economy. The impact of energy use on economic growth remains dependent on economic structure and growth stability of concerned countries (Westerland 2007).

It is worth nothing then to implosive that numerous are the studies proving that results concerning the causal accord between renewable energy consumption and economic growth are at adds.

In other words, they are in conflict through different countries .As an example Bowden and Payne (2010) have examined this correlation between REC renewable energy consumption) and industrial cost – effectiveness in the USA .So that, they stressed that the reverse impact of industrial return (cost effectiveness) on hydroelectricity, of cost-offs, and of wind energy consumption, is a negative impact on the solar energy consumption .in the case of the USA. Yildirini and all (2012) have done several essays of causality to examine renewable and non –renewable energy consumption versus economic growth relationship over the period between 1949-2006. They note nothing proves the existence of a causal relationship between the mentioned factors above (REC VS EG).

Received:09 Jan 2018/Accepted:16 April 2018/Published:28 June 2018

Similarly, relying explore the causal relationship between renewable and nuclear energy consumption and economic growth in the USA.

Hence, result suggested any causality between renewable energy and CO2 emission, in the same time causality countries from nuclear energy consumption .Salim and Rafiq (2012) have studied along lasting essay of causality in order to examine causality between non sector renewable energy consumption and true GDB. Thus, results suggested neutrality hypotheses for commercial and industrial renewable energy consumption on one hand and for the true connection of the GDB on the other hand. So that they emphasized retro –active hypotheses for non –renewable, commercial and residential energy consumption .Also, Sadorsky (2009) who coped with this causal relationship between biomass energy consumption and true GDB by relying on causality essays of Granger. Apparent by the latter essays .empirically traited marked a continual causality functioning from biomass energy consumption to real GDB.

Like, wise, Mulali and al (2013) over the period between 1994-2003 and for 18 emerging, countries, in a case –study, they paneled error-correction model to study the relationship between economic growth, renewable energy consumption and conservatory hypotheses of supporting results.

It is now clear that empirical results explain this truth whose shown augmentation have statistically a positive as well as significatif impact on the renewable energy consumption of precipitators.

In their study Lee and Chang (2008) describe that price augmentation (rise) of petrol have a negative impact on renewable energy consumption .Meanwhile ,Lee (2005) notes the causal relationship entre REC and economic growth in GDP countries over the period between 1992-2007 in both short and long runs ,with reference to grangers causality examination. Such empirical results hold up retroactive hypotheses.

Immeasurably, Pao and Fu (2013) have modified the least ordinary squares model by the least dynamic squares and by causality principal of Granger in order to determine the relationship between renewable energy consumption and the GDB in Bresil.

Obtained results suggested that renewable energy consumption becomes sensibly determined by a long run returns. In both terms, Apegis et Payne (2010) suggest the retro-active hypotheses for 80 countries using the error correction model of Panel to examine the relationship between renewable and non-renewable energy consumption on one side and economic growth in the other side .

Data –method and results

As a starting point, endogenous models of growth have underlined the paramount importance of energy and human capital in efficiency of productivity and in the stimulation of a long run growth .In the same research perspective,other economists have explained that technology transfer from north to south have a clear effect of training on PTF growth . Moreover, as mentioned before, renewable energy is vehicle of great importance of economic development of countries. It is, than, AN accumulation factor of PTF growth of these countries. Our study shall deal with six countries of the MENA zone, on the base of 21 countries over the period of 1990 to 2011.Those countries are Tunisia, Algeria, Egypt, Marocco, Arabia Saoudia and Oman.

They may be classified in two groups according to their geographical position: countries of North Africa and those of Middle East.

Actually, qualified works (task) utilized for renewable energy improve a productive efficiency .For instance, a well trained work force is move efficient whose advantage able to understand and use new

Received:09 Jan 2018/Accepted:16 April 2018/Published:28 June 2018

technologies .None the less, the definition of a variable of relevant human capital is a delicate problem because it is too difficult to obtain neither stocks indicators nor capital quality because carried out estimation are often subject to measure errors (Kilic and Kayo 2007).

The present study uses annual data covering the period between 1990 and 2011.Thes data were taken from WDI (World Development Indicators) 2011 and from the WB (World Bank).

Our choice of this period is set on the base to get rid of lost series problems .Besides, these series proposed by this institution give us the possibility to carry out estimation of a longer period capable here to sufficiently lead to robust results .These data are related to GDP (Gross Domestic Product).To renewable energy consumption, and To FCGF (First Capital Gross Formation) .The GDP is taken in a real base by using the deflator (2000=100).

In the literary tradition, other variable are also used such as employment standard and urbanization rate. Owing to the fact of long series variable non disponibility, we have been induced to spread them out of our analysis.

Taking account of ecological dimension with resources in the economic theories does not date back to present time, Since OZturk (2010) come to show that economic processes is not in fact isolated and independent seeing that this latter cannot function without a persistent change altering cumulatively the environment. So by reference to precedent works we detain (delay) energy in the production function at the mean time we use the production model of Change and Lee (2008).

These choice are not only motivated by this model aptitude to determine the causality meaning between economic growth and energy consumption , but also by it specify in distinguishing between causality principals of long and short runs. By the ?way VAR models are only capable to identify short run relation .Furthermore ,they are incapable to determine the co-integration between variable Since long run relation fades away with the first differentiation not as it is with error correction model (ECM),so we have a distinguishing tool of causality relation, both for short and long runs between variables (Ohand Lee 2004).In this manner ,Panel data can provide much more information than temporal series .All these arguments incite use to use Panel Data , notably models of the unit root tests and of co-integration with Panel Data (Ghaliand El Sakka 2004) .

According to stationarity results , we can show that certain variable are stationary up to standord (I1) and other are stationary on first difference (I1) to sale this problem ,we rely on ARDL aproche of co-integration (Autovevogressive Distributed lag model) an econometrical technique relativity recent developed by Pessaran and AL (2001) to estimate relation of of long run between variables . This approach testifies la relation de co integration without exaggerating the same order of integration of all variables.

Firstly ARDL approach of co-integration implies an estimation of condional errors correction version of ARDL model. This representation then is formulated as follow:

$$\Delta y_t = \alpha_0 + \sum_{i=1}^{p} \lambda_i \Delta y_{t-i} + \sum_{j=0}^{q} \beta_j \, \Delta x_{1,t-j} + \sum_{j=0}^{q} \alpha_j \, \Delta x_{2,t-j} + \delta_1 y_{t-1} + \delta_2 x_{1,t-1} + \delta_3 x_{2,t-1} + u_t$$

Where y represents endogenous variable and X stands for hexogen variable.

Secondly, incase long-term relation is set ,long term estimation of error correction model (ECM) of ARDL model may be obtained from precedent equation .So , a general representation of error correction model (ECM) of the precedent equation is formulated as follows:

Received:09 Jan 2018/Accepted:16 April 2018/Published:28 June 2018

$$\Delta y_t = \alpha_0 + \sum_{i=1}^{p} \lambda_i \Delta y_{t-i} + \sum_{j=0}^{q} \beta_j \, \Delta x_{t-j} + \sum_{j=0}^{q} \alpha_j \, \Delta x_{2,t-j} + \delta \, EC_{t-1} + \varepsilon_t$$

When δ the speed of adjustment parameter and EC is is the obtained residue of model estimation of co – integration of precedent equation.

Although, statistic of co-integration tests of Pedroni (2001) permit ted us to testify the existence of a long term relation between variables, they may not guarantee estimation by VECM.

Thus, this model (Vector Error Correction Model) VECM, allows to estimate several relation of co-integration in a simultaneous way within a co –integration system. For instance, there exists too much method in order to estimate co-integration relation between model variables.

A further point , the estimation of production function y=f(K,L,E)using (ECM) permits us to determine causality sense between consumption of energy and economic growth both in short and long terms. Logarithmically speaking this equation can be modeled under these two forms

$GDP_{it} = \delta_{1i} + \delta_{2i}t + \alpha_i GDP_{it} + \lambda_{1i} ER_{it} + \lambda_{2i} LK_{it} + \lambda_{3i} LL_{it\ j} + \varepsilon_{it}$

$EU_{it} = \delta'_{1i} + \delta'_{2i}t + \alpha'_{2i} ER_{it} + \lambda'_{1i} GDP_{it} + \lambda'_{2i} LK_{it} + \lambda'_{3i} LL_{it} + + \varepsilon'_{it}$

GDP, UE, LE and SCGF are respectively the logs of reel GDP of energy consumption, work force, the gross formation of fixed capital and finally the error term.

The equation (1) allows the regression of GDP in energy consumption work force and gross formation of fixed capital. While, equation (2) allows the regression of energy consumption on the rest variable.

These two regressions allow us to determine the sense of causality between economic growth and energy consumption, from parameters significance, this after having according necessary modification to this model.

Moreover, to study the stationarity of utilized series, we make recourse unit root tests on panel data (Maddala and Wu (1999), Pesaran (2004)).These results of these two tests are presented in this table.

Table 1: Unit root tests on variables with panel

Model	with trend			
	LGDP	LL	LK	LER
In level				
Pesaran	-2.83782*	-2.35871*	-2.14588*	-1.51698
Fisher-ADF	34.0153*	25.1043*	22.8413*	18.4468*
Pesaran	-5.75167*	-2.38395*	-3.65308*	-8.21981*
Fisher-ADF	53.3304*	27.3470*	34.5747*	72.8343*

Remembering that co –integration con be defined like a systematic co-movement of long term between two or more economic variables (Yoo 2005) .In addition , in order to make clear this relation relying on the result of unit root test on Panel , we will hold on co-integration test on panel of westerland (2007) ,we globally consider that all variables of panel are integrated in the order one .The underlying idea is to testify co –integration absence at the sometime we assure that every individual of the panel can adopt an error correction model. Two pairs of tests can be distinguished; G and P = "Panel tests":

Received:09 Jan 2018/Accepted:16 April 2018/Published:28 June 2018

Pa and P1, supposing that ;error correction term (ECT),and the same for every I , and are then α_i,, set p to testify H0 against Hp 1:$\alpha 1 = \alpha < 0$ for every i . H0 rejection is considered like the rejection of co-rejection of co-integration for the whale of the panel.

Ga and G, do not exaggerate equality of parameters α, between different panel individuals, which means that H0 is testified against H1: α_i, <0 for at least one individual i .

Table 2: co-integration test with Panel

Statistic	LGDPH	LGDPH -LK	LGDPH -LL	LGDPH -LER
Gt			0.433663	0.272784
		1.992903		
Pt		1.112373	0.304704	0.544116
	2.022080			
Pa		1.268811	0.072575	0.101225
	2.382102			

With regards to results presented in the table2, we notice that the couple of tests manage to reject the null and void hypotheses of no co –integration of series for the whole panel. We then, may conclude that the GDP and energy consumption maintain a long term relation in MENA region , what may suggest the pertinence and relevance of an option of an error correction model in order to make clear both long and short –term relation between economic growth and energy consumption.

The existence of at least a co-integration relation between variables, is all are integrated in order one I (1) ,impose (to set) the implementation of an error correction model to estimate the relation between economic growth and energy consumption in the Mediterranean region. With reference to Wasteland (2007), we can write our error correction model as follows:

$$\Delta GDP_{it} = \delta_{11i} + \delta_{12i}t + \alpha_{1i}GDP_{it-1} + \lambda_{11i}ER_{it-1} + \lambda_{12i}LK_{it-1} + \lambda_{13i}LL_{it-1} + \sum \alpha_{ij}\Delta GDP_{it-j} + \sum \gamma_{11ij}\Delta E_{Uit-j} + \sum \gamma_{12ij}\Delta LK_{it-j} + \sum \gamma_{13ij}LL_{it-j} + \varepsilon_{1it}$$

$$\Delta EU_{it} = \delta_{21i} + \delta_{22i}t + \alpha_{2i}ER_{it-1} + \lambda_{21i}GDP_{it-1} + \lambda_{22i}LK_{it-1} + \lambda_{23i}LL_{it-1} + \sum \alpha_{ij}\Delta GDP_{it-j} + \sum \gamma_{21ij}\Delta EU_{it-j} + \sum \gamma_{22ij}\Delta LK_{it-j} + \sum \gamma_{23ij}\Delta LL_{it-j} + \varepsilon_{2it}$$

Where in γ_{1ij} and γ_{2ij} represent short term elasticity's and ratios (λ_{1i}/α_{1i}) and (λ_{2i}/α_{2i}) represent long term elasticity.

Those ratios are accord of co-efficient caracterising long –term equiliberence bearing in mind error correction term coefficient .α1i and α2i standing for error correction respectively, in the equation.

They also represent the speed of adjustment co-efficient whose negativity and significance make valid the model of error correction. They measure the speed by which economic growth and energy consumption attain long-term equilibrence .Those parameters have implication of major importance on the dynamics of the system. The negative sign of the speed estimated from adjustment co-efficient refers to the convergence towards long –term equilibrence.

Received:09 Jan 2018/Accepted:16 April 2018/Published:28 June 2018

For instance, the more the value of term coefficient of error correction is elevated, the, more variables answer becomes more powerful and true and, the more it is weaker, the more the equilibrence retrieving time becomes longer.

A further fact is that whenever ECT is statistically significant in the two models, a changement within a variable affects the other in the course of retro- active system, something proves the existence bidirectional causality accord between variables.

So, discussion held about the estimation of equation and to make our results more robust,we are going to proceed estimation with a global standard (level) , in order to allocate them to the following in to geographic groups (North Africa and Middle east) and that probably to highlight relative specificities of the economic growth and energy consumption relation to the bosom of every group.

It show that the error term is highly negative and significant which make valid our recourse of ECM .For instance ,significant of error correction term makes valid the existence of a long term relation, wilt heir the co-integration processus , and that the movements between different variables of model are considered as permanent.

The impact of these different determinants which influence in a significant manner economic growth in MENA region. The significativity and negativity of error correction term prove that there exist a relation germinating from energy consumption towards economic growth .That is to say , the acceptance of equation set true the consistent hypotheses to consider the energy as a production factor in the same level as work and capital .

Table 3: Estimation of error –equation correction model

Error Correction:	**D(LGDPH)**	**D(LK)**	**D(LL)**	**D(LER)**
CointEq1	-0.014044	-0.019711	-0.001413	-0.245205
	(0.00510)	(0.01818)	(0.00271)	(0.08165)
	[-2.75474]	[-1.08443]	[-0.52069]	[-3.00316]

Those results have a set of implication on the political, economic and energetic sides in MENA region .By this way, the adoption of a policy of conservation of energy in the region should take regard risks of a negative impact of a short and long term .Since there exist an economical dynamics hardly dependent to the energy at that an economy of energy may expose the risk to economic loss.

Results of table number 4 concerning estimation of the second equation show that not only error correction term of panel but also all the other model parameters are non-significant. Wat may annonce the absence of a causality springing out from economic growth towards energy consumption and, causality in the Mediterranean region between economic growth and energy consumption.

Table 4: Estimation of Error Correction model

Error Correction:	**D(LGDPH)**	**D(LK)**	**D(LL)**	**D(LER)**
D(LER(-1))	-0.004597	-0.012330	0.003311	-0.142154
	(0.00645)	(0.02300)	(0.00343)	(0.10332)
	[-0.71257]	[-0.53607]	[0.96416]	[-1.37588]

Received:09 Jan 2018/Accepted:16 April 2018/Published:28 June 2018

Actually, economic dynamics in the region MENA is not homogeneous; it differs from one place to the other. This classification will lend us the best identification of the causality relation between economic growth and energy consumption of region.

The persistence of causality relation between EG and EC .By this way, the sense of this causality is different, it goes from economic growth towards energy consumption , in another words, every variation in the economic growth affects the energy consumption. Whereas a variation in the energy consumption have nothing to do with economic growth,

What may be attributed not only on the economic structure of Middle east panel .And here , energy consumption does not enlarge , only , if economic and political conditions are favorable and reconciling .This is explained by the act that economic bloom permits an increase of returns, what may lead consequently to the enlargement of energy consumption.

Conclusion

To conclude, we may say; the presence of a unidirectional causality relation flowing from energy consumption towards economic growth in a time the significance of energy consumption refers that the implementation of policy of energy conservation in the region, in order to guarantee a lasting development, will have harmful consequences on economic growth.

Finally, it is also crucial to sum that the geographical repartition of MENA countries have helped us to make obvious conclusion on what may interest the causality relationship between economic growth and energy consumption .

It seems clearly that the adoption of the policy of energy conservation is something of prejudice on economic growth especially in the Middle East .But it is equally imperative to remember that governmental energetic polices have to move to energetic efficiency more profound.

References

Al-mulali U, Fereidounia HG, Lee JY, Che NB, Sab C., Examining the bi- direction along run relationship between renewable energy consumption and GDP growth, Renewable and Sustainable Energy Reviews 2013; 22: 209–22.

Apergis N, Payne JE., Renewable energy consumption and growth in Eurasia, Energy Economics 2010; 32: 1392–7.

Apergis N, Payne JE., The renewable energy consumption–growth nexus in Central America, Applied Energy 2011; 88: 343–7.

Bowden N, Payne JE., Sectoral analysis of the causal relationship between renewable and non-renewable energy consumption and real output in the US, energy sources, part B: economics. Planning and Policy 2010; 5(4): 400–8.

Breusch, T. S. and A.R. Pagan (1980). "The Lagrange Multiplier Test and Its Applications to Model Specification in Econometrics," Review of Economic Studies, 47(1), 239-253.

Ghali,, El-Sakka. (2004). Energy Use and Output Growth in Canada: A Multivariate Co-integration Analysis. Energy Economics 26: 225-238.

Kilic, F. C. and Kaya D. (2007), Energy Production, Consumption, Policies, and Recent Developments İn Turkey, Renewable and Sustainable Energy Reviews 11, 1312–1320.

Received:09 Jan 2018/Accepted:16 April 2018/Published:28 June 2018

Lee, C. (2005). Energy Consumption and GDP in Developing Countries: A Co-integrated Panel Analysis. Energy Economics 27: 415-427.

Lee, C.C., and Chang C. P. (2008) Energy Consumption and Economic Growth in Asian Economies: A More Comprehensive Analysis Using Panel Data, Resource and Energy Economics 30, 50-65.

Maddala, G.S. and Wu, S., 1999. "A Comparative Study of Unit Root Tests with Panel Data and A New Simple Test", Oxford Bulletin of Economics and Statistics, 61, p. 631-652.

Menyah K., Wolde-Rufael Y., CO2 emissions, nuclear energy, renewable energy and economic growth in the U.S. Energy Policy, 2010; 38 : 2911–5.

Oh, W., Lee, K. (2004) .Causal Relationship between Energy Consumption and GDP Revisited: The Case of Korea 1970-1999. Energy Economics 26: 51-59.

Ozturk I., A literature survey on energy-growth nexus. Energy Policy 2010; 38: 340–9.

Pao H-T, Fu H-C., Renewable energy, non-renewable energy and economic growth in Brazil, Renewable and Sustainable Energy Reviews 2013; 25: 381–92.Yamini, M. (1992). Systems of universities. Tehran: Institute for Research and Planning in Higher Education.

Payne J E. Survey of the international evidence on the causal relationship between energy consumption and growth. Journal of Economic Studies 2010; 37: 53–95.

Pedroni, Peter, "Purchasing Power Parity Tests in Cointegrated Panels," Review of Economics and Statistics, November 2001, Vol. 83, No. 4, pp. 727-731.

Pesaran, M. H., Shin, Y. and Smith, R. J. Bounds Testing Approaches to the Analysis of Level Relationships; Journal of Applied Econometrics, Vol. 16, 2001, pp. 289–326.

Pesaran, M.H., (2004), "A Pair-Wise Approach to Testing for Output and Growth Convergence", Cambridge Working Papers in Economics No. 453, University of Cambridge, and CESifo Working Paper Series No. 1308.

Sadorsky P., Renewable energy consumption, CO2 emissions and oil prices in the G7 countries. Energy Economics 2009; 3(1): 456–62.

Salim RA, Rafiq S., Why do some emerging economy proactively accelerate the adoption of renewable energy? Energy Economics 2012; 34: 1051–7.

Westerlund, J. 2007. Testing for error correction in panel data. Oxford Bulletin of Economics and Statistics 69: 709–748.

Yildirim E, Sarac S, Aslan A., Energy consumption and economic growth in the USA: Evidence from renewable energy, Renewable and Sustainable Energy Reviews 2012; 16: 6770–4.

Yoo, S. H. (2005). Electricity Consumption and Economic Growth: Evidence from Korea. Energy Policy 33: 1627-1632.

Received:09 Jan 2018/Accepted:16 April 2018/Published:28 June 2018