The Electricity Consumption in a Rentier State: Do Institutions Matter?

Bouoiyour, Jamal and Selmi, Refk and Shahbaz, Muhammad

CATT, University of Pau, ESC, Business School of Tunis,
COMSATS Institute of Information Technology of Lahore

31 March 2014

The Electricity Consumption in a Rentier State: Do Institutions Matter ?

Jamal Bouoiyour
CATT, University of Pau, France
Email: jamal.bouoiyour@univ-pau.fr

Refk Selmi
ESC, Business School of Tunis, Tunisia
Email: s.refk@yahoo.fr

Muhammad Shahbaz
Department of Management Sciences,
COMSATS Institute of Information Technology,
Lahore, Pakistan. Email: shahbazmohd@live.com
Cell:+92-334-3664-657, Fax: +92-42-99203100

Abstract: The core focus of this paper is to assess the relationship between the electricity consumption and institutions within rentierism phenomenon by incorporating economic growth, urbanization, trade openness and foreign direct investment in the case of Algeria. To this end, we have applied the ARDL bounds testing approach to cointegration and innovative accounting approach (variance decomposition and impulse response methods) over the period of 1971-2012. Our empirical results show that these variables are cointegrated in the long-run. We find that institutions play an important role to explain this cointegration. The response of electricity demand is increasingly negative due to the one standard deviation shock in institutions. This highlights an insightful evidence, providing that the poor governance drawbacks in a rentier state may affect directly electricity consumption or indirectly via urbanization and foreign direct investment. The contribution of economic growth to electricity consumption appears minor (the conservation hypothesis is limitedly supported), while that of trade openness seems insignificant.

Keywords: Electricity consumption, institutions, rentier state.

1. Introduction

Electricity is an important factor of production for both developed and developing countries. Controlling this factor seems a great challenge not only for businesses but also for policy makers. The first ones focused on controlling the production costs. The second ones aim to improve the rate of economic growth and to use cleaner energy forms to enhance environmental protection. This is why the relationship between energy consumption -in general and electricity consumption particularly- and economic growth has received appreciable attention in the existing energy economics literature, either theoretically or empirically.

Given the importance of this issue in formulating the energy policies, the causal relationship between energy consumption and economic growth has been and continues to be one of the main subjects of intense empirical economics' research. The purpose of assessing the causal link between these two variables is to make policy recommendation for government. For example, if there is an unidirectional causal relationship running from economic growth to energy consumption, this means that a conservative energy policy plays an important role to enhance economic development (the conservation hypothesis). In addition, if the energy consumption is a crucial component in economic growth (the growth hypothesis), this implies that while energy is a limiting factor to economic growth, a policy to increase investment in industrial sectors, particularly electrification is likely to stimulate economic development. We can also identify the bidirectional causality (the feedback hypothesis), emphasizing an interdependent relationship between electricity consumption and economic growth. Moreover, energy can have no impact on economic growth and vice versa (the neutrality hypothesis), suggesting that neither conservative nor expansive energy policies have any effect on economic growth. The results of these studies are mixed and inconclusive. They depend to the different country coverage, econometric methodologies and data disponibility (see for example, Apergis and Payne (2009) and Ozturk (2010)). Bouoiyour et al. (2014) add that energy policies cannot be designed without considering economic and political factors, which are unfortunately excluded in the majority of researches.

Our study differs from the previous works on the same field. It not only re-assesses the above assumptions, but it attempts to give novel insights and some new explanations to elucidate understanding on the concerned relationship. Among these elements of explanation, this research considers institutions as the focal factor that explains the cointegration between electricity consumption and economic growth by incorporating other explanatory variables that may have effect on electricity consumption. Normally, the results should help policy

makers in implementing future electricity policies for sustainable economic growth in long-run.

This study has focused on the Algerian case for six main reasons: Firstly, few studies have investigated how interact institutions with energy consumption-economic growth nexus on the case of Algeria. Alvarez (2010) and Fuinhas and Marques (2013), for example, have well invoked the institutions to explain the fact that energy consumption negatively impacts economic growth, but this has not been demonstrated. This improves the need to an accurate investigation on the field. Secondly, the electricity sector concerns a major part of the population but it receives a low priority and a limited attention at policy level. This sector is not regulated, not organized between producers and consumers and stills an informal sector (Mebtoul, 2013). Thirdly, Algeria is a large consumer of electricity compared to its Maghreb neighbours. The electricity is largely produced from gas in Algeria, which covers 96% of electricity demand in the country in 2013. A 3% comes from diesel, especially for the isolated areas (the South), and 1% from water. This country has experienced an electrification rate of 41% in 1970 to nearly 99% in 2013, classed as one of the most important rates in the world. Fouthly, residential consumption accounts for 60% of total electricity consumption, while consumption in the industrial sector is about 10%. For comparison, these percentages are respectively 30% and 45% in Europe. This highlights the gap that separates Algeria from its European neighbors. Then, an assessment of the relationship between electricity consumption and its determinants, with a predominant source of rent (hydrocarbons), refers to the issue of energy transition that the Algerian government tries to implement. This energy transition can be hardly achieved given the inherent constraints closely related to the question of the energy's usage in Algeria. This question is itself highly linked to the wider issue of governance in this country, especially in light of the Arab revolutions across the North Africa and Middle East region. Finally, Algeria is characterized by the existence of a powerful state and a well-established structure that has preserved its expansive prerogatives and has enhanced its power. Under these conditions, innovative or creative individual initiatives are, de facto, limited. The rentier economy allows the state to have sufficient resources to subsidize of most consumer products, which inhibit the emergence of an industrial spirit. The main aim of the paper is to explain why Algeria failed to join the club of higher performers. The quality of institutions may properly constitute a substantial element of explanation. We address this issue by interplaying institutions with the relationship between electricity consumption and its determinants.

The remainder of the article is laid out as follows. In Section 2, we briefly review previous empirical research into the relationship between electricity consumption, institutions and economic growth. Section 3 presents an overview on the link between electricity demand and institutions in a rentier state. Section 4 presents the followed methodology. Section 5 describes and discusses the results, while the last section concludes and offers some economic implications.

2. Brief literature survey

The sizeable growing energy consumption, the steady increase in energy prices and the continuous reconfiguration of energy markets present an array of problems often highlighted by policy makers. This, in turn, make economists increasingly pay attention to energy consumption as an important determinant of economic growth (see, for example, Kraft and Kraft (1978), Soytas and Sari (2003), Lee (2006), Tang (2008), Ghosh (2009), Al-Mulati (2011), Niu et al. (2011), Dobnick (2011), Sadrosky (2012), Shahbaz et al. (2012), Shahbaz et al. (2013), Bouoiyour and Selmi (2013), Bouoiyour et al. (2014), Sbia et al. (2014)). Despite this huge amount of empirical research on this field, neither the theoretical nor the empirical literature finds one-sided evidence with respect to the nature of this relationship (short-run, long-run or joint links) or to the direction of causation. Due to different studied countries, econometric methodologies, time periods and variables, there is no cut-clear consensus for this focal relationship.

The different results frequently obtained by previous studies may be synthesized into four testable hypotheses[1]. First, the conservation hypothesis is based on a unidirectional causal relationship running from economic growth to energy consumption (Lee and Chang (2005), Tang (2008), Arouri et al. (2012)). Second, the growth hypothesis suggests that energy consumption is a crucial component in economic growth. This means that while energy is a limiting factor to economic growth, a policy to increase investment in industrial sectors, particularly electrification is likely to stimulate economic activity and hence economic growth (Wolde-Rufael (2005), Al-Ariani (2006), Zamani (2007) and Gosh (2009)). Third, the feedback hypothesis or the bidirectional causality emphasizes an interdependent relationship between electricity consumption and economic growth (Masih and Masih (1996) and Ghali and El-Sakka (2004)). Fourth, the neutrality hypothesis means that energy

[1] The denotations of neutrality hypothesis and the bidirectional link or the feedback hypothesis have been widely used by the previous studies on the energy consumption-economic growth nexus. However, the denotations of the other directions of causality (i.e. growth hypothesis and conservation hypothesis) were proposed by Apergis and Payne (2009).

consumption is not correlated with economic growth and suggests that neither conservative nor expansive energy policies have any effect on economic growth (Soytas end Saris (2003) and Chiou-Wei et al. (2008)).

All the above researches have neglected the role that plays governance in explaining the relationship between electricity consumption and economic growth in rentier state. Surprisingly, Middle East specialists have long invoked poor governance (weakness of institutions), rentier economic development, severe social disparities and repression that characterize the region (Schwarz (2008), Foley (2010), Gray (2010) and Elbadawi and Makdisi (2011)). Despite these interesting conclusions that may have important economic implications, a limited strand of literature has focused on the interplay between electricty consumption, economic growth and institutions. For instance, Auty (2001), Gylfason (2001), Damania and Bulte (2003), Aslaksen and Torvi (2005) and Farooq et al. (2013) argue that corruption could be blamed for the failure of a number of energy-rich economies to develop.

In the economies with rentierism characteristics, the relationship between electricity consumption and economic growth may be more complicated, i.e. given to poor governance in MENA countries, energy subsidies are infamously inefficient, which makes the dynamic interaction between electricity consumption and economic growth more complex that has been sometimes claimed (Stevens and Dietshe (2008) and Fuinhas and Marques (2013)). Due to the apparent lack of literature considering the link between electricity consumption, governance and economic growth in rentier states, we intend to fill this gap by providing new evidence on whether institutions matter or not for the focal nexus, with special reference to rentier countries highly exposed to external price shocks (Algeria).

3. Rentierism : Algerian context

Despite the widespread use of the concept of rentierism within the literature on the energy MENA countries (Anderson (1987), Talahite (2005), Jenkins et al. (2011)), rentierism stills a concept lacking an accurate definition. In general, a rentier state is a government that is able to extract significant rents from international transactions and thereby become the dominant actor in the political economy (Beblawi and Luciani, 1987). When the government has substantial income, it may reduce the tax burden and domestic expenditures. This weakens institutions[2] (Smith (2004 a), Herb (2005) and Aslaksen (2011)). In rentier

[2] Institutions are the formal and informal constraints on political, economic and social interactions (North, 1990).

economies, people have a little influence over political class and the state is free from the need to extract income from taxes on the domestic economy. Since resource rents highlight the need to levy taxes against the citizenry, the state is able to act independent of the will of the people (Auty (1998), Fearon (2005), Ross (2006), Aslaksen and Torvik (2005), de Soysa and Neumayer (2007), de Soysa (2007) and Lotz (2008)). This may expose electricity sector (in particular electric projects) to strong barriers due to the ineffectiveness of institutions and to inflexible electricity market structures prevailing in rentier states (Alvarez (2010) and Fuinhas and Marques (2013)). With property rights highly disseminated through society (Stevens and Dietshe, 2008) and with an energy market unliberalized, non-competitive and dominated by cumbersome state monopolies (Synder and Bhavanani (2005), Synder (2006) and Jenkins et al. 2011), rentier state often encounter difficulties when seeking energy projects.

Algeria is a typical example of rentier economy because most of the economic activity (90% of the national wealth and 96% of exports) is mainly linked to single sector, hydrocarbons. This creates several outcomes (Alvarez, 2010). First, the country seems highly dependent to ups and downs energy's movements, yielding to an exogenous economic development. The fluctuations of international markets generate excessive volatility. This prevents a long-run development-building strategy. Second, this great dependence and sizeable instability prevent the government and the administration to make credible forecasts of budget and economic growth in the short-and-medium terms. Finally, this dependence is harmful not only for an economy as a whole, but also at the societal perception of the values of work, efforts and self-sacrifice in order to achieve results. This may be the most disastrous consequence. It seems perverse of rentier economy. This obviously explains the wide diffusion of rentier mentality within society. Therefore, to take risk no longer offer guarantees to get rich. It is the clientelism rather than the predation that allow some close circles to get rich fastly. The reward is related to a fluke and not to a well organized production process, generating therefore a ''circulation economy'' instead of a ''production economy'' (Chatelus, 1982). In good governance countries, the institutions promote the private initiatives. More precisely, entrepreneurs choose to invest in productive activities rather than rentier, non-developmental and non-productive resource sectors.

In Algeria, there exist several paradoxes. Residential electricity consumption represents 60% of total electricity consumption of the country. For comparison, this

percentage amounts twice of that found in Europe[3]. It should be noted that both wealthier and poor households pay the same price of electricity. This is also valid for other subsidized products (bread, fuel). In the same vein, industrial consumption is very low (10% against 45% in Europe). In other words, households consume more electricity than businesses. This paradox is related to generalized subsidies and non-target electricity prices. Obviously, these subsidies are very expensive and ineffective. They pushe households electricity use upwards. It is recalled that the subsidies for energy products reached $ 10.59 billion in 2010, where electricity consumption subsidies amounted to $ 2.13 billion, while 8.46 billion dollars were directed to fuels. This represents 6.6% of the national wealth or 298 dollars per capita. Accurately, it should be added that these rates vary between 2 Algerian dinar (DA) and 3.20 DA/ kwh depending on the level of electricty consumption, against respectively 3.45 DA and 4.94 DA / kwh in Tunisia and 5.27 DA and 6.40 DA / kwh in Morocco. Given the impossibility to remove or at least reduce the subsidies, some national reports (Mebtoul, 2013) highlight the risk of going to 70 billion of gas cubic meters of domestic consumption on the horizon 2017-2020, surpassing the volume of exports in 2012 and making problematic the extrapolation of 85 billion gas cubic meters expected in 2014. It is true that the current context and the events that knows the MENA region (the aftermath of revolution) do not allow subsidies' limitations that may have detrimental effect on social peace. But the system slows down. Some researchers (Mebtoul, 2013) predict the depletion of oil reserves in 2020 and conventional gas reserves in 2030, taking into account the strong domestic consumption, the cost-of-living and the increased competition facing the new world energy markets.

4. Methodology

4.1. Data

The study uses annual data of real GDP (*Y*), electricity consumption (*EC*), urbanization (*URB*) in percentage of population, foreign direct investment (*FDI*) and the global index of political rights as governance indicator or institutional quality's proxy(*INS*). Theoretically, the poor governance has various detrimental effects on energy sector policies, particularly electricity sector. Accordingly, Smith (2004 b) argues that the electricity theft and weaker institutions are closely linked and adds that higher power fraud is intensely associated to corrupt practices within power sector organizations. Rencently, Fouinhas and Marques (2013) show that the corruption is one of the most difficult problem for electricity sector.

[3] The comparison with Europe is given for illustrative purposes. We are well aware that Algeria and Europe are totally different at all levels.

Nevertheless, some studies show that trade opennes reduces the detrimental effects of poor governance, suggesting therefore that countries which do not favor institutional improvements can establish a policy of open market (Ades and Di Tella (1999) and Blake and Christopher (2002)). Given this evidence, we include trade opennes (*TR*) in the same models to verify this evidence.

Obviously, the governance consists of the institutions by which authority in a state is exercised. This includes the capacity of the government to implement effective policies. To test claims about the impact og institutions on electricity demand, adequate measurements of institutional quality are needed. While some data are available, they are problematic because they are not an accurate effective governance proxy. Data come from expert assessments and surveys of government officials. The coverage of most sources of data is limited and do not share a common methodology, set of questions or measurement scale of responses. Freedom House (United States) tried to address these problems by developing aggregate governance indicators that draw from many available sources. The global index of political rights is a quantitative assessment tool that presents a comprehensive set of indicators on the possible situations in which the political rights may have a direct impact on the lives of ordinary people. This indicator combines various dimensions of political rights including fundamental rights, open government, effective regulatory enforcement, access to civil justice, among others. The lowest score (1 and 2) in the scale of political rights are awarded to countries that respect the holding of fair elections, the presence of opposition parties and the rights of minority groups. The highest scores (6 and 7) are granted to states where political rights are absent, either because of an oppressive regime or a situation of political instability.

All the data are collected from perspective Usherbrooke[4], covering the period of 1971-2012. During this period, Algeria had a population explosion. To deal with this fact, *Y* and *EC* were converted into values per capita (in thousands of person). To improve the precision power of results, we carry out a log-linear specification that incorporates *Y, URB, TR* and *FDI* (Model 1). Then, we add the *INS* used as an indicator of governance (Model 2).

$$LEC_t = a_0 + a_1 LY_t + a_2 LURB_t + a_3 LTR_t + a_4 LFDI_t + \varepsilon_t \quad (1)$$

$$LEC_t = b_0 + b_1 LY_t + b_2 LURB_t + b_3 LTR_t + b_4 LFDI_t + b_5 INS + \zeta_t \quad (2)$$

Where ε and ζ are the error terms with normal distribution, zero mean and finite variance. Economic growth affets electricty consumption via income and technique effects. If income

[4] http://perspective.usherbrooke.ca/bilan/statistiques/9

effect dominates technique effect, $a_1 > 0$ otherwise $a_1 < 0$. An incraese in urbanization leads industrialization, raises the demand for housing, public utilities etc which affects electricty demand (Shahbaz and Lean, 2012). We expect $a_2 > 0$. Trade openness affects electricty consumption via income effect, technique and composite effect (Sadorsky, 2011, 2012). So, it is expected that $a_3 > 0$. Foreign direct direct investmnet stimulated eocnomic activity which impacts electricty demand positively. We expect that $a_4 > 0$. Similarly for equation 2, we expect $b_1 > 0$ (if income effect dominates technique effect), $b_2 > 0, b_3 > 0, b_4 > 0$. However, the sign of b_5 seems ambiguous. More precisely, good institutions can improve electricity consumption in the sense that they allow optimal management of resources. But we cannot say at this stage that electricity should increase or decrease. This depends on the degree of development of the country in question.

4.2. The ARDL Bounds Testing Method

The ARDL bounds testing approach has been introduced by Pesaran and Shin (1999) and extended by Pesaran et al. (2001). It deals with single cointegration. This method allows us to see whether there is long-run relationship beteween a group of time-series, some of which may be stationary at level, while others are not. The ARDL bounds testing approach has three main advantages compared to other cointegration approaches: Firstly, the time series are assumed to be endogenous. Secondly, it obviates the need to classify the time series into I(0) or I(1) as Johansen cointegration. Thirdly, it allows us to assess simultanuously the short-run and the long-run coefficients associated to the variables under consideration. This paper applies this method to investigate the relationship between electricity consumption, economic growth, urbanization, trade openness, foreign direct investment (with institutions versus without institutions). The ARDL representations of equations (1) and (2) or the equations of unrestricted error correction models (UECM) are formulated respectively as follows :

$$DLEC_t = \alpha_0 + \sum_{i=1}^{n} \alpha_{1i} DLEC_{t-1} + \sum_{i=0}^{m} \alpha_{2i} DLY_{t-1} + \sum_{i=0}^{l} \alpha_{3i} DLURB_{t-1} + \sum_{i=0}^{h} \alpha_{4i} DLTR_{t-1} + \sum_{i=0}^{v} \alpha_{5i} DLFDI_{t-1} + \beta_1 LEC_{t-1} + \beta_2 LY_{t-1} + \beta_3 LURB_{t-1} + \beta_4 LTR_{t-1} + \beta_5 LFDI_{t-1} + \mu_t \quad (3)$$

$$DLEC_t = \alpha_0' + \sum_{i=1}^{n} \alpha_{1i}' DLEC_{t-1} + \sum_{i=0}^{m} \alpha_{2i}' DLY_{t-1} + \sum_{i=0}^{l} \alpha_{3i}' DLURB_{t-1} + \sum_{i=0}^{h} \alpha_{4i}' DLTR_{t-1} + \sum_{i=0}^{v} \alpha_{5i}' DLFDI_{t-1} + \sum_{t=0}^{q} \alpha_{6i} INS_{t-1} + \beta_1' LY_{t-1} + \beta_2' LEC_{t-1} + \beta_3' LURB_{t-1} + \beta_4' LTR_{t-1} + \beta_5' LFDI_{t-1} + \beta_6' LINS_{t-1} + v_t \quad (4)$$

Where D denotes the first difference operator; μ and ν are the usual white noise residuals.

To evaluate whether there is a cointegration or not depends upon the critical bounds tabulated by Pesaran et al. (2001, p.300). There is a cointegration among variables if calculated F-statistic is more than upper critical bound. If the lower bound is superior to the computed F-statistic, we accept the null hypothesis of no cointegration. Moreover, if the F-statistic seems between lower and upper critical bounds, the cointegration is inconclusive. The stability of ARDL approach to cointegration is assessed by carrying out various diagnostic tests and stability analyses. The diagnostic tests include the adjustment R-squared, the standard error regression, Breush-Godfrey-serial correlation and Ramsey Reset test. The stability of short-run and long-run estimates is checked by applying the cumulative sum of recursive residuals and the cumulative sum of squares of recursive residuals.

4.3. The innovative acounting approach

The previous studies on the relationship between electricity consumption and economic grwth have widely investigated whether there is a causal link between both variables. To this end, the majority of them use the standard Granger causality test augmented with a lagged error correction term. Based on Engle and Granger (1987)'s method, the Granger causality test through vector autoregression method may be inadequate. To overcome this gap, an inclusion of an additional variable to the vector autoregression may be effective and would allow us to detect the long-run relationship between variables under consideration. However, the Granger causality drawbacks still. It is unable to capture the possible effects of shocks and to indicate how much extent of causality exists from one variable to other (Shahbaz et al. 2013). To resolve these limitations, we explore an innovative accounting approach to assess the dynamic interaction among electricity consumption, economic growth, urbanization, trade openness, foreign direct investments and institutions. This method includes forecast error variance decomposition and impulse response function. The procedure decomposes forecast error variance for each series following a one standard deviation shock to a variable, and allows us to test the strength of its impact on the series.

5. Results

5.1.ARDL results

To investigate if there is a significant long-run relationship that runs from electricity consumption to economic growth or vice versa, we began by evaluating the validity of estimated coefficients. We worthy notice from Table-1 a great variability of data, which

highlights the need to use robust models to handle possible shocks. The coefficient of kurtosis appears inferior to 3 for all variables under consideration (except *Y* and *TR*), implying that the distribution is less flattened than the Gaussian distribution. The Skewness coefficient is negative for *Y, EC* and *FDI*, while it seems negative for *URB* and *TR*. This indicates that the symmetrical distribution is plausible for the first ones and inversely for the second ones. The Jarque- Bera test revealed low and insignificant values (except *Y* and *INS*), leading to accept the assumption of normality for all variables except *Y*.

Table 1. Summary of statistics

	LEC	*LY*	*LURB*	*LTR*	*LFDI*	*LINS*
Mean	6.197305	9.050105	3.974662	11.12861	18.35663	5.974359
Median	6.309388	9.053522	3.975133	11.08701	19.04662	6.000000
Maximum	6.943259	9.257345	4.306198	14.16968	21.83939	7.000000
Minimum	4.945555	8.646407	3.680494	9.303406	12.72163	4.000000
Std. Dev.	0.552327	0.122415	0.198924	1.014125	2.768434	0.584321
Skewness	-0.741402	-0.631308	0.047553	0.580637	-0.646494	-1.603734
Kurtosis	2.695106	4.223384	1.746310	3.677718	2.354147	8.275203
Jarque-Bera	4.010415	5.409016	2.766373	3.163754	3.394532	61.93788
Probability	0.134632	0.066903	0.250778	0.205589	0.183184	0.000000

Source: Usherbrooke perspectives dataset.

From the first correlations reported in Table-2, we show that there is a positive interaction between urbanization and electricity consumption, economic growth and electricity consumption, trade openness and electricity demand and foreign direct investment and electricity consumption, while the correlation between the used governance index (the global index of political rights) and Algerian electricity demand seems negative. As the lowest scores are associated to the respect of political rights including the holding of fair and free elections and the highest scores are greatly linked to the absence of political rights, the negative correlation means that the poor governance (the high scores of governance proxy between 6 and 7) is closely related to the electricity demand in Algeria.

Table 2. First correlations between electricity consumption and its determinants

	LEC	*LY*	*LURB*	*LTR*	*LFDI*	*LINS*
LEC	1					
LY	0.7406542	1				
LURB	0.9510890	0.64406628	1			
LTR	0.275828	0.27525291	0.41326495	1		
LFDI	0.3517625	0.1722970	0.5509528	0.49325713	1	
LINS	-0.0819792	-0.0906488	-0.0167425	0.04329295	0.3161668	1

Source: Usherbrooke perspectives dataset.

Before proceeding ARDL estimation, we determine the degree of integration of variables. To do so, we apply Dickey-Fuller (ADF) and Phillips-Perron (PP) tests. The results are reported in Table-3. We clearly show that the variables are integrated either at level or first difference (I(0) and I(1)). Given this finding, the ARDL bounds testing approach can be employed to test the cointegration hypothesis among concerned variables.

Table 3. Results of ADF and PP Unit Tests

Variables	ADF test		PP test	
	Level	First difference	Level	First difference
LEC	-4.1086 (1) ***	---	-3.7297 (4) ***	---
LY	-0.5487 (1)	-8.4468 (0) ***	-3.1257 (4) **	---
LURB	-0.2377 (6)	-3.0834 (0) ***	1.3492 (4)	-3.46787 (12) **
LTR	-2.4402 (0)	-8.4485 (0) ***	-2.5021 (3)	-8.4596 (1) ***
LFDI	-0.9446 (1)	-9.6209 (0) ***	-2.2221 (1)	-10.0241(4) ***
LINS	-4.3724 (0)	---	-4.16637 (0)	---

Notes: ***, ** and * imply significance at the 1%, 5% and 10% levels, respectively ; The numbers within parentheses for the ADF and PP statistics represents the lag length of the dependent variable used to obtain white noise residuals ; The lag lengths for the ADF and PP tests were selected using Akaike Information Criterion (AIC).

According to the ARDL bounds testing approach, lag order of the variables is important for the model specification. Hence, we determine the lag optimazation based on lag-order selection using various information criteria including Akaike criterion, Bayesian and Hannan-Quinn criteria (Table-4). It is widely pointed that AIC has superior power properties for small sample data compared to any lag length criterion. Akaike information criterion is more parcimonious than other criteria since it provides more consistent results (Lütkepohl, 2006). We find that the optimum lag is 1 over the period of 1975-2011 either for model 1 (without institutions) or model 2 (with institutions).

Table 4. Lag-order selection

Lag	LogL	LR	FPE	AIC	SC	HQ
			(1)			
0	60.12773	NA	0.002931	-3.007514	-2.603477	-2.869726
1	67.85856	10.91411*	0.001982*	-3.403445	-2.954515*	-3.250347*
2	68.90888	1.421012	0.001989	-3.406405*	-2.912582	-3.237997
3	69.63692	0.942176	0.002036	-3.390407	-2.851692	-3.206690
			(2)			
0	96.36237	NA*	0.000371	-5.080139	-4.631210	-4.927041
1	98.55212	2.962601	0.000348*	-5.150125*	-4.656302*	-4.981717*
2	98.71004	0.204367	0.000368	-5.100590	-4.561875	-4.916873
3	98.75296	0.053024	0.000393	-5.044292	-4.460683	-4.845265

Notes : * indicates lag order selected by the criterion; (1) : Equation of electricity consumption without taking into account the institutions ; (2) : Equation of electricity consumption considering institutions ; LR: sequential modified LR test statistic (each test at 5% level) ; FPE: Final prediction error ; AIC: Akaike information criterion ; SC: Schwarz information criterion ; HQ: Hannan-Quinn information criterion.

Next, we present our empirical results based on ARDL bounds testing (Table-5). We show that economic growth has an insignificant impact on electricity consumption (equations 1 and 2, Table-5). Urbanization contributes positively and significantly to electricity consumption when including institutions-particularly the global index of political laws-(equation 2, Table-5). Accurately, an increase of urbanization by 10% leads to an increase in electricity consumption by 39.3%. The trade openness has no influence on electricity demand in Algeria, while foreign direct investments and institutions affect negatively and significantly elecrticity consumption. More precisely, an increase by 10% in foreign direct investment and institutions leads to a drop in electricity demand by 0.011% and 0.14% respectively (equation 2, Table-5). Using different diagnostic tests such as serial correlation and Ramsey Reset tests, the adequacy of these models are checked.

In addition, we depict from Table-6 that the values of our F-statistics exceed the upper bound at the 1% significance level for the model that incorporates economic growth, urbanization, trade openness and foreign direct investment (equation 1), implying that there is evidence of a long-run relationship among variables at this level of significance or greater, while the F-statistic value appears insignificant when accounting for instruments (equation 2).

Table 5. The ARDL Bounds Testing Analysis

Dependent variable: ΔLEC_t		
	(1)	(2)
C	0.09502	1.16495
	(0.05866)	(0.55548)
ΔLEC_{t-1}	-0.4789**	-0.71152**
	(-2.4191)	(-2.5246)
ΔLY_{t-1}	0.01130	0.17131
	(0.0383)	(0.5166)
$\Delta LURB_{t-1}$	5.25362	3.93008*
	(1.13826)	(1.7989)
ΔLTR_{t-1}	0.0020	-0.0032
	(0.1721)	(-0.2347)
$\Delta LFDI_{t-1}$	-0.00081*	-0.00116*
	(-1.5133)	(-1.8986)
$\Delta LINS_{t-1}$	---	-0.01473*
		(-1.9370)
LEC_{t-1}	-0.17458	-0.09217
	(-1.0116)	(-0.45850)
LY_{t-1}	0.29833	-0.0529
	(0.2107)	(-0.2887)
$LURB_{t-1}$	0.14403	-0.08324
	(0.3273)	(-0.1582)
LTR_{t-1}	-0.0052	-0.0005
	(-0.4136)	(-0.0331)
$LFDI_{t-1}$	-0.0081*	0.01306*
	(-1.5133)	(1.8320)
$LINS_{t-1}$	---	0.00173
		(0.09790)
Diagnostic tests		
ARS	0.5604	0.5796
SER	0.0451	0.0469
LM	1.2717 [0.2993]	1.3787 [0.2760]
Reset	6.8933* [0.0148]	0.2841 [0.5999]

Notes : ***, ** and * imply significance at the 1%, 5% and 10% level, respectively ; (1) : Equation of electricity consumption without taking into account the institutions ; (2) : Equation of electricity consumption considering institutions ; [.] : p-values ; ARS denotes the adjustment R-squared. SER means the standard error regression ; LM means the Breush-Godfrey serial correlation ; Reset denotes Ramsey Reset test; Diagnostic tests results are based on F-statistic.

Table 6. The ARDL Bounds Testing Analysis

	Estimated model	Optimal lag length	F-statistic	Prob.
(1)	F_{EC} *(EC/Y, URB, TR, FDI)*	1, 1, 6, 0, 1	10.1657***	0.0007
(2)	F_{EC} *(EC/Y, URB, TR, FDI, INS)*	1, 1, 0, 0, 1, 2	0.0037	0.9509
Significance level		Critical values: T=23		
		Lower bounds I(0)	Upper bounds I(1)	
1%		6.84	7.84	
5%		4.94	5.73	
10%		4.04	4.78	

Notes: ***, ** and * imply significance at the 1%, 5% and 10% levels, respectively ; (1) : Equation of electricity consumption without taking into account the institutions ; (2) : Equation of electricity consumption considering institutions ; Critical values were obtained from Pesaran et al. (2001).

These results seem vulnerable because ARDL bounds test is unable to detect structural breaks stemming in the variables. It neglects possible nonlinearities in the focal relationship. Due to the apparent drawback, we carried out Gregory-Hansen (1996)'s method to investigate this link. This technique accommodates on an unknown structural break in the studied series based on Engle-Granger residual (Farooq et al. 2013). The main findings of this test put in evidence that there is cointegration when taking into account institutions (equation 2, Table-7), while there is no evidence of cointegration between variables for equation 1.

Table 7. Gregory-Hansen Structural Break Cointegration Test

Estimated model	(1)	(2)
	F_{EC} *(EC/Y, URB, TR, FDI)*	F_{EC} *(EC/Y, URB, TR, FDI, INS)*
Structural break year	1997	2002
ADF-test	-4.6972***	-4.2680
Prob.values	0.0000	0.2135
Significance level	Critical values of the ADF test	
1%	-5.71	
5%	-4.86	
10%	-4.59	

Notes: ***, ** and * imply significance at the 1%, 5% and 10% level, respectively ; (1) : Equation of electricity consumption without taking into account the institutions ; (2) : Equation of electricity consumption considering institutions.

In the short run, economic growth positively and significantly impacts electricity consumption at 10 percent level (Table-8), while this correlation becomes insignificant when including institutions (equation 2). Urbanization increases electricity consumption at 10 percent level either with or without institutions. The effects of trade openness and foreign direct investment on electricity demand are statistically insignificant (equations 1 and 2). Seemingly, the relationship between institutions and electricity consumption is negative and significant. The electricity demand increases because intuitions are inadequate. The price of electricity, like that of many necessity products, are fixed too low. This allows to buy lack of the social peace, highlighting then the lack of political courage. The political power seems ineffective since it is not the result of free elections and therefore can not impose prices more or less free, or at least not far from the prices of world market. This country is unable to properly administer social programs (Talahite, 2005). More precisely, the inefficient subsidy policy aggravates the lack of transparency in the conduct of public policy. This leads necessarely to the inability of government to reallocate resources to benefit the broader population that may have harmful effects on energy sector and thus on the whole economy.

Furthermore, the value of *ECT* is negative and statistically significant at 5 percent level for the two estimated equations, which is theoretically correct. This implies that the deviations in the short-run are corrected by 29% towards the long-run equilibvrium (without institutions) and becomes less important (27%) when considering institutions. This indicates that institutions mitigate the speed of adjustment towards long-run equilibrium path in the case of Algeria. The R-adjusted value shows that the electricity consumption is 14.28% explained by economic growth, urbanization, trade openness and foreign direct investment. This value increases when adding institutions (Equation 2, Table-8), it becomes 19.22%. This highlights the role of institutions to explain electricity demand in Algeria.

The diagnostic tests indicate that there is no evidence of serial correlation. The Ramsey reset test statistic confirms the well construction of the short-run model. The results obtained from the CUSUM and CUSUM squares tests show that either considering institutions or not, the graphs are between the critical bounds at 5% level of significance (Figure-1), which reinforces the adequacy of the ARDL bounds testing approach, the stability and the efficience of the ARDL parameters.

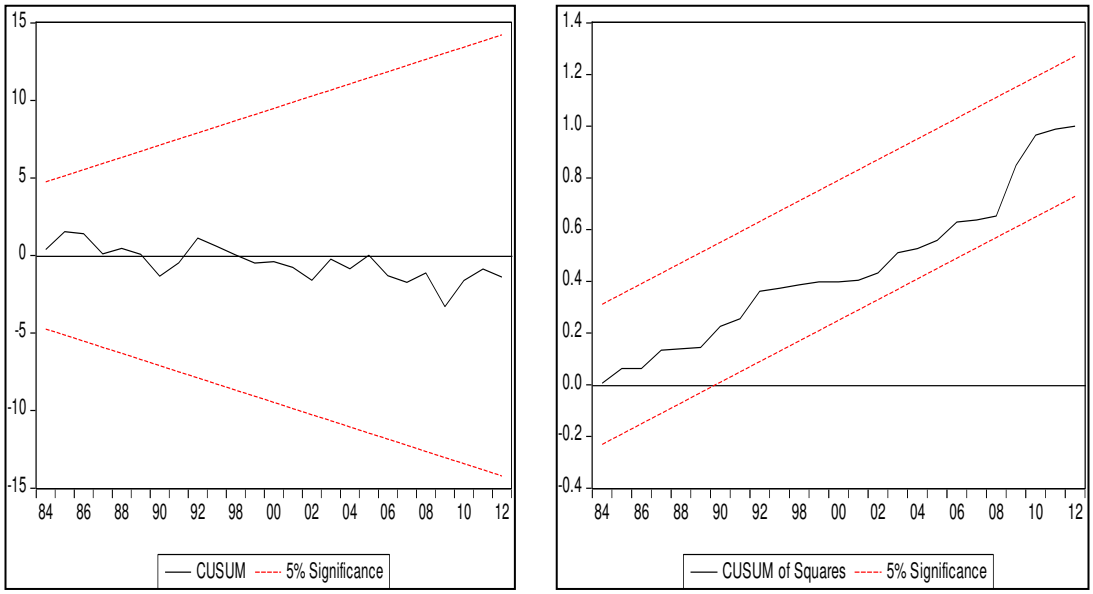
Table 8. Short-run and long-run Analysis

Dependent variable: LEC_t		
	(1)	(2)
Short-run		
ΔLY_t	0.30789*	0.23981
	(1.62314)	(0.87842)
$\Delta LURB_t$	3.89112*	4.3839*
	(1.60067)	(1.6441)
ΔLTR_t	-0.00338	-0.00264
	(-0.3654)	(-0.23824)
$\Delta LFDI_t$	-0.00338	0.00021
	(-0.3654)	(0.04508)
$\Delta LINS_t$	---	-0.01725*
		(-1.7475)
ECT_t	-0.29243**	-0.27116**
	(-2.89173)	(-2.1116)
Long-run		
LY_t	-0.06900	-0.08535
	(-0.63282)	(-0.57567)
$LURB_t$	-0.37063	-0.55472
	(-1.06747)	(-1.25424)
LTR_t	-0.00035	0.00258
	(-0.03624)	(0.21176)
$LFDI_t$	0.00047	0.00426
	50.07688)	(0.66751)
$LINS_t$	---	0.00955
		(0.66957)
Diagnostic tests		
ARS	0.1428	0.1922
SER	0.0371	0.0343
LM	1.0357	1.6942
	[0.4621]	[0.1339]
Reset	2.3594	0.9606
	[0.0112]	[0.0081]

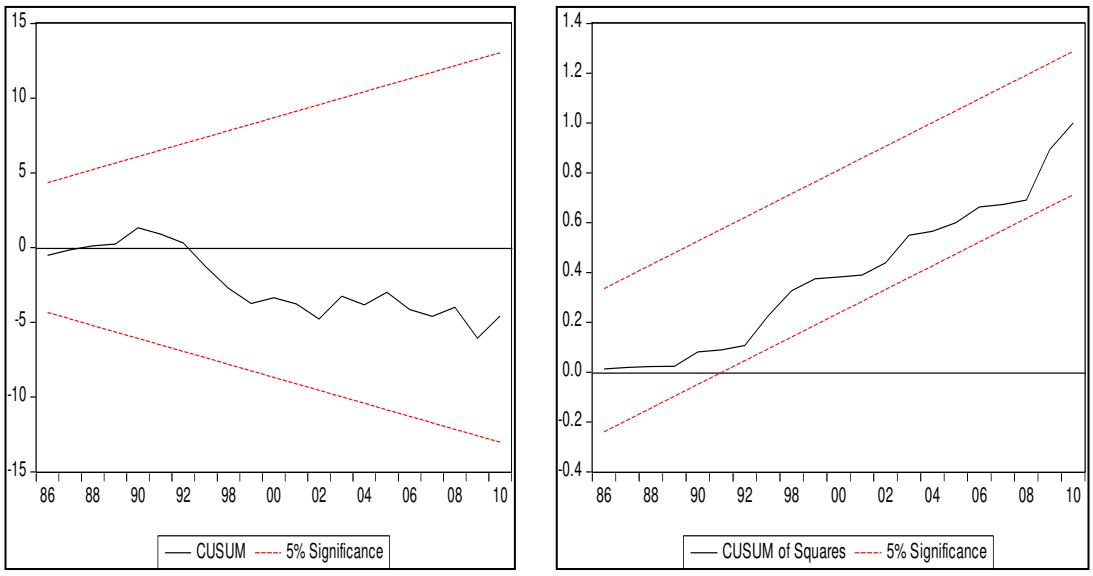
Notes : ***, ** and * imply significance at the 1%, 5% and 10% levels, respectively ; (1) : Equation of electricity consumption without taking into account the institutions ; (2) : Equation of electricity consumption considering institutions; [.] : p-values ; ARS denotes the adjustment R-squared. SER means the standard error regression ; LM means the Breush-Godfrey serial correlation. Reset denotes Ramsey Reset test; Diagnostic tests results are based on F-statistic.

Figure 1. Plots of cumulative sum of recursive and of squares of recursive residuals

(1)



(2)



Notes : (1) : Equation of electricity consumption without taking into account the institutions ; (2) : Equation of electricity consumption considering institutions ; The straight lines represent the critical bounds at 5% significance level.

5.2.Variance decomposition results

The variance decomposition approach findings of electricity consumption are reported in Table-9. The results of Equation 1 (without institutions) show that 50.92 percent of electricity demand is explained by its own innovative shocks and 10.97 percent of electricity consumption is explained by economic growth. The contribution of urbanization in explaining electricity demand is only 6.73, while that of trade openness seems minor, i.e. 4.55%. The support of foreign direct investments amounts 26.83%. The results change substantively when considering institutions (Equation 2, Table-9). 10.49% of electricity demand is explained by institutions. We clearly observe that the contribution of economic growth, foreign direct investments in explaining electricity consumption as well as its own innovative shocks become less important, which amount respectively, 6.36%, 15.93% and 33.28%. However, the contributions of urbanization and trade openness become more strong, (23.19% and 10.76% respectively). This confirms the evidence, providing that institutional quality plays an important role in explaining electricity consumption in the rentier states (Jenkins et al. 2011). Unfortunately, in MENA rentier economies in general and Algeria in particular (Fuinhas and Marques, 2013), public institutions responsible for the energy sector management are weak and ineffective. Hence, it will substantially important to strengthen the human capacity to effectively administer the electricity sector (Jenkins et al. 2011). It appears also necessary to improve energy governance including the development of appropriate systems of energy pricing, the implementation of effective subsidy policy that allows a gradual reduction of energy subsidies, the publication of electricity contracts and information on active shareholders and the conflicts of interest between official state and politicians who occupy responsibility positions in electricity companies in order to enhance the transparency of electricity sector.

Table 9. Variance Decomposition of Electricity Consumption

Period	*S.E.*	*LEC*	*LY*	*LURB*	*LTR*	*LFDI*	*LINS*
				(1)			
1	0.037466	100.0000	0.000000	0.000000	0.000000	0.000000	---
2	0.038269	95.85230	3.610005	0.005937	0.375789	0.155973	---
3	0.045122	79.03017	2.816987	12.69830	0.839084	4.615465	---
4	0.057562	70.57462	3.951738	8.714615	5.172940	11.58609	---
5	0.061551	66.19041	6.008333	8.137104	5.056548	14.60761	---
6	0.068542	60.65183	7.963584	7.498157	4.456970	19.42946	---
7	0.073781	56.96610	9.341106	7.017138	4.763999	21.91166	---
8	0.077386	54.41681	10.01879	6.902700	4.791627	23.87008	---
9	0.080729	52.39140	10.64713	6.727147	4.656163	25.57816	---
10	0.082891	50.92714	10.97532	6.735621	4.553169	26.80875	---
				(2)			
1	0.031842	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.035433	81.04281	8.925533	4.213529	1.011339	3.666561	1.140225
3	0.041108	71.03186	6.658812	10.62393	1.426997	5.615896	4.642510
4	0.056931	61.26317	3.526467	14.11910	10.52043	4.155385	6.415443
5	0.065231	46.85499	5.718320	18.70492	8.680000	15.11069	4.931082
6	0.070761	44.16903	6.393693	21.16796	8.072030	15.99746	4.199824
7	0.082930	41.16901	6.835441	18.25306	7.938125	15.88966	9.914703
8	0.087722	38.00078	6.501868	19.13884	7.724652	17.51696	11.11690
9	0.092172	34.42882	5.892172	23.70122	9.496603	16.40441	10.07677
10	0.097242	33.23831	6.368909	23.19980	10.76670	15.93377	10.49250

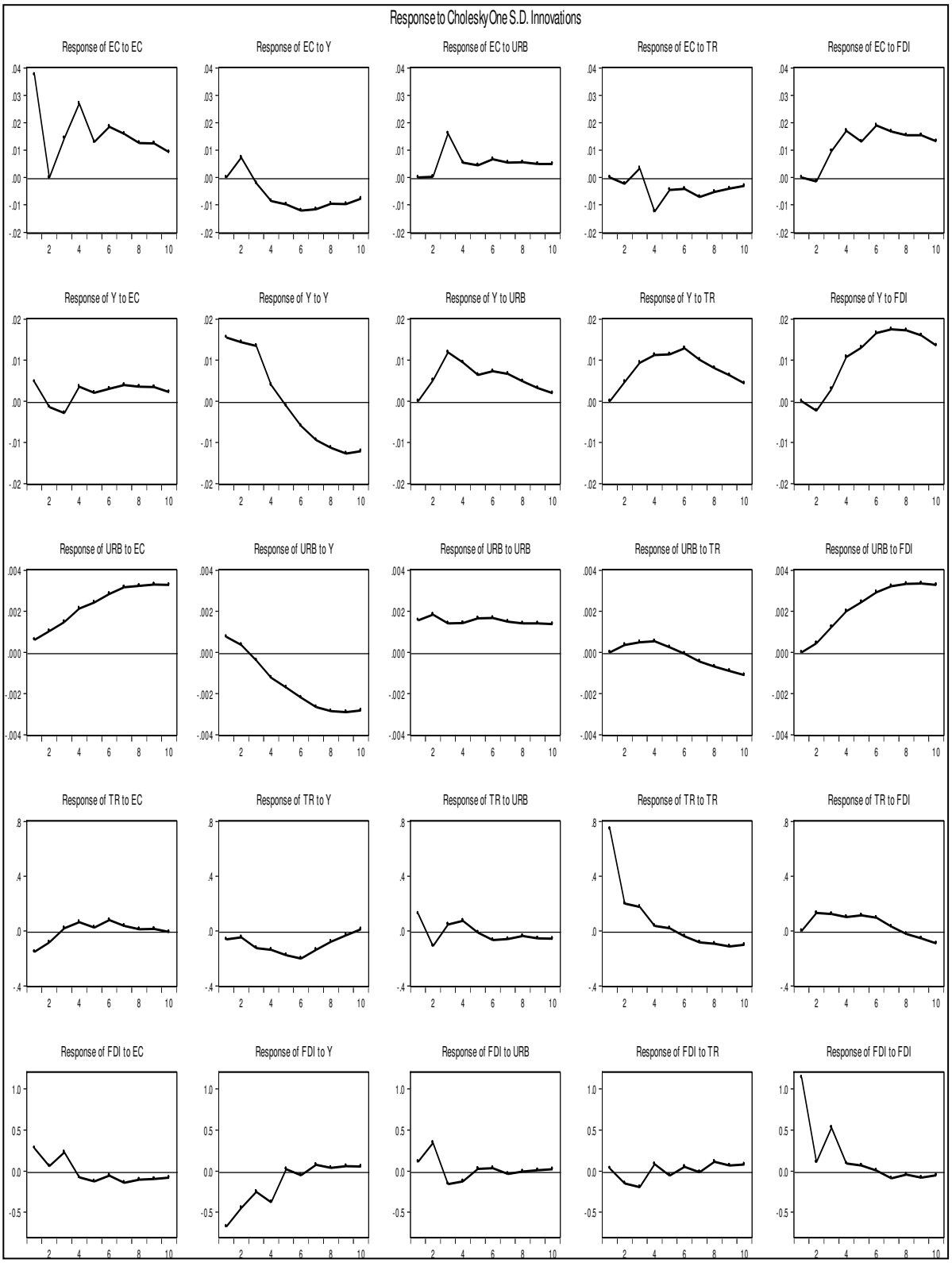
Notes : (1) : Equation of electricity consumption without taking into account the institutions ; (2) : Equation of electricity consumption considering institutions.

5.3.Impulse responses results

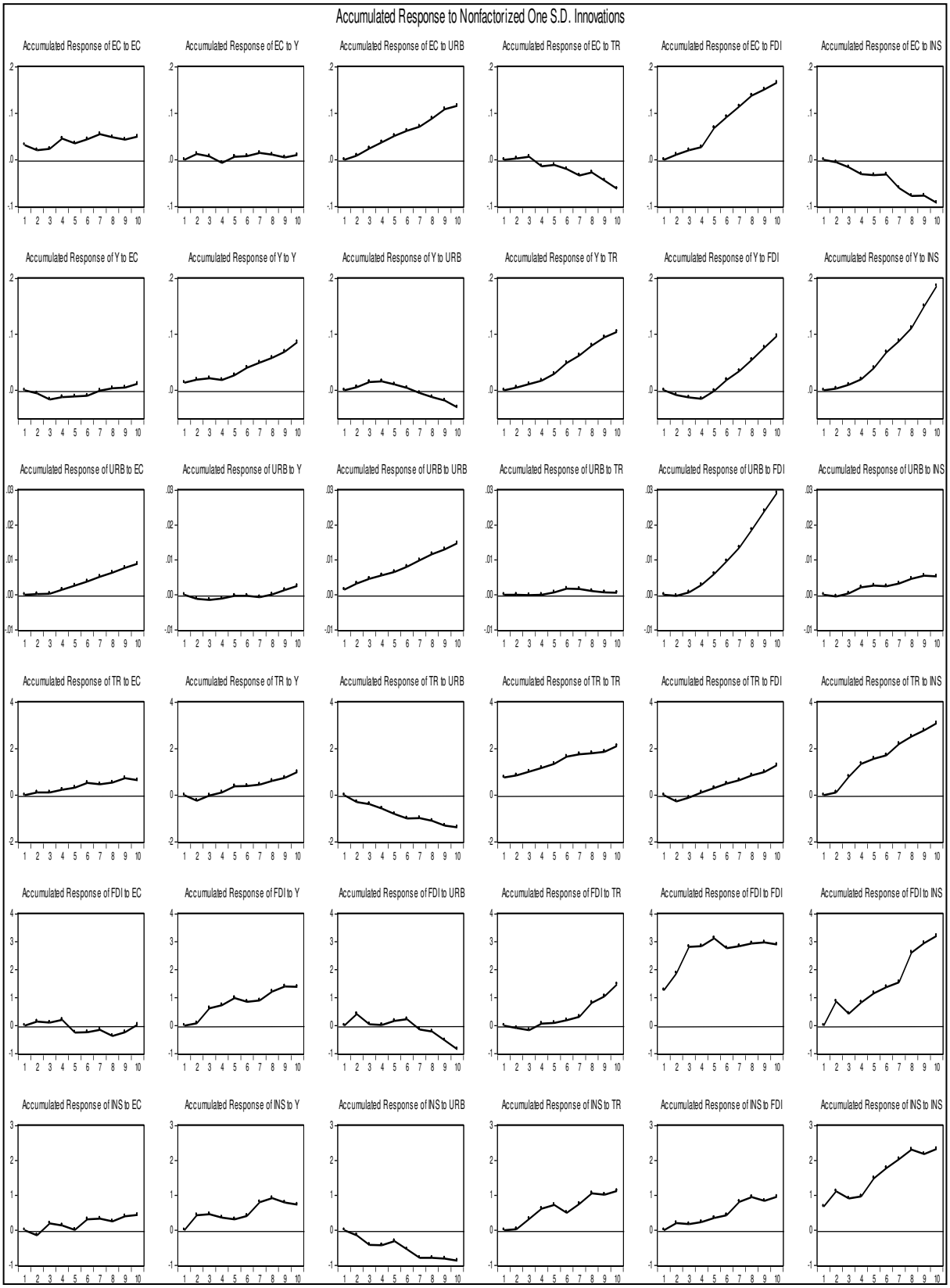
The impulse response function is alternative to the variance decomposition method showing how long independent variable reacts to shocks stemming in the dependent variables. By applying this technique, we can identify the magnitude of the response of electricity consumption to its own shocks, those of economic growth, urbanization, trade openness, foreign direct investment and to see then whether the behaviours of the dynamic interactions between these variables change when including institutions. The results reported in Figure-2 indicate that the response in electricity consumption owing to forecast error stemming in economic growth is initially positive, goes downwards after 2th time horizon and becomes negative until 4th time horizon. The contribution of urbanization to electricity demand is positive over time and becomes less stable after 10th time horizon. The response of electricity consumption seems initially positive and becomes negative after 4th time horizon due to the forecast error stemming in trade openness. The response of Algeria's electricity demand due to foreacast error stemming in foreign direct investment appears negligible at the two first time horizons and becomes positive untile the 3rd time horizon (first graph, Figure-2). When considering institutions, the behaviours of the relationships under consideration change intensely (second graph, Figure-2). The electricity demand reacts to growth as it reponds positively (slightly) for the first 2 time horizons and then subsides to zero afterwards. The contribution of urbanization to electricity consumption seems negligeable until 2th time horizon and then becomes a positive contributor factor. Trade openness contributes negatively electricity consumption, especially after the firt 3 time horizons. The response of electricity demand is positive due to one standard deviation shock in foreign direct investment, while its response appears increasingly negative due to one standard deviation shock in instruments. Given these observed outcomes, there is a need to improve the governance situation and the quality of institutions by strengthening civil and political liberties, government effectiveness, the political stability, by reducing burdensome regulations (the implementation of regulatory burdens program that has as main objectives to check if there are inopportune rules) and by developing various initiatives aimed at establishing the traceability systems for electricity sector in favour of technological investments.

Figure 3. Impulse Response Function

(1)



(2)



Notes: (1) : Equation of electricity consumption without taking into account the institutions ; (2) : Equation of electricity consumption considering institutions.

6. Conclusion and some economic implications

The article attempts to assess empirically the relationship between electricity consumption and institutions in Algeria by incorporating economic growth, urbanization, trade openness and foreign direct investment over the period of 1971-2012. The main aim is to check whether institutions play an important role to explain electricity demand whithin rienterism framework. To do so, we applied the ARDL bounds testing approach to test cointegration and the innovative accounting approach to capture the responses of electricity consumption to the shocks stemming in the above variables.

Our results show that the series in model 1 (without institutions) are cointegrated, similarly for those in model 2 (with institutions) but only when accounting for structural breaks using Gregory and Hansen (1996)'s test. This means that it is crucial to consider regime shifts when investigating the linkage between electricity demand and institutions. The innovative accounting approach indicates that institutions play an important role in explaining electricity consumption. The variance decomposition results reveal that the interaction dynamics between series change intensely when considering institutions (i.e. by adding institutions (model 2), the contributions of urbanization and trade openness become stronger and those of economic growth and foreign direct investment become less important). Intuitively, the impulse response method puts in evidence that the response of electricity consumption seems increasingly negative due to the one standard deviation shock in instituions. This may have interesting economic implications.

First, the Algerian government must take proactive measures to improve governance. The institutional weaknesses in energy sector needs to be overcome. Such expertise will be needed for years to come in the public sector for the development and management of energy policies and regulations. Additionally, policy makers should provide accurate solutions to overcome financial and technical constraints on energy efficiency investments (Marino et al. (2011) and Kevin (2013)). Well developed institutions will support and push foreign direct investment on progress. For example, the communication and the sensitisation among policy makers, investors and consumers can play a prominent role in promoting energy conservation in different sectors.

Second, Algeria should mitigates its dependence on hydrocarbons by adopting incentive measures including appropriate systems of energy pricing and the gradual reduction of fuel subsidies. This should be granted indiscriminately to all energy consumers, to mitigate then a great rise in electricity consumption. Obviously, the over consumption may prompt power cuts especially during the high heat periods (summer). This requires courageous

political decisions and transparent elections. Therefore, there is a need for legislative frameworks that would take into account the way in which authority is organized and legitimated (Fjelde, 2009).

Thirdly, due to the significantly negative effect of institutions on the electricity demand and thus to governance drawbacks, it is crucial to implement various commitments to ensure better energy sector governance. For example, it seems important to facilitate the right of access to information from executive bodies related to power policies, to develop the rights to participate in policy-making decisions by implementing timelines for electricity system, and to enhance the access to the reports of institutions in order to strengthen the transparency of electricity sector governance.

Finally, because the economic growth and the increased cost-of-living in Algeria remain despite the abundance of natural resources, this latter may be beneficial if it is accompanied by important internal changes. These positive outcomes cannot be significant without an improvement of the management strategy. This highlights the utmost importance of human resources development including employee training, employee career development, innovative incentives and performance management. 50 years after independence, Algeria lacks human capital with creative thinking skills able to create innovative projects and establish solid institutions, prerequisite for self-sustaining and durable growth. Far from being independent, these elements are mutually reinforcing (Beblawi, 2008). However, the development of human resources cannot ignore the necessity of profound institutional changes, not only in terms of the different training and educational levels, but also on how the country is governed.

References

Ades, A. and Di Tella, A. (1999), Rents, Competition, and Corruption. American Economic Review, 89, 982-993.

Al-Ariani, M.A. (2006), Energy–GDP Relationship Revisited: An Example from GCC Countries Using Panel Causality. Energy Policy, 34(17), 3342-3350.

Al-Mulali, U. (2011), Oil Consumption, CO2 Emission and Economic Growth in MENA Countries. Energy Policy, 36(10), 6165-6171.

Alvarez, (2010), Rentierism in the Algerian economy based on oil natural gaz. Energy policy 38 (10), 6338-6348.

Anderson, L. (1987), The State in the Middle East and North Africa", Comparative Politics, vol. 20, n°1.

Apergis, N., Payne J-E. (2009), CO2 emissions, energy usage, and output in Central America. Energy Policy 37, 3282–3286.

Arouri, M.H, Ben Youssef, A., M'Henni, H, Rault, C. (2012), Energy Consumption, Economic Growth and CO2 Emissions in Middle East and North African Countries. CESifo Group Munich, Working Paper Series, 3726.

Aslaksen, S and Torvik, R. (2005), A theory of civil conflict and democracy in frontier states, mimeo, Norwegian University of Science and Technology: Trondheim.

Aslaksen, S. (2011), Oil and Democracy: More Than a Cross-Country Correlation? Journal of Peace Research, 47, 421–431.

Auty, R. (1998), Resource Abundance and Economic Development. Helsinki, Finland: UNU World Institute for Development Economics Research.

Auty, R. (2001), The political economy of resource-driven growth. European Economic Review 46, 839–846.

Beblawi ,H.E., and Lucian, G. (eds.) (1987), The Rentier State, London, Croom Helm series: "Nation, State, and Integration in the Arab World", Vol.2.

Beblawi ,H.E., (2008), Economic growth in Egypt: impediments and constraints (1974–2004). The International Bank for Reconstruction and Development/ World Bank—On behalf of the Commission on Growth and Development. WorkingPaper n°14.

Blake, C.H., and Christopher G. M. (2002), Combating Corruption: Reexamining the Role of Democracy, paper presented at the Annual Meeting of the Midwest Political Science Association, Chicago, April 25-28.

Bouoiyour, J. and Selmi, R. (2013), The nexus between electricity consumption and economic growth in MENA countries. Energy Studies Review, 20 (2), 25-41.

Bouoiyour, J., Selmi, R. and Ozturk, I. (2014), The Nexus between Electricity Consumption and Economic Growth: New Insights from Meta Analysis. Mimeo CATT, University of Pau.

Chatelus, M. (1982), Brève histoire du pêtrole dans la peninsule Arabique, in Bonnenfant, P. (ed.), La Peninsule Arabique d'Aujourd'hui, Centre d'Etudes et de Recherches sur 1' Orient Arabe Contemporain, Aix-en Provence, France.

Chiou-Wei, S.Z., Chen, Ching-Fu and Zhu, Z. (2008), Economic growth and energy consumption revisited—evidence from linear and nonlinear Granger causality. Energy Economics 30 (6), 3063-3076.

Damania, R and Bulte, E. (2003), Resources for sale: Corruption, democracy and the natural resource curse. Mimeo Tilburg University.

de Soysa, I., (2007), The 'Resource Curse': An Empirical Overview. pp. 48–58 in Michael Dauderstadt and Arne Schildberg (eds.) Dead End of Transition: Rentier Economies and Protectorate. Campus: Frankfurt.

de Soysa, I. and Neumayer, E. (2007), Resource Wealth and the Risk of Civil War Onset: Results from A New Dataset of Natural Resource Rents, 1970–1999. Conflict Management and Peace Science, 24, 204–218.

Dobnick, F., (2011), Energy consumption and economic growth revisited: structural breaks and cross section dependenc. Ruhr Economic Papers n° 303.

Elbadawi, I.A. and Makdisi, S. (2011), Democracy in the Arab World: Explaining the Deficit. London: Routledge.

Engle, R. F. and Granger, C. W. J. (1987), Co-integration and error-correction: Representation, estimation and testing. Econometrica, 55, 251-276.

Farooq, A., Shahbaz, M., Arouri, M. and Teulon, F. (2013), Does corruption impede economic growth in Pakistan? Economic Modelling, 35, 622- 633.

Fearon, J. (2005), Primary Commodity Exports and Civil War. Journal of Conflict Resolution, 49, 483–507.

Fjelde, H. (2009), Buying Peace? Oil Wealth, Corruption and Civil War, 1985–99. Journal of Peace Research, 46, 199–218.

Foley, S. (2010), The Arab Gulf States: Beyond Oil and Islam. Boulder, Co.: Lynne Rienner.

Fouinhas, J-A. and Marques, A-C. (2013), Rentierism, energy and economic growth: The case of Algeria and Egypt (1965-2010). Energy policy, 62, 1165-1171.

Ghali, K.H. and El-Sakka, M. (2004), Energy use and output growth in Canada: a multivariate cointegration analysis. Energy Economics 26, 225-238.

Ghosh, S. (2009), Electricity supply, employment and real GDP in India: evidence from cointegration and Granger-causality tests. Energy Policy 37 (8), 2926-2929.

Gray, M. (2010), Towards A Theory of Late Rentierism. Mimeo Department of Political Science, Australian National University, Canberra Australia.

Gregory, A.W. and Hansen, B.E. (1996), Residual based Tests for Co-integration in Models with Regime Shifts. Journal of Econometrics, 70, 99-126.

Gylfason, T. (2001), Natural resources, education, and economic development. European Economic review, 45, 847–859.

Herb, M. (2005), No Representations without Taxation? Rents, Development and Democracy. Comparative Politics, 37, 297–316.

Iqbal, N., Nawaz, S. and Anwar, S. (2013), Electricity Demand in Pakistan: A Nonlinear Estimation. Mimeo Pakistan Institute of Development Economics.

Jenkins, J.C., Meyer, K., Costello, M. and Aly, H. (2011). International Rentierism in the Middle East and North Africa, 1971-2008. International Area Studies Review, 14, 300-311.

Kevin, L. (2013), Energy Conservation in China's Higher Education Institutions. Energy Policy, 56, 703-710.

Kraft, J. and Kraft, A., (1978), On the relationship between energy and GNP. Journal of Energy and Development, 3, 401-403.

Lee, C-C. and Chang C-P. (2005), Structural breaks, energy consumption, and economic growth revisited: evidence from Taiwan. Energy Economics 27, 857–72.

Lee, C.C., (2006), The causality relationship between energy consumption and GDP in G-11 countries revisited. Energy Policy 34, 1086-1093.

Lotz, C. (2008), Rentierism and Repression. Journal of Politics and International Affairs, 3,106–118.

Lütkepohl, H., (2006), Structural vector autoregressive analysis for cointegrated variables. AStA Advances in Statistical Analysis 90, 75-88.

Masih, A. and Masih, R. (1996), Energy consumption and real income temporal causality, results for a multi-country study based on cointegration and error-correction techniques. Energy Economics 18, 165-183.

Marino, A., Bertoldi, P., Rezessy, S. and Boza-Kiss, B., (2011), A snapshot of the European energy service market in 2010 and policy recommendations to foster a further market development. Energy Policy 39, 6190-6198.

Mebtoul, A. (2013), L'Algérie face à la concurrence et à la transition énergétique mondiale. Colloque de la Revue internationale Passages, Paris.

Niu, S., Ding, Y. Niu, Y. Li, Y. and Luo, G. (2011), Economic growth, energy conservation and emissions reduction: A comparative analysis based on panel data for 8 Asian-Pacific countries. Energy Policy 39 (4), 2121-2131.

North, D.C. (1990). Institutions, Institutional Change, and Economic Performance. Cambridge University Press, New York.

Ozturk, I. (2010). A literature survey on energy consumption-growth nexus. Energy policy 38, 340-349.

Pesaran, M. and Shin, Y. (1999), An Autoregressive Distributed Lag Modeling Approach to Cointegration Analysis. S. Strom, (ed) Econometrics and Economic Theory in the 20th Century, Cambridge University.

Pesaran, M.H., Y. Shin., and Smith R. (2001), "Bounds testing approaches to the analysis of level relationships." Journal of Applied Econometrics, 16, 289-326.

Sadorsky, P. (2012), Energy consumption, output and trade in South America. Energy Economics 34, 476-488.

Sbia, R., Shahbaz, M. and Hamdi, H. (2014), A contribution of foreign direct investment, clean energy, trade openness, carbon emissions and economic growth to energy demand in UAE, Economic Modelling, Elsevier, vol. 36(C), 191-197.

Schwarz, R. (2008), The Political Economy of State-Formation in the Arab MENA region: Rentier States, Economic Reform and Democratization. Review of International Political Economy 15, 599-621.

Shahbaz, M., Zeshan, M. and Afza, T. (2012), Is energy consumption effective to spur economic growth in Pakistan? New evidence from bounds test to level relationships and Granger causality tests. Economic Modelling 29, 2310-2319.

Shabhaz, M., Lean, H. H. and Farooq, A. (2013), Natural gas consumption and economic growth in Pakistan. Renewable and Sustainable Energy Reviews 18, 87-94.

Smith, B. (2004 a) Oil Wealth and Regime Survival in the Developing World, 1960–1999. American Journal of Political Science, 48, 232–246.

Smith, T.B. (2004 b), Electricity Theft: A Comparative Analysis. Energy Policy, 32(18), 2067-2076.

Soytas, U. and Sari, R. (2003). Energy consumption and GDP: causality relationship in G-7 countries and emerging markets. Energy Economics 25, 33-37.

Stevens, P. and Dietshe, E. (2008), Resource curse: An analysis of causes, experiences and possible ways forward. Energy Policy 36, 56-65.

Synder, R. and Bhavani, R. (2005), Diamonds, Blood and Tawes: A Revenue-Centered Framework for Explaining Political Order. Journal of Conflict Resolution, 49, 563–597.

Synder, R. (2006), Does Lootable Wealth Breed Disorder? A Political Economy of Extraction Framework. Comparative Political Studies, 39, 943–968.

Talahite, F. (2005), La rente et l'état rentier recouvrent-ils la réalité de l'Algérie d'aujourd'hui? Mimeo CNRS, University of Paris 8.

Tang, C-F. (2008), A re-examination of the relationship between electricity consumption and economic growth in Malaysia. Energy Policy 36, 3077–85.

Triesman, D. (2007), What Have We Learned About the Causes of Corruption From Ten Years of Cross-National Empirical Research. Annual Review of Political Science, 10, 211–244.

Wolde-Rufael, Y., (2005). Energy demand and economic growth: the African experience. Journal of Policy Modeling 27 (8), 891-903.

Zamani, M., (2007), Energy consumption and economic activities in Iran. Energy Economics 29 (6), 1135-1140.