International Journal of Energy Economics and Policy
Vol. 2, No. 4, 2012, pp.348-356
ISSN: 2146-4553
www.econjournals.com

Energy Consumption and Growth in Romania: Evidence from a Panel Error Correction Model

Nicholas Apergis, Corresponding Author
Department of Banking and Financial Management
University of Piraeus, Karaoli and Dimitriou 80,
Piraeus 18534, Greece. Email: napergis@unipi.gr

Dan Danuletiu
Department of Economics and Business Administration
"1 Decembrie 1918" University of Alba Iulia,
Alba Iulia, Romania. Email: danuletiu.dan@gmail.com

ABSTRACT: This study examines the relationship between energy consumption and economic growth for the economy of Romania over the period 2000-2011 within a multivariate framework. A cointegration and error correction model is employed to infer the causal relationship. Cointegration test reveals a long-run equilibrium relationship between real GDP, energy consumption, the labor force, and real gross fixed capital formation with the respective coefficients positive and statistically significant. The Granger-causality results indicate both short-run and long-run causality from energy consumption to economic growth which supports the growth hypothesis.

Keywords: Energy consumption; Growth; Cointegration tests; Granger-causality
JEL Classifications: C23; Q43

1. Introduction

Romania is rich in natural resources with the agricultural, energy, and other commodity sectors providing much of the region's export-driven growth. The continued expansion of this growth hinges on the ability to combine the region's natural resources with value-added industry. Furthermore, the enhancement of the transportation infrastructure and trade routes to link the inland countries of the region will provide greater access to agricultural and energy products for global markets.

However, the abundance of natural resources, namely oil and natural gas, has led to concerns of the economy's dependency on these resources. With respect to fossil fuels, petroleum and natural gas production and consumption dominant the production and consumption of coal. The energy sources used in net electricity generation varies across countries as well.

The objective of this study is to examine the causal relationship between energy consumption and economic growth for the first time, in the economy of Romania within a multivariate framework in order to determine the degree to which energy consumption influences the growth prospects of this economy. Section 2 discusses the various hypotheses associated with the energy consumption and economic growth literature. Section 3 reports an overview about the energy conditions in Romania, while Section 4 presents the data, the methodology, and the empirical results. Concluding remarks are given in Section 5.

2. The Energy Consumption-Growth Literature

The causal relationship between energy consumption and economic growth has been extensively examined in the literature with varying results across countries[1]. Of significance is the policy implications associated with the causal inferences drawn with respect to the energy consumption-

[1] For a survey of the international evidence on the causal relationship between energy consumption and economic growth see Payne (2010) and Ozturk (2010).

growth relationship. The presence of unidirectional causality from energy consumption to economic growth (growth hypothesis) signals the economy is energy dependent in which case energy conservation policies may have an adverse impact on economic growth. By contrast, unidirectional causality from economic growth to energy consumption (conservation hypothesis) suggests that energy conservation policies may have little or no impact on economic growth. It is also possible there is bidirectional causality between energy consumption and economic growth (feedback hypothesis) reflecting the interdependence and possible complementarities associated with energy consumption and economic growth. Finally, the absence of causality between energy consumption and economic growth (neutrality hypothesis) implies that energy conservation policies will have an insignificant impact on economic growth.

Previous studies yield a range of results. In a sixteen country study, Nachane et al. (1988) find unidirectional causality from commercial energy consumption per capita to real GDP per capita for Argentina and Chile while bidirectional causality in the cases of Brazil, Colombia, and Venezuela. In another multi-country study, Murray and Nan (1996) show unidirectional causality from real GDP to electricity consumption for Colombia. In a twelve country study of G7 and emerging markets, Sari and Soytas (2003) find bidirectional causality between energy consumption and GDP per capita. Cheng (2007) provides evidence of unidirectional causality from energy consumption to real GDP. Within a panel of eighteen developing countries, Lee (2005) finds unidirectional causality from energy consumption to real GDP. In a study of net energy exporting developing countries, Mahadevan and Asafu-Adjaye (2007) provide support for bidirectional causality between energy consumption per capita and real GDP per capita. Within a panel of eleven oil exporting countries, Mehrara (2007) finds unidirectional causality from real GDP per capita to commercial energy consumption per capita. In a study of OPEC countries, Squalli (2007) provides evidence of unidirectional causality from electricity consumption per capita to real GDP per capita. In an eighty-two country panel, Huang et al. (2008) find for the low income panel the absence of causality between energy consumption and real GDP per capita whereas unidirectional causality from real GDP per capita to energy consumption for the middle and high income panels. Ozturk *et al.* (2010) through Pedroni cointegration methodologies find that for a panel of 51 countries there is long-run causality running from GDP to energy consumption for low income countries and a bidirectional causality for middle income countries. Firouz (2011) use Markov-switching VAR modeling for the US and finds evidence in favor of bidirectional causality up to 2000 and no causality afterwards. Lau *et al.* (2011) make use of a panel of 17 Asian countries and find that there is causality running from energy consumption to growth in the short-run, while the vice versa is tru in the long-run. Adom (2011) and Kwakwa (2012) examine the relationship between energy consumption and growth for the economy of Ghana. They both find that on an aggregate as well as on a disaggregated level causality runs from economic growth to energy consumption, while Binh (2011) perform the same analysis for the case of the economy of Vitnam. His results support the neoclassical evidence that energy consumption is an assisting factor to economic growth. Finally, Abid and Sebri (2012) implement a sectoral empirical analysis for Tunisia and their empirical findings display that causality shows a different pattern in aggregated and disaggregated data analysis. Energy consumption is important for economic growth only on an aggregated level.

There are, however, only a handful of papers about investigating energy consumption in Romania. In a study dedicated to the causal relationship between energy consumption and GDP from 1980 to 2006 in Albania, Bulgaria, Hungary and Romania, Ozturk and Acaravci (2010) use data for energy use per capita, electric power consumption per capita and real GDP per capita and the two-step procedure from the Engle and Granger model to explore long-run relationships and to test causal relationships between the variables of interest. They find that for the case of Romania there is no a unique equilibrium relationship between energy consumption and real GDP per capita. Pîrlogea and Ciucea (2012) examine the relationship between energy consumption by fuel end economic growth in a comparative analysis for Spain, Romania and European Union countries as a whole for the period 1990-2010. They provide evidence in favor of short- and long-run relationships between these variables. According to their analysis, energy consumption related to total petroleum products is closely linked to economic growth in the long-run in both countries and in the European Union as well. By contrast, in Romania, renewable energy consumption influences the country’s economic performance in the long-run with the relation being unidirectional. Pirlogea and Ciucea (2011) examine whether a relationship between economic growth and energy consumption is present across both time horizons. They use energy consumption by fuel per capita and real GDP per capita for the period 1965-2007 and realize Engle-Granger methodological approaches to determine the presence of cointegration and Granger causality. They find that long-run causality appears between GDP and energy consumption only if energy comes from hydropower, while the relationship is not valid in the short-run. By contrast, energy consumption from coal or oil sources does not affect long term GDP.

Another strand in the literature studies the relationship between electricity consumption and economic growth. In particular, Kayhan *et al.* (2010) explore dynamic causal relationships between electricity consumption and economic growth in the Romanian economy for the period 2001–2010. They find that causality runs from electricity consumption to economic growth. Finally, Shahbaz *et al.* (2011) analyze cointegration and causality relationships between electricity consumption, capital and economic growth for Romania over the period 1980-2008. They find the presence of bidirectional causality between electricity consumption and economic growth.

The majority of previous studies evaluated the relationship between energy consumption and economic growth within a bivariate framework. However, a common problem of bivariate analysis is the possibility of omitted variable bias (Lütkepohl, 1982). To circumvent the omitted variable issue, this study examines the relationship between energy consumption and economic growth within a multivariate framework by including measures of capital and labor.

3. The Energy Sector in Romania

According to US Energy Information Administration and in terms of energy consumption, Romania was in 2008 the 39th country in the world. The country has diversified energy sources, such as oil, natural gas, coal, uranium, but the quantities are not sufficient to insure the total consumption of energy of the country. Over the last years and in line with the EU Energy Strategy plan, Romania attempted to acquire more energy from renewable resources. However, the production and the utilization of such sources of energy are limited due mainly to technological limitations, economic inefficiencies and environment laws.

In terms of total energy consumption in Romania, over the period 2000-2008 energy consumption showed a 9% increase (from 36,374 to 39,658 thousand tones of oil equivalent), while it experienced a reduction of 13.44%. to 34,328 thousand tones of oil equivalent over the period 2009-2010. At this point it is worth emphasizing that Romania must import more than 30% of the country's consumed energy. In terms of the structure of its imports, about 99% of its total imports represent natural gas, coal, crude oil and imported petroleum products, with the remaining 1% being represented by electric energy, fuel wood and other types of fuels. However, due to its natural resources (natural gas, oil, coal and uranium), Romania has one of the smallest energy import dependency ratios across EU countries (EC, EU Energy, 2012). The energy import dependency ratio in 2010 was 21.2%. The country has been third to Denmark and to Estonia.

The sources of the energy consumption in Romania over the period 2000-2010 are mainly natural gas, oil and petroleum products and coal, with these three sources weighting more than 80% of its total energy consumption for the 2000-2008 period and about 75% for 2010. The rest of consumption is based on fuel wood (including biomass), hydro-power and nuclear heat.

The most important source for energy consumption is natural gas that accounts for more than 30% of the country's total energy consumption, but with an important reduction of the weight for the years 2008-2010 (31% of the total consumption in 2009, following a 39.24% of total energy consumption in 2003). With respect to the energy import dependency ratio for natural gas, Romania has the smallest ratio across EU dependent countries (Denmark and Nederland are independent in this case), much lower the ratio for EU (20.1% for Romania vs 62.4% for EU). However, according to Energy Strategy of Romania, the existing reserves of natural gas insure the internal energy consumption of the country only for the next 15 years, in case that new resources are not found in the meantime (Energy Strategy, 2012). Another weak point of this source of primary energy is the low pressure in the majority of the gas wells, generating inefficiencies in transportation for long distances (Neguț *et al.*, 2008).

Other important source of primary energy consumption in Romania is oil and petroleum products, which account for 24% of the country's total energy consumption in 2010, declining from 28.46% in total consumption in 2001. In this case, the import dependency ratio is much higher (58.5% in 2010, following a 64.6% in 2007) than in the case of natural gas, but remaining at lower levels than the counterpart measures in theEU-27 import dependency ratio of crude oil and petroleum products (84%). One of the main threats in this domain remains the depletion of the internal resources, which are calculated to insure the internal energy consumption for about 14 years in case that actual consumption is maintained and new resources are not found (Energy Strategy, 2012).

Coal, as a source for energy consumption in Romania, accounts for 19.85% of the total energy consumption in 2010, after a weight of 25.70% in 2008. Most of the energy consumption from coal is based on lignite and brown coal (more than 80% of the total coal), which is the lowest quality and most crumbly coal. Lignite contains the lowest level of fixed carbon (25 to 35 percent) and highest level of moisture (typically 20 to 40 percent by weight, but can go as high as 60 to 70 percent) (see http://energy.about.com/). However, the reserves of lignite could insure the actual consumption for a period of more than 40 years, being the only source that can insure the necessary source to maintain consumption for a longer period. The reserves of pit coal could insure energy consumption for a long time, because the production of this type of coal is small. But the necessity to do investments in that domain to increase the economic efficiency of mines or to close the unprofitable mines as well as the need to attain the environmental targets and the elimination of the subsidies is expected to generate probably the reduction of the utilization of this resource, due to the growth of the production cost.

The other sources of energy consumption (fuel wood, biomass, nuclear heat, hydroelectric power) increased their weight from 14.88% of total energy consumption in 2000 to 23.34% in 2010 and according to forecast measures, they will further increase it to more than 30% in 2020 (NCP, 2012).

In Romania, the transformation losses accounted for about 15% of total energy consumption, while energy distribution loses accounted for 4.11% in 2010, after a peak value of 6.07% in 2003. As a way to improve the energy balance of the country, one important objective of the energy policy is to reduce the energy distribution loses, an indicator that is estimated to be at 2.88% of total energy consumption in 2012 (NCP, 2012). In this sense, was established that the reduction of the energy intensity is the main objective and certain actions have to be undertaken, such as: the adoption of high energy efficiency norms once new capacities of production are installed; the initiation, the development and the implementation of concrete organizational and institutional measures for growing the energy efficiency of significant energy consumers. After that, the National Plan for Energy Efficiency establishes measures for obtaining energy savings.

Because of the import energy dependency, there is a tendency of the Romanian authorities to stimulate the renewable energy sector, with one of the primary objectives of the Energy Strategy of Romania for period 2007-2020 being the promotion of energy based on renewable sources. The National Action Plan for Valorization of the Renewable Sources of Energy established as another primary global national objective the country to obtain 24% of its total energy consumption from renewable sources and it detailed the global objectives across sectors, while it determined a number of necessary measures to take care of that.

4. Data, Methodology and Results

Quarterly data from 2000 to 2011 were obtained from the Datastream database for Romania. The multivariate framework includes real GDP (Y) per capita in constant 2005 U.S. dollars, real gross fixed capital formation (K) in constant 2005 U.S. dollars, labor force (L) in millions, and energy consumption (E) per capita in kilogram of oil equivalent.[2] All variables are in natural logarithms, while the RATS software (Version 7.1) assisted the empirical analysis.

In terms of the unit root testing, to serve as a benchmark for comparison, all series are first tested for a unit root using the ADF test (Dickey-Fuller, 1981). However, the power of the statistical unit root test is of critical importance. Therefore, two modified Dickey-Fuller tests with good power are also applied. They are the DF-WS test, proposed by Park and Fuller (1995), which makes use of the WSLS estimator, which is more efficient then the OLS estimator in estimating autoregressive parameters and the DF-GLS test, proposed by Elliott et al. (1996), which analyzes the sequence of

[2] The use of real gross fixed capital formation follows Sari and Soytas (2007) in that under the perpetual inventory method with a constant depreciation rate, the variance in capital is closely related to the change in investment.

Neyman-Pearson tests of the null hypothesis of the presence of a unit root. The results are reported in Table 1. The unit root tests indicate all the variables are integrated of order one.

Table 1. Unit root tests

Unit Root Test	*Y*	*ΔY*	*E*	*ΔE*	*K*	*ΔK*	*L*	*ΔL*
ADF	-0.93	-4.42	-0.39	-4.69	-0.89	-5.52	-0.76	-5.54
DF-WS#	-0.81	-5.64	-0.69	-5.93	-0.41	-6.52	-1.14	-6.58
DF-GLS#	-1.03	-6.11	-1.15	-6.37	-1.27	-6.83	-1.05	-6.42

Notes: # denotes that testing involves trend. Critical values at the 5 percent significance level are: ADF=-1.289, DF-WS=-3.64 and ADF-GLS=-1.361.

With the respective variables integrated of order one, a long-run (cointegration) equation yields:

$$Y_t = \alpha + \gamma_1 E_t + \gamma_2 L_t + \gamma_3 K_t + \varepsilon_t \quad (1)$$

where ε_t denotes the estimated residuals which represent deviations from the long-run relationship. Thus, Johansen and Juselius (1990) cointegration tests are performed. They reveal evidence in favor of cointegration between real output per capita, energy consumption, labor and fixed capital formation. The cointegration results are reported in Table 2. Both the eigenvalue test statistic and the trace test statistic indicate that there is a single long-run relationship among the variables under study.

Table 2. Cointegration tests

Lags=2 r	n-r	ml	95 per cent	Tr	95 per cent
r=0	r=1	69.8447	47.8561	75.4829	27.5843
r<=1	r=2	46.3327	29.7971	32.8562	21.1316
r<=2	r=3	26.8094	15.4947	27.4953	16.2646
r<=3	r=4	1.7832	3.8415	1.7832	3.8415

Notes: r is the number of cointegrating vectors, n-r is the number of common trends, ml = maximum eigenvalue statistic, Tr = Trace statistic. The number of lags was determined through Likelihood Ratio tests, developed by Sims (1980).

Table 3 reports the estimates of the cointegrated vector, according to which, all the coefficients are positive and statistically significant at the 5 percent significance level and given the variables are expressed in natural logarithms, the coefficients can be interpreted as elasticity estimates.

Table 3. Long-run estimates and causality tests

Dependent variable: Y

	Independent variables	t-statistics
Constant	0.498	(4.04)*
E	0.418	(5.95)*
K	0.041	(17.01)*
L	0.265	(6.04)*

Diagnostics:

Adj.R^2 = 0.76

LM = 1.12[0.47]

RESET = 1.81[0.24]

HE = 1.26[0.33]

Notes: t-statistics are reported in parentheses and probability values in brackets. LM is the LaGrange multiplier test for serial correlation. RESET is the misspecification test. HE is White's heteroskedasticity test. Significance at the 1 percent level denoted by "a".

The results indicate that a 1 percent increase in energy usage increases real GDP by 0.42 percent; a 1 percent increase in real gross fixed capital formation increases real GDP by 0.04 percent; and a 1 percent increase in the labor force increases real GDP by 0.27 percent. Compared to the results of other estimates, the elasticity of energy usage with respect to real GDP is slightly smaller than the 0.50 percent reported by Lee (2005) for eighteen developing countries, while the elasticity estimate associated with energy usage is larger than the 0.32 percent reported by Lee and Chang (2008) for sixteen Asian countries, the 0.25 percent reported by Lee et al. (2008) for twenty-two OECD countries, the 0.12 percent reported by Narayan and Smyth (2008) for G7 countries, and the 0.28 percent reported by Apergis and Payne (2009a). The elasticity estimate for Romania is also larger than the 0.24 percent reported by Apergis and Payne (2009b) for a panel of CIS countries excluding Russia and the same value for the CIS panel that includes Russia.

Given the variables are cointegrated, a panel vector error correction model (Pesaran et al. 1999) is estimated to perform Granger-causality tests. The Engle-Granger (1987) two-step procedure is undertaken by first estimating the long-run model specified in equation (1) in order to obtain the estimated residuals. Next, defining the lagged residuals from equation (1) as the error correction term, the following dynamic error correction model is estimated:

$$\Delta Y_{it} = \alpha_{1j} + \sum_{k=1}^{q} \theta_{11ik} \Delta Y_{it-k} + \sum_{k=1}^{q} \theta_{12ik} \Delta E_{it-k} + \sum_{k=1}^{q} \theta_{13ik} \Delta K_{it-k} + \sum_{k=1}^{q} \theta_{14ik} \Delta L_{it-k} + \lambda_{1i} \varepsilon_{it-1} + u_{1it} \quad (2a)$$

$$\Delta E_{it} = \alpha_{2j} + \sum_{k=1}^{q} \theta_{21ik} \Delta Y_{it-k} + \sum_{k=1}^{q} \theta_{22ik} \Delta E_{it-k} + \sum_{k=1}^{q} \theta_{23ik} \Delta K_{it-k} + \sum_{k=1}^{q} \theta_{24ik} \Delta L_{it-k} + \lambda_{2i} \varepsilon_{it-1} + u_{2it} \quad (2b)$$

$$\Delta K_{it} = \alpha_{3j} + \sum_{k=1}^{q} \theta_{31ik} \Delta Y_{it-k} + \sum_{k=1}^{q} \theta_{32ik} \Delta E_{it-k} + \sum_{k=1}^{q} \theta_{33ik} \Delta K_{it-k} + \sum_{k=1}^{q} \theta_{34ik} \Delta L_{it-k} + \lambda_{3i} \varepsilon_{it-1} + u_{3it} \quad (2c)$$

$$\Delta L_{it} = \alpha_{4j} + \sum_{k=1}^{q} \theta_{41ik} \Delta Y_{it-k} + \sum_{k=1}^{q} \theta_{42ik} \Delta E_{it-k} + \sum_{k=1}^{q} \theta_{43ik} \Delta K_{it-k} + \sum_{k=1}^{q} \theta_{44ik} \Delta L_{it-k} + \lambda_{4i} \varepsilon_{it-1} + u_{4it} \quad (2d)$$

where Δ is the first-difference operator; q is the lag length set at two based on likelihood ratio tests; and u is the serially uncorrelated error term. With respect to equations (2a)-(2d), short-run causality is determined by the statistical significance of the partial F-statistics associated with the corresponding right hand side variables. Long-run causality is revealed by the statistical significance of the respective error correction terms using a t-test.

Table 4 reports the results of the short-run and long-run Granger-causality tests. With respect to equation (2a), energy consumption, fixed capital formation and the labor force have a positive and statistically significant impact in the short-run on economic growth. Moreover, the error correction term is statistically significant at the 5 percent level, but with a relatively slow speed of adjustment to long-run equilibrium. In terms of equation (2b), it appears that economic growth and real gross fixed capital formation have a statistically significant impact on energy consumption, while this is not the case for the labor force.

In equation (2c), it is not surprising that in the short-run, economic growth, energy consumption, and the labor force have a positive and statistically significant impact on real gross fixed capital formation, while the error correction term also appears to be statistically significant. Finally, in regards to equation (2d), economic growth and real gross fixed capital formation have a positive and statistically significant impact on the labor force in the short-run. The error correction term is statistically significant with a relatively high speed of adjustment towards equilibrium.

In summary, the short-run and long-run Granger-causality tests reveal several interesting results. First, there is bidirectional causality between energy consumption and economic growth in both the short- and the long-run, and, second, energy consumption indirectly affects economic growth through its positive impact on real gross fixed capital formation and not through its impact on the labor force. These findings lend support for the feedback hypothesis, reflecting the interdependence and complementarities associated with energy consumption and economic growth.

Table 4. Causality test results

Dependent Variable	Sources of Causation (Independent Variables)				
	Short-run			Long-Run	
	ΔY	ΔE	ΔK	ΔL	ECT
	----	56.43 (0.361) [0.00]* [0.00]*	49.29 (0.288) [0.00]*[0.00]*	37.30 (0.301) [0.00]*[0.01]*	-0.065 [0.00]*
(2b) ΔE	50.02 (0.179) [0.00]* [0.00]*	----	60.25 (0.176) [0.00]*[0.00]*	0.04 (0.022) [0.85] [0.19]	-0.045 [0.00]*
(2c) ΔK	36.48 (0.313) [0.00]*[0.00]*	34.29 (0.021) [0.00]* [0.00]*	-----	58.07 (0.266) [0.00]* [0.00]*	-0.053 [0.00]*
(2d) ΔL	95.88 (0.404) [0.00]*[0.00]*	0.06 (-0.311) [0.80] [0.81]	75.06(0.099) [0.00]*[0.00]*	----	-0.095 [0.00]*

Notes: Partial F-statistics reported with respect to short-run changes in the independent variables. The sum of the lagged coefficients for the respective short-run changes is denoted in parentheses. ECT represents the coefficient of the error correction term. Probability values are in brackets and reported underneath the corresponding partial F-statistic and sum of the lagged coefficients, respectively. Significance at the 5 percent level is denoted by *.

5. Concluding Remarks

With respect to energy sources, Romania is not among the world's leaders in oil, natural gas and hydroelectricity and, therefore, its economic fortune rests with the sustainability of its respective energy sectors. This study attempted to examine the contribution of energy consumption to economic growth. Specifically, the study employed a data set over the period 2000-2011 to infer the causal relationship between energy consumption and economic growth taking into account the labor force and real gross fixed capital formation.

Cointegration tests reveal that there is a long-run equilibrium relationship between real GDP, energy consumption, real gross fixed capital formation, and the labor force. Furthermore, the estimation of a vector error correction model indicated the presence of both short-run and long-run bidirectional causality between energy consumption and economic growth. This result provided support for the feedback hypothesis which suggests that energy consumption plays an important role in the growth process of Romania.

Though Romania is energy dependent, it is vital for continued diversification of its economic base in order to insulate itself from the possible depletion of these natural resources along with their susceptibility to volatile oil and natural gas prices in international markets. Furthermore, policymakers need to continue to enhance energy efficiency and reliability usage and reduce the long-run environmental consequences associated with dependence on fossil fuels production and consumption. In addition, energy policy should be implemented in a manner that ensures energy conservation actions to not have adverse effects on economic growth.

Finally, future research disaggregated total energy consumption into its various components, i.e. oil, coal, natural gas and nuclear, and across sectors, is expected to shed more light about the dynamic relationships under study.

References

Abid, M., Sebri, M. (2012), Energy consumption-economic growth nexus: does the level of aggregate matter? International Journal of Energy Economics and Policy, 2, 55-62.

Adom, P.K. (2011), Electricity consumption-economic growth nexus: the Ghanaian case. International Journal of Energy Economics and Policy 1, 18-31.

Apergis, N., Payne, J.E. (2009a), Energy consumption and economic growth in Central America: evidence from a panel cointegration and error correction model. Energy Economics, 31, 211-216.

Apergis, N., Payne, J.E. (2009b), Energy consumption and economic growth: evidence from the Commonwealth of Independent States. Energy Economics, 31, 641-647.

Binh, P. T. (2011), Energy consumption and economic growth in Vietnam: threshold cointegration and causality analysis. International Journal of Energy Economics and Policy 1(1), 1-17.
Cheng, B. S. (1997), Energy consumption and economic growth in Brazil, Mexico, and Venezuela: a time series analysis. Applied Economics Letters 4, 671-674.
Dickey, D.A., Fuller, W.A. (1981), Likelihood ratio statistics for autoregressive time series with a unit root. Econometrica, 49, 1057-1072.
Elliot, G., Rothenmberg, T.J., Stock, J.H. (1996), Efficient tests for an autoregressive unit root. Econometrica 64, 813-836.
Engle, R.F., Granger, C.W.J. (1987), Cointegration and error correction: representation, estimation, and testing. Econometrica, 55, 251-276.
Energy Strategy of Romania for period 2007-2020, (2012), online at: http://www.minind.ro/dezbateri_publice/2012/STRATEGIA_energetica_actualizata_22_august_2012.pdf
European Commission, EU Energy in figures (2012), online at: http://ec.europa.eu/energy/publications/doc/2012_energy_figures.pdf
Firouz, F. (2011), Causal relationships between energy consumption (EC) and GDP: A Markov switching (MS) causality. Energy, 36, 4165-4170.
Huang, B.N., Hwang, M.J., Yang, C.W. (2008), Causal relationship between energy consumption and GDP growth revisited: a dynamic panel data approach. Ecological Economics, 67, 41-54.
Kayhan, S., Adiguzel, U., Bayat, T., Lebe, F. (2010), Causality relationships between real GDP and electricity consumption in Romania (2001-2010). Romanian Journal of Economic Forecasting, 4, 169-183.
Kwakwa, P.A. (2012), Disaggregated energy consumption and economic growth in Ghana. International Journal of Energy Economics and Policy, 2(1), 34-40.
Lau, E., Chye, X.H., Choong, C.K. (2011), Energy-growth causality: Asian countries revisited. International Journal of Energy Economics and Policy, 1, 140-149.
Lee, C.C. (2005), Energy consumption and GDP in developing countries: a cointegrated panel analysis. Energy Economics, 27, 415-427.
Lee, C.C., 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.
Lee, C.C., Chang, C.P., Chen, P.F. (2008), Energy-income causality in OECD countries revisited: the key role of capital stock. Energy Economics, 30, 2359-2373.
Lütkepohl, H. (1982), Non-causality due to omitted variables. Journal of Econometrics, 19, 267-378.
Mahadevan, R., Asafu-Adjaye, J. (2007), Energy consumption, economic growth and prices: a reassessment using panel VECM for developed and developing countries. Energy Policy, 35, 2481-2490.
Mehrara, M. (2007), Energy consumption and economic growth: the case of oil exporting countries. Energy Policy, 35, 2939-2945.
Murray, D.A., Nan, G.D. (1996), A definition of the gross domestic product-electrification interrelationship. Journal of Energy and Development, 19, 275-283.
Nachane, D.M., Nadkarni, R.M., Karnik, A.V. (1988), Cointegration and causality testing of the energy-GDP relationship: a cross-country study. Applied Economics, 20, 1511-1531.
Narayan, P.K., Smyth, R. (2008), Energy consumption and real GDP in G7 countries: new evidence from panel cointegration with structural breaks. Energy Economics, 30, 2331-2341.
National Commission for Prognosis (NCP), (2012), Energy balance prognosis 2012-2020. Online at: http://www.cnp.ro/user/repository/prognoza_echilibrului_energetic_2012-2020.pdf
Neguț S., Leca A., Papatulică M., Vlad L.B., Neacşu M.C. (2008), Orientations regarding energetic security of Romania. Study No. 2, online at: http://www.ier.ro/documente/spos2008_ro/Studiul_2_-_Securitatea_energetica_RO.pdf
Ozturk, I. (2010), A literature survey on energy – growth nexus. Energy Policy, 38, 340-349.
Ozturk, I., Acaravci, A. (2010), The causal relationship between energy consumption and GDP in Albania, Bulgaria, Hungary and Romania: evidence from the ADRL bound testing approach. Applied Energy, 87, 1938-1943.
Ozturk, I., Aslan, A., Kalyoncu, H. (2010), Energy consumption and economic growth relationship: evidence from panel data for low and middle income countries. Energy Policy, 38, 4422-4428.

Park, H.J., Fuller, W.A. (1995), Alternative estimators and unit root tests for the autoregressive process. Journal of Time Series Analysis, 16, 415-429.

Payne, J.E. (2010), Survey of the international evidence on the causal relationship between energy consumption and growth. Journal of Economic Studies, 37, 53-95.

Pesaran, H.M., Shin, Y., Smith, R.P. (1999), Pooled mean group estimation of dynamic heterogeneous panels. Journal of the American Statistical Association, 94, 621-634.

Pîrlogea, C., Ciucea, C. (2012), Econometric perspective of the energy consumption and economic growth relation in European Union. Renewable and Sustainable Energy Reviews, 16, 5718-5726.

Pîrlogea, C., Ciucea, C. (2011), Obtaining economic growth from energy consumption in urban areas. Theoretical and Empirical Researches in Urban Management 6, 73-83.

Sari, R. and Soytas, U. (2007), The growth of income and energy consumption in six developing countries. Energy Policy, 35, 889-898.

Shahbaz, M., Mutascu, M., Tiwari, A. (2011), Revisiting the relationship between electricity consumption, capital and economic growth: cointegration and causality analysis in Romania. MPRA, University Library of Munich, online at: http://mpra.ub.uni-muenchen.de/29233/.

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

Squalli, J. (2007), Electricity consumption and economic growth: bounds and causality analyses of OPEC countries. Energy Economics, 29, 1192-1205.