Submission number 271 to 7th ELAEE 2019: DO NOT DISTRIBUTE!

RENEWABLE ENERGY AND SUSTAINABLE DEVELOPMENT NEXUS IN SELECTED OECD AND DEVELOPING AFRICAN COUNTRIES

By

Oladeji Yusuf T.

Energy Studies, Centre for Petroleum Energy Economics and Law; University of Ibadan, Nigeria

Phone +234 706 1077 814, E-mail: yoladeji@gmail.com

Overview

Energy is the life blood of any economy irrespective of its level at achieving development as energy and growth cannot be treated in isolation of each other. The global demand for energy will continue to increase as a result of increasing population and this raises the question of how to effectively satisfy the world's increasing energy demands through different energy sources without increasing its negative impact on the environment. There exists an insatiable demand for energy in all its forms despite increasing population coupled with the quest for growth by developing countries and the thirst for sustainable economic development by the developed ones as their lifestyles becomes consumption oriented and more energy intensive respectively. Two OECD countries and two developing countries are included in the model in order to differentiate the relationship between renewable energy consumption and economic growth in more developed OECD countries such as the U.S. and Germany with less developed African countries such as South Africa and Nigeria.

Methods

This study utilizes cointegration analysis to examine the relationship between GDP per capita, renewable energy consumption, gross fixed capita and total labor force. In order to examine the long-run relationship existence, cointegration tests was used. ARDL estimation method is been used due to the difference in the order of integration of variables since ARDL approach has consistent results against autocorrelation and endogeneity problems. Based on above discussions, real income is described as a function of renewable energy consumption, labour force and real gross fixed capital formation. The time series version of this model can be written as follows:

$$\ln GDP_t = a_o + a1 \ln REN_t + a2 \ln k_t + a3 \ln L_t + \varepsilon_t$$

The data used in this study consists of yearly observations between 1990 and 2016 for two OECD countries such as US, Germany and two developing countries Nigeria and South Africa. Data on GDP per capita, combustible renewable and waste (percentage of total energy) and real gross fixed capital are sourced from World Development Indicators (2017) of World Bank, data on total population is sourced from OECD database.

Results

The long-run causality test is evaluated with ARDL bound test results which reveals that there exists a long run relationship between renewable energy and sustainable development as renewable energy consumption in United States, Germany, and Nigeria yields economic growth and sustainable development on the long run; however renewable energy consumption has indirect effect on South Africa's growth on the long run. In the short-run and long-run, renewable energy consumption has a direct effect on economic growth in U.S, Germany, South Africa and Nigeria, however it has indirect effects in South Africa on the long-run. The effect of gross fixed capital on economic growth is direct for all countries except for South Africa and the labor positively correlated with economic growth for only South Africa in the long-run.

Conclusion

In sustaining long run relationship between renewable energy and sustainable development, there must be a need for renewable energy investment incentives for private investors by both developed and developing countries coupled with energy- saving policies, consistent policy auditing and policy redirection, with the sole aim of ensuring that existing policies yield a formidable future which is founded on the pillars of sustainability. This will further aid policy consistency across nations.

Reference

Apergis, N., Danuletiu, D.C. (2014), Renewable energy and economic growth: evidence from the sign of panel long-run causality. International Journal of Energy Economics and Policy, Econ Journals, 4(4), 578587.

Apergis, N., Payne, J.E. (2011), The renewable energy consumption-growth nexus in central America. Applied Energy, 88, 343-347.

Azapagic, A., Perdan, S. (2000), Indicators of sustainable development for industry: a general framework. Transactions of IChemE Part B, 78, 243-261.

Hardi, P., Zidan, T. (1997), Assessing sustainable development. Winnipeg: International Institute for Sustainable Development.

Hung-Pin, L. (2014), Renewable energy consumption and economic growth in nine OECD countries: bounds test approach and causality analysis. The Scientific World Journal, 2014, 919167. Available from: http://www.dx.doi.org/10.1155/2014/919167. [Last accessed on 2014 Jan 24].
Inglesi-Lotz, R. (2015), the Impact of Renewable Energy Consumption to Economic Growth: a Panel Application. Energy Economics. p1, 2. [In Press] http://www.dx.doi.org/10.1016/j.eneco.2015.01.003. [Last accessed on 2015 Feb 02]. International Council for Local Environmental Initative (ICLEI). (1996)

REN21 (Renewable Energy Policy Network) (2016), Renewables Global Status Report 2006
Update, REN21 Secretariat, Paris & Worldwatch Institute, Washington, DC.

World Bank. (2016b). Fact sheet: The World Bank and energy in Africa. Retrieved from http://web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/AFRICAEXT/0,,contentMDK:2193559
4~pagePK: 146736~piPK: 146830~theSitePK: 258644, 00.html

Bozkurt and Destek (2015): Renewable Energy and Sustainable Development Nexus in Selected OECD Countries. http: www.econjournals.com,International Journal of Energy Economics and Policy, 2015, 5(2), 507-514
UNDP (2011) United Nations Development Program – Human Development Index. http://hdr.undp.org/en/statistics/hdi/ (accessed June 2011)

IEA (2009a), "Towards a More Energy Efficient Future: Applying Indicators to Enhance Energy Policy", OECD/IEA, Paris, available at: www.iea.org/papers/2009/indicators_brochure2009.pdf.

IPCC (2007): B. Metz, O.R. Davidson, P.R. Bosch, R. Dave, L.A. Meyer (eds): Contribution of Working Group III to the Intergovernmental Panel on Climate Change, 2007. Cambridge; New York: Cambridge University Press.

IPCC (2011): Sathaye, J., O. Lucon, A. Rahman, J. Christensen, F. Denton, J. Fujino, G. Heath, S. Kadner, M. Mirza, H. Rudnick, A. Schlaepfer, A. Shmakin, 2011: Renewable Energy in the Context of Sustainable Energy. In IPCC Special Report on Renewable Energy Sources and Climate C hange Mitigation [O. Edenhofer, R. PichsMadruga, Y. Sokona, K. Seyboth, P. Matschoss, S. Kadne r, T. Zwickel, P. Eickemeier, G. Hansen, S. Schlömer, C. von Stechow (eds)], Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA