

Energy consumption and economic growth: Evidence from 11 Sub-Sahara African countries

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Abstract

The paper examines the causal relationship between energy consumption and economic growth for eleven countries in sub-Saharan Africa. Using the autoregressive distributed lag (ARDL) bounds test, the study finds that energy consumption is cointegrated with economic growth in Cameroon, Cote D'Ivoire, Gambia, Ghana, Senegal, Sudan and Zimbabwe. Moreover, this test suggests that energy consumption has a significant positive long run impact on economic growth in Ghana, Kenya, Senegal and Sudan. Granger causality test based on vector error correction model (VECM) shows bi-directional relationship between energy consumption and economic growth for Gambia, Ghana and Senegal. However, Granger causality test shows that economic growth Granger causes energy consumption in Sudan and Zimbabwe. The neutrality hypothesis is confirmed in respect of Cameroon and Cote D'Ivoire. The same result of no causality was found for Nigeria, Kenya and Togo. The result shows that each country should formulate appropriate energy conservation policies taking into cognizance of her peculiar condition.

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1. Introduction

Several studies taking advantage of the advances in time series analysis, have examined the causal relationship between energy consumption and economic growth with either income or

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employment used as a proxy for the latter¹. However, to date empirical findings have been mixed or conflicting. While some studies found a unidirectional causality running from gross national product (GNP; others reported bidirectional relationship. Few others have reported evidence of neutrality of energy consumption and economic growth². However, the general observation from literature is that most studies on the causal relationship between energy consumption and economic growth have been focused on the advanced economies and other industrialized economies. Not many studies have been reported in the case of Sub-Saharan Africa. Moreover, none of the known existing studies have used the Autoregressive Distributed Lags (ARDL) bounds test in examining the casual relationship between energy consumption and economic growth.³ Hence, the objective of the paper is to investigate the cointegration and causality relationships between energy consumption and income using ARDL bounds test and the Granger causality (GC) test based on vector error correction model (VECM).

The knowledge of causation between energy consumption and economic has significant policy implications. For example, if a unidirectional Granger causality running from income to energy is obtained, it could imply that energy conservation policies might be implemented with little adverse or no effects on economic growth. In contrast, if unidirectional causality runs from energy consumption into income, reduction in energy consumption could precipitate a fall in income or employment. However, the finding of no causality in either direction otherwise called 'neutrality hypothesis' could imply that energy conservation policies do not affect economic growth.

The paper is organized as follows. Section 2 provides the methodology adopted in the work. Section 3 presents the empirical results. Section 4 provides the concluding remarks.

2. Methodology

2.1. Data

This study involved 11 countries in Sub-Saharan Africa for the period 1980–2003. The eleven (11) countries covered in the study are namely Cameroon, Cote D'Ivoire, Congo, Gambia, Ghana, Kenya, Nigeria, Senegal, Sudan, Togo and Zimbabwe. The choice of countries included in the work was based on the availability of data on the variables incorporated in the work. In the study, total energy consumption (E) for the countries, measured as commercial energy use in kilograms of oil equivalent per capita, comes from World Development Indicators 2005 CD-ROM. Data for nominal GDP, the GDP deflator (1985 = 100) are from International Financial Statistics IMF 2005 CD-ROM. The nominal GDP data on the nominal currency are transformed into constant GDP in 1985 prices using the GDP deflator (1985 = 100). This is denoted as Y . Since data on energy prices were not available for most of the countries covered in the work, we proxied it by the consumer

¹ For a detail literature survey on the relationship between energy consumption and economic growth, see Hondroyannis et al. (2002), Asafu-Adjaye (2000) and Masih (1996, 1997) among others.

² The pioneer works on the causal relationship between energy consumption and economic growth by Kraft and Kraft (1978), Akarca and Long (1979) found a unidirectional causality running from gross national product to energy in USA. However, Akarca and Long (1980), Erol and Yu (1987a), Yu and Choi (1985) and Yu and Hwang (1984) among others found no causal relationship between income proxied by GNP and energy consumption while Erol and Yu (1987b, 1989), Yu and Jin (1992) and Yu et al. (1988) found evidence in favour of neutrality of energy consumption and employment.

³ However, the studies by Ebohon (1996) and Wolde-Rufael (2006) are exception. All the same, the results obtained for the selected African countries were mixed. More importantly, none of the studies considered the possible effects other key variables such as price and government expenditure.

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