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Energy Policy

journal homepage: www.elsevier.com/locate/enpol

Causality analysis of diesel consumption and economic growth in Cameroon

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ARTICLE INFO

Article history:

Received 14 November 2011

Accepted 4 March 2012

Available online 30 March 2012

Keywords:

Diesel consumption

Causality

Cameroon

ABSTRACT

This study examines the causal relationship between diesel consumption and economic growth in Cameroon by using a three-step modern time-series technique. Tests for unit roots, cointegration, and Granger-causality based on error correction model are employed on annual data covering the period 1975–2008. Empirical results of the study confirm the presence of a long-run equilibrium relationship between diesel consumption and economic growth. The error correction model shows that an estimated 1% increase in economic growth causes a rise in diesel consumption of 1.30% in the long-run. The overall results show that there exists bidirectional causality in the long-run relationship and no causality in the short-run relationship between diesel consumption and economic growth at the 5% level of significance. Thus, the energy policies in Cameroon should place priority on the discovery of new oil field and building capacity additions of the refinery to increase production of petroleum products, as this would propel the economic growth of the country.

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1. Introduction

Energy is the basic building block of economic development; it is driving wheel of the world's global economy and the foundation of modern society. It greatly contributes to human and economic development and well being of the society. Modern societies use huge amounts of energy for industries, services, housing and transport. We can name oil as example, which is now the most sold product, and diesel in particular, whose demand is greater than that of the other petroleum products in Cameroon (Cameroon Company of Petroleum Deposits, SCDP, 2009). It is omnipresent in virtually all sectors of energy activities in Cameroon. However, as the economy of African countries continues to grow, it is obvious to worry about the energy challenges that represent an obstacle to the continent's overall growth, especially the achievement of the millennium for development goals (Growth and Employment Strategy Paper, GESP, 2005). Although Africa is endowed with significant energy sources that remain unexploited in many cases, the continent is marked by the weakness of its energy services. Thus, energy conservation is assuredly dominated

by two myths that first result, from a belief that social progress depends on the quantity of wealth produced and hence the amount of energy consumed. Secondly, from the idea that energy choices are the results of rational decision process that market mechanisms are likely to cause (Percebois, 1978). The relationship that exists between energy consumption and economic growth in a given country and at a given period of time rapidly varies with time and space due to many factors. Thus, the energy–economy relationship are usually mentioned (Diandy, 2009).

The analysis of the causal relationship between energy consumption and economic growth is predominant in the literature to energy economics and has been subject to many empirical studies. Interest in establishing the direction of causality between energy consumption and economic growth was raised in the literature since the 1970s (Kraft and Kraft, 1978; Akarca and Long, 1980).

To date, except the global countries' studies (Esso, 2010; Akinlo, 2008; Wolde-Rufael, 2009, 2006, 2005), no detailed study has been carried out on the causal relationship between energy or diesel consumption and economic growth in Cameroon. Does a causal relationship exist between diesel consumption and economic growth in Cameroon? Answers to this question are necessary to define and implement the appropriate energy development policies in Cameroon. We can spontaneously answer affirmatively to this question. It can be said before all experiments that a correlation exists between these two parameters, because energy as a whole is important for economic and social development. As a proof, the industrial revolution was possible due to the abundance of energy sources. From another perspective, the national economy

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exerts some influence on the energy consumption. The latter, through its evolution, determines the final energy demand (Spierer, 1982). The vast literature dealing with the same field as this work shows that researchers reached the following three conclusions: bidirectional causality, unidirectional causality and no causality between energy consumption and economic growth. Unidirectional causality results can be further divided into two categories: energy consumption causes economic growth and economic growth causes energy consumption.

The purposes of this paper are therefore to describe the relationship between energy or diesel consumption and economic growth, and to investigate the long and short-run causality relationship between diesel consumption and economic growth in term of Gross Domestic Product (GDP) in Cameroon. The methods used in this study are a three-step approach. The first step is to check the properties (stationary and integration order) of two time series using the unit root test of Augmented Dickey-Fuller (1981). The second step involves the cointegration theory from the Johansen multivariate approach (Johansen, 1991, 1988 Johansen and Juselius, 1990), used to examine the long-run relationships between diesel consumption and economic growth. Finally, we establish the Granger-causality tests (Granger, 1969; Granger and Weiss, 1983, Engle and Granger, 1987) within an error correction model in order to determine the direction of causality between diesel consumption and economic growth.

The remainder of this paper is organized as follows: Section 2 provides a brief review of literature on causality studies related to energy consumption and economic growth. Section 3 gives an overview of the energy sector in Cameroon. In Section 4, the methodology adopted in the study is presented. We describe the data used in Section 5. Section 6 presents empirical results and the last section concludes the study.

2. Literature review

In general, we can accredit the idea that there is a clear relationship between energy consumption and economic growth. It is important to bear in mind the traditional problem of causality between two correlated variables. Can we say that the increase in energy consumption leads to immediate changes in economic growth? Or rather, can we sustain that economic growth promotes the consumption of energy? Or does another variable inducing these two effects exist? It is difficult to provide final answers to these questions. We know that works which addressed them led to different conclusions which are sometimes controversial.

Pioneers in the study of the causal relationship between energy consumption and economic growth were Kraft and Kraft (1978). Using the causality techniques specified by Sims (1972), they demonstrated the existence of a strong relationship between energy and economics. This paper provided evidence to support unidirectional causality running from economic growth to energy consumption for the USA over the period 1947–1974. They concluded that energy conservation policies may be initiated without deteriorating economic side effects. The work of Kraft and Kraft (1978) was contested by Akarca and Long (1980) who noted that the period chosen was unstable because it included the first oil crisis. Returning to the analysis using the same technique, but over the period 1950–1968, they showed no causality relationship between energy consumption and economic growth. Later, this result was confirmed by the work of Yu and Hwang (1984) concerning the USA over the period 1947–1979. However, the studies of the causal relationship between energy consumption and economic growth succeed by focusing on other countries, and also by adopting many methods of econometric analysis. Thus, Table 1 shows the overview comparative analysis of empiric results

of Granger causality test published in various scientific literatures for various countries in the world (Lai et al., 2011; Apergis and Payne, 2011; Payne, 2010; Ouedraogo, 2010; Abosedra et al., 2009; Belloumi, 2009; Yoo, 2006).

There exist a few research studies concerning Africa. Ebohon (1996) used the Granger-causality test to examine the causal relationship between energy consumption and economic growth for Tanzania and Nigeria. He founded the bidirectional relationship between energy consumption and economic growth for both countries. Jumbe (2004) applied the Granger-causality and error-correction technique from 1970–1999 data for Malawi, to detect causality between electricity consumption and economic activity in Malawi. The Granger-causality results detected bidirectional causality between electricity consumption and economic growth and one-way causality running from non-agricultural economic growth to electricity consumption. Ambapour and Massamba (2005), using cointegration and the error correction model to detect causal relationship between economic growth and electricity consumption in Congo, found that there is unidirectional causality running from economic growth to energy consumption. Wolde-Rufael (2005) used the Bounds test approach to cointegration and the Toda–Yamamoto statistical inference in vector autoregression to examine the causal relationship between energy consumption and economic growth for 19 African countries for the period 1971–2001. Their results did not provide a definite stance on the existence or none of a causal or long-run relationship between energy consumption and economic growth. The empirical evidence showed that there was a long-run relationship between the two series for only eight countries and causality for only ten countries. For Cameroon there was a positive causality running from energy consumption to economic growth. Wolde-Rufael (2006) remade the same study for 17 African countries for the period 1971–2001. Thus, the empirical evidence shows that there was a long-run relationship between energy consumption and economic growth for only nine countries and Granger-causality for only twelve countries. For Cameroon, there was a unidirectional causality running from economic growth to electricity consumption. Akinlo (2008) examined the causal relationship between energy consumption and economic growth for eleven countries in sub-Saharan Africa. Using the autoregressive distributed lag bounds test. Granger-causality test shows bidirectional relationship for three countries, unidirectional relationship for three countries and no causality relationship for five countries between energy consumption and economic growth. There is no causality between energy consumption and economic growth in Cameroon. In Tunisia, Belloumi (2009) used the causal relationship between energy consumption and economic growth during the period 1971–2004. The estimation results indicate that the energy consumption and economic activity growth for Tunisia are related by one cointegrating vector and that there is a long-run bidirectional causal relationship between energy consumption and economic growth and a short-run unidirectional causality from energy consumption to economic growth. Esso (2010) investigated the long-run and the causality relationship between energy consumption and economic growth for seven sub-Saharan African countries during the period 1970–2007. He used testing approach to threshold cointegration. Causality tests suggest bidirectional causality between energy consumption and economic growth for one country, unidirectional causality running from economic growth to energy consumption for two countries and no causality relationship between energy consumption and economic growth for four countries. In the case of Cameroon, the Granger-causality test shows no causality between energy consumption and economic growth.

This study has been conducted on various samples of countries. This research shows that there is no clear conclusion about

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