



Electricity consumption and economic growth in Burkina Faso: A cointegration analysis

Idrissa M. Ouédraogo*

Economics Department, University of Ouagadougou, 01 BP 1412 Ouagadougou, Burkina Faso

ARTICLE INFO

Article history:

Received 22 November 2008
Received in revised form 20 April 2009
Accepted 25 August 2009
Available online 1 September 2009

JEL classification:

Q43
C32

Keywords:

Electricity consumption
Cointegration
Causality
Burkina Faso

ABSTRACT

This study empirically establishes the direction of causality between electricity consumption and economic growth in Burkina Faso for the period 1968–2003. The bounds test yields evidence of cointegration between electricity consumption, GDP, and capital formation when electricity consumption and GDP are used as dependent variable. Causality results indicate that there is no significant causal relationship between electricity consumption and investment. Estimates, however, detect in the long-run a bidirectional causal relationship between electricity use and real GDP. There is also evidence of a positive feedback causal relationship between GDP and capital formation. Burkina Faso is therefore an energy dependent country. It is also a country in which electricity consumption is growing with the level of income. All of this shows that electricity is a significant factor in socio-economic development in Burkina Faso; as such, energy policy must be implemented to ensure that electricity generates fewer potential negative impacts.

© 2009 Elsevier B.V. All rights reserved.

1. Introduction

The analysis of the causal relationship between energy consumption and economic activity is predominant in the literature related 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 some 30 years ago (Kraft and Kraft, 1978; Akarca and Long, 1979, 1980). This was inspired by the various oil crises of the seventies that somehow slowed down economic activity all over the world. Beyond its impact on world inflation, the increase in oil prices can have recession effects on economies strongly dependent on energy, both in the long-term and the short-term. These last years, because of the events in the Persian Gulf and due to recent developments in econometric techniques, the literature related to energy consumption and economic growth has shown a renewal of interest (Asafu-Adjaye, 2000; Shiu and Lam, 2004; Jumbe, 2004; Paul and Bhattacharyya, 2004; Oh and Lee, 2004; Lee, 2005; Narayan and Smyth, 2005; Narayan and Singh, 2007; Akinlo, 2008; Odhiambo, 2009; Wolde-Rufael, 2009).

Like most African countries, Burkina Faso is basically an agricultural country with a relatively small industrial sector. The per capita

Gross National Income (GNI) was estimated at 430 U.S. dollars in 2007. For the same year, the Gross Domestic Product (GDP) was approximately 6.8 billion US dollars. The GDP grew annually by an average of 5.6% between 1997 and 2007. Fig. 1 displays trends in electricity consumption, real GDP, and Gross Capital Formation. The three variables move in the same direction and describe a positive trend during the period of the study. Over the last decade of the study period, electricity consumption has outpaced real GDP, denoting the growing demand for electricity. The Burkinabe economy is a young and growing economy. Electric energy production is thus an essential element to support its growth needs. The modernization of traditional economic sectors and the continuous expansion of secondary and tertiary sectors create new energy needs that increase the national consumption of electricity. Electricity needs come from three main sources: households, public administration, and the commercial and industrial sectors. Over the period 1988–2003, the commercial and industrial sectors accounted for 54.52% of the total electricity consumption; that of households was 27.61%, and public administration consumed 17.37%. The consumption for the primary sector was very low, about 0.50%.

To date, no study has been carried out on the causal relationship between energy consumption and economic growth in Burkina Faso. Yet, this type of analysis is necessary in the context of liberalization in which the energy sector is involved these last years. This paper aims to fill this gap. Using the bounds testing approach to cointegration and the Granger causality test, this study empirically establishes the causal relationship between electricity consumption and economic growth

* Tel.: +226 70211622; fax: +226 50312686.

E-mail addresses: midrissa@univ-ouaga.bf, idriss_mo@yahoo.fr.

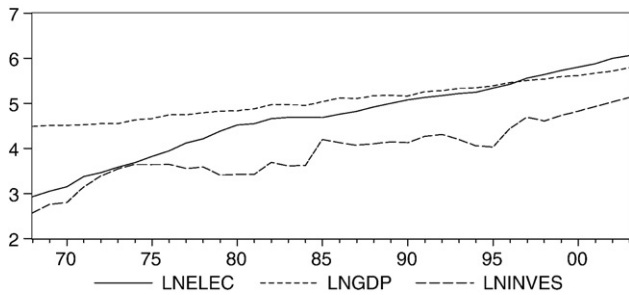


Fig. 1. Trend in electricity consumption, GDP and Gross Capital Formation, 1968–2003.

in Burkina Faso, and further elaborates on the implications and possible forecasts for the new direction of the national energy policy.

This paper is organized as follows. Section 2 describes the energy sector in Burkina Faso and Section 3 provides a brief review of literature related to energy consumption and economic growth. Section 4 outlines the methodology used in the study. Following, Section 5 presents the empirical results of the research and the last section concludes the study.

2. The energy sector in Burkina Faso

Burkina Faso is a landlocked country with energy resources limited to some hydro-electrical installations. Without any domestic oil resources, Burkina Faso must import all of the hydrocarbons needed to fuel the country. For its oil products, the nation strongly relies on the refineries and oil terminals of bordering countries that have access to the sea (Côte d'Ivoire, Ghana, Togo, and Benin). Presently, Burkina Faso's energy needs are about 8000 barrels/day.

Hydrocarbons and electricity constitute the main sources of energy in Burkina Faso. The other sources represent only a small part of energy production and contribute only incidentally to the production of goods and services. Solar energy is used in two forms: the thermal form and the electrical form. In the direct thermal form solar energy is used for heating and drying fruits and vegetables, among other things. This type of use has never been quantified in Burkina Faso. On the other hand, the amount of solar energy in its electrical form (via conversion of solar radiation) is estimated in an indirect way based on the amount of solar energy equipment installed in the country for various uses (refrigeration, television, video, communication, street lighting, etc.). In this quantification, it is assumed that the demand for electricity is a derived demand related to the stock of electrical components available in the country. This method has been used to estimate households' electricity demand in Burkina Faso (Ouédraogo and Abdou Rifa, 2005). In 2002, the total estimated power installed for solar energy collection was 1368 kWc. In 2005, less than 20 districts of the country were supplied with such systems.

Wood products are likewise used as a source of energy in the form of firewood and charcoal. According to statistics available, wood production is primarily intended for domestic use as firewood (more than 80%). The demand is particularly important in rural areas where need exceeds 85% of the total firewood demand.

Electricity as a factor of production is very important to the production process of goods and services in Burkina Faso. Almost all companies resort to electrical power. An important proportion of these industrial companies (61.4%) exclusively use the electric power provided by The National Company of Electricity (SONABEL) for the production of their goods and services. Only 38.6% jointly use other sources of energy, such as power generating units or steam turbines (Ouédraogo et al., 2005). Electricity costs account, on average, for 15% of the total expenses of the industrial and commercial companies (Ouédraogo et al., 2005).

The National Company of Electricity is a State owned company with a capital of 46 billion CFA francs, and is in charge of electricity supply and distribution in Burkina Faso. It has a monopoly over the production, import, transport, distribution, and marketing of electricity in the country. Its total production in 2007 was 612,711,927 KWH. For the production of electricity, SONABEL has 28 thermal power stations and 4 hydroelectric power stations. However, it should be noted that this production is insufficient to meet the country's needs for electricity. SONABEL is thus obliged to import electricity from Côte d'Ivoire and Ghana, and in 2007 SONABEL imported an estimated 123,910,359 KWH. In the same year, SONABEL provided 68 localities of Burkina with electricity; its distribution network, about 7521 km long, made it possible to provide 288,475 users with electricity.

As a result of the reforms undertaken within the framework of economic liberalization, the government of Burkina Faso initiated a profound reorganization of the electricity sector in December 1998 by passing a law on the general regulation of the electric power supply in Burkina Faso. In a specific way, this law suggests the repealing of the monopoly on electricity production by SONABEL: it authorizes the distribution of electricity in areas where no distribution company is settled and it creates a fund for the development of electrification that will be supplied by additional taxes on each kWh sold. A change in the institutional status of SONABEL is planned for the years to come by the creation of two companies: a state owned company that will be the owner of assets and in charge of rural electrification, and a private company that will be in charge of production and distribution of electricity in urban areas.

These various measures imply for SONABEL a certain number of changes at the level of production, management, and result in terms of financial equilibrium. In this context, SONABEL carried out a series of studies that led to the establishment of an optimum plan of investment totaling 240 billions CFA francs for the period 2003–2020. To carry out these investments, SONABEL will have to significantly mobilize its own resources. With this purpose, it will have to develop a self-financing capacity. To this end, SONABEL led two studies, one on electricity price and the other on a prospective financial analysis of the company. These two studies showed the need for SONABEL to revise its tariffs in order to restore its financial balance. This step will help the company undertake necessary investments for its development.

If financial viability proves to be an imperative for SONABEL's durability, its social and economic mission should not be ignored. Indeed, it should be noted that electric power is today, not only a necessary commodity for the Burkinabe population but also, a primary production factor for many manufacturing units of the country. Although electricity constitutes one of the main sources of energy in Burkina Faso, only 13% of the households have access to it and in rural areas only 1.1% of households use electricity as a source of energy.

In September 2006, SONABEL decided to readjust its rates, a change that became effective in October 2006. This readjustment was the second in 2 years, as rate adjustments were first introduced in October 2004. The increases of 2006 vary between 2.7% and 15.4% for non-industrial consumption. For industrialists, the increase rate was between 5.9% and 7.7%. In addition, there was an increase of 20% in the service charge. According to SONABEL, the low rates applied to industries were justified by the fact that the company did not want to generate dysfunctions in the productive sectors. This increase was further justified by the fact that 75% of managers of company supplied by SONABEL say that the previous rise in the price of electricity negatively influenced their sales. And since the majority of these companies operate in a competitive environment, a high increase in electricity prices can affect their competitiveness (Ouédraogo et al., 2005). Electricity prices in Burkina Faso are now among the highest in West Africa. From a policy point of view, the results of this study will be of major importance for policymakers, in that it will provide them

متن کامل مقاله

دریافت فوری ←

ISIArticles

مرجع مقالات تخصصی ایران

- ✓ امکان دانلود نسخه تمام متن مقالات انگلیسی
- ✓ امکان دانلود نسخه ترجمه شده مقالات
- ✓ پذیرش سفارش ترجمه تخصصی
- ✓ امکان جستجو در آرشیو جامعی از صدها موضوع و هزاران مقاله
- ✓ امکان دانلود رایگان ۲ صفحه اول هر مقاله
- ✓ امکان پرداخت اینترنتی با کلیه کارت های عضو شتاب
- ✓ دانلود فوری مقاله پس از پرداخت آنلاین
- ✓ پشتیبانی کامل خرید با بهره مندی از سیستم هوشمند رهگیری سفارشات