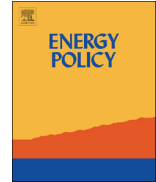




Contents lists available at ScienceDirect

## Energy Policy

journal homepage: [www.elsevier.com/locate/enpol](http://www.elsevier.com/locate/enpol)

## Effects of energy consumption on per worker output: A study of Kenya and South Africa

Ronald Ravinesh Kumar<sup>a,\*</sup>, Radika Kumar<sup>a,b,2</sup><sup>a</sup> School of Accounting & Finance, FBE Green House, Faculty of Business & Economics, University of the South Pacific, Laucala Campus, Suva, Fiji<sup>b</sup> Ministry of Foreign Affairs, Government of Fiji, Level 2, South Wing BLV Complex, 87 Queen Elizabeth Drive, Nasese, Suva, Fiji

## HIGHLIGHTS

- The ARDL approach and Solow (1965) model extended by Rao (2010) is used, with critical bounds from Narayan (2005).
- The Toda and Yamamoto (1995) procedure is used to investigate direction of causality.
- Long-run energy elasticities for Kenya and South Africa are 1.71 and 0.34.
- For South Africa, the elasticities are 0.17 and 0.34, respectively.
- A unidirectional causality is detected from energy and capital to output.

## ARTICLE INFO

## Article history:

Received 20 January 2013

Accepted 27 July 2013

Available online 21 August 2013

## Keywords:

Kenya

South Africa

Energy-growth nexus

## ABSTRACT

The paper investigates the long-run cointegration relationship and energy elasticities for Kenya and South Africa over the periods 1978–2009 and 1971–2009, respectively, using the ARDL procedure developed by Pesaran et al. (2001) with recomputed critical bounds from Narayan (2005) and the Solow (1956) framework extended by Rao (2010). We also conduct the (Toda and Yamamoto (1995) test for Granger non-causality. The regression results show that short-run and long-run energy elasticities are 0.50 and 1.71, respectively for Kenya and 0.17 and 0.34, respectively for South Africa. The causality results indicate a unidirectional Granger causality running from capital per worker and energy per capita to output per worker for both countries. Moreover, in Kenya, we detect a strong unidirectional causality: (a) on output from joint consideration of capital stock and energy; and (b) on capital stock from joint consideration of energy and output. In South Africa, the joint causations are neutral. Hence, while energy and capital stock spurs growth in both countries, Kenya has a greater potential to harness growth and capital productivity via joint consideration of energy with capital and output, respectively.

© 2013 Elsevier Ltd. All rights reserved.

## 1. Introduction

Africa's growth and development largely depend on the access of affordable and reliable energy. Although the region is endowed with vast renewable and non-renewable sources of energy besides other resources, it is faced with some serious issues pertaining to energy poverty. Access to modern energy services, (in rural areas), poor infrastructure, low purchasing power, low investment and over-dependence on traditional biomass are some constraints to sustainable development of the region. Only a fifth of the Sub-

Saharan population has access to electricity. Nevertheless, the contribution of energy to the growth of Africa is noticeable, at least for some countries.

In this paper, we explore the role of energy consumption in two of the relatively growing countries in the region—South Africa and Kenya. South Africa is highly energy intensive, consuming a large amount of energy predominantly sourced from coal for its economic activities. The economy has a secure and well structured natural energy supply. At present, 33% of the coal extracted in South Africa is reserved for the foreign markets. From the total domestic supply of energy, 55% is transposed into electricity, 21% into petroleum products, 4% into gas and the remainder is utilized directly. Most direct coal consumption is found in the commercial, transport and residential sectors of the country.

However, the country's energy sector is largely driven by the economic and political forces which have a major effect on the energy policies. South Africa's energy policy can be divided into three periods. The first period covered a lag from 1948 to 1994 in the apartheid era. The second period followed after the first

\* Corresponding author. Tel.: +679 32 32571; fax: +679 32 31506.

E-mail addresses: [kumar\\_RN@usp.ac.fj](mailto:kumar_RN@usp.ac.fj), [kumar\\_rn@usp.ac.fj](mailto:kumar_rn@usp.ac.fj),[ronaldkmr15@gmail.com](mailto:ronaldkmr15@gmail.com) (R.R. Kumar), [radikakumar@gmail.com](mailto:radikakumar@gmail.com) (R. Kumar).<sup>1</sup> Ronald Ravinesh Kumar is an assistant lecturer at the School of Accounting & Finance, University of the South Pacific.<sup>2</sup> Radika Kumar works as a special assistant at the Ministry of Foreign Affairs, Government of the Republic of Fiji Islands and is a Ph.D. candidate at the University of the South Pacific. Tel.: +679 330 9645; fax: +679 331 7580.