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Causality between energy consumption and economic growth in India: a note on conflicting results

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Abstract

This note examines the different direction of causal relation between energy consumption and economic growth in India. Applying Engle–Granger cointegration approach combined with the standard Granger causality test on Indian data for the period 1950–1996, we find that bi-directional causality exists between energy consumption and economic growth. Further, we apply Johansen multivariate cointegration technique on the different set of variables. The same direction of causality exists between energy consumption and economic growth. This is different from the results obtained in earlier studies.

JEL classification: Q_{41}; Q_{43}

Keywords: Energy consumption; Economic growth; India; Granger causality; Cointegration

1. Introduction

All production and many consumption activities involve energy as an essential input. It is the key source of economic growth, industrialization and urbanization. On the other hand, economic growth, industrialization and urbanization may induce use of more energy,

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particularly commercial energy. India has been passing through an economic reform since 1991, the general aim of which is to quadruple its economic growth and remove the problems of poverty and unemployment. One of the obstacles to achieve these objectives has been the frequent occurrence of energy shortages in the economy. In India, commercial energy consumption over time has grown at a compound annual growth rate (CAGR) of about 6% which is more than the CAGR of GDP during the last two decades.[1] So the relation between energy consumption and economic growth is of great interest to the energy economists. It is not possible to achieve high growth in one, without keeping pace with another.

The direction of causation between energy consumption and economic growth has significant implications. If, for example, there exists unidirectional causality running from economic growth to energy consumption, it may be implied that energy conservation policies may be implemented with little adverse or no effects on economic growth. On the other hand, if unidirectional causality runs from energy consumption to income, reducing energy consumption could lead to fall in income. The finding of no causality in either direction, the so-called 'neutrality hypothesis' would imply that energy conservation policies do not affect economic growth (Asafu-Adjaye, 2000).

However, in India not much attention has been devoted to investigate the causal relationship between economic growth and energy consumption. In some earlier studies Pachuri (1977) and Tyner (1978) using regression approach have found a strong relation between energy consumption and economic growth in India. Cheng (1999) in his quest for causality has established a unidirectional causal relation from economic growth to energy consumption. In contrast, Asafu-Adjaye (2000) has estimated a unidirectional Granger causality from energy consumption to income. The finding of Asafu-Adjaye (2000) does not support the finding of Cheng (1999). Our empirical result identifies bi-directional causality between energy consumption and economic growth. The present analysis attempts to discuss how our finding contrasts with the findings of Cheng (1999) and Asafu-Adjaye (2000).

2. Empirical evidence

The empirical findings on the causal issue between energy consumption and economic growth have been mixed or conflicting. The reason for the disparate and often conflicting empirical findings lies in the variety of approaches of time frame considered and testing procedures employed in the analysis.

Cheng (1999) has applied Johansen–Hsiao's version of the Granger causality method on the Indian data for the time period 1952–1995. This study finds that energy consumption, economic growth, capital and labour are cointegrated and the direction of causality runs from economic growth to energy consumption both in the short-run and

[1] It is worthwhile to note that past trend in energy consumption does not fully represent the growth of energy demand. To a large extent it reflects the net availability (Bhattacharya and Paul, 2001).