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Energy consumption and economic growth: assessing the evidence from Greece

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Abstract

This paper attempts to shed light into the empirical relationship between energy consumption and economic growth, for Greece (1960–1996) employing the vector error-correction model estimation. The vector specification includes energy consumption, real GDP and price developments, the latter taken to represent a measure of economic efficiency. The empirical evidence suggests that there is a long-run relationship between the three variables, supporting the endogeneity of energy consumption and real output. These findings have important policy implications, since the adoption of suitable structural policies aiming at improving economic efficiency can induce energy conservation without impeding economic growth. © 2002 Elsevier Science B.V. All rights reserved.

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1. Introduction

The energy crises in the 1970s and the unprecedented high levels of energy prices, especially oil, which had a detrimental effect on growth, called for the implementation of energy conservation processes. Indeed, most of the industrialized countries managed to have gradually curtailed energy requirements.

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Since the end of the 1970s, there has been fairly extensive empirical research interest on the temporal causality between energy consumption and economic growth or employment, with neither conclusive results nor persuasive explanations. The research effort, very much facilitated by the ‘newly’ developed statistical techniques (e.g. Sim’s test), aimed at investigating whether economic growth takes precedence over energy consumption or if energy consumption can boost economic growth. The advance of econometric techniques in recent years stimulated further empirical research on the energy consumption–economic growth debate, still with elusive results. As regards to policy issues, the question is whether the adoption of energy saving processes is a stimulus to growth or the opposite, the relevant literature referring to the possibility or feasibility for the adoption of energy saving processes.

In this paper, we take a fresh look at the empirical evidence on the relationship between economic growth and energy consumption with a view of offering suggestions about how the issue may be addressed in future. We feel that the question of energy growth is more usefully analyzed if it is placed in a broader perspective, rather than within the partial consideration of energy conservation issues. The case of Greece, a medium size country, serves as an example in our empirical investigation and the conclusions drawn could be useful for the analysis of other medium-sized economies.

The paper evaluates empirically the dynamic interaction between energy consumption, real output and the price level and tests for the endogeneity of these three variables included in the vector, utilizing the vector error-correction models (VECM) technique. The relevance of endogenous energy consumption is investigated and its dynamic response to structural shocks is estimated. Furthermore, the empirical analysis distinguishes between three categories of energy consumption: total; residential; and industrial energy consumption, all treated independently.

The empirical results showed that total energy consumption is an endogenous variable also affecting economic growth. In addition, economic efficiency, as reflected in price developments, is a determining factor of both energy consumption and income behavior. The same applies to industrial energy consumption, while energy consumption for residential uses behaves independently of price and income developments. As regards to policy implications, policies aiming at improving economic efficiency via structural reforms (implementation of adjustment policies, enforcement of endogenous growth mechanisms) boost economic growth and result in lower energy requirements. At the same time, these policies induce energy conservation, positively affecting economic growth. Hence, structural policies are a stimulus to both economic growth and energy saving. This being the case, energy conservation does not impede economic growth.

The paper proceeds as follows. Section 2 briefly reviews previous empirical work on the relationship between energy requirements and growth, also considering the developments in Greece. Section 3 deals with methodological issues and the data used in the empirical analysis, while in Section 4 the empirical evidence is presented. Finally, in Section 5, the conclusions of the analysis are summarized and policy implications are discussed.

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