Economic development, pollutant emissions and energy consumption in Malaysia

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Abstract

The objective of this paper is to examine the long-run relationship between output, pollutant emissions, and energy consumption in Malaysia during the period 1971–1999. To supplement the findings of cointegrating analysis, we assess the causal relationships between the variables using the recent causality tests available in the literature. The results indicate that pollution and energy use are positively related to output in the long-run. We found a strong support for causality running from economic growth to energy consumption growth, both in the short-run and long-run.
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1. Introduction

The relationships between output and energy consumption, as well as output and environmental pollution, have been the subject of intense research over the past few decades. However, the empirical evidence remains controversial and ambiguous to date.

Economic development is closely related to energy consumption since higher economic development is expected when more energy is consumed. However, it is also equally likely that more efficient use of energy (which could lead to a reduction in energy consumption) requires a higher level of economic development. That is, better economic performance may be a catalyst for energy

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efficiency. As such, energy consumption and economic development may be jointly determined. The importance of this nexus has been well-documented in the literature. In a seminal study, Kraft and Kraft (1978) found a uni-directional Granger causality running from output to energy consumption for the United States during the period 1947–1974. The subsequent studies on this subject, which differ in terms of the time period covered, country chosen, econometric techniques employed, and the control variables used in the estimation, either confirm or contradict the results of Kraft and Kraft (1978).[1] With the development of time series econometric techniques, more recent studies tend to focus on the cointegrating relationship between output and energy consumption.[2]

The relationship between output and pollution has also been extensively studied in the literature. Whether continued increase in national income brings greater harm to the environment is critical for the design of development strategies for developing economies. Most empirical studies in this subject mainly focus on testing the validity of the Environmental Kuznets Curve (EKC), which postulates that the relationship between economic development and the environment resembles an inverted U-curve. The findings of Hettige, Lucas, and Wheeler (1992), Cropper and Griffiths (1994), Selden and Song (1994), Grossman and Krueger (1995), and Martinez-Zarzoso and Bengochea-Morancho (2004) are consistent with the EKC hypothesis. However, increased national income level does not necessarily warrant greater efforts to contain the emissions of pollutants. The empirical results of Shafik (1994) and Holtz-Eakin and Selden (1995) show that pollutant emissions are monotonically increasing with income levels.

An assessment of the existing literature suggests that most studies focus either on the nexus of output-energy or output-pollution where little effort has been made to test these two links under the same framework. This study is an attempt to fill the gap. Malaysia appears to be an interesting case study for this subject given that it is one of the highest growth open economies in the developing world, and it has experienced a significant rise in pollutant emissions and energy consumption in recent years. The choice of this country is also motivated by the fact that no known study has been conducted to examine the relationship between output, energy consumption and pollutant emissions in Malaysia.

We prefer a country-specific case study to a cross-sectional study since empirical analyses conducted at the aggregate level are unable to capture and account for the complexity of the economic environments and histories of each individual country. Hence, any inference drawn from these studies provides only a general understanding of how the variables are broadly related, and thus offers little guidance for policy formulation. In this spirit, a country-specific in-depth case study appears to be more promising in order to find deeper answers for the issue at hand.

We formulate and estimate a vector error-correction model using the full-information maximum likelihood method by treating output, pollutant emissions, and energy consumption as endogenous variables. Unlike structural models, the proposed reduced-form model in this study does not require *a priori* information on parameters. In order to supplement the findings of the long-run cointegrated relationship, we perform various causality tests to shed light on the causal relationships between output and energy use, as well as output and pollutant emissions.

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[1] See Akarca and Long (1980), Yu and Choi (1985), Erol and Yu (1987), Abosedra and Baghestani (1989), and Hwang and Gum (1991).

[2] See Masih and Masih (1996, 1997), Cheng and Lai (1997), Glasure and Lee (1998), Asafu-Adjaye (2000), Stern (2000), Yang (2000), Jumbe (2004), and Paul and Bhattacharya (2004).