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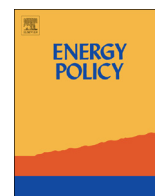
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# Dynamic linkages among transport energy consumption, income and CO<sub>2</sub> emission in Malaysia



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## HIGHLIGHTS

- We examine the dynamic relationship among energy consumption in transportation sector, income and CO<sub>2</sub> and also attempts to validate the environmental Kuznet curve (EKC) hypothesis.
- We used a multivariate approach based on VECM.
- The inverted U-shape EKC hypothesis is not valid in the case of Malaysia.
- Uni-directional causality exists from emission to income, energy consumption and renewable energy use.
- Income Granger-causes energy consumption and renewable energy use, and both structural change and renewable energy use Granger-cause energy consumption in road transportation.

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## ABSTRACT

This paper examines the dynamic relationship between income, energy use and carbon dioxide (CO<sub>2</sub>) emissions in Malaysia using time-series data during 1975 to 2011. This study also attempts to validate the environmental Kuznet curve (EKC) hypothesis. Applying a multivariate model of income, energy consumption in the transportation sector, carbon emissions, structural change in the economy and renewable energy use, the empirical evidence confirmed that there is a long-run relationship between the variables as shown by the result of co-integration analysis. The results indicate that the inverted U-shape EKC hypothesis does not fully agree with the theory. The coefficient of squared GDP is not statistically different from zero. The time duration and the annual data used for the present study do not seem to strongly validate the existence of EKC hypothesis in the case of Malaysia. Causality test shows that the relationship between GDP and CO<sub>2</sub> is unidirectional. The Granger causality test results reveal that emissions Granger-cause income, energy consumption and renewable energy use. Moreover, we find that income Granger-causes energy consumption and renewable energy use, and both structural change and renewable energy use Granger-cause energy consumption in road transportation.

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## 1. Introduction

The increasing threat of global warming and climate change has been one of the most urgent environmental problems in the last two decades. Among several pollutants that have been linked to climate change, energy consumption has been generally identified as a major contributor to environmental pollution. As a

consequence, many empirical studies on the relationships between economic growth and environmental pollution as well as between economic growth and energy consumption have been conducted in developed and developing countries (see [Ang, 2007](#); [Zhang and Cheng, 2009](#); [Menyah and Wolde-Rufael, 2010](#); [Ozturk and Acaravci, 2010](#); [Azlina and Nik Mustapha, 2012](#); among others). Economists and environmentalists have investigated this nexus of relationships because it has important implications from the theoretical, practical and policy points of view. For instance, if energy use is found to Granger-cause economic growth, it implies that growth requires energy and decreasing in energy use will possibly restrain economic development. Thus, the implementation of energy conservation policies may severely affect

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