

The nexus of emissions and energy consumption in the transport sector and economic activity

SUMMARY

The aim of this research is to study the trends and the causal relationship between emissions and energy consumption in the transport sector and the activity of the whole economy. In order to help the design of measures to reduce emissions and energy consumption in the transport sector without affecting economic activity, it is very important to elucidate the causality between these variables. In other words, it is necessary to answer to the question if it is possible to reduce emissions and energy consumption in the transport sector and, at the same time, to increase economic activity.

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EXTENDED ABSTRACT

In recent decades there has been a growing concern to achieve lower energy consumption and greenhouse gas emissions. The increasing energy use at worldwide level is the main cause of greenhouse gas emissions, which are responsible of global warming and climate change. On the other hand, energy is an essential factor to economic activity.

An extensive literature has focused on analysing the relationships between greenhouse gas emissions and economic activity in the past decades. Most empirical research in this subject has been related to the study of the validity of the Environmental Kuznets Curve (EKC), see for instance Coondoo and Dinda (2002), Dinda and Coondoo (2006) and Lee and Lee (2009), among others. In the same way, energy consumption and economic activity have also been an issue of intense investigation in the last few years. Recent studies include Soytas and Sari (2009) and Chandran et al. (2010), among others. Nevertheless, the empirical evidence has not been conclusive in finding a clearly defined link between emissions and economic activity by one side, and energy and economic activity by the other.

Recently, new research has been conducted considering jointly greenhouse gas emissions, energy consumption and economic activity, in an effort to test these two links under the same framework. The literature focused on studying the relationship between emissions, energy consumption and economic activity is the result of synthesising the EKC literature, which relates emissions and economic activity, and the literature that studies the relationship between energy consumption and economic growth. Representative studies in this regard are those of Ang (2007, 2008) using time series data and Apergis and Payne (2009, 2010) using panel data, to mention only a few.

At worldwide level, the transport sector is responsible for 20% of greenhouse gas emissions; moreover, this activity consumes 25% of final energy. Data from the United Nations Framework Convention on Climate Change (UNFCCC) shows that the emissions from OCDE countries have increased by 10.4% in the transport sector between 1990 and 2012, meanwhile its consumption has grown by 14.9%, and GDP has increased by 52.9% in the same period.

Taking into account the above, the aim of this research is to study the trends and the causal relationship between emissions and energy consumption in the transport sector and the activity of the whole economy. From this perspective, this investigation intends to explore the dynamic nature of the relationship between emissions and energy consumption in the transport sector and economic activity.

In order to help the design of measures to reduce emissions and energy consumption in the transport sector without affecting economic activity, it is very important to elucidate the causality between these variables.. That is, it is necessary to know if it is possible to reduce emissions and energy consumption in the transport sector and, at the same time, increasing economic activity.

We use the methodology proposed by Apergis and Payne (2009) and Hamit-Hagggar (2012) in the panel data framework, to investigate the long-run relationship between greenhouse gas emissions, energy consumption and economic activity growth, as follows:

where the subscript $i = 1, \dots, N$ denotes each country in the panel, while $j = 1, \dots, K$ the modal transport, and $t = 1, \dots, T$ refers the time period. G is the natural log per capita of the greenhouse gas emissions in the transport sector; E is the natural log of per capita of energy consumption; GDP is the natural log of real GDP per capita; and GDP^2 is the natural log of the square of real GDP per capita. Annual data from 1990 to 2012 from the United Nations Framework Convention on Climate Change (UNFCCC) is used in the empirical analysis for 40 annex I - OCDE countries.

The methodology to be applied, given the nature of the data, is a panel data econometric analysis. It consists of five phases: i) to study the dynamic heterogeneity of relevant variables; ii) to estimate the stationarity of the series; iii) to determine the possible long-term relationship through cointegration analysis; iv) to study the behaviour of short-term equilibrium relationship, and, v) to examine the causality.

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