

ABSTRACT: The Energy Consumption-Growth Causality Debate: Evidence from ASEAN+6 Countries

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KEYWORDS

Climate change, energy consumption, energy-GDP causality, cointegration

OVERVIEW

The Durban conference in December 2011 marks the last attempt to forge an international agreement on climate change in view of the expiration of the Kyoto Protocol in 2012. The Kyoto Protocol was not fully effective because some countries felt that there is a trade-off between energy consumption and economic growth. Thus, the kind of energy and climate policy to be formed post-2012 will depend on the direction of causality between energy consumption and GDP. These are:

1. One way causality from energy consumption to economic growth. It asserts that an increase in energy consumption induces an increase in real GDP so that policies to reduce energy consumption will adversely affect growth. This is referred to as the “growth hypothesis”. Alternatively, it is also called the production approach.
2. One way causality from real GDP to energy consumption or the “conservation hypothesis.” It shows that an increase in real GDP causes energy consumption to rise. Thus, energy conservation policies will not have a negative effect on economic growth. This is also considered as the consumption/demand approach.
3. The absence of causality between energy consumption and GDP or the “neutrality hypothesis” This implies that energy conservation policies will not also reduce growth.
4. Bi-directional causality between energy consumption and economic growth which is also referred to as the “feedback hypothesis.” Both GDP and energy consumption affects each other.

Currently, there is no consensus in the literature on the direction of causality. Studies show different and conflicting empirical results. The varied outcomes arises from different data sets, time frame, methodologies and country characteristics. Thus, it is difficult to form a general policy recommendation on energy and climate change rather; policies must be country/region specific.

The contribution of this study is to expand and develop the theory behind the causation between energy consumption and economic growth. For the empirical part, the paper will study the ASEAN+6 countries covering the ASEAN 10, People’s Republic of China, Japan, Republic of Korea, India, New Zealand and Australia. The cointegration analysis is multivariate and includes macroeconomic and environmental variables pertinent to the region.

METHODS

The energy –GDP growth nexus has been studied extensively. The literature can be divided into four generations (Mehra, 2007). The first generation applies a traditional vector autoregression (VAR)

methodology and Granger causality testing. Second and third generation studies developed more sophisticated unit root and cointegration tests. Finally, fourth generation studies used panel-based unit root and cointegration methodologies. This paper follows panel-based tests which will apply the cointegration test introduced by Pedroni (1999). These tests accounts for the heterogeneity across countries and are therefore less restrictive. If the variables are cointegrated, a panel vector error correction model is employed for the Granger-causality tests. This will reveal the short-run and long-run causality between the variables specified.

RESULTS

Studies involving Asian countries show that the results are mixed and inconclusive. In Masih and Masih (1996) no causality was observed between energy consumption and growth in the Philippines while the causality runs from GDP to growth in the case of Indonesia. In contrast, Asafu-Adjaye (2000) found that bi-directional causality is present in the Philippines while uni-directional causality from energy consumption to GDP exists in Indonesia. Overall, Lee and Chang (2008) shows that in the short-run there is no causality between energy consumption and growth for 16 Asian countries but in the long run energy consumption affects GDP.

CONCLUSION

A better understanding of the relationship between GDP and economic growth will enable policymakers to meet the challenge of climate change more effectively. Whether energy consumption leads economic growth or its converse will exert a significant impact on international policy after the Kyoto protocol. Based on the gridlock in international negotiations and the ongoing debate in the literature, a more important question is whether an international agreement is still necessary or would unilateral actions be more efficient and effective. This paper intends to answer this by clarifying the theory and testing it on ASEAN+6 countries.

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