# Crowding-out of Energy Consumption Using the Hefty Network of Trade-induced Spillover and Feedback Effects: A Structural Decomposition Analysis

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(1) The research question:
According to the Global Energy and CO2 Status Report, 2019, China, the USA and India stand top three positions for their total carbon-dioxide emissions in the year 2018 (IEA, 2019). Interestingly, China, the USA and India are also leading the trend in deploying the renewable energy generation capacity in the world (IEA, 2017).
Besides competing on the aspects of energy consumption, China, USA and India are also having an intense international trade relationship. Therefore, it would be of interest to examine how far these major carbon emitters as well as leading renewable energy deploying economies are contributing to the saving of each otherâ€™s national energy use. This study theoretically explores how significantly international trade can reorder and help crowding-out the national energy use of the major carbon emitter trade partners and empirically analyses the implied economics of national energy governance by concentrating on the trade-induced spillover and feedback effects.

(2) The method used:
2.1. Hybrid-units IRIO Framework: The study adopts a hybrid-units based input-output framework where the energy flows in the economy is measured in physical units (TJ) and the non-energy transactions are measured in value units (Millions of USD).
2.2. Hierarchical Structural Decomposition Analysis (SDA): The study first conducts the SDA exercise of the increased aggregate energy use of top three world emitter economies. In the initial level, the contribution of the total energy requirement multiplier is decomposed into the contribution of changed energy-intensities and technological change represented by hybrid-Leontief multiplier. The study considers year 2012 as base year time-point â€˜0â€™ and of 2018 as final year time-point â€˜1â€™. To avoid the hybrid-units related computational complications, the study also follows the suggestions proposed in Dietzenbacher and Stage (2006). In the subsequent levels of decompositions, the study is digging deeper into analysing all the contributing drivers decomposed at the initial level.

(3) The data used:
The study uses the ADB-MRIO database at constant prices of 2010 for the years of 2018 and 2012 for constructing the three-country IRIO table consisting of China, India and the USA. For the non-energy sectors, the study extracted data from the energy-commodity balance tables and electricity profile tables of the United Nations Energy Statistics.

(4) Novelty of the Research:
From the hierarchical SDA, the study found that China is both the biggest contributor to the potential interregional energy use and major driving economy to eliminate this scale-driven increased potential energy consumption. On the other hand, the USA found as the worst performer among the three countries in terms of generating dampening impact on the increased potential energy use and India is sharply increasing its energy consumption compared to China and the USA, although contributing to reducing the potential energy consumption to a smaller extent. To understand the roles of these economies and their driving forces the study further explored a couple of simulation-based exercises.

Assuming an 3-country emission-binding treaty, in simulation exercise 1 and 2, the USA and India are considered as the free-rider countries respectively and that the free-rider country does not initiate prudent energy-saving policies rather depends on the outsourcing of a proportion of its production activities required to facilitate the delivery of its unilaterally increased final demand. With a 50% increased final demand, the outsourcing of production from the free-rider country is empirically addressed.

Based on these simulations, the study substantiates that the USA in both the situations of being as a free-rider or a non-free-rider saves aggregate energy use of the three countries by outsourcing its production to China and India. On the other hand, China found serving to save energy usage of the outsourced energy requirement of India and the USA in the two simulation exercises. Here, India is found saving energy as a non-free-rider country, whereas fail to save energy from outsourcing as a free-rider. Therefore, this analysis portrays the comparative positions of these countries in terms of how far their aggregate emission is adjusted in the inter-country energy flows to govern the global volume of energy consumption to a substantial extent.

The study is the first of its kind where a comparative analysis is brought forth which yield the prudence of national energy-saving initiatives under an international emission-binding agreement, while imprecating the external energy saving and energy decaying roles of international spillover and feedback effects on the national energy inventory to elaborate the roles of structurally decomposed drivers of increased energy use.