

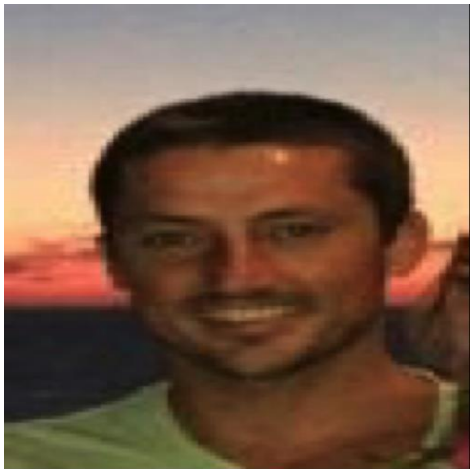


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- Iglesias, J., ME Gegundez, AA Golpe, JC Vides (2018). How do foreign income shocks affect the magnitude of Spanish tourism? *Tourism Economics*, Forthcoming, 1354816618783568

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Energy consumption in the US reconsidered. Evidence across sources and economic sectors



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ABSTRACT

This study analyzes the impact of GDP shocks in USA on primary energy consumption and the reverse impact in a comprehensive and novel framework, distinguishing by economic sectors (commercial, industrial, residential and transportation) and energy source, i.e., total fossil (coal, natural gas and petroleum), nuclear, and renewable (hydroelectric, geothermal and biomass) for the period 1973:1 to 2015:2. To this end, we apply Granger causality analysis through the Hatemi-J [1] and Toda and Yamamoto [2] approaches from a time series perspective to evaluate the existence of asymmetries on this bidirectional relationship. The empirical results suggest that the impact of GDP on primary energy consumption is heterogeneous and energy source-specific, and an asymmetric behavior appears among cycles. Moreover, it seems clear that the US economy is highly dependent on petroleum energy consumption. The renewable energy sources do not seem to show any relationshipsources seem to show no relationship with economic growth, and finally, our results suggest that energy consumption in the industrial sector is key to economic growth and is also very sensitive to negative economic shocks.

1. Introduction

Meeting the essential energy needs economically and sustainably requires a balanced energy portfolio that is suited to the economic, social, and resource conditions of individual countries and regions [3]. Furthermore, the International Energy Agency [4] warns that current trends in energy supply and use are still economically, environmentally and socially unsustainable. In this context, renewable energy sources, such as wind, solar, hydro, geothermal, and bioenergy, have partially replaced the fossil fuels and nuclear power in four distinct markets: power generation, thermal applications, transport fuels energy and

of renewable energy increased from approximately 16.8 million metric tons of oil equivalent in 2001 to nearly 60 million metric tons of oil equivalent in 2013, whereas 13% of the nation's total electricity generation was derived from biomass, hydro and wind sources.

Comprehending the actual direction of causality between energy consumption and economic growth has substantial implications for policymakers as well as for the natural environment, at least with respect to reducing the consumption of non-renewable energies and consequently the impact on the environment through the reduction of carbon dioxide (CO₂) emissions [6]. A unidirectional causal relationship from energy consumption to growth reflects an unsustainable