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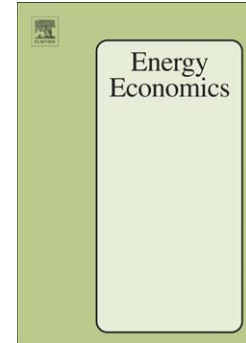
Residential and non-residential electricity dynamics

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Residential and non-residential electricity dynamics[☆]Michael P. Tonkovic^{a,*}, Syed Azfar Hussain^{a,**}^aDepartment of Economics, Illinois State University, Campus Box 4200, Normal, IL 61790-4200, USA**Abstract**

This paper uses U.S. panel data to instrument and examine the dynamics of electricity within the world market while separating between both residential and non-residential electricity consumption during the time period of 1990-2014. To better assess the true differences within each causal relationship, all panel data has been separated into one Full panel and three subpanels of High, Middle, and Low income. The empirical framework used consists of various tests that identify the existence of cross-sectional dependency, a Pesaran panel unit root test, a Westerlund panel cointegration test, and the Dumitrescu-Hurlin method of the Granger causality test. Furthermore, this paper utilizes DOLS to estimate any long-run elastic relations between real GDP and residential or non-residential electricity consumption. Based on the results, this paper determines that no long-run relationship exists between non-residential electricity consumption and economic growth throughout and that the relationship between residential electricity consumption and economic growth possess unit elastic behavior in the long run. Other findings throughout imply causality moves from economic growth in the direction of residential electricity consumption for all panels.

Keywords: electricity consumption, economic growth, residential, non-residential, United States

1. Introduction

With the current energy market rapidly changing over the past couple decades, questions such as, “What role does energy play in economic growth?” and, “Do areas of higher energy consumption possess greater opportunity for economic development?” have been in high demand. Empirically, a large body of literature has already attempted to answer these types of questions but produced differentiated results believed to have arisen due to three reasons. First, no two studies employ identical data sets.¹ Second, no two studies employ the same empirical framework. Similar, yes. Same, no. Third, each country examined throughout the large body of already existing literature is made up of different key characteristics that may effect their energy supply, such as: (1) infrastructure and capital; (2) political and economic history; and (3) cultural demographics.²

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¹Eden and Hwang (1984) did find identical results while using updated data from the same data mart as Kraft and Kraft (1978) when examining causality within the U.S.

²For example, levels of electricity consumption generally increase in urban markets, or geographic regions where developed economies are more common than not (Karanfil and Li, 2015). Another example would be the increasing relations between both energy policy and environmental policy. Recent environmental concerns have increased the level of retrofits required by electricity generators making it much more difficult to produce enough electricity to remain efficient while seeing levels of consumer demand increase.

The primary purpose of this paper will be to re-examine the dynamics of electricity by exploring the possibility that differing causality relationships exist for both residential and non-residential electricity consumption and economic growth. However, current world data marts do not contain electricity consumption data for extraction other than overall net consumption.³ Therefore, this paper instruments U.S. panel data and infers its results toward various world markets for electricity. Present energy policy within the U.S. grants each U.S. state regulating authority over their own intrastate electricity market. In other words, current electricity markets within each U.S. state are based on each U.S. state's own implemented energy policy. Keeping this in mind, it is appropriate to utilize the findings of this paper to represent various markets for electricity throughout the world as this paper uses a panel dataset that theoretically assesses multiple markets separated by governing borders.

Contributions made to existing literature from this paper are twofold. First, this paper determines the relationship between electricity consumption and economic growth in much greater detail than previously sought. Currently, no prior study has examined the dynamics of electricity, or any other form of energy, by separating energy into its residential and non-residential levels of consumption. This paper does just that while taking robust control measures to ensure all results estimated are specific to either residential or non-residential consumption. Any identified existence of causality will be represented as an indication of an existing equilibrium between economic growth

³The Public Utilities Holding Act of 1935 facilitated the regulation of electric utilities within the U.S. by (1) limiting their operations to a single U.S. state; and (2) forcing divestitures so that each electric utility became a single integrated system serving a limited geographic area.

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