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Global estimates of energy-growth nexus: Application of seemingly unrelated regressions

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ABSTRACT

As the world struggles to emerge from a global recession and financial crisis, countries are looking for solutions to improve domestic economic performance and put people back to work. Global energy demand and prices have been resilient during the recession, leading policy-makers in countries with the potential to produce energy to look to that sector as a potential engine for economic growth. The objective of this study is to undertake an empirical study on linkages among energy consumption, economic growth, FDI, relative price and financial development (i.e., broad money supply – M_2) in low income, middle income, high income non-OECD, high income OECD, South Africa, Middle East and North Africa (MENA) and the aggregate data of the World over a period of 1975–2011. Data is analyzed by the Im–Pesaran–Shin (IPS) test of unit root to find out the order of integration. The long-run relationship is investigated through the Pedroni [37] test of panel cointegration. At last, the Seemingly Unrelated Regression (SUR) method is used for estimation of the impact of growth factors on energy consumption in these regions. The results reveal that each variable seem to have a unit root at level, so we could investigate cointegration of the series at level. On the basis of Pedroni test, we can bring to a close that series are cointegrated. The results of seemingly unrelated regression (SUR) suggests that GDP per capita has a positive impact on energy consumption in low income, middle income, South Africa, MENA and aggregate data of the World. However, in high income OECD and non-OECD regions, there is no significant relationship been found in both regions. FDI plays a pivotal role in increasing energy demand in middle income, high income OECD and non-OECD region which implies that whatever other benefits may accrue from FDI, it should not be expected to generate sufficient energy in South Africa, MENA and the World directly. FDI enhancement policies should be supplemented to stimulate growth in those regions. Broad money supply exerts positive impact on energy demand in low income, middle income, high income non-OECD and MENA regions. Finally, relative prices has either a positive impact i.e., middle income region and/or a negative impact on energy consumption i.e., low income, high income OECD and MENA region. The results conclude that lower energy prices reduce input costs for nearly all goods and services in the regions, thus making them more affordable.

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Contents

1. Introduction	64
2. Literature review	65
3. Data source and methodological framework	66
3.1. Panel unit root test	66
3.2. Panel cointegration test	67
3.3. Seemingly unrelated regressions (SUR)	67
4. Empirical findings	67
4.1. Panel unit root estimation	67

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4.2. Panel cointegration estimation	68
4.3. Estimation of seemingly unrelated regression (SUR).....	68
5. Summary and conclusion	69
References	70

1. Introduction

The world has been reeling from the financial crisis with reverberations being felt throughout the real economy on production, consumption, jobs and well-being. Energy is the “oxygen” of the economy and the life-blood of growth, particularly in the mass industrialization phase that emerging economic giants are facing today [49]. According to IEA [19] data from 1990 to 2008, the average energy use per person increased 10% while world population increased 27%. Regional energy use also grew from 1990 to 2008: the Middle East increased by 170%, China by 146%, India by 91%, Africa by 70%, Latin America by 66%, the USA by 20%, the EU-27 block by 7%, and world overall grew by 39%.

Green renewable energy is type of energy, which is usually produced by natural resources, for example wind, sunlight, rain, tidal energy, geothermal heat, and many more. In 1800’s, most of the energy in this world came from the renewable energy resources. However, the use of natural energy has already decreased since the findings of non-renewable energy resources, such as coal, natural gas, and also oil. It is dangerous for the earth because most of the non-renewable energy resources are not eco-friendly [38]. According to American Institute of Biological Sciences [3] report an “enormous” increase in energy supply will be required to meet the demands of projected world population growth and lift the developing world out of poverty without jeopardizing standards of living in most developed countries. Investing in energy efficiency creates jobs, fosters economic growth and improves energy security for countries that lack domestic fossil fuel resources. Of the three objectives of Sustainable Energy for All, improving energy efficiency has the clearest impact on saving money, improving business results, and delivering more services for consumers – better refrigerators that cost the same but use less energy; new vehicle designs that travel further on less fuel; and buildings that require less energy to heat and cool [46].

Global energy consumption has seen declining growth rates. In recent years, the growth of energy consumption in developed countries has been flat or decreasing. In 2010, primary energy consumption in OECD countries grew by 3.5%, similar to the growth rate of a decade ago. Primary energy consumption in non-OECD countries went up by 7.5%. Developing countries, led by the BRIC countries (Brazil, Russia, India and China), have seen decreasing energy consumption per unit of GDP, while total energy demand increases rapidly. Due to political unrest in the Middle East and North Africa, crude oil futures prices and spot prices were severely volatile with an upward trend. UK North Sea Brent oil price reached US\$ 126.65 per barrel in April 2011, the record high since the beginning of the financial crisis. Influenced by the situation in Iran, oil prices have trended upwards recently. As compared with Libya, issues in Iran have a greater impact on oil prices. In the event the situation deteriorates in Iran, oil prices will soar [13].

Worldwide, nations are beginning to face up to the challenge of sustainable energy, in other words, to alter the way that energy is utilized so that social, environmental and economic aims of sustainable development are supported. South Africa is a developing nation with significant heavy industry, which is by its nature energy intensive. This energy intensive economy largely relies on

indigenous coal reserves for its driving force. At first sight there would appear to be an apparent paradox between using less energy and developing a healthy and prosperous nation based on energy intensive activities. This is not the case. In recent years energy efficiency has significantly gained in stature and has become recognized as one of the most cost-effective ways of meeting the demands of sustainable development [48]. Zhang [53] induce for MENA governments to improve energy efficiency is to address pressing domestic concerns, such as urban air pollution, energy security, economic competitiveness, the fiscal cost of energy subsidies and the balance of payments. However, improved energy efficiency is also seen as the most promising route for reducing the region's green house gas (GHG) emissions. Vietnam is among the top five countries in the world most vulnerable to climate change, and natural disasters are causing economic losses of 1.5% of gross domestic product annually. Many poor depend on natural resources for their livelihood, yet supplies are threatened by unsustainable practices. Insufficient investment in water supply and sanitation, solid waste management, and transport is contributing to pollution. To address energy and sustainable development issue, the World Bank has financed investments to increase access to basic services in water and sanitation, energy, and roads as well as promotion of agriculture livelihoods. World Bank further support for more sustainable urbanization has included financing of investment in water and sanitation, transport, and urban upgrading [50].

The WHO Air Quality Guidelines recommend reduction of air pollution to a specified level in all regions of the world. No separate guideline values should be proposed for low-income countries where pollution, and its burden on health, is much higher than in Europe or the USA. However, to facilitate progress towards clean air, the Air Quality Guidelines propose “interim targets” promoting steady progress towards meeting the WHO guidelines [27]. The global recession and financial crisis that began in 2008, bring a new focus to decisions about energy. Many parts of the developed world still face sluggish economic growth and risks from financial crises. Financial institutions lowered their forecasts for world economic growth, impacting an energy sector tied to capital markets. Therefore, oil prices remain volatile, and the global economy is still looking gloomy (Weforum, 2012). Global foreign direct investment (FDI) inflows rose modestly in 2010, following the large declines of 2008 and 2009. At \$1.24 trillion in 2010, they were 5% higher than a year before (Fig. 1). This moderate growth was mainly the result of higher flows to developing countries, which together with transition economies – for the first time – absorbed more than half of FDI flows. While world industrial production and trade are back to their pre-crisis levels, FDI flows in 2010 remained some 15% below their pre-crisis average, and 37% below their 2007 peak [47].

The year 2011 was a challenging one for the global FDI market. Natural disasters in Asia-Pacific and economic and political instability in Europe, North Africa and the Middle East led many companies to put on hold their FDI plans, leading to a sharp decline in FDI in many countries. North America, with brighter economic prospects and a ‘shale rush’, achieved solid FDI growth. Likewise, companies continued to be attracted to the investment opportunities in Africa and Latin America, with 20%-plus growth in FDI in each region. Brazil was again the star performer, with a 38%

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