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Factors influencing renewable electricity consumption in China

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ABSTRACT

Renewable energy is an important factor in achieving a low-carbon economic development path in China. This paper investigates the factors influencing renewable electricity consumption in China. Specifically, the factors that influence the share of renewable electricity in total electricity consumption in China is investigated using data from 1980 to 2011 and employing the Johansen cointegration technique and vector error correction model. The result of the analysis shows that there is a long run relationship between renewable electricity consumption and GDP per capita, trade openness, foreign direct investment, financial development and share of fossil fuel in energy consumption. Economic development and financial development promotes renewable electricity consumption while foreign direct investment, trade openness and the lobby of conventional energy sources undermine the share of renewables in total electricity consumption in China. While the effects of shocks to the other variables appear to die out over time, the "lobby effect" is persistent and explosive. The results also show that there is a uni-directional short run causality from financial development to renewable electricity consumption and from renewable electricity consumption to trade openness. The Chinese government should pursue policies that not only increase the amount of renewable electricity, but also increase the share of renewables in total electricity consumption.

Contents

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1. Introduction

China's impressive economic performance in the past decades has resulted in increased energy consumption and carbon intensity. Over the past few years, China's economy has grown at an average of over 7%, exceeding that of the United States and the European Union combined. However, this impressive economic performance has led to increase in energy consumption and carbon (CO_2) emission. According to the United States Energy Information Administration (EIA), China's primary energy consumption increased from 17.29 Quad BTU in 1980 to 103.72 Quad BTU in 2011. Similarly, her electricity net consumption increased from 261.49 billion kilowatthours in 1980 to 4207.70 billion kilowatthours in 2011 (Fig. 1), an increase of over 1500%. With the increase in total primary energy and coal-dominated electricity consumption, carbon emission also increased significantly as shown in Fig. 1. Carbon emission associated with electricity production and consumption in China is high because coal is the dominant fuel for electricity production in the country. As at 2012, China's energy consumption-related CO_2 emission stands at 8547.74 million metric tons compared to 1448.46 million metric tons in 1980, which makes it the largest CO_2 emitter in the world. The current emission in China is almost that of Africa (1152.22), Europe (4305.17), Middle East (1951.80) and Central and South America (1339.47) combined. The current trend of high resource intensity, energy consumption and emission is not sustainable. If current trend continues, China's emission level will undermine global effort to stem climate change and global warming.

The high level of energy intensity and CO_2 emission in China has attracted local and international attention, and has called for significant changes to the country's energy strategy and policy. In response to this, measures are being put in place to address the situation. One of the key measures aimed at addresing energy-related CO_2 emission in China is increasing the share of renewable energy in the total energy mix. The share of renewable-generated electricity in total electricity consumption in China is small and has decreased over time, as shown in Fig. 2. China has the highest amount of renewable electricity net consumption in 2011 (800.96 billion Kwh) compared to the United States (527.48 Kw h), Germany (126.18 Kwh), India (160.36 Kw h) and Finland (23.39 Kw h). Yet, the share of renewable-generated electricity in total electricity net consumption in China (19.03%) is low compared to Germany (23.46%), India (21.15%) and Finland (28.86%).

However, the enactment of the Renewable Energy Law of 2005 was aimed at reversing the trend and promoting renewable energy in the country. The 11th Five-Year Plan (2006–2010) targets 20% reduction in per capita GDP energy consumption and 10% reduction in two major air pollutants, while the renewable energy

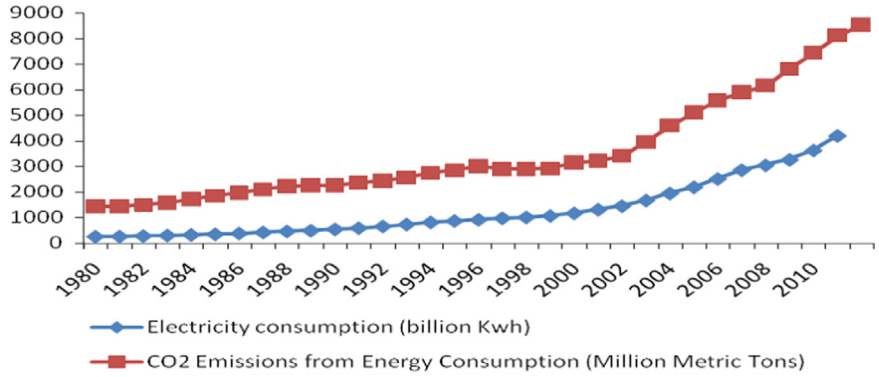

Fig. 1. Electricity consumption and CO_2 emission in China.
Source: Data from EIA Database.

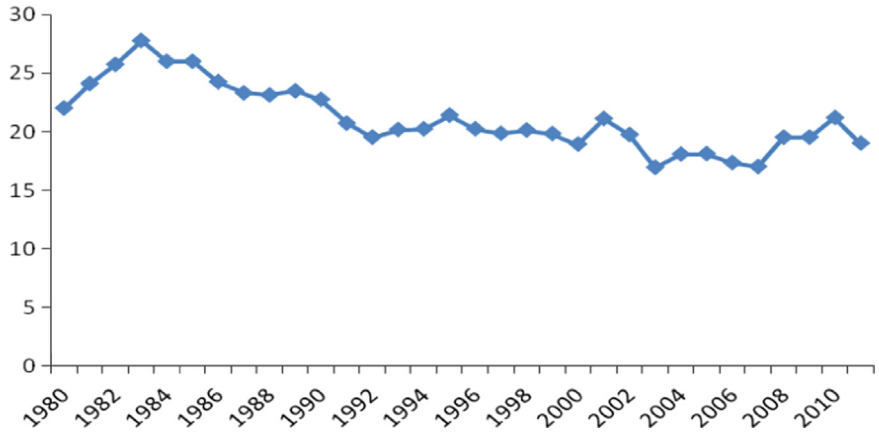

Fig. 2. Share of renewables in total electricity consumption in China, 1980–2011.
Source: Data from US Energy Information Administration.