THE IMPACT OF FOSSIL FUEL PRICES ON RENEWABLE ENERGY INVESTMENT AND CONSUMPTION IN THE U.S.

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Overview

Achieving renewable energy targets (RETs) necessarily relies on a substitution away from fossil fuels by both investors and consumers. Achieving RETs therefore largely rests on two main factors. First, large-scale capital investment in renewable forms of energy. Renewable energy investments will therefore compete for capital that might otherwise be directed towards fossil fuel investments. Second, consumers must substitute away from fossil fuels towards renewable energy sources. However, consumers are constrained in terms of their capacity to substitute away from fossil fuels and into renewable energy depending on whether there has been sufficient investment in renewable energy to make this an available and cost effective alternative energy source.

The price of fossil fuels is an important consideration for both investors in, and consumers of, energy. The influence of fossil fuel prices on consumption choices in the overall energy mix is well established in the literature. Evidence suggests that policy makers and regulators face significant challenges in their attempts to decarbonise the energy value chain, particularly when fossil fuel prices are low. The reason is that low fossil fuel prices can motivate consumers to continue to rely on fossil fuels as their dominant energy source. This is known as the consumption substitution theory. In contrast, the capital switching theory posits that low fossil fuel prices may incentivise investors to direct capital towards renewable energy investments, potentially offering higher returns.

The most commonly cited determinants of energy consumption are income, CO2 emissions and fossil fuel prices (see, for example Salim and Rafiq (2012), Sadorsky (2009) and Atalla et. al. (2017)). While the drivers of renewable energy consumption has been investigated in the academic literature, we know little about the drivers of renewable energy investment. Important questions remain unanswered, such as how can renewable energy policies more effectively incentivise greater investment in, as well as consumption of, renewable energy when fossil fuel prices are low? This study examines the role played by fossil fuel prices in determining the level of investment in, and consumption of, renewable energy in the United States. Specifically, we aim to quantify and compare the influence of fossil fuel prices on investment in, and consumption of, renewable energy.

Methods

The study aims to examine trends and causal relationships between fossil fuel prices, renewable energy consumption and renewable energy investment. We employ a dynamic model to examine the relationship between renewable energy consumption and investment, against fossil fuel prices, CO2 emissions and income in the United States from 2008 to 2015. A dynamic model incorporating these explanatory variables to analyse the determinants of energy consumption is commonly used in the literature (see, for example, Bloch et. al., 2015 and 2012). What is unique to this study is that we will employ these same explanatory variables to model renewable energy *investment*. Data are sourced from the U.S. Energy Information Agency, Bloomberg New Energy Finance, FRED economic data and International Energy Agency. Our primary data sample spans from 2008 to 2015.

The main hypothesis we aim to test is whether fossil fuel prices influence renewable energy investment as well as renewable energy consumption. Specifically, we test the following two hypothesis: H1: Do fossil fuel prices influence investment in renewable energy? H2: Does the impact of fossil fuel prices on investment in, and consumption of, renewable energy differ? We test H1 by examining the estimation results of the dynamic model and formally testing the statistical significance of the coefficient for fossil fuel prices. For H2, we test whether the estimated coefficient for fossil fuel prices is statistically different for the consumption model versus the investment model.

Results

Preliminary results indicate that the determinants of consumption of renewable energy are not necessarily the same as the drivers of investment in renewable energy. Importantly, the influence of fossil fuel prices on investment in and consumption of renewable energy differs. Evidence in favour of the capital switching theory suggest that

periods of low fossil fuel prices is the optimal time for policy makers to target energy investors in order to help achieve RETs. In contrast, evidence in favour of the consumption substitution theory suggests that policies designed to motivate consumers to substitute away from fossil fuels are less likely to be effective when fossil fuel prices are low. Therefore, the effectiveness of renewable energy policies can be influenced by fossil fuel prices, among other variables.

Conclusions

The achievement of RETs necessarily requires a substitution away from fossil fuels and this can only be facilitated by increased investment, production and consumption of renewable energy. To date, little attention has been paid to the drivers and determinants of investment in renewable energy. The findings of this study will shed light on how fossil fuel prices affects both consumption of, as well as investment in, renewable energy. As movements away from the consumption of fossil fuels is largely dependent on sufficient investment in renewable forms of energy, this study makes a valuable contribution to the current body of literature which, to date, has overlooked the drivers of investment in renewable energy. In doing so, the findings will stimulate debate and help inform evidence based policy making. The results are important for policy makers and regulators because depending on whether fossil fuel prices are relatively high or low will influence the effectiveness of policies designed to help achieve RETs. We therefore conclude that fossil fuel prices are one of the factors policy makers should take into account in order to improve the effectiveness of climate change policies and therefore achieve RETs.

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