

INVESTMENTS IN VARIABLE RENEWABLE ENERGY: DO OIL PRICES REALLY MATTER ? A NONLINEAR APPROACH

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Overview

For the past two decades, a strong interest has emerged in favor of the integration of renewable energies in the electricity mix. This constitutes a major concern for both developed and emerging countries in order to ensure energy transition policies, to fight against climate change and reduce greenhouse gas emissions (GHG). In 2017, investments in renewable energy sources (RES) rose by 2% at around 280 billion dollars, but remain still significantly below the level observed in 2015 amounting at 330 billion dollars. This decline, partly due to decreasing costs of technology (for a utility-scale photovoltaic projects, costs down by 15% in 2017¹), does not mean that energy capacities have been reduced. On the contrary, an upward trend has been identified for renewables from 3.15% to 3.60% in the world total energy mix² (+ 11.8% for OECD countries and + 10.2% for European countries). This recent trend of global investment in RES leads us to think in terms of power energy capacities, rather than in monetary terms. Hence, in a context of energetic transition, identifying the determinants of investment in variable renewable energy (VRE) capacities appears to be essential for policy makers in order to implement adequate policies. In this paper, we focus on investment in low carbon supply energy and define investment in VRE as the investment in cleaner energy sources, i.e., variable energy sources (solar photovoltaic and wind) for electricity production allowing to reduce air pollutant emissions from electricity production.

Methods

In our estimations, we rely on annual data over the 1980-2017 period. The dependent variable is the share of installed solar photovoltaic (PV) and wind sources capacities in the electricity mix, extracted from ENERDATA. Turning to the explanatory and control variables, we consider (i) macroeconomic determinants (real GDP, interest rates, population, business climate indicator), (ii) determinants allowing an enabling environment for investing in VRE (such as primary energy consumption, CO₂ emissions, energy security), and (iii) “catalyst” determinants such as feed-in tariffs (FITs), costs of technologies and oil prices. Acknowledging the major role played by the price of oil, we account for nonlinearities by estimating a panel smooth-transition regression (PSTR) model, proposed by Gonzalez, Terasvirta, and van Dijk (2005), for a panel of 41 countries (OECD countries and the BRICS). Our motivation of using such a model comes from the link between oil prices and the deployment of VRE sources (VRES) suggested in the literature in a context of high oil prices and energy transition (although there is no consensus regarding the link between oil prices and the deployment of VRES). Indeed, in this type of modeling, the impact of exogeneous variables on VRES capacities varies, depending on the value of another observable variable, i.e., the price of oil. Specifically, the observations in the panel are divided into two homogeneous groups or “regimes” – high oil price and low oil price regimes –, with different coefficients depending on the regimes. Therefore, by estimating a PSTR model we tend to exhibit a threshold depending on oil prices that triggers a “signal” of investment and then, demonstrate the existence of a link between oil prices and the deployment of VRES.

Results

Our findings show that a rise in FITs together with a decrease in costs of technology tend to improve the deployment of VRES. However, this impact is nonlinear, depending on the level reached by the price of oil. Specifically, we find that for high values of the price of oil, a decrease in the costs of technology leads to a significant raise of investment in both wind and solar PV energy sources. When the price of oil decreases below about 50 US dollars per barrel, the effect of costs of technology on the deployment of new VRE capacities tends to decrease until becoming non significant. Overall, our findings show that once oil prices reach this cut-off, investors are more willing to invest in VRES as such investments become more profitable.

¹ Sources: UNEP-BNEF 2018

Conclusion

On the whole, our findings put forward the importance of accounting for the effect of oil prices in designing policies to promote the use of VRES. In particular, while an increase in oil prices is benefit for the deployment of VRES in a high oil price regime, it is no more the case in low oil price states.

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