

# How important is energy price for long run industrial energy efficiency?

Theodoros Arvanitopoulos <sup>(1, 2, \*)</sup>, Vincenzo De Lipsis <sup>(3, 4)</sup>, and Paolo Agnolucci <sup>(4, 5)</sup>

## Abstract

The dynamics of long-run energy efficiency are often captured by a stochastic trend component in energy consumption, but no attempt has so far been made to connect this trend with its possible causes. We develop a new approach to explore the role of two potential sources influencing the observed trend in energy consumption, economic growth, and energy price. In this way, we bridge two strands of research, one focused on the statistical characterisation of energy efficiency and the other analysing short-term determinants of energy consumption. Our methodology is based on linear state-space modelling and consists in the systematic comparison of models incorporating alternative sets of regressors. Using this approach, we are able: first, to characterise the nature of the trend in the UK industrial energy demand; second, to quantify the extent to which the observed shape in the trend is due to price effects; and third, to determine how this relationship with price has evolved over time. Applying our methodology to 50 years of UK quarterly data, we find robust evidence that price in the short-term period is important for energy efficiency to the extent that it exactly offsets the surge in energy consumption induced by economic growth. However, in the long-term, energy efficiency is predominantly imputable to exogenous technological progress not directly induced by the dynamics of energy prices. When we examine the stability of price elasticity, we conclude that in the UK it has remained constant over the last half a century.

**JEL:** C32 - Time-Series Models • Dynamic Quantile Regressions • Dynamic Treatment Effect Models • Diffusion Processes • State Space Models; Q41 - Demand and Supply • Prices.

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<sup>1</sup> Cardiff University, Cardiff Business School, <sup>2</sup> London School of Economics and Political Science, Hellenic Observatory Centre, \* Corresponding author, email: t.arvanitopoulos@lse.ac.uk, <sup>3</sup> University of Southampton, Department of Economics, <sup>4</sup> University College London, Institute for Sustainable Resources, <sup>5</sup> World Bank, Prospects Group.