Fuel Demand across UK Industrial Subsectors

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The industrial sector contributes significantly to the world energy consumption and emissions of greenhouse gases. Pursuing actions to keep a global temperature rise this century within 1.5 degrees Celsius, as part of the Paris agreement, will require drastic action from all sectors of the national economies, including the industrial sector. In this context, econometric studies are useful to help explore the pathways of energy and fuel consumption which can be expected if historical drivers continue to unfold in the way they did in the recent past.

Econometric studies of industrial energy demand are however surprisingly scarce. Studies for industrial subsectors are even more so, with evidence starting to be built recently and for a very limited number of countries. On the other hand, the topic of heterogeneity has gained more and more importance in energy economics, as testified by contributions taking into account the impact of this factor topics such as energy efficiency and the rebound effect. In fact, heterogeneity in the industrial subsector fuel demand is key to understand fuel substitution, its impact on business-as-usual scenarios used as a starting point for climate mitigation, as well as the strength of the levers available to policy maker to help the industrial sector in the decarbonizing transition. As future climate commitments become more stringent, the importance of understanding subsectorial of fuel substitution becomes more valuable. At the same time, as longer time series become available, econometric studies assessing heterogeneity in the industrial subsectors become more and more viable.

This paper show that useful empirical evidence on this subject can be obtained by applying a parsimonious multivariate cointegration analysis that makes use of the readily available time series data on fuel demand and its determinants. We estimate fuel demand by incorporating dynamic specifications typical of cointegration studies and the system approach typical of translog studies. We model fuel demand as shares in a cointegrating VAR system with as many cointegrating vectors as the number of modelled fuels, each representing the long-run demand for a specific fuel.

Our approach presents a number of important advantages. Firstly, we are able to model the simultaneous determination of demand for different fossil fuels within a consistent framework. Secondly, we can exploit the cross-equation restrictions implied by the long-run representation, which offer a useful means to reduce the number of parameters to estimate. Finally, additional gain in terms of degrees of freedom is ensured by the fact that we model shares rather than fuel intensities.

Our main result, the emergence of substantial differences in the systematic behavior of firms across subsectors, provides a note of caution to authors imposing homogeneity in the fuel demands across subsectors, estimating fuel share elasticities for the industrial sector as a whole or focusing on energy consumption rather than fuel consumption. In addition, we find that price elasticities in the UK industrial sector are larger than many previous estimates available in the literature, and we confirm that gas consumption is more sensitive to price variations than electricity consumption. These conclusions are important not only from a modelling perspective, in a way which we would expect to be replicated for other countries, but also for policy-making

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