

Cost Pass-through in the British Wholesale Electricity Market: Implications of Brexit and the ETS reform

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Political events and reforms in the United Kingdom (UK) and the European Union (EU) could strongly influence the cost of energy to producers and hence to consumers. First, the UK voted to leave the EU in 2016. This leads to widespread political and economic uncertainty, and a substantially weaker Sterling. With half of domestically-consumed natural gas imported from the Continent, and gas setting the British electricity price most of the time (Ofgem, 2018), the cost of energy for British consumers is exposed to exchange rate fluctuations. Second, as EU carbon emission Allowance prices (EUA prices, or the price of CO₂ set in the Emission Trading System, ETS) have been too low to deliver the desired levels of emission reductions, the EU Commission (EC) reformed the ETS by creating a Market Stability Reserve (MSR). The MSR came into effect in January 2019 and intends to cancel surplus allowances, tighten the carbon market and increase the EUA price (EU Commission, 2015). Higher carbon prices encourage cleaner electricity generation across Europe. The Brexit referendum and introduction of the MSR resulted in substantial changes in Sterling exchange rates and carbon prices (respectively), providing an ideal test-bed for studying cost PTRs.

This paper investigates how proportionately the input cost of electricity generation (including fuel and carbon prices, as well as exchange rates) has passed through to the British wholesale electricity price, and whether this is consistent with the notion of a competitive British wholesale electricity market. Our investigation is conducted both theoretically and empirically.

From a theoretical standpoint, we also contribute to the theory of competition. We show that the carbon price PTR should be equal to the ratio between the partial effect of carbon prices on electricity prices and the Marginal Emission Factor (MEF) of the electricity system. We formally prove this to be the case by linking a Cournot competition model with the underlying wholesale market structure and associated PTR. We also show that a 100% fuel-price PTR should be interpreted as “a £1/MWhe

increase in the fuel price associated with a $\text{£}s^{\text{fuel}}/\text{MWh}$ increase in the wholesale electricity price”, where s^{fuel} denotes the total share of the type of fuel plants at marginal supply. These interpretations are generally ignored in the related empirical literature as most of the studies use thermal unit-level data to estimate the PTR directly. However, in our paper, these interpretations cannot be ignored as we employ the much cruder “generation by fuel type” dataset, which is typically widely-available in the public domain.

Empirically, we use econometrics to estimate long-run relationships between the input cost of electricity generation and the GB wholesale electricity price during 2015-2018. We do not reject the null hypothesis that gas prices, carbon prices, and exchange rates are entirely passed through to the British wholesale electricity prices. We find heterogeneous PTRs for different times of the day and days of the week. We argue this occurs due to electricity generators exercising different bidding strategies over different periods of the day. We then discuss generators' profit-maximising bidding strategy: the off-peak bids are mainly based on fuel costs, while those at peak depend on both fuel and carbon costs. Finally, assuming that the wholesale cost has been fully passed through to the domestic electricity bill, we use the econometric results to estimate how the Brexit referendum and MSR have affected British electricity bills. We also anticipate how the GB wholesale electricity price would react following the UK's departure from the EU without a deal.

The study also considered how the 2016 Brexit referendum and the introduction of the EU's Market Stability Reserve have affected electricity prices in GB. We estimated that the referendum resulted in an average increase in GB electricity wholesale prices of $\text{£}6.40/\text{MWh}$. In other words, the vote has led to an increase in electricity costs for the average British household by $\text{£}25.20$ in 2017, corresponding to a 4.1% rise. We also estimated that a no-deal Brexit could further increase the GB electricity wholesale price by $\text{£}5.33/\text{MWh}$, which corresponds to an addition of $\text{£}21.20/\text{year}$ to the average household's annual bill. Finally, the MSR is also shown to increase GB electricity prices, which it does by cancelling surplus carbon emission allowances. The MSR has resulted in a $\text{£}4.13/\text{MWh}$ increase in the GB electricity price in 2018. This means that an average GB household would need to pay $\text{£}15.90$ (or 2.6%) on top of its current electricity bill due to the associated increase in the EU carbon price.

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