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Elecxit: The Cost of Bilaterally Uncoupling British-EU Electricity Trade

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Electricity traders sometimes make mistakes, and they know it. To reduce the expected cost of mistakes, risk-averse traders scale back their actions when it is unclear which direction of trade will maximise profit. The benefits of interconnecting electricity markets are significantly reduced if capacity is under-used, and sometimes used in the wrong direction. The European Union's Internal Electricity Market is designed to maximise the benefits of interconnection among member states. In particular, market coupling between 19 countries in North-Western Europe uses algorithms to ensure that as much electricity as possible is traded from lower- to higher-priced markets. This "market coupling" has brought significant welfare gains. The British electricity market is one of the 19, but may de-couple itself from the system as a possible consequence of Brexit – the UK's decision to leave the EU. We wish to calculate the cost of this "Elecxit".

Without market coupling, adjoining electricity markets often clear at different times, and even if they are simultaneous, traders have to decide which market to buy in and where to sell – they cannot make bids in one market contingent on the results of the other. Those decisions are made on the basis of incomplete information, and naturally, will sometimes be wrong. For example, the European Commission calculated the cost of trading errors and underused capacity on the English-French Interconnector to be €64 million in 2005.

If the UK decides to leave the EU without a deal (or does so through inaction), one possible outcome is that it would be required to leave the market coupling process. Traders would revert to committing to a direction of trade on the basis of their own varied expectations, rather than benefitting from the market's ability to aggregate information. The cost of this could be much larger than the savings from past reforms. There is more interconnector capacity over which to make mistakes, and the rapidly increasing share of intermittent wind and solar generation creates more uncertainty about the future.

We estimate a model of trade under uncertainty. Data on the supply and demand curves for electricity in each country are used to calculate the amount of trade that would give identical prices at both ends of the interconnector. This is often more than the available capacity, which sets limits on the maximum amount of trade we can observe in the data for 2009, before market coupling took place. Those observed trades are also affected by traders' mistakes, and would be reduced by risk-aversion if the traders are not sufficiently confident in the profit-maximising direction of trade. We estimate how widely those mistakes are spread, and how much traders scale back their desired trades compared to their (inaccurate) best estimate of those that would be profit-maximising.

We then apply the findings to a simple model of the electricity industry in 2030 to compare several Elecxit scenarios. Demand and generation capacities are taken from a 2030 scenario from ENTSO-E. Our base case is a "soft Elecxit" in which interconnector capacity expands to 10 GW, and the British electricity market is still coupled to France and its neighbours. We contrast this with a "hard Elecxit" scenario in which uncertainty hinders investment, keeping capacity at 5 GW, and market coupling is abandoned. We estimate the extra uncertainty, and the size of the mistakes, that could come from growth in renewable capacity. Combining these effects, the combined cost of generation rises by €560m or 1.5% of the market value, compared to the base case. Costs in Great Britain rise by slightly more than those on the Continent. We find that most of these additional costs are due to market decoupling, as the net benefits of adding interconnector capacity are low if this simply allows traders between decoupled markets to make greater mistakes. Among the costs of market decoupling, the reduction of trading volumes due to risk aversion is more important than trading errors based on imperfect information.

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