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Is the depressive effect of renewables on power prices contagious? A cross border econometric analysis

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Non-Technical Summary

European electricity markets have become increasingly integrated in the past decade. The European Commission continues to push for further integration, through building up cross border lines, and the removing barriers to cross border trade. In parallel, European countries have set ambitious deployment targets of renewables for 2020 and 2030 (20% and 27% of final energy consumption, respectively).

The rapid growth of renewable energy generation has had significant effects on power prices in a number of European countries. There is well established evidence that renewables have a depressive effect on average power prices, and that they increase the volatility of power prices in the short term. This is often referred to as the 'merit order' effect of renewables such as wind and solar, which are low variable cost technologies and displace more expensive technologies in the merit order.
Our paper contributes to this literature focussing on the impact of renewables on power prices in several ways. First, whilst most studies rely on simulated power prices or empirical data with limited granularity, we leverage empirical data from 2011-2014 with hourly granularity for power prices and both solar and wind production.

Second, there are to our knowledge no papers investigating the impact of renewables on cross border power prices in the case of coupled markets with implicit allocation of transmission capacity. We investigate the joint effect of solar PV and wind production on power price levels and variability in France and Germany.

Third, based on empirical market resilience data from the spot market operator (overall supply and demand orders) we simulate the impact of increasing the physical interconnection capacity between France and Germany on power price dynamics in both countries – and more specifically on the volatility of power prices.
We find that intermittent generation of renewables have a significant impact on electricity prices in both the domestic (German) and the neighbouring market (France). In addition, we find that increasing the interconnection capacity between France and Germany would generate a transfer of the volatility generated by the German wind production to French power prices.

However, the analysis of the overall effect of an interconnection expansion shows that the transfer of wind –related price volatility is mitigated and even offset by the dampening effect of integrating the French power markets (resulting from larger demand and supply). But even if the price variance is decreasing when interconnections are larger, the price variance is also more sensitive to the wind generation. This means that if Germany continues to massively develop intermittent renewables, the overall effect of an interconnection expansion could potentially overrun the positive effect of interconnecting markets. Our findings therefore have important policy implications as they demonstrate the need to coordinate cross-border support policies of renewables and interconnection expansion in order to mitigate the impact on power prices.

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