**Carbon leakage and the framework for Compensation of Electricity Intensive Industrials for Indirect CO2 Costs in Europe:**

**Modelling the Evolution of CO2 emissions intensity**

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**Abstract**

Europe implemented its emission trading scheme in 2005, which induces additional costs both directly (the cost of certificates) and indirectly (via the increase in electricity prices). In order to mitigate the potential risk of carbon leakage (i.e. the relocation of industries affected by asymmetric carbon related cost burden), Europe introduced a framework for the compensation of indirect CO2 costs induced by electricity price increases for electricity intensive users. The framework critically relies the estimation of an “emission factor”, which corresponds to pass-through rate of carbon cost to the electricity price. As the electricity mix in Europe decarbonises with the retirement of some thermal plants and the growth of renewables, this emission factor is expected to decrease and so will the level of compensation for indirect CO2 costs. Due to the lack of an established methodology to estimate the evolution of this emission factor, the European Commission has to date resorted to using a simplified approach. Our paper introduces a methodology based on a European power market hourly dispatch model to simulate the evolution of the emission factor over the period of 2019-2025. We find that the emission factor in the CWE region will decrease from 0.63t/MWh in 2019 to 0.50t/MWh in 2025 because of the changes in the generation mix, compare our results with the existing simplified approach used by the European Commission, and confirm the robustness of our modelling approach by doing a number of sensitivity analysis.