POLICIES FOR ACCELRATING THE DECARBONISATION OF THE EUROPEAN CEMENT INDUSTRY

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Overview

The new IPCC report reminds the world once again how drastically emissions have to be reduced to keep global warming below 1.5°C. This reduction calls for a transition in all sectors – from the way we produce food, to the energy sector, to transport, to industrial production systems. While investments in renewable power production have been mainstreamed in Europe in the past two decades thanks to effective support policies, investments in clean industrial production technologies still lack a comparatively secure investment environment – especially as in today's globalized world, industrial production is heavily exposed to the risk of carbon leakage.

The EU emissions trading system (ETS), EU's most powerful tool to steer emissions reduction over the long term, however, has been volatile ever since its implementation in 2005 (Eugenia Sanin et al., 2015) due to political and market uncertainties. Only recently, Russia's invasion of Ukraine (two countries not part of the ETS) led to a temporary 33% plunge of the ETS price within just eleven day (Intercontinental Exchange, 2022). With emissions costs being a major determinant of production costs in the regulated industries, such volatility impedes timely investments in mature clean production technologies and ultimately emissions reductions.

To no surprise, there is a lively debate among scholars, policy makers and industry representatives on policy mixes best suited to overcome existing uncertainties and create a business environment conducive to investments in clean technologies (see e.g. Edenhofer et al. (2019)). Policy options to reduce emissions costs uncertainties frequently discussed in literature are industry-agnostic emissions price floors or collars (Flachsland et al., 2018) and industry- or project-specific Carbon Contracts for Difference (CCfDs) that polluters and the state agree on and which fix the carbon price for a defined period (Chiappinelli & Neuhoff, 2020).

From all basic materials regulated by the EU ETS, well designed policies are of particular importance for cement as for this comparatively cheap commodity emissions costs have the biggest contribution in percentage terms (Stede et al., 2021). The cement industry is also highly relevant in terms of absolute emissions, contributing 18% of all EU ETS industry emissions (de Bruyn et al., 2020). In addition, assets are comparatively large and have long lifetimes (Dröge, 2013) leading to particularly bulky investments and thus potentially to negative lock-in effects in case of bad policy. This makes the European cement industry an interesting case to study.

In this context, the article addresses the following question: *How do different carbon price policies influence the timing of clean investment decisions in the cement industry?*

Methods

We use real options analysis (more specifically the "option to defer" (Amram & Kulatilaka, 1999; Dixit, 1994)) to research the effect of different policy interventions on investment decisions in the European cement industry under multiple uncertainty scenarios. Real options are particularly suitable to model the freedom of action that the EU ETS gives to the operators of industrial and power plants (invest & (over-)abate or not invest & offset). While many real options-based studies exist for power sector investments (see e.g. Blyth et al. (2007), Laurikka & Koljonen (2006), Reedman et al. (2006), and Yang et al. (2008)), less work is available for clean technologies in the industrial sector (Agaton, 2021). Our analysis focusses on three decarbonisation options for cement, namely carbon capture and storage (CCS, see e.g. Gardarsdottir et al. (2019) and Voldsund et al. (2019)), a fuel switch to biofuels, and the combination of both, as these options are universally applicable to the majority of cement plants in Europe, have high technological maturities and a significant decarbonisation potential. In addition, the combination of CCS with biofuels is particularly appealing as it can transform emitters to CO_2 sinks. We inform and triangulate this real options analysis by interviews

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with practitioners from the industry and technology providers. We further test how sensitive results are towards changes in different input parameters.

Results

Preliminary results show that both CCfDs and a price floor could significantly de-risk and accelerate investments in clean technologies in the majority of European cement plants. The extent to which investments can be expedited depends on the perceived price uncertainty, expected development of emissions costs, the price floor or CCfD strike price, infrastructure restrictions, and the assumed correlation between emissions costs and other input parameters. The results further indicate that policies targeting OPEX-related uncertainties have a much greater influence than CAPEX subsidies.

Conclusions

De-risking policies have to be implemented swiftly to accelerate investments into no-regret carbon capture installations at the majority of European cement plants. Although currently often driven nationally, the decarbonisation of the cement industry should be guided by EU wide policies – either a price floor or CCfDs – as a coordinated EU-wide approach would allow for economies of scale and would ease a coordinated approach on the development of a cross-border CO_2 transport and storage infrastructure as well as a joint push towards closing the carbon cycle.

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