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The long-term costs of delaying carbon taxation in the oil sector

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Overview

Renewed States commitments towards lowering carbon emissions lead carbon-intensive companies to expect future ambitious climate policies, especially in the oil and gas sector. Carbon taxation is widely viewed among the economic literature as the most efficient way to reduce carbon emissions. However, as of 2023, few regions around the world implemented such taxes, and their level is usually far from the one needed to keep in line with the objectives set within the Paris Agreement framework. Most political leaders prefer to delay ambitious climate policies in order to avoid the economic burden associated with them.

Delaying the implementation of carbon taxation in the oil and gas sector has an obvious direct effect: higher effort is needed afterwards to make up for inefficient emissions during the delay (van der Ploeg et Rezai, 2020, Kotlikoff et al., 2021). Yet, despite this negative effect, numerous studies argue that keeping in line with the 2°C carbon budget is still possible even if climate policies are delayed until 2030 (Rogelj et al., 2013, Riahi et al., 2015). However, these studies usually overlook the dynamics of investment that underlie energy supply and consider aggregate supply as a smooth and continuously increasing curve. Considering these investment dynamics, Cairns and Smith (2019) show for instance that the green paradox only arises in a Hotelling framework and that it should not be considered as a possible outcome of an increasing carbon tax. Regarding the consequences of delaying climate policy, taking into account these dynamics adds a second dimension to its cost. Indeed, from an oil investor's point of view, once a project is developed, only future costs matter to decide whether to continue producing or not. The breakeven prices of newly developed projects decrease once their development costs are incurred (and considered as sunk), leading to a downward shift of the aggregate supply curve disregarded in the literature (such as Heal and Schlenker, 2019). Therefore, the lack of credibility of States when they commit leads to the development of oil projects that should not exist should carbon taxation be implemented or fully anticipated. Given that most recent oil projects have large investment costs relative to operating costs (Venables, 2014), we can expect this drop in breakeven prices to be sizeable.

This indirect effect of delaying carbon taxation results from the lock-in into carbon-intensive infrastructure difficult to phase-out afterwards. Up to now, the literature studying the consequences of delaying climate policies only focuses on its direct cost (emissions during the delay that must be compensated afterwards) but fail to take into account this progressive downward shift of the supply curve as new projects are developed. This paper aims at estimating both costs resulting from delaying carbon taxation in the oil sector since 2016, after States committed to reduce their emissions within the Paris Agreement framework.

Methods

This project relies on the UCube proprietary data from Rystad Energy, containing annual expenses by category and production by type of fuel for most oil projects in the world from 1900 to 2100. The evaluation of the cost of delaying climate policies is carried out by considering two different breakeven prices for each oil project: one comprising development costs and another once these costs are incurred and therefore not included. Assuming that once a project is developed, the choice faced by investors is either to continue producing or to abandon the project, only the second breakeven price matters. The evaluation of the two costs originating from delaying carbon taxation from 2016 to 2023 relies on the comparison between three scenarios, given a level of carbon tax faced by producers. In each of these scenarios, oil production up to 2100 is computed, and the carbon tax affects oil producers heterogeneously, taking into account the full lifecycle carbon intensity of each oil project. Carbon intensities were drawn from Coulomb et al. (2021).

1. *"Immediate action" scenario*: Carbon taxation is implemented in 2016, thus leading to the abandonment of some currently producing fields and the cancellation of some oil projects not yet developed.

2. *"Full anticipation" scenario*: Investors expect carbon taxation to be implemented in the year following their decision to develop a project or not, meaning that some observed developments of projects are cancelled in this scenario. Carbon taxation is then implemented in 2023.

3. *"Observed" scenario*: Observed production and development of assets up to 2022 are taken into account, with among newly developed assets some that should have been cancelled should future climate policy be credible but that will continue producing in the future even if taxation is implemented. Carbon taxation is implemented in 2023, not having been fully anticipated by investors in their investment decisions.

Comparing the first and second scenarios allows to estimate the delay cost regarding inefficient production that happened between 2016 and 2022 (the direct cost related to inaction during the period). Comparing the third and the second scenarios allows to estimate locked-in emissions from assets that should have been stranded (the indirect cost resulting from the lack of credibility of future climate policy). In each scenario, corresponding emissions are computed. For a given level of tax, and thus of expected reduction in future carbon emissions, I compute the overshoot in terms of emissions resulting from each cost. In a similar fashion, trusting Rystad Energy's expectations regarding future assets development, I estimate the same costs resulting from continued climate inaction between 2023 and 2030.

Results

The direct cost of delaying carbon taxation logically increases with the level of tax. Preliminary results indicate that, for an oil price of $80/bbl and a $120/tCO2eq tax, which roughly equates to a 50% reduction in cumulative emissions since 2016, inefficient production during the period leads to an overshoot of the expected carbon budget of 32.7GtCO2eq (8% of the budget). For this level of tax, 30% of the production between 2016 and 2022 is inefficient. Regarding the indirect cost, the focus of this study, its magnitude in absolute follows a reversed u-shaped curve, and is higher for taxes ranging from $110 and $135. Interestingly enough, this effect reaches its maximum around levels of taxes that are in line with estimates of remaining carbon budgets for oil computed by McGlade and Ekins (2015) or Rystad (2013). For a $120 carbon tax, the overshoot resulting from locked-in emissions of assets that should have been stranded amounts to 15.9GtCO2eq (3.9% of the budget).

When considering further delaying carbon taxation from 2023 to 2030, the shape of the results remains similar, but the magnitude of the second effect becomes larger. For a $120 carbon tax (49% reduction in cumulative emissions since 2023), the direct cost is 35.5GtCO2eq (10% of the budget) and the indirect cost 25.6GtCO2eq (7.2% of the budget).

Conclusions

Preliminary results indicate that focusing exclusively on the direct effect of climate policy delay leads to a large underestimation of its cost. A large share of oil reserves developed each year becomes locked-in once production has started instead of remaining in the ground should correct policies be implemented in time.

The magnitude of the effect computed in this study for the 2016-2022 period does not fully reflect the potential size it could have in the future. Because of the threefold drop in oil prices in 2014-2015 as well as the COVID pandemic, numerous projects were temporarily cancelled or simply postponed. Sizeable reserves are already discovered, available, but not yet developed. Economic conditions more favorable to fossil fuel investments in the future could greatly increase the long-lasting adverse effect of delaying the introduction of carbon taxation in the oil and gas sector and make climate objectives unattainable.

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