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Digest

Optimal Management of Emissions Trading Systems

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Regulators worldwide are increasingly favouring explicit carbon pricing mechanisms, recognising their effectiveness in driving climate action. This trend is reflected in the rising number of Emissions Trading Systems (ETS) being implemented globally, as noted by the World Bank (2023). These systems, which establish emission limits while allowing carbon prices to fluctuate, are seen as vital tools for spurring innovation and investment in cleaner technologies, thus aiding the shift towards a low-carbon economy. However, most ETSs, also known as cap-and-trade systems, face a significant challenge: the rigidity of their caps and the inflexibility in allocating emission permits, typically set within a strict allocation program. This is far from an ideal central control instrument, which would ideally be a contingency mechanism with instructions that adapt to various states of the world, such as economic shocks, technological advancements, and new policies. The structural reform of the European Union ETS (EU ETS) exemplifies this. Having navigated through the Great Financial Crisis and the implementation of various counteracting policies, like renewable energy support, the EU ETS now includes a mechanism to manage the cap and the allocation of allowances in the market. Yet, the academic community continues to debate the optimal management of the cap and the corresponding supply of allowances in an ideal cap-and-trade system.

1 Fixed quantities vs indexed quantities

Newell and Pizer (2008) suggest an indexed policy approach, wherein the effective emissions cap is designed to adjust in response to fluctuations in a suitably chosen index, like economic output. This approach holds economic appeal, as it allows for a more flexible response to cost variations in achieving environmental targets. Specifically, the cap can be relaxed when the costs of compliance are unexpectedly high, and conversely, it can be tightened when these costs are lower. In particular, the paper examines whether a fixed cap on emissions performs better than a cap on emission intensity (emissions indexed to GDP) in a wide range of countries. They find that if changes in the index (GDP) are less than double the changes in the optimal quantity level of emissions, intensity standards are preferred to fixed cap on emissions. The authors argue that such regulatory tool allows to adjust the effective cap on emission in response to change in output, resulting more politically appealing than the alternative because it is less likely to be perceived as a constraint to economic growth. However, indexing a policy formula translates in another form of uncertainty, as the chosen index (GDP) is potentially noisy and could have negative consequences on the policy's efficiency. Thus, identifying the appropriate index for such policies is a complex and challenging endeavor.

2 Adapting to business cycles

Heutel (2012) explores a scenario where the policy is specifically tailored to adapt in response to shifts in productivity. This paper investigates how environmental policy optimally responds to business cycles through a DSGE model with persistent productivity shock and pollution as a negative externality. The model is calibrated to the US economy and the welfare comparison is between a dynamic policy that adjusts to productivity shocks and a static policy that holds emissions constant in the long-run. The main findings suggest that a policy that pegs emissions to GDP is a good approximation of optimal policy, because it dampens the procyclicality of emissions. In fact, while it is true that emissions rise during booms and fall during crisis, an emission cap indexed to GDP smooths this dynamic, as the emission quota is reduced during recessions. However, such a policy has two drawbacks: i) while under uncertainty over abatement costs, the net benefits to adapt to cycles are higher than those ripped from policies that do not, this benefits may be smaller than setting the rigid emission cap to the correct long-run emission outcome; ii) these net benefits are not uniformly distributed across all agents in the economy, as nearly the totality of them go to agents which would bear the costs of the policy (i.e. firms).

3 Banking of allowances

Linton and Kuusela (2018) propose an alternative approach that involves actively adjusting the supply of new allowances to prevent the accumulation of a bank of allowance permits and to mitigate price volatility. This approach entails the active management of allowance supply, a departure from previous policies where the regulator pre-determines the quantity of emissions allowances for a multi-year period. Instead, they advocate for a policy where the regulator sets a new cap for each period. The number of new allowances is chosen such that, when combined with the banked allowances, they align with the desired cap level. Furthermore, under such a Markov equilibrium policy, the regulator can steer the expected allowance price to stay relatively close to the Social Cost of Carbon (SCC) by actively updating the supply of allowances for each period.

4 Carbon Cap Rule

These studies have explored various mechanisms for actively managing allowance supply, responding to observable factors that can influence the demand for emission permits. However, other elements such as technological advancements and innovations, along with expectations about them, and regulatory changes, which, despite being less observable, significantly influence emission allowance prices both empirically and theoretically.

Benmir, Roman, and Taschini (2023) introduce an innovative method to estimate these less observable factors within the European Emission Trading System. Their approach allows them to quantify the shocks related to abatement and policy changes, thus uncovering all the key factors that play a role in determining the price of emission allowances. Building upon this, they propose the 'Carbon Cap Rule' (CCR), a mechanism which dynamically adjusts the emission cap over time, offering a structured approach to cap management. This method is akin to the environmental equivalent of the Taylor rule. Just as the Taylor rule assists central banks in adjusting interest rates in response to economic indicators like inflation and output gaps, the CCR provides a systematic method for modifying emission caps. The CCR also shares similarities with the Market Stability Reserve (MSR) currently employed in the EU ETS. The MSR adjusts the supply of emission permits in response to the total bank of emission permits, demonstrating a practical application of dynamic cap management.

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