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ON THE ROLE OF POLICY INSTRUMENTS IN DESIGNING EMISSIONS MARKETS

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Overview

In most theories of tradable emission permits,[1] regulated emitters are supposed not only to participate in spot markets, but also to determine and implement optimal levels of emissions abatement simultaneously. This premise is based on an assumption that the options for abatement action are available at the time of spot market participation. However, this assumption cannot easily be justified because emission permit trading activities and abatement actions are not synonymous; in contrast to real-time trading regarding security-like instruments such as tradable emission permits, instantaneous emissions abatement is physically impossible. Emissions of greenhouse gases or sulfur dioxide are closely linked to production activities, and thus, abatement decisions are usually constrained by long-term production plans. In most cases, physical investments in abatement technology for production facilities are needed. Such investments take at least months, and often years.

The necessity of preceding physical investments entails time lags between abatement decisions and permit trading activities and it brings fundamental changes in the decision frame for emission abatement; a sequential decision structure with uncertainty arises. Permit trades in most existing or planned programs are possible until the very end of each compliance period, when actual emission levels are revealed and observed with certainty, but abatement decisions such as investments in abatement technology must take place before actual emission levels, permit market prices, and other factors are known; in this sense, abatement decisions are made under conditions of uncertainty.

Moreover, when emission abatement decisions must be made under conditions of uncertainty, permit market participants may be afraid that market prices can happen to soar. Unaffordable market prices may force emitters who had planed to purchase permits instead of reducing emissions to go bankrupt. To avoid such possibility of extremely high prices, regulators may set an upper limit of market prices, so-called “safety valve.” It can also take a form of “penalty for noncompliance,” which is an option given to emitters; the option of not complying with emission regulations, and instead paying penalty. With such options, emitters first decide how much abatement they will undertake during a compliance period, and then enter volatile permit markets to buy or sell permits as necessary, while at the same time deciding how much they are willing to get out of the emission regulation by paying for the upper limit of market prices at the end of the period. The question for regulators is how to make the design of an emissions market under uncertainty with policy choices in hand.

Methods

In this paper, we develop an analytical model of emissions markets which incorporates time lag between abatement decisions and permit trades and uncertainty of future unconstrained emissions at the time of abatement decision. The purpose is to analyze the role of policy tools in designing emissions markets. The analysis highlights the regulator’s control of aggregate

[1] For an extensive survey of the literature of tradable permits, see, for example, Maeda (2003).

emissions abatement through the setting of two policy parameters: aggregate emission targets and safety valves (or penalties for noncompliance).

Results

We show that the capabilities of the policy tools of setting these two parameters for controlling aggregate emissions abatement are greatly affected by uncertainty about unconstrained aggregate emissions, and that the ways in which they are affected makes them complementary. Specifically, adjusting safety valves turns out to be ineffective in controlling aggregate emissions abatement when uncertainty is small, while adjusting aggregate emissions targets is ineffective when uncertainty is great. We also show that there exists a specific combination of target- and safety valve-setting that frees aggregate abatement by emitters from dependence on uncertainty about unconstrained emissions.

Conclusions

The findings offer practical guidance for policy-makers on designing a permit market, specially finding a preferable combination of aggregate emission targets and safety valves.

References

Maeda, A. (2003) “The Emergence of Market Power in Emission Rights Markets: The Role of Initial Permit Distribution.” *Journal of Regulatory Economics* 24(3): 293-314.