

Abatement Investment by a Monopoly with a Stock Pollutant

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Abstract

Regulation of a polluting monopoly must deal with two market failures: market power and negative externalities because of the emissions. Efficiency-inducing (first-best) taxation for polluting firms with market power was characterized by Benckroun and Long (1998,2002). However, in their model the only way to reduce emissions is reducing production. More recently, Martín-Herrán and Rubio (2016) have revisited this issue taking into account that emissions can be eliminated without declining output if the monopoly uses an abatement technology. Their paper assumes that the abatement capacity is installed in the initial period and that the firm only supports the operative costs, and focuses on the effects of the lack of regulatory commitment on emission tax applied by the regulator, abatement effort made by the firm and social welfare in a second-best policy setting. In this paper, we extend this model considering that the firm can invest to expand the capacity. Technically speaking, we deal with a differential game with two state variables: the pollution stock and the abatement capacity. In the first part of the paper, we characterize the first-best policy that consists on a tax on emissions along with a subsidy on investment costs and we show that the first-best policy is time consistent. In the second part, we consider that for political or economic reasons, for instance a large

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public deficit, the regulator can apply only an emission tax and we show that with two state variables the lack of commitment in a second-best policy setting has no effects on the tax. In fact, we find out that the second-best emission tax with commitment is also time consistent. Finally, we solve a LQ environmental policy game with the aim of comparing the temporal paths of the first-best and second-best emission tax and to evaluate the welfare costs of the political constraint on the policy instruments.

Keywords: monopoly, commitment, emission tax, abatement investment, stock pollutant, abatement capacity

JEL Classification System: H23, L12, L51, Q52

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