

ON OPTIMAL EXTRACTION UNDER ASYMMETRIC INFORMATION OVER RECLAMATION COSTS

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Overview

Exhaustible resource extraction ends with costly reclamation and the producers often have private information regarding the parameters of the extraction operation including for example extraction costs (Gaudet et al. 1995; Osmundsen 1997) and initial resource stock (Osmundsen 1998; Martimort et al. 2018). Currently a problematic feature of many extraction operations is that the monies intended for the reclamation of the site including a pollution stock after shut-down are not sufficient to return the site into a productive alternative use. A plausible reason for the failure to cover the costs is that the regulator does not know the reclamation costs and is forced to ask the better informed producer for a cost report before giving a permit to commence extraction. The producer, who cares about its profits, has incentives to misreport. The regulatory design of a polluting exhaustible resources must take this asymmetric information into account.

Many pollutants related to exhaustible resource extraction are stock pollutants and they are accumulated on or nearby the extraction site, and it is this stock that forms the object to which the reclamation operations are targeted. One example are the tailings from oil sand extraction. Reclamation of such stocks is costly and this cost is private information for the firm. Hence the focus of the study is on optimal extraction under stock pollution and private information over reclamation costs, and the main research questions are: How to design the regulation and the contract between the regulator and the firm that gives the highest possible (expected) net benefits to the society? What kind of properties do the regulation and the contract have?

Methods

This paper applies a principal-agent framework to a dynamic polluting resource extraction problem and analyzes the second-best optimal reclamation contract between the firm and the regulator, the optimal pollution tax and the shut-down date for the extraction operation. The model of the study has two stages: resource extraction is followed by costly reclamation.

Results

It is shown that the two-stage structure and timing of the model dictate a contract that extracts all the profit from the highest-cost type firm, but leaves profits for the more efficient types. The second-best reclamation effort is lower compared to the first-best for a given shut-down date pollution stock, and the deviation is greater for more expensive types. It is further shown, that asymmetric information regarding the costs also affects the optimal pollution tax and the shut-down date, but the tax and the date are nevertheless identical across different firm types. Optimal tax can be lower or higher than the tax under complete information depending on the parameters of the model.

Conclusions

As reclamation cost is private information for the firm, and the regulator is in practice forced to ask for this information from the firm, the optimal contract between the extracting firm and the regulator and the pollution tax must be designed.

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