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Optimal coverage of an emission tax in the presence of monitoring, reporting, and verification costs

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ABSTRACT

Environmental policies often include exemptions for some firms, e.g. the small emitters. This paper explores the implications of such exemptions in the case of an emission tax, and in the presence of monitoring, reporting, and verification (MRV) costs. We develop an analytical framework capturing the trade-off between the cost-effectiveness of a broader tax base, and the savings on MRV costs enabled by a partial coverage. Second-best partial coverage is defined by a threshold value of some characteristic of the firms below which firms are exempted. We characterize the optimal threshold and discuss its welfare implications. Since determining this threshold is demanding in terms of information regarding firm-level MRV and abatement costs, we show how limited knowledge about these costs at the aggregate level can be used in practice to approximate the optimal threshold. We apply this framework to assess the welfare implications of such an instrument in the case of greenhouse gas emissions from European agriculture. The findings indicate that exempting the small emitters may provide significant savings on MRV costs compared to the full coverage, while still incentivizing cost-effective reductions in emissions.

1. Introduction

Many policy instruments include provisions that leave some agents out of the scope of regulation. These provisions may involve exclusion of firms in specific sectors, or a threshold value of some characteristic above or below which agents are granted exemption. A typical example is income tax, which in many countries includes exemption provisions for households in the lowest income bracket. Examples can also be found in the field of environmental policy (Becker et al., 2013). The European Union Emissions Trading Scheme (EU-ETS)–currently the main instrument in EU climate policy–explicitly excludes emissions from the residential, agricultural, transport, and waste sectors. Within the sectors included in the EU-ETS, only the installations emitting more than a given amount are subject to cap-and-trade. The EU-ETS covers almost 45% of total European emissions, but only some 11,200 installations (Vlachou, 2014; European Commission, 2015), a small number compared to the millions of car and home owners and farmers in Europe who account for most of the remaining 55% of emissions.

The justification for adopting partial coverage is often based on considerations of inequality, as e.g. in the case of income-tax exemptions for lowest-income households. It may be based also on cost-effectiveness considerations, in particular when the implementation of the policy requires the regulator and/or the agents to engage in costly monitoring, reporting, and verification

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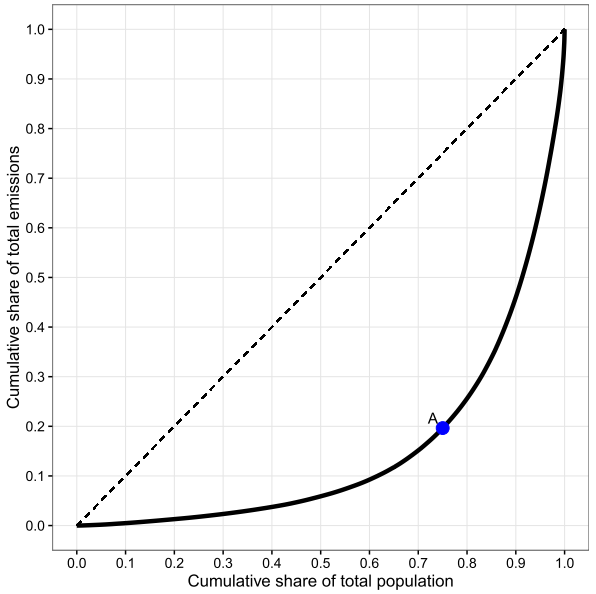

Fig. 1. Lorenz curve of initial emissions. *Note: Point A corresponds to the third quartile of emissions. Emissions from firms emitting more than this value total approximately 80% of total emissions.*

(MRV) procedures.[1] If the related costs increase with the number of agents subject to the policy, the regulator faces a trade-off between the larger benefits that may be expected from broader coverage, and the cost savings associated with the monitoring of fewer agents.

In this paper, we examine this trade-off in the context of an emission tax. The regulator must determine *ex ante* which firms should be subject to the emission tax, taking into account the fact that the broader the coverage, the larger the overall reduction in emissions but also the larger the MRV costs. Grosjean et al. (2016) suggest a relationship between the social interest of partial coverage and the distribution of emissions among firms. The intuition is that the more concentrated the emissions among agents, the larger the social interest of targeting only the larger emitters. As an illustration, consider that firms' initial emissions are distributed as depicted by the Lorenz curve in Fig. 1.

In this situation, targeting only the top 25% emitters (i.e. those to the right of point A in Fig. 1) saves the MRV costs associated with the remaining 75% of agents, while still covering almost 80% of total initial emissions. Of course, it may be that (some of) the smaller emitters are very efficient at reducing their emissions, while abatement and MRV are very costly for (some of) the larger emitters. Therefore, how such a partial coverage would perform in terms of social welfare depends on the distribution of abatement and MRV costs among agents, not just the distribution of emissions. Determining the optimal coverage thus requires detailed information about individual abatement and MRV costs. This is a strong requirement, especially if a large number of heterogeneous firms are involved, as is the case for many environmental issues.

Informational issues have given rise to a large body of literature in environmental economics. Most of this literature has focused on the design of truthful direct revelation mechanisms to tackle adverse selection and/or moral hazard (see e.g. Spulber, 1988; Macho-Stadler and Pérez-Castrillo, 2006; Montero, 2008). A recent example can be found in Mason and Plantinga (2013). The authors address the additionality issue in carbon offset programs under asymmetric information about the agents' opportunity costs. They propose a two-part menu of contracts that combines an amount of land included in the program and a differentiated payment. The mechanism enables the regulator to identify to what extent emission reductions are truly additional. It thus avoids paying for reductions in emissions that would have been undertaken anyway. Note that such a mechanism involves the transfer of information rents to induce the agents to reveal their true type. It also requires *ex ante* knowledge of the distribution of agents' types. In addition, even if the mechanism can overcome adverse selection, the issue of costly monitoring and enforcement would remain (Bontems and Bourgeon, 2005; Stranlund et al., 2009).

In this paper, we explore a simpler design whereby firms below a given threshold are exempted, and emissions from firms above the threshold are all taxed at the same marginal rate. We circumvent the adverse selection problem by using a threshold based on some known and non-manipulable characteristic of the firms. Unlike Mason and Plantinga (2013), we explicitly account for the presence of administrative, transaction and other MRV costs involved by the implementation of the policy instrument.

[1] The term MRV is commonly used in the context of climate policy (Bellassen and Stephan, 2015). The related costs correspond to the costs associated with (i) the collection of the relevant data (monitoring), (ii) their communication to the administration or the environmental agency (reporting), and (iii) the certification of the reliability of reports (verification) that ensures the compliance with the regulatory requirements defined in the policy objective.