



# Choice and design of regulatory instruments in the presence of green consumers

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## Abstract

Using a vertically differentiated product model, this paper examines welfare implications of various government policies in a situation where consumers are environmentally discerning. It studies ad valorem taxes/subsidies and emission taxes. The optimal policy depends on the magnitude of damage parameter associated with environmental externality. For a given distribution of tastes and preferences, as the damage parameter increases from a low to a high value, the optimal policy shifts from an ad valorem tax to an ad valorem subsidy. It also shows that for a sufficiently low damage parameter, an ad valorem tax dominates an emission tax.

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## 1. Introduction

In recent years there has been an increasing evidence of the emergence of *green consumers*, that is, consumers who differentiate between products on the basis of their environmental attribute. The significance of this phenomenon is reflected in the success of labeling schemes in Europe and many developing countries.<sup>1</sup> Environment-friendly variants of consumer products like facial tissues, detergents and other cleaning products account for over 50% of the market

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<sup>1</sup> In this paper, we abstract from the issues of credence and assume that consumers can observe the true (environmental) quality of the product.

share in Sweden (Sterner, 2003, Chapter 10). Green marketing has also been used in the context of transportation services. Consumers are willing to pay extra for buying “green electricity” (Kraftborsen, 2001). The price differential provides a good measure of willingness to pay for the “green” attribute, which has no direct importance for the consumer. The success of various public disclosure (of pollution levels) programs like Toxic Release Inventory in the US, PROPER (Program for pollution control, evaluation and rating) in Indonesia and Ecowatch in Philippines also supports the above phenomenon.<sup>2</sup> Apart from generating community and citizen group pressures, such information enables consumers to make informed choices and signal their preferences for environmentally friendly firms.

A question then arises whether the performance of standard regulatory instruments changes when consumers care about the environmental impacts of the products they buy. To address the above issue, the paper incorporates environmental externality in a standard vertically differentiated duopoly model.<sup>3</sup>

Other things being equal, consumers prefer clean goods to polluting goods and therefore, are willing to pay a price premium for the cleaner variant. The willingness to pay differs across consumers. Firms play a two-stage game, choosing cleanup activity in the first stage and competing in prices in the second stage. The cleanup costs are increasing in quality as well as quantity produced.

A firm can strengthen its market position by providing a good that is cleaner than that of its rival. Hence cleaning up becomes a strategic variable. In a market with oligopolistic competition, firms differentiate their product more than what a social planner would desire. Thus even though the average pollution generated in the market outcome is higher than the average pollution under the social optimum, some firms in the market outcome may cleanup more than the socially desirable level. Hence environmental policy here works differently from that in a standard model. The paper, therefore, explores implications of various government policies adopted to control pollution. Specifically, it studies an ad valorem tax/subsidy and an emission tax policy.

The paper first demonstrates that a firm that has a leadership in profits also has a leadership in market shares. The high quality firm is a leader in both profits and market shares if and only if the (cleanup) cost function is sufficiently convex. Such a link has not been demonstrated earlier in the context of the present model.

It then goes on to show that an ad valorem subsidy reduces pollution. The subsidy increases marginal benefit of the clean up effort for both the firms. To bring marginal cost in line with marginal benefit, the firms are induced to raise their clean up effort. The paper has two other important results. The first shows that *the damage parameter* associated with environmental externality determines the optimal policy. The second best ad valorem tax is decreasing in the marginal environmental damage and may eventually become negative, i.e., it may become a subsidy. The second result pertains to the comparison of emission tax with the ad valorem tax policy. If the marginal damage from pollution is sufficiently low, an ad valorem tax dominates an emission tax.

The two sources of distortion that make the market solution different from the social optimum are—oligopolistic powers of the firms and environmental externality. The former leads to a larger

<sup>2</sup> See Tietenberg (1998), Khanna and Damon (1999), World Bank (2000) for a discussion of these programs.

<sup>3</sup> Other papers in the literature using similar settings are Arora and Gangopadhyay (1995), Cremer and Thisse (1999), Lutz et al. (2000), Moraga-Gonzalez and Padron-Fumero (2002), Bansal and Gangopadhyay (2003), and Lombardini-Riipinen (2005).

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