Two-Part Tax for Polluting Oligopolists with Endogenous Entry*

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I. Introduction

According to the Pigouvian rule, the optimal pollution tax should be equal to marginal social damage. Over the last few decades, however, the analysis of optimal taxation for polluting firms has been extended,

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incorporating various imperfect market structures such as monopoly and oligopoly competitions with or without market entry (see for example, Buchanan (1969) and Barnett (1980) on monopoly; Levin (1985) and Simpson (1995) on oligopoly; Katsoulacos and Xepapadeas (1995) and Lee (1999) on endogenous market structure; and Canton et al. (2008) on a vertically related market structure). Requate (2007) summarizes important works on the theory of pollution tax under imperfect competition and shows that complete internalization of external damages under imperfect competition will impose additional social costs by further restricting the already suboptimal output of the firms. Thus, the second-best pollution tax should not be equal to marginal social damage, which does not follow Pigouvian rule—the trade-off in optimal taxation.

Most literature on these second-best instruments in the context of pollution tax has taken the single form of linear tax on the level of pollutant, output, or revenue. Yet, some of the literature consider a quadratic tax or an additional entrance fee to achieve the first-best outcome. For example, Shaffer (1995) suggests the use of a firm-specific ad valorem tax, and Xepapadeas (1997) shows how the use of an entrance fee can improve social welfare compared to a second-best pollution tax. Schott (2008) also proposes combined instruments of ad-valorem tax and entrance fee into the Pigouvian pollution tax. On the other hand, Lee and Kim (2000) construct an optional nonlinear pollution tax with asymmetric information, while Shaffer (1989) derives quadratic tax schedules that induce polluting firms to alter their output levels in a welfare-increasing direction under uncertainty. In principle, the exact number of combinations of some instruments is required to remedy different market failures, such as environmental policy for externality, competition policy for imperfect