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Pollution tax, partial privatization and environment

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ABSTRACT

Considering a differentiated mixed duopoly we show that when privatization and pollution tax are used together environmental damage will be non-monotone in the level of privatization, and optimal privatization is always partial privatization. Whether privatization will improve the environment or not depends on the public firm's concern for environment. If the public firm is unconcerned about environment, the socially optimal privatization will also damage the environment most. But when the public firm is concerned about environment, privatization will improve the environment. Generally, the relationship between optimal privatization and product substitutability is also non-monotone and inverted U-shaped.

1. Introduction

We consider a mixed duopoly with differentiated products to study the environmental impact of optimal privatization and pollution tax. Existing studies have considered product differentiation and

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optimal privatization only in isolation, but not together. It is undeniable that both product variety and privatization are important features of modern economy. Partial or complete privatization of state-owned enterprises has been a feature of government policy in many developing as well as developed countries since 1980s (Megginson and Netter, 2001; Maw, 2002). For example, Boubakri et al. (2008) document that partial privatization of state-owned enterprises has been the most prevalent phenomenon in a sample of 120 developing countries during the period from 1988 to 2005. Evidence of partial privatization is also found by Gupta (2005) and Fana et al. (2007) in the case of India and China, respectively. Bortolotti and Faccio (2009) document that at the end of 2000 governments retained control of 88 out of 141 privatized firms in 'Organization for Economic Co-operation and Development' countries. Recent examples of partial privatization include UK's 'Bio Products Laboratory' (80 percent) in 2013, New Zealand's 'Mighty River Power Limited' (48.22 percent) and 'Meridian Energy Limited' (49 percent) in 2013 and New Zealand's 'Genesis Energy Limited' (49 percent) in 2014 (Wikipedia, 2014). It has also been noted that in transition economies many state-owned industries were reliant on highly polluting technologies. Hence, omitting these considerations from formal models invariably leaves a gap in the literature.

There is a growing literature on environmental policy in strategic settings involving privately owned firms. A wide range of issues has been covered in this literature, from product differentiation (Canton et al., 2008; Fujiwara, 2009) and strategic delegation (Barcena-Ruiz and Garzon, 2002; Pal, 2012) to foreign trade (Barrett, 1994; Bhattacharya and Pal, 2010). Alongside there is a separate literature on mixed oligopoly devoted to studying the strategic impact of full or partial public ownership in one of the competing firms, generally without environmental implications (deFraja and Delbono, 1989; Matsumura, 1998). This literature shows that optimal privatization can be partial or zero depending on many considerations such as production technology, firm entry, foreign trade and product variety.

Recently an overlap of the above-mentioned two literatures has emerged where the impact of privatization on environment is sought to be analyzed.[1] Barcena-Ruiz and Garzon (2006) and Wang and Wang (2009) have examined the effects of privatization on environmental outcomes, by comparing equilibrium outcomes under full privatization with that under full nationalization. While Barcena-Ruiz and Garzon (2006) considered homogeneous goods, Wang and Wang (2009) allowed product differentiation. But, none of them allowed the possibility of partial privatization and, thus, failed to analyze how the *optimal* privatization affects the environment. Saha (2009) studied social optimality of partial privatization in one or both firms in a setting of differentiated mixed duopoly with external cost (such as pollution); but his model did not allow for pollution tax or abatement measures. Using a setting of international duopoly with homogeneous products, Ohori (2006) has shown that partial privatization will be socially optimal, but the environmental damage will also be higher. In contrast, Naito and Ogawa (2009) and Wang et al. (2009) argued that partial privatization will improve the environment if all firms were domestically owned (assuming homogeneous products).[2] On the other hand, considering tax-subsidy scheme that allows for the possibility of the tax on the output and the subsidy on the abatement to be different, in a homogeneous products mixed duopoly, Pal and Saha (2014) have shown that the government can implement the socially optimal output and abatement by keeping the public firm fully public. However, it is optimal for the government to partially privatize the public firm, unless the private firm is fully owned by a domestic party.

From the above literature it appears that the relationship between privatization and environmental damage is complex. Ordinarily, in the presence of environmental concerns optimal privatization will be greater, because privatization tends to reduce the industry output and the associated pollution.

[1] In a monopoly set-up Beladi and Chao (2006) and Saha (2013) have examined the effects of privatization on pollution, and argued that privatization of a public firm may increase environmental damage in some cases. However, these models ignored abatement measures, and of course output competition. Ohori (2012) extends this framework to vertical relationship. Cato (2008) have demonstrated that desirability of mixed oligopoly over private oligopoly depends on the extent of negative externalities generated through production.

[2] Kato (2013) analyzed implications of pollution by firms on socially optimal level of privatization, without allowing for any environmental policy instrument and ignoring the possibility of abatement by firms. Whereas, Kato (2006) examined effects of emission permits, tradable vis-a-vis non-tradable, on social welfare in the case of a mixed oligopoly.