Spatial competition in a mixed duopoly with one partially nationalized firm

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This paper analyzes the effects of partial public ownership on product differentiation and social welfare in the framework of a mixed duopoly with spatial competition. It shows that unless the public ownership exceeds a critical level, maximal differentiation continues to hold and social welfare does not improve. However, both the critical level of ownership and the marginal effect of ownership on welfare vary between different types of the partially public firm, where the types relate to different decision making mechanisms. Next, when the partially public firm has higher production cost, it responds to nationalization less vigorously than the private firm. *Journal of Comparative Economics* **36** (2) (2008) 326–341. Business Analytics & Research, Fidelity Business Services, India; School of Economics, University of East Anglia, UK.
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1. Introduction

Since De Fraja and Delbono (1989) the mixed oligopoly literature has been extended in a number of directions. To name a few, Cremer et al. (1991), Matsumura and Matsushima (2003, 2004), and Matsushima and Matsumura (2003) analyzed the effects of public ownership on spatial competition. Using a homogeneous product setting, Fershtman (1990) examined profits of the public firm, Nett (1993) social welfare, Fjell and Pal (1996) foreign competition, White (1997) privatization, Matsumura (1998) optimal privatization, Pal (1998a) endogenous order of moves, Pal and White (1998) strategic trade policy, and Saha and Sensarma (2004) partial privatization of banks. In a monopolistic competition type of model Anderson et al. (1997) studied the effects of privatization, and in horizontally differentiated product setting Barcena-Ruiz and Garzon (2003) have studied merger, and Bennett and Maw (2003) post-privatization investment. Ishibashi and Matsumura (2006) have analyzed R&D race between a public and a private firm.

In the context of spatial competition (of the linear city variety due to Hotelling (1929) and D'Aspremont et al. (1979)) it is now well understood that when there are two firms, public ownership of one firm has a strong welfare improving effect. The two firm case of Cremer et al. (1991), and the sequential case of Matsumura and Matsushima (2003) confirm that when one firm is fully publicly owned, the equilibrium locations are socially optimal if both firms choose location simultaneously, or if the public firm leads in the location choice stage.[1] Thus, it can be said that in some duopolies (such as the spatial model) the presence of a public firm guarantees the social optimum.[2]

However, nowadays rarely are public sector firms fully government-owned. They are often joint ventures with a private partner, or partially divested through stock market. They present a great deal of variations not only in terms of equity participation and managerial control, but also with respect to price and output-setting behaviors. See Djankov and Murrell (2002) for a comprehensive discussion of the privatization experience of Eastern Europe, and Abarbanell and Bonin (1997) for a particular case of bank privatization in Poland that held strategic importance to the government. For more on privatization see La Porta and Lopez-de-Silanes (1999) for Mexico, Gupta (2005) for India and Dong et al. (2006) for China. But in the theoretical literature, only a few of the above mentioned mixed oligopoly models, have considered partial privatization. These are Matsumura (1998), Fershtman (1990), Bennett and Maw (2003) and Saha and Sensarma (2004).[3]

In this paper, we allow the public firm to be partially privatized, and argue that the effects of partial public ownership on the degree of product differentiation and social welfare are far from obvious. In other words, the results of Cremer et al. (1991), and Matsumura and Matsushima (2003) cannot be easily generalized to settings with a partially public firm. One interesting finding of our work is that public ownership will fail to make any difference unless it exceeds a critical level.

There is another interesting issue that arises with partial public ownership. What should be the objective function of the partially public firm? Partial private ownership brings partial private control, and thus it may induce bargaining at different levels of decision making. Traditionally it is assumed that this bargaining takes place over the payoffs, and it is captured by taking a weighted average of the objective functions of respective stake-holders, where the weights are directly given by the proportions of stake-holding. In such firms stakeholders do not bargain at later stages of decision making *viz*. price determination. We may call them as BP firms (bargaining over payoffs).

An alternative approach, due to Fershtman (1990), allows the stake-holders to bargain over the actions of the firm, such as choosing price/output. Fershtman (1990) suggested that when the two sides strike a balance in terms of the price (or output) to be chosen against its rival firm, its reaction function can be described as a weighted average of the two extreme reaction functions (emanating from fully public and fully private firms). The weights are once again directly given by the degree of nationalization or the degree of private ownership. Any underlying objective function that is consistent with the weighted reaction function can be taken as the objective function of the partially public firm. We may refer to this as bargaining over action (BA) and such firms as BA firms. Thus, accordingly, we can think of two types of partially public firms: In one type, the private partner (who is interested in maximizing profit) and the social planner (who is interested in minimizing the total transportation and production costs) 'bargain' over their pay-offs. In the other, the private partner and the government representative bargain over the price to be chosen.[4]

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[1] If, however, as Cremer et al. (1991) have shown, the number of firms exceeds 2, but remains less than 6, the presence of public firm can reduce social welfare. A similar negative prediction was made by De Fraja and Delbono (1989) in a homogeneous product setting with multiple private firms and one public firm. Nevertheless, the efficiency result of the two firms case is fairly robust. For example, Matsumura and Matsushima (2004) have shown that even if the two firms (one of them publicly owned) have different production costs, their locations will remain socially optimal (given their exogenous production costs).

[2] The question of firm location is important not only for socially optimal product differentiation, but also for studying industrial agglomeration. A number of papers have delved into the latter issue both within the circular city framework and the linear city framework. See, for instance, Pal (1998b), Matsushima (2001) and Pal and Sarkar (2002) for the location choice of private firms. Matsushima and Matsumura (2003) extended this line of work to mixed oligopoly. While all of the above papers, as is ours, consider mill pricing, there is a body of work that considers delivered pricing. The question of implicit collusion becomes important in that context. See for instance, Espinosa (1992) and Zhang and Sexton (2001).

[3] In particular, Matsumura (1998), Bennett and Maw (2003) and Saha and Sensarma (2004) also determined the degree of public ownership or nationalization endogenously.

[4] This, by no means, is an exhaustive classification. One obvious case excluded here is that of majority stake-holders having complete control over decision making. That is, if the government owns less than fifty percent of the firm, it will act like a fully private firm. Bennett and Maw (2003) have modeled this type of partially nationalized firm.