DISCUSSION PAPER SERIES

No. 4871

PRIVATIZATION AND RESTRUCTURING IN CONCENTRATED MARKETS

Pehr-Johan Norbäck and Lars Persson

INDUSTRIAL ORGANIZATION

Centre for Economic Policy Research

www.cepr.org

Available online at: **www.cepr.org/pubs/dps/DP4871.asp**

ISSN 0265-8003

PRIVATIZATION AND RESTRUCTURING IN CONCENTRATED MARKETS

Pehr-Johan Norbäck, Research Institute for Industrial Economics (IUI), Stockholm
Lars Persson, Research Institute for Industrial Economics (IUI), Stockholm and CEPR

Discussion Paper No. 4871
January 2005

Centre for Economic Policy Research
90–98 Goswell Rd, London EC1V 7RR, UK
Tel: (44 20) 7878 2900, Fax: (44 20) 7878 2999
Email: cepr@cepr.org, Website: www.cepr.org

CEPR Discussion Paper No. 4871

January 2005

ABSTRACT

Privatization and Restructuring in Concentrated Markets*

This Paper examines the restructuring of state assets in markets deregulated by privatizations and investment liberalizations. We show that a net revenue maximizing government has a stronger incentive to restructure than a profit maximizing acquiring firm: a restructuring firm only takes into account how much its own profit will increase. The government internalizes that restructuring increases the sales price not only due to the increase in the acquirer's profit, but also due to a reduced profit for the non-acquirer, whose profits decrease due to its rival's restructuring. We also identify situations where a slow sale can significantly reduce the sales price because of strategic investment and product market effects.

JEL Classification: D44, L13, L33, L40 and P31
Keywords: asset ownership, oligopoly, privatization and restructuring

Pehr-Johan Norbäck
Research Institute of Industrial Economics (IUI)
Box 5501
S-114 85 Stockholm
SWEDEN
Tel: (46 8) 665 4522
Fax: (46 8) 665 4599
Email: pjn@iui.se

For further Discussion Papers by this author see:
www.cepr.org/pubs/new-dps/dplist.asp?authorid=153438

Lars Persson
Research Institute of Industrial Economics (IUI)
Box 5501
S-114 85 Stockholm
SWEDEN
Tel: (46 8) 665 4504
Fax: (46 8) 665 4599
Email: larsp@iui.se

For further Discussion Papers by this author see:
www.cepr.org/pubs/new-dps/dplist.asp?authorid=134788

*We have benefited from useful comments from Peter Norman and Johan Stennek and participants in seminars at IUI in Stockholm and University College Dublin. Thanks also to Christina Lönnblad for improving the language. Financial support from the Marianna and Marcus Wallenberg Foundation, and Tom Hedelius' and Jan Wallender's Research Foundations is gratefully acknowledged.

Submitted 03 January 2005

1. Introduction

In liberalization and privatization programs, we observe that governments use (or encourage) different types of restructuring prior to privatization (liberalization). Specific areas of restructuring include (1) a change in management and labor, (2) efficiency programs and (3) investment and de-investment programs.[1] This presents a puzzle: Why would a government restructure state assets instead of leaving this for the buyer to decide? The private buyer should be able to achieve efficiency goals at the same cost and more in line with its specific needs.

In the literature, informational, political and financial restrictions have been suggested to explain why governments should (sequentially) restructure prior to privatization; see, for instance, Roland (1994). In contrast, the starting point of this paper is that these privatizations have been carried out through an auction-like selling[2], where the potential buyers compete in an oligopolistic market subsequent to the privatization.[3] [4] Studying privatizations in an oligopolistic environment is relevant, given that many privatizations in developed countries have been undertaken in highly concentrated markets such as the

[1] This was the case in, for instance, the Mexican privatization program in the 1980s and 1990s, see Lopez-de-Silanes 1997. Moreover, prior to its privatization, British Steel cut its employment by 40 % without losing sales, while British Airways experienced a similar reduction in employment, while increasing the number of flights, see Djankov and Pohl (1997).

[2] Several western countries employed various kinds of auctions to sell state-owned enterprises to the highest bidder. In some transition countries, a substantial fraction of the shares of all firms was given to the general population for free. Most privatization programs combined several elements of these basic methods; see Schmidt and Schnitzer (1997).

[3] Some privatizations take place in a more general liberalization program with the selling of the state assets and a deregulation of the market by abolishing investment restrictions taking place almost simultaneously. In some liberalization programs, the market is first deregulated allowing for private investment and the privatization takes place thereafter. Yet in other markets, private and state-owned firms compete in a mixed oligopoly over a long time before the privatization takes place. The state ownership in these markets might, for instance, be due to the rescue of a failing firm or political preferences.

[4] Many countries also announce substantial forthcoming privatizations. Planned privatizations suggest that the privatization proceeds will remain strong through continued activities in Europe and Asia. Examples of countries with large privatization plans are China, Japan, Portugal, Thailand and Turkey (OECD (2001)).

banking and telecommunication industries. Moreover, it is well established that many markets in transition economies are highly concentrated[5] and that product market competition is important for the performance of firms.[6] [7]

To highlight the effects stemming from the oligopolistic interaction and the competitive auction-like selling, we work with a stylized model for which we discuss a number of extensions at the end of the paper. In the model, there is initially a market which has previously been served by a state monopoly, which possesses local productive assets. The government then liberalizes the market through a program with two distinct measures: (i) selling the state assets, and (ii) deregulating the market by abolishing investment restrictions. Prior to the privatization, the government may restructure the state assets, thereby improving the profitability of their use in the product market. The government is assumed to maximize the net revenues[8] and set the restructuring levels such that the sales price of the privatized firm net of restructuring costs is maximized. The (restructured) state assets will then be sold at an auction where two profit maximizing firms simultaneously post bids and the bidder with the highest bid obtains the state assets.[9] These might be firms in a related industry, firms in the world market, or other private investors contemplating entering the liberalized market. The acquirer then has the option of further restructuring the state assets. Finally, firms compete in oligopoly fashion in the product market.

We show that in this environment, a net revenue maximizing government has a stronger

[5] See Estrin (2002).

[6] See Djankov and Murrell (2002).

[7] Konings, Van Cayseele and Warzynski (2004) estimate significant positive price cost margins over a large range of industries using firm-level data on Bulgarian and Romanian manufacturing firms. They also find that price cost margins in highly competitive markets are lower as compared to lowly competitive markets. This suggests that firms in lowly competitive markets can exert some of their market power which is reflected in higher price cost margins. This, in turn, indicates that oligopolistic effects are present.

[8] Gupta, Ham and Svejnar (2000) find evidence in data from privatizations in the Czech Republic that more profitable firms were privatized first, thereby suggesting that the government sequenced the sale of firms in a way consistent with theories of sale revenue maximization and/or maximizing public goodwill from subsidized share transfers to citizens.

[9] For early contributions on auctions models with externalities see, for instance, Jehiel, Moldovanu and Stacchetti (1996), Jehiel and Moldovanu (1996) and Kamien and Zang (1990).

incentive to restructure than a profit maximizing buyer of the privatized firm, since the government internalizes externalities on rival firms via the sales price of the privatized firm. A restructuring firm takes into account how much its own profit will increase from the process. The government, on the other hand, takes into account how the acquisition price is affected. The acquisition price is, in equilibrium, shown to be equal to a firm's valuation of obtaining the state assets. A firm's valuation, in turn, consists of the profit for this firm when obtaining the state assets, net of its profit when the rival firm obtains them. The government then internalizes that restructuring increases the sales price, not only from generating an increase in the acquirer's profit, but also through the negative impact on the non-acquirer's profit as an outcome of the restructuring. It should be noted that in this set-up, the government and the acquirer have the "same" first-mover advantage in that the investments by both types of players take place before the investment by the non-acquirer. Thus, the difference in restructuring incentives between the government and the acquirer is solely due to the difference in objectives, where the government maximizes the sales price net of restructuring costs and the acquirer maximizes the profits.

Government restructuring can thus be rationalized as a way of taking advantage of market rivalry and bidding competition to extract a higher acquisition price. However, in this study, we also show that if such a strategy fails or is too prolonged, the same forces can also considerably reduce the acquisition price. Indeed, some recent evidence shows that restructuring policies can be very costly. Lopez-de-Silanes (1997) estimates that the direct cost of prior restructuring policies delaying the privatization process amounted to an average of 33% of the sales price in Mexico. A slow sale of the assets may lead to lower productivity due to, for instance, managerial distraction, misconduct and lost investment opportunities. In a situation without oligopolistic interaction, the acquisition price would then decrease with the amount of waste. However, in a situation with oligopolistic interaction, we show that a slow sale of the state assets will have strategic investment and product market effects that can lead to a substantially larger reduction of the sales price.

We identify two different situations where a slow sale will substantially reduce the sales price as a result of the strategic effects. The first is when a slow sale implies that the acquirer will not have time to commit to sequential investments before the other firms make

their investment decisions and the second is when early entry provides the acquiring firm with a competitive advantage in the ensuing product market competition. For instance, an early entry could be crucial in creating consumer loyalty before rivals are present in the market. A slow sale will, in these situations, reduce a firm's valuation of the state assets and hence, the sales price, for two reasons: (i) it reduces the acquiring firm's product market profit, and (ii) it increases the non-acquiring firm's product market profit.[10]

To our knowledge, our paper is the first in the theoretical privatization literature or transition literature to examine incentives for restructuring in privatizations in situations where potential buyers can invest in new capital and compete in an asymmetric oligopoly.[11] [12]

The model is spelt out in Section 2 and in Section 3, we derive the equilibrium restructuring and investment pattern and examine how government and private incentives may differ in restructuring. In Section 4, the effects of a delayed privatization are analyzed. In Section 5, we explore how robust is the finding that the government has a stronger incentive to restructure by allowing for a different timing of the privatization and the new investments, asymmetric firms, and continuous investment by the non-acquiring firm.

[10] More generally, in the international business literature several factors have been argued to be important for explaining why firms may prefer to grow via M&As rather than through organic growth: the quest for strategic assets, such as brand names, the possessions of local permits or distribution networks and patents. Moreover, when the time to market is vital, the takeover of an existing firm with an established distribution system is preferable to developing a new local distribution and marketing organization. All these motivations seem build on the fact that the acquirer gains a strong position in the product market by its acquisition. See, World Investment Report (WIR) 2000.

[11] For overviews of the theoretical privatization literature see, for instance, Schmidt and Schnitzer (1997) and Vickers and Yarrow (1991), and for the transition literature see, for instance, Roland (2000).

[12] Bennett and Maw (2000, 2003) use a set-up with a sale of assets followed by investment in new assets and oligopoly interaction. However, the focus of their papers is to derive the welfare-maximizing retained ownership share for the state, while our focus is on the difference between the government's and the acquirer's incentives to restructure. Note also that Bennett and Maw (2000, 2003) use a sales mechanism of the state assets, where the non-acquiring firms are assumed not to make a profit in the ensuing product market interaction, whereas in our setting, the effects of restructuring on non-acquiring firms' profits are crucial.

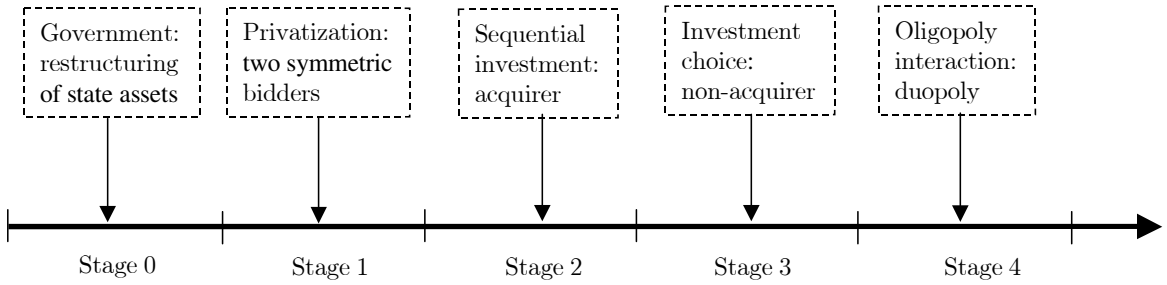

Figure 2.1: The structure of the game.

Section 6 concludes.

2. The Model

Let us start with a brief overview of the model. Consider a country where the market has previously been served by a state monopoly, which possesses k_0 units of productive assets. The government will liberalize the market through a program with two distinct measures: (i) selling the state assets, and (ii) deregulating the market by abolishing investment restrictions. The interaction takes place in five stages, as illustrated in Figure 2.1.

In stage 0, the government may restructure the state-assets k_0 to k_G, thereby improving the profitability of using the assets in the product market. The government is assumed to maximize the net revenues and set the restructuring levels such that the sales price of the privatized firm net of restructuring costs is maximized. In stage 1, the state assets will be privatized. The privatization process is depicted as an auction[13] where two profit maximizing firms simultaneously post bids, b_i, and the bidder with the highest bid obtains the state assets.

In stage 2, the acquirer has the option of further restructuring state assets from k_G to

[13] To focus on the market forces as the determinants of the equilibrium market structure, we assume that the government sells the state assets to the highest bidder at an auction. Several western countries employ various kinds of auctions to sell state-owned enterprises to the highest bidder. In some transition countries, a substantial proportion of the shares of all firms was given to the general population for free. Most privatization programs combined several elements of these basic methods; see Schmidt and Schnitzer (1997).

k_A, thereby even further improving the profitability of using these assets. In stage 3, the non-acquiring firm invests in capital k_{NA} to be able to produce in the product market. Finally, in stage 4, firms compete in oligopoly fashion.

To highlight the main result of the paper, we work with a very stylized set-up. However, in Section 5, we show that the main result of the paper also holds when allowing for a different timing of the privatization and the new investments, asymmetric firms, and continuos investment by the non-acquiring firm.

3. Government and private incentives for restructuring

To examine the incentives for restructuring faced by the government and a private firm, we shall solve the model for the equilibrium restructuring and investment pattern. As usual, we proceed by backward induction.

3.1. Stage 4 : Product market equilibrium

We first describe optimal behavior in the product market interaction. Firm $i = \{A, NA\}$, where A denotes the acquirer and NA denotes the non-acquirer, chooses an action $x_i \in R^+$ to maximize its *direct* product market profit, $\Pi_i(x_i, x_j, k_i, k_j)$, which depends on its own and its rival's market actions, x_i and x_j, as well as their respective capital investments, k_i and k_j, undertaken prior to the market interaction. We may consider the action x_i as setting a quantity or a price, as will be shown in later sections. Furthermore, we assume that there exists a unique Nash-Equilibrium in actions, $\mathbf{x}^*(k_i, k_j)$, defined from the first-order condition (3.1):

$$\frac{\partial \Pi_i}{\partial x_i}(x_i^*, x_j^*; k_i, k_j) = 0. \tag{3.1}$$

Since the optimal actions x_i and x_j only depend on k_i and k_j, we can define a *reduced-form* product-market profit for firm i as follows:

$$R_i(k_i, k_j) \equiv \Pi_i(x_i^*(k_i, k_j), x_j^*(k_i, k_j), k_i). \tag{3.2}$$

We shall assume that the reduced-form product market profit $R_i(k_i, k_j)$ is strictly increasing in the own capital holdings and strictly decreasing in the rival's capital holdings, i.e. we assume:

Assumption 1: $\frac{\partial R_i}{\partial k_i} > 0$ and $\frac{\partial R_i}{\partial k_j} < 0$.

To keep the exposition simple, we use the derivatives of reduced-form product market profits in Assumption 1, $\frac{\partial R_i}{\partial k_i}$ and $\frac{\partial R_i}{\partial k_j}$, keeping in mind that these summarize the total effects on the product market profits. These effects are spelled out in detail in Appendix A.1.

As also shown in Appendix A.1, Assumption 1 holds in the Linear-Quadratic Cournot model used in section 4. But assumption 1 is also compatible with other oligopoly models. For example, Farrell and Shapiro (1996) show that under Cournot competition and under general assumptions on demand and costs, an increase in capital for a firm (i) increases this firm's profit, while (ii) decreasing the profits of its competitors. Moreover, using a quantity-setting conjectural variation oligopoly model under a set of stability criteria, Dixit (1986) shows that a change, which is prima facie favorable for a firm, as is an increase in effective capital, reduces the profits of all other firms. Finally, it can be shown that Assumption 1 extends to a linear Bertrand model with differentiated goods.

3.2. Stage 3: Optimal investment by the non-acquirer

The non-acquirer makes its investment decision, k_{NA}, taking as given the investment made by the acquirer, k_A. To highlight the different incentives for restructuring faced by the government and the acquirer, we assume without loss of generality that a non-acquiring firm faces a discrete investment decision, $k_{NA} = \bar{k}$, which is always profitable, i.e. we assume $R_{NA}(\bar{k}, k_A) - F > 0$, where F is a fixed investment cost and profit of not investing is normalized to 0. In Section 5, we show that the main result of the paper also holds when allowing for continuous investment by the non-acquiring firm.

It is then convenient to define the *total* profit for the non-acquirer as the reduced product market profit net the investment cost, and write this as a function of the acquirer's

investment, k_A:

$$\pi_{NA}(k_A) \equiv R_{NA}(\bar{k}, k_A) - F, \tag{3.3}$$

where we can note that from Assumption 1, $\pi_{NA}(k_A)$ is strictly decreasing in the acquirer's investment, k_A.

3.3. Stage 2: Optimal Restructuring (sequential investments) by the acquirer

To describe the acquirer's investment decision, let us once more define total profit as the reduced product market profit, $R_A(k_A)$, net the investment cost:

$$\pi_A(k_A) \equiv R_A(k_A) - C(k_A; k_G), \tag{3.4}$$

where $C(k_A; k_G)$ is the total cost of restructuring state assets, given the choice of the government, k_G. We assume the marginal cost to be increasing and convex, i.e. $C'(k_A; k_G) \geq 0$ and $C''(k_A; k_G) \geq 0$. Note that we omit the investment by the non-acquirer as an argument, since $k_{NA} = \bar{k}$ is fixed by assumption. We shall also assume that $C(k_A)$ is sufficiently convex, so that $\pi_A(k_A)$ is strictly concave in k_A, i.e. so that $\dfrac{d^2\pi_A}{dk_A} < 0$.

Given the government choice, k_G, the acquirer maximizes its total profit $\pi_A(k_A)$ in (3.4) by optimally choosing k_A, thereby facing the following marginal investment costs:

$$C'(k_A; k_G) = \begin{cases} 0 : k_A \leq k_G \\ C'(k_A) : k_A > k_G \end{cases}. \tag{3.5}$$

To proceed, we define the optimal choice by the acquiring firm if the government would not invest at all (i.e. $k_G = k_0$), as $k_A^{\mathcal{A}}$. Maximizing (3.4), $k_A^{\mathcal{A}}$ is given from:

$$\frac{d\pi_A}{dk_A} = \frac{dR_A}{dk_A} - C'(k_A) = 0, \tag{3.6}$$

where $k_A^{\mathcal{A}}$ is illustrated in point $\mathcal{A}$ in the upper diagram in Figure 3.1. As also shown in the figure, the optimal choice of k_A, k_A^* is then:

$$k_A^* = \begin{cases} k_G : k_A^{\mathcal{A}} \leq k_G \\ k_A^{\mathcal{A}} : k_A^{\mathcal{A}} > k_G \end{cases}. \tag{3.7}$$

Hence, whenever $k_A^{\mathcal{A}} \leq k_G$, the acquiring firm refrains from restructuring and just uses the (cost-less) capacity installed by the government, $k_A^* = k_G$. Given that $k_A^{\mathcal{A}} > k_G$, the optimal capacity $k_A^* = k_A^{\mathcal{A}}$ is given from (3.6).

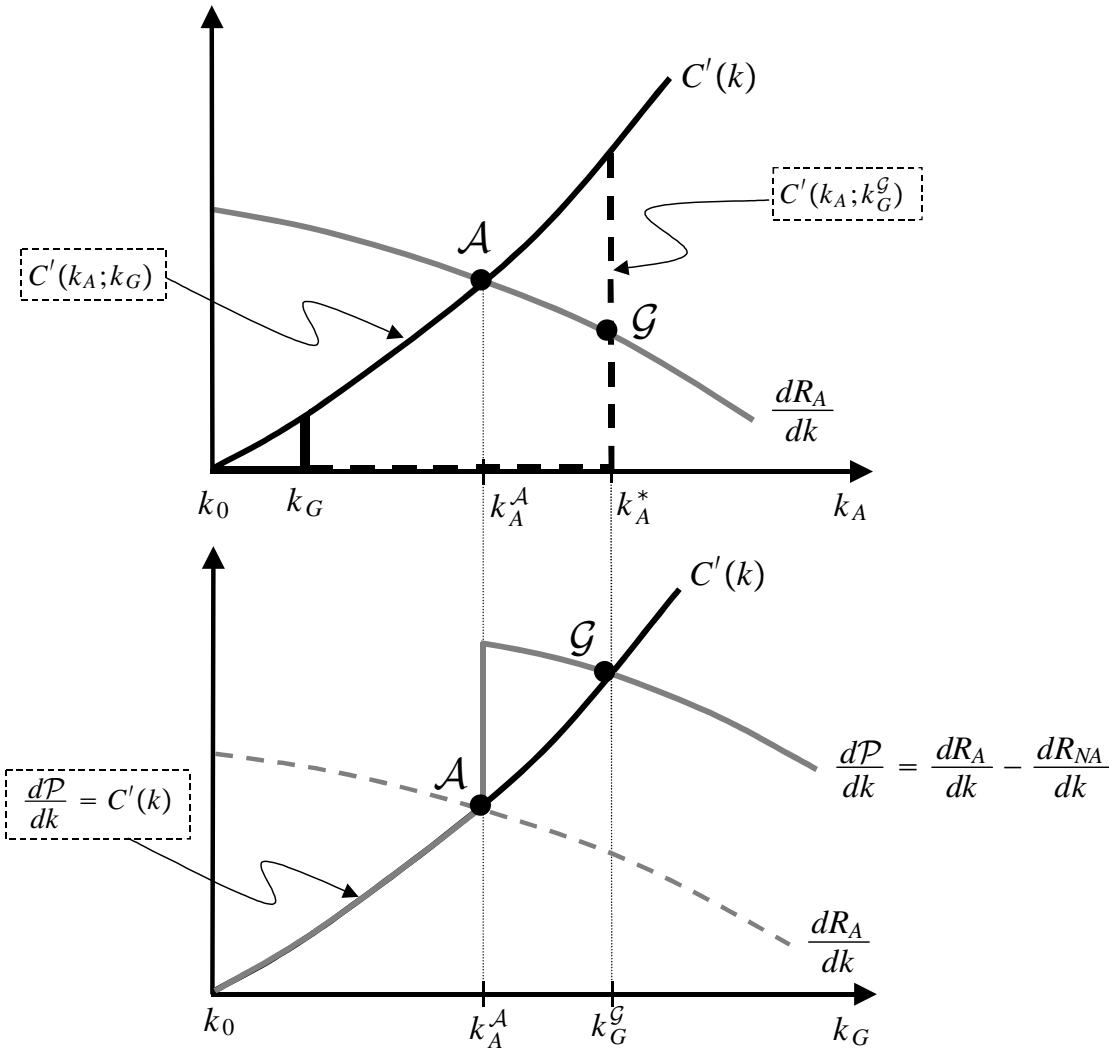

Figure 3.1: Comparison of government and private incentives to restructuring.

3.4. Stage 1: The privatization auction

In practice, different types of measures have been used to privatize former state-owned enterprises. Several western countries employed various kinds of auctions to sell state-owned enterprises to the highest bidder. In some transition countries, a substantial fraction of the shares of all firms was given to the general population. In Eastern Germany, the Treuhandanstalt bargained on the terms of trade and negotiated employment and investment guarantees.[14] To focus on the market forces as the determinants of the equilibrium market structure, we assume that the government sells the state assets to the highest bidder at an auction. More specifically, the privatization process is depicted as an auction where the two firms simultaneously post bids b_i and the bidder with the highest bid obtains the state assets.[15] If more than one firm posts such a bid, each such firm obtains the assets with equal probability. The winning buyer pays an amount equal to his bid. The auctions will be solved for Nash equilibria in undominated pure strategies. There is assumed to be a smallest monetary unit, denoted ε. We assume ties to be randomly broken, and all equalities in valuations to be ruled out. The smallest amount ε is chosen such that all inequalities are preserved if ε is added or subtracted.[16]

Let us now turn to the firms' valuations of the state assets. The valuation for firm i, v_i, is defined as $v_i \equiv \pi_A(k_A^*) - \pi_{NA}(k_A^*)$, where $\pi_{NA}(k_A^*)$ denotes the reduced-form total profit made by firm i when firm j has acquired the state assets and $\pi_A(k_A^*)$ denotes the reduced-form total profit made by firm i when it has acquired the state assets itself, and where k_A^* is the optimal investment by the acquirer given by (3.7). Since firms are ex-ante symmetric, it also follows that $v_i = v_j$.

In the case of two symmetric firms in the industry, the analysis is straightforward, as shown by the following lemma:

Lemma 1. *The state assets are acquired by firm $i \neq j$, at a price $\mathcal{P}$ equal to firm $j \neq i$'s*

[14] See Schmidt and Schnitzer (1997).

[15] See

[16] All firms are completely informed about their own and other firms' characteristics. This allows us to clearly attribute market force effects, as opposed to, for instance, problems of incomplete information.

valuation of obtaining the state assets instead of firm i, i.e. $\mathcal{P} = v_j = \pi_A(k_A^*) - \pi_{NA}(k_A^*)$.

Proof. See the Appendix.

We now proceed to the government's restructuring decision.

3.5. Stage 0: Optimal Restructuring by the government

In period 0, the government internalizes the dependency of the acquirer's capacity investment, k_A^*, on its own investment, k_G. To focus on strategic product market effects, we assume that the government maximizes the net acquisition price, i.e., the acquisition price net the restructuring cost, $\mathcal{P} - C(k_G)$. Then, we assume that the government and the acquirer face the same cost function when restructuring, $C(k)$. The implications of relaxing these assumptions are discussed in the concluding section.

From (3.7), it follows that the reduced form product market profits $R_A(k_A)$ and $R_{NA}(k_A)$, can be written as direct functions of k_G. Using the symmetry among the bidding firms, it then follows from Lemma 1, (3.4), (3.3) and (3.7) that the government's restructuring problem, can be written:

$$\underset{\{k_G\}}{Max}: \ \mathcal{P}(k_G) - C(k_G) \tag{3.8}$$

$$s.t \ : \ \mathcal{P}(k_G) = \begin{cases} R_A(k_A^{\mathcal{A}}) - C(k_A^{\mathcal{A}} - k_G) - \left[R_{NA}(k_A^{\mathcal{A}}) - F\right], & k_G \leq k_A^{\mathcal{A}} \\ R_A(k_G) - \left[R_{NA}(k_G) - F\right], & k_G > k_A^{\mathcal{A}} \end{cases}. \tag{3.9}$$

Note that the first line in (3.9) shows the acquisition price when the acquirer invests (restructures) $k_A^{\mathcal{A}} - k_G \geq 0$ sequentially upon the acquisition, whereas the second line in (3.9) indicates the acquisition price when the acquirer uses the government's entire restructured capital (without sequential investment), $k_A^* = k_G$ when $k_A^{\mathcal{A}} - k_G < 0$.

The government's maximization problem is illustrated in the lower diagram in Figure 3.1. Foreseeing the acquirer's optimal restructuring, k_A^*, the marginal benefit of restructuring for $k_G \leq k_A^{\mathcal{A}}$ is simply $C'(k)$. The government then only affects the cost of achieving the acquirer's optimal restructuring, $k_A^{\mathcal{A}}$, but these cost savings for the acquirer directly

increase the acquisition price, thereby leaving the net acquisition price $\mathcal{P} - C$ unchanged. This follows directly from (3.7), where the level k_A is not changed.

However, if we suppose that the government reflects on a capacity choice $k_G > k_A^{\mathcal{A}}$, making use of (3.3), the first-order condition from maximizing the acquisition price $\mathcal{P}(k_G)$ in (3.8) net of the investment cost $C(k_G)$, is:

$$\frac{d\mathcal{P}}{dk_G} = \frac{dR_A}{dk_G} - \frac{dR_{NA}}{dk_G} = C'(k_G), \tag{3.10}$$

where we shall assume $C(k)$ to be sufficiently convex so that $\mathcal{P}$ is strictly concave in k_G.

The optimal k_G is indicated as $k_G^{\mathcal{G}}$ in the lower diagram in Figure 3.1. Comparing expressions (3.6) and (3.10), we see that the government has stronger incentives to invest in capacity than the acquiring firm. This is because the government achieves a higher acquisition price by not only taking into account the increase in profits for the acquirer, but also by exploiting the negative externalities on the non-acquirer, captured by the last term $\frac{dR_{NA}}{dk_G}$ which is negative from Assumption 1. This is also illustrated in Figure 3.1, where we may note that it is indeed also optimal for the acquiring firm to fully use the government investment.

Thus, we have the following result:

Proposition 1. *The government has a stronger incentive to restructure the state assets than the acquiring firm, since it internalizes the negative effect of restructuring on the non-acquiring firm's profit through the sales price.*

In the introduction, we posed the question of why a government would restructure state assets for sale instead of leaving this to a future buyer to decide. The private buyer should be able to achieve restructuring at the same cost, and more in line with its specific needs. However, Proposition 1 illustrates that in an oligopoly, restructuring will have strategic product market effects which increase the sales revenue by taking advantage of market rivalry among firms (by improving the competitive position of the acquiring firm while worsening the competitive position of the non-acquiring firm). This may provide the government with incentives to restructure prior to privatization.

4. Why speed may be important in privatizations

While the result in the previous section provides an argument why governments use restructuring programs, the importance of quickly selling the domestic assets has also been highlighted. Lopez-de-Silanes (1997) has shown that a slow selling in the Mexican privatization program lead to a substantially lower sales price. A slow sale of the assets may lead to lower productivity due to, for instance, managerial distraction, misconduct and lost investment opportunities.[17] In a situation without oligopolistic interaction, the acquisition price would decrease with the amount of waste. However, in an oligopoly, a slow sale of the state assets will have strategic investment and product market effects that affect the sales price in a complicated way. In this section, we will study these strategic effects in more detail.

To this end, we apply a Linear-Quadratic model which allows us to derive analytical unique solutions for the optimal behavior of firms at all stages of the game. For completeness, we relax the assumption of fixed investments by the non-acquiring firm. This type of framework, typically modelling an investment game followed by a stage with oligopoly interaction, has been applied in, for example, Neary (2002), Neary and Leahy (1997) and d'Aspremont and Jaquemin (1988). A central difference between these papers and our study is that our application examines the effects of adding an acquisition game to the oligopoly- and investment interaction.[18]

To highlight the strategic investment and product market effects of a slow sale, we assume that the government fails to restructure when trying, i.e. we assume that the state assets remain at k_0 after restructuring. The results in this section would also hold if this assumption were relaxed, but the analysis would then be much more tedious.

In Section 4.1, we investigate the case where a slow sale implies that the buyer loses

[17] On the other hand, the incentives may not deteriorate if career concerns make managers of SOEs eager to establish a good reputation in the labor market; see Roland and Sekkat (2000).

[18] Note that also Bennett and Maw (2000, 2003) use a set-up with sale of assets, followed by investment in new assets and oligopoly interaction. However, they use a sales mechanism of the state assets where the non-acquiring firms are assumed not to make a profit in the ensuing product market interaction, whereas in our setting, the effects of restructuring on non-acquiring firms' profits are crucial.

its possibility of committing to sequential investments.

In Section 4.2, we allow different types of capital to have different effects on firms' production possibilities. This implies that we can identify other situations where a slow sale of the state assets might cause a substantial fall in the acquisition price as a result of strategic effects.

4.1. Delayed privatization: first-mover advantage in investments

In this section, we highlight the effect of the fact that an acquisition may provide the acquiring firm with a first-mover advantage in the investment game, thereby allowing this firm to act as a "Stackelberg-leader". However, this position is only attainable given that privatization takes place with speed (henceforth, indicated S). In contrast, a delay in the privatization (henceforth, indicated by D) causes a loss of the acquirer's first-mover advantage, which implies that the investment game takes place in simultaneous moves (stages two and three of the game taking place simultaneously).

4.1.1. The product market

The game is solved by backward induction. We model the oligopoly interaction in the last stage as Cournot competition in homogeneous goods. Let the inverse demand in the product market be given by (4.1):

$$P = a - b\left(q_i + q_j\right), \tag{4.1}$$

where q_i and q_j are the quantities produced by firm i and firm j, $a > 0$ is a demand parameter, and b may be interpreted as the (inverse) size of the market. The product market profit for firm i, $\Pi_i(q_i, q_j, k_i, k_j)$, can be written:

$$\Pi_i = (P - c_i)q_i, \tag{4.2}$$

where we assume that the firm's marginal cost, c_i, is decreasing in its own capital ownership:

$$c_i = c - k_i. \tag{4.3}$$

Making use of (4.1) in the first-order condition (3.1), leads to the following Nash-quantities:

$$q_i^*(k_i, k_j) = \frac{\Lambda + 2k_i - k_j}{3b}, \tag{4.4}$$

where $\Lambda = a - c > 0$.

From (4.1), the first-order condition (3.1) can be re-written as $P - c_i = bq_i$. Hence, the reduced-form product market profits defined in (3.2), $R_i(k_i, k_j)$, take the form:

$$R_i(k_i, k_j) = b\left(\frac{\Lambda + 2k_i - k_j}{3b}\right)^2. \tag{4.5}$$

4.1.2. Investments

Let us start with the case where the privatized assets are sold slowly which, as stated above, implies that the investment game takes place in simultaneous moves.

The total profit for firm i can then be written:

$$\pi_i(k_i, k_j) \equiv R_i(k_i, k_j) - C_i(k_i), \tag{4.6}$$

where we shall assume a quadratic cost of investments into capital:

$$C_i(k_i) = \frac{\mu k_i^2}{2}. \tag{4.7}$$

For simplicity, we assume that all firms share the same investment technology in terms of the cost-parameter, μ. Firm i then invests in capital k_i, taking as given the capital investments of its opponent, k_j. Formally, optimal investment involves setting:

$$\frac{\partial \pi_i}{\partial k_i} = \frac{\partial R_i}{\partial k_i} - C'(k_i) = 0. \tag{4.8}$$

Using (4.5) and (4.7) in (4.8), it is straightforward to derive the non-acquirer's reaction function as:

$$k_{NA}(k_A) = \frac{\Lambda - k_A}{\frac{9}{4}\mu b - 2}. \tag{4.9}$$

The non-acquirer's reaction function is illustrated in Figure 4.1, where it is inverted and written as $\mathcal{R}_{NA}(k_A) = \Lambda - \left(\frac{9}{4}b\mu - 2\right)k_{NA}$, where $\frac{9}{4}\mu b - 2 > 0$ is assumed to ensure a

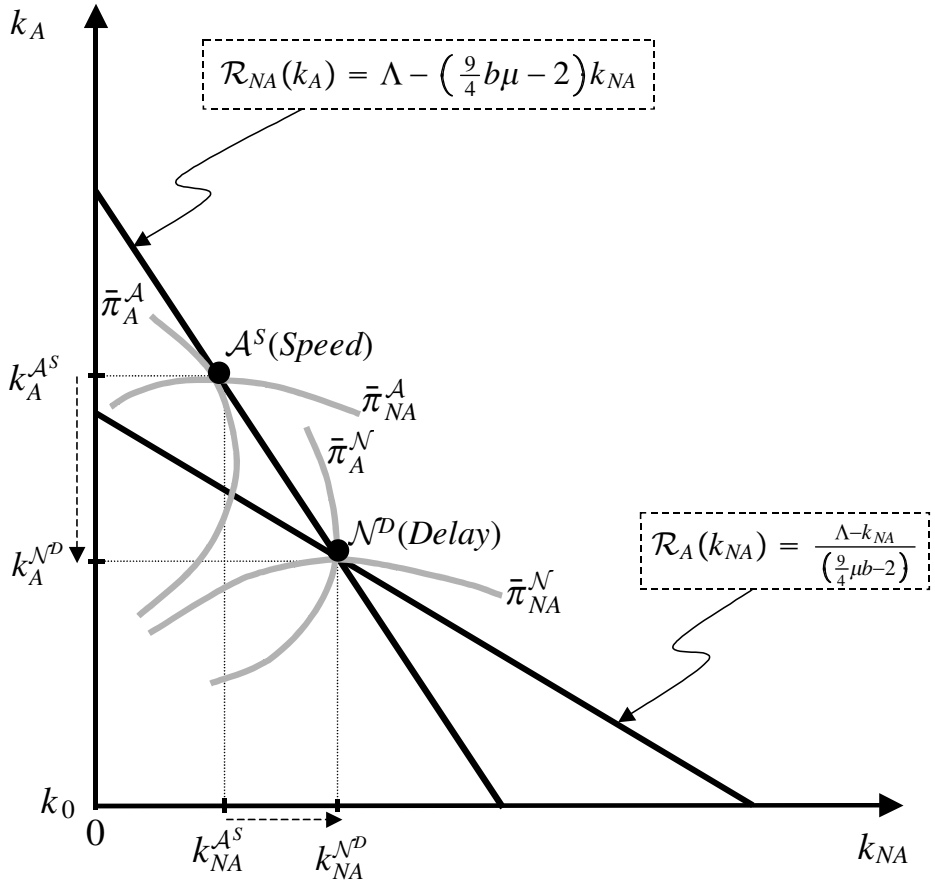

Figure 4.1: The investment game under speedy (S) and delayed privation (D) with homogenous capital.

downward-sloping reaction function. Noting that the acquirer's reaction function is then $R_A(k_{NA}) = \frac{\Lambda - k_{NA}}{\left(\frac{9}{4}\mu b - 2\right)}$, it is straightforward to derive the Nash equilibrium investment levels:

$$k_A^{\mathcal{N}^D} = 4\frac{\Lambda\left(3b\mu - 4\right)}{\left(9b\mu - 4\right)\left(3b\mu - 4\right)} \tag{4.10}$$

$$k_{NA}^{\mathcal{N}^D} = 4\frac{\Lambda\left(3b\mu - 4\right)}{\left(9b\mu - 4\right)\left(3b\mu - 4\right)}, \tag{4.11}$$

where it can be shown that $(3b\mu - 4) > 0$ ensures uniqueness and stability and where $\mathcal{N}^D$ indicates simultaneous Nash-solution under delayed privatization.

Let us now turn to the case where the privatized firm is sold quickly. The acquirer will then have a first-mover advantage and it will choose its investment internalizing the non-acquirer's behavior through the reaction function (4.9). Then, we can rewrite the

acquirer's total profit in (3.4) as:

$$\pi_A(k_A) \equiv R_{NA}(k_A, k_{NA}(k_A)) - C_A(k_A). \tag{4.12}$$

Using the reaction function (4.9) and the reduced profit product market profit (4.5), the first-order condition is:

$$\frac{d\pi_A}{dk_A} = \frac{\partial R_A}{\partial k_A} + \frac{\partial R_A}{\partial k_{NA}} \frac{dk_{NA}}{dk_A} - C'(k_A) = 0. \tag{4.13}$$

Using the investment cost function (4.7), the reaction function (4.9) and the reduced-profit product market profit (4.5), it can be shown that the acquirer's optimal investment, denoted $k_A^{\mathcal{A}}$, and the subsequent investment by the non-acquirer, denoted $k_{NA}^{\mathcal{A}}$, are:

$$k_A^{\mathcal{A}^S} = 4\frac{\Lambda\left(3b\mu - 2\right)\left(3b\mu - 4\right)}{160b\mu - 216b^2\mu^2 + 81b^3\mu^3 - 32} \tag{4.14}$$

$$k_{NA}^{\mathcal{A}^S} = 4\frac{\Lambda\left(9b^2\mu^2 - 20b\mu + 8\right)}{160b\mu - 216b^2\mu^2 + 81b^3\mu^3 - 32}, \tag{4.15}$$

where $160b\mu - 216b^2\mu^2 + 81b^3\mu^3 - 32 > 0$ holds from the second-order condition $\frac{d^2\pi_A}{dk_A^2} < 0$, and $9b^2\mu^2 - 20b\mu + 8 > 0$ is assumed to have positive investments by the non-acquirer, and where $\mathcal{A}^S$ indicates the "Stackelberg-solution" under speedy privatization.

Comparing the outcomes under delayed (D) and speedy (S) privatization, we can state the following Lemma.

Lemma 2. *In the Linear-Quadratic model,* $k_A^{\mathcal{A}^S} > k_A^{\mathcal{N}^D}$ *and* $k_{NA}^{\mathcal{A}^S} < k_{NA}^{\mathcal{N}^D}$.

Proof. See the Appendix. ■

Lemma 2 is also illustrated in Figure 4.1. Note that under delayed privatization (N^D), the acquirer's first-mover advantage is lost and it cannot commit to a large investment. Hence, it reduces its sequential investments as compared to the case of speedy privatization (A^S). In contrast, the corresponding change for the non-acquirer involves an increase in investments.

4.1.3. Effects on the acquisition price

We now turn to the effect of the acquisition price of a slow sale. To illustrate the effects of a slow sale of the state assets, first define $\pi_i^l \equiv \pi_i^l(k_i^l, k_j^l)$ as the *reduced-form* total profit

for firm i under slow or speedy sale, respectively, i.e. $l = \left(\mathcal{N}^D, \mathcal{A}^S\right)$. The corresponding iso-profit curves are denoted $\bar{\pi}_i^l$ and are also shown in Figure 4.1. For instance, $\bar{\pi}_A^{\mathcal{A}}$ is then the acquirer's reduced-form total profit when privatization takes place with speed. Then, define $\mathcal{P}^{\mathcal{D}-\mathcal{S}} = \mathcal{P}^{\mathcal{N}^D} - \mathcal{P}^{\mathcal{A}^S}$ as the difference in acquisition price under delayed (D) and speedy (S) privatization, that is:

$$\begin{aligned} \mathcal{P}^{\mathcal{D}-\mathcal{S}} &= [\pi_A^{\mathcal{N}^D} - \pi_{NA}^{\mathcal{N}^D}] - [\pi_A^{\mathcal{A}^S} - \pi_{NA}^{\mathcal{A}^S}] \\ &= [\underbrace{\pi_A^{\mathcal{N}^D} - \pi_A^{\mathcal{A}^S}}_{(-)}] - [\underbrace{\pi_{NA}^{\mathcal{N}^D} - \pi_{NA}^{\mathcal{A}^S}}_{(+)}] < 0. \end{aligned} \tag{4.16}$$

As illustrated in Figure 4.1, firms' valuation of the state assets are reduced by a delay in the privatization. Formally, expression (4.16) then shows that the acquisition price is reduced for two reasons: First, the first-mover advantage is lost for the acquirer, which from Lemma 2 and (4.5) *reduces* the acquirer's profit and second, the loss of the acquirer's first-mover advantage also improves the non-acquirer's competitive position which**,** from Lemma 2 and (4.5), leads to an *increase* in this firm's profit.

Therefore, a slow sale reduces firms' willingness to pay, since the delay reduces the acquirer's profit, while the profit of the non-acquiring firms increases. In sum:

Proposition 2. *A slow sale of state assets which removes the acquirer's first-mover advantage in the investment game, reduces the sales price for two reasons: (i) it reduces the acquiring firm's product market profit, and (ii) it increases the non-acquiring firm's product market profit.*

4.2. Delayed privatization: depreciation of irreplaceable assets and other first-mover advantages

So far in the analysis, we have treated the state assets, restructured assets and new assets as perfect substitutes. However, these different types of capital might have significantly different effects on firms' production possibilities. In some situations, the state assets may be unique and irreplaceable; for example, unique land or natural resources might be destroyed by misconduct during a slow sale. Another situation is when early entry provides the acquiring firm with a competitive advantage in the ensuing product market

competition; for example, an early entry might give the acquirer an opportunity to create consumer loyalty before rival firms enter the market.

To model heterogenous capital of this kind, let the marginal cost for firm i be:

$$c_i = \bar{c}_i - k_i, \qquad \text{where:} \quad \bar{c}_{NA} = c, \qquad \bar{c}_A = c - \gamma^l k_0. \tag{4.17}$$

In (4.17), $k_i \neq k_0$ once more denotes invested (new) capital in stage two. Asymmetries between firms are captured by the intercept term, $\bar{c}_i$, which measures the impact on firm i's absolute efficiency level of the possession of all other assets (such as firm-specific assets or acquired state assets) prior to investment in new assets, k_i, in stage two.[19] Hence, state assets k_0 and new assets k_i are assumed to be imperfect substitutes. k_0 may, for instance, provide knowledge of the market, thereby providing assets distinct from new investments k_i, which provide a capacity to produce. To capture the effect of delayed privatization, we introduce the efficiency parameter γ^l and make the following assumption:

Assumption 2: $\gamma^S > \gamma^D$.

Above, we noted that a slow or delayed privatization might lead to (i) unique assets being *depreciated* or destroyed while waiting, or that (ii) *first mover advantages* from an early entry (such as creating consumer loyalties) may not materialize.[20] Assumption 2 captures both these features of a delay, assuming that the "effective size" of the former state assets, as captured by the parameter γ^l, is larger when privatization takes place with speed ($l = S$) than with a delay ($l = D$), that is, $\gamma^S k_0 > \gamma^D k_0$.

Let us then turn to the investment game. To *highlight* the effect of delay in this context of unique state assets, we shall assume that investment in new assets takes place

[19] Assuming that asymmetries between firms enter through the intercept term $\bar{c}_i$ in the marginal cost, $c_i = \bar{c}_i - k_i$ simplifies the calculations. Alternatively, we could assume that firms differ in their investment costs for new investments (μ_i). Qualitatively, this yields similar results.

[20] Note that we model the benefits of an acquisition as a reduction of the marginal cost. Alternatively, acquired assets could affect consumers' willingness to pay. If goods were differentiated, an acquisition would then affect the intercept of the acquirer's demand function, which could capture that this firm is able to create some type of consumer loyalty before the entry of a rival firm. While involving more algebra, such an extension does not qualitatively change the results.

simultaneously (i.e. stages two and three of the game occur simultaneously).[21] Then, we need merely replace firms' marginal costs in (4.3) by the marginal cost in (4.17). The non-acquirer's reaction function then becomes:

$$k_N(k_A) = \frac{\Lambda - \gamma^l k_0 - k_A}{\frac{9}{4}\mu b - 2}, \tag{4.18}$$

which is is illustrated in Figure 4.2**,** where it is inverted and written as $\mathcal{R}_A(\gamma^l k_0) = \Lambda - \gamma^l k_0 - \left(\frac{9}{4}b\mu - 2\right) k_{NA}$, and where $\frac{9}{4}\mu b - 2 > 0$ is once more assumed to ensure a downward-sloping reaction function. The acquirer's reaction function now becomes $\mathcal{R}_A(\gamma^l k_0) = \frac{\Lambda + 2\gamma^l k_0 - k_{NA}}{\left(\frac{9}{4}\mu b - 2\right)}$.

Figure 4.2 also illustrates the effects of a delay in the privatization. Since, from Assumption 2, this leads to a less efficient ownership of the state assets, the acquirer's reaction function shifts inwards from $R_A(\gamma^S k_0)$ to $R_A(\gamma^D k_0)$, whereas the non-acquirer's reaction function shifts outwards from $R_N(\gamma^S k_0)$ to $R_N(\gamma^D k_0)$. As in the preceding section, this occurs because with less efficient ownership of state assets, the acquirer cannot commit to a large investment and hence reduce its sequential investments as compared to the case of speedy privatization (N^S). Likewise, the corresponding change for the non-acquirer once more involves an increase in investments.

It is straightforward to derive:

$$k_A^{\mathcal{N}^l} = 4\frac{\Lambda\left(3b\mu - 4\right) + 2\gamma^l k_0\left(3b\mu - 2\right)}{\left(9b\mu - 4\right)\left(3b\mu - 4\right)}, \quad l = \{S, D\} \tag{4.19}$$

$$k_{NA}^{\mathcal{N}^l} = 4\frac{\Lambda\left(3b\mu - 4\right) - 3\gamma^l k_0 b\mu}{\left(9b\mu - 4\right)\left(3b\mu - 4\right)}, \quad l = \{S, D\}, \tag{4.20}$$

from which we can derive the following Lemma 3 using Assumption 2:

Lemma 3. *In the Linear-Quadratic model with heterogenous capital,* $k_A^{\mathcal{N}^S} > k_A^{\mathcal{N}^D}$ *and* $k_{NA}^{\mathcal{N}^S} < k_{NA}^{\mathcal{N}^D}$.

[21] Assuming Stackelberg-leadership for the acquirer would not lead to any qualitative change in the results.

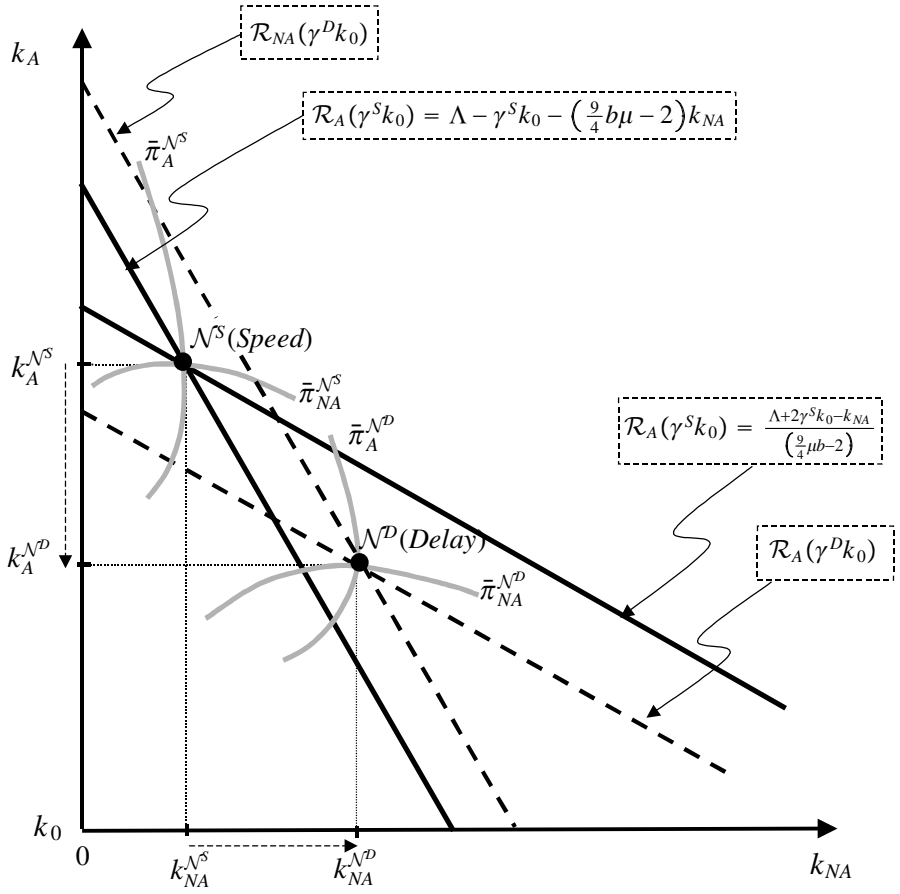

Figure 4.2: The investment game under speedy (S) and delayed privation (D) with heterogenous capital.

4.2.1. Effects on the acquisition price

Once more, define $\pi_i^l(k_i^l, k_j^l)$ as the reduced-total profit for firm i under delayed or speedy sale, respectively, i.e. $l = \left(\mathcal{N}^D, \mathcal{N}^S\right)$ and let $\bar{\pi}_i^l$ be the corresponding iso-profit curve. Then, define $P^{D-S} = P^{\mathcal{N}^D} - P^{\mathcal{N}^S}$ as the difference in acquisition price under slow and speedy privatization. Thus, we have:

$$\begin{aligned} \mathcal{P}^{D-S} &= [\pi_A^{\mathcal{N}^D} - \pi_{NA}^{\mathcal{N}^D}] - [\pi_A^{\mathcal{N}^S} - \pi_{NA}^{\mathcal{N}^S}] \\ &= [\underbrace{\pi_A^{\mathcal{N}^D} - \pi_A^{\mathcal{N}^S}}_{(-)}] - [\underbrace{\pi_{NA}^{\mathcal{N}^D} - \pi_{NA}^{\mathcal{A}}}_{(+)}] < 0. \end{aligned} \tag{4.21}$$

As shown in Figure 4.2, it follows that firms' valuations of the state assets are reduced from a delay in the privatization. Expression (4.16) then shows that the acquisition price is reduced for two reasons: *First*, as the acquirer can less efficiently use the former state assets (due to depletion or weaker complementarities) it faces a less advantageous position in the investment game which, from Lemma 2 and expression (4.5), reduces its profit. *Second*, this also improves the non-acquirer's competitive position, which from Lemma 2 and (4.5), leads to an increase in this firm's profit.

Thus, a slow sale of the state assets reduces firms' willingness to pay also in a situation where state assets have an element of uniqueness. We have the following result:

Proposition 3. *A slow sale of the state assets which causes a depreciation of irreplaceable state assets or restricts the acquirer's possibility to exploit non-commitment first-mover advantages, reduces the sales price for two reasons (i) it reduces the acquiring firm's product market profit, and (ii) it increases the non-acquiring firm's product market profit.*

Summing up, we have thus show that in some industries and some situations, too prolonged a restructuring process implies that the acquisition price would be substantially reduced, due to strategic investment and product market effects.

5. How robust is the finding that the government has a stronger incentive to restructure?

The main finding of this paper is that in equilibrium, the government may have a stronger incentive to restructure the state assets than the acquiring firm since it internalizes the negative effect of restructuring on the non-acquiring firm's profit through the sales price. However, would these incentives remain sufficiently strong also when relaxing some of the assumptions made in the analysis in Section 3? In the sections below, we explore this allowing for continuous investment by the non-acquiring firm, a different timing of the privatization and new investments, and asymmetric firms.

5.1. Optimal investment by the non-acquirer

For illustrational purposes, we derived Proposition 1, showing the stronger incentive to restructure for the government, under the assumption that the non-acquiring firm faced a discrete investment, $k_{NA} = \bar{k}$. As already indicated by the analysis in Section 4, the framework in Section 3 can be extended to allow for continuous investment decisions by both firms and the government. To this end, we solve for the government restructuring in the linear Cournot model used in Section 4, and assume (i) that the government is able to restructure maximizing the net acquisition price $P(k_G) - C(k_G)$, (ii) that the timing is that illustrated in Figure 2.1, where the acquirer has a first-mover advantage over the non-acquirer in the investment game, (iii) that capital is homogenous, and (iv) that the government and the firms face identical investment costs.

Making use of the reduced-profit functions $R_i(k_i, k_j)$ from (4.5), the investment cost function (4.7) and the non-acquirer's reaction function (4.9) in the first-order condition (3.10), we can derive the government's optimal restructuring, $k_G^{\mathcal{G}}$ and the non-acquirer's optimal investments $k_{NA}^{\mathcal{G}}$:

$$k_G^{\mathcal{G}} = 2\frac{\Lambda\left(27b^2\mu^2 - 44b\mu + 16\right)}{\left(3b\mu - 2\right)\left(9b\mu - 4\right)\left(3b\mu - 4\right)} \tag{5.1}$$

$$k_{NA}^{\mathcal{G}} = 4\frac{\Lambda\left(9b^2\mu^2 - 20b\mu + 8\right)}{\left(3b\mu - 4\right)\left(9b\mu - 4\right)\left(3b\mu - 2\right)}. \tag{5.2}$$

Let us now compare the government's optimal restructuring $k_G^{\mathcal{G}}$ to the acquirer's optimal restructuring without government investments $k_A^{\mathcal{A}^S}$, which is given from (4.14). From (5.1) and (4.14), it is straightforward to derive the following Lemma.

Lemma 4. *In the Linear-Quadratic model,* $k_G^{\mathcal{G}} > k_A^{\mathcal{A}^S}$ *and* $k_{NA}^{\mathcal{G}} < k_{NA}^{\mathcal{A}^S}$.

Proof. See the Appendix. ■

Hence, the government's optimal restructuring exceeds the acquirer's optimal restructuring (investment). It is also optimal for the acquirer to use $k_A^{\mathcal{G}}$ in (5.1), i.e. from (3.7), we have $k_A^* = k_G^{\mathcal{G}}$. Proposition 1 thus holds when allowing for continuous investments by the non-acquirer.

Lemma 4 is illustrated in Figure 5.1. This figure which is a modified and extended version of Figure 4.1, depicts the equilibrium restructuring (investment) levels for different timings of the game. Point $\mathcal{G}$ indicates the equilibrium levels of restructuring (investments) for the case where the government has the option to restructure and point A^S indicates the equilibrium levels of restructuring (investments) for the case where the government would not have that option.

5.2. Different timing of the different investments

As illustrated in Figure 2.1, the analysis in Section 3 assumes the timing of investments/restructuring to be: (0) restructuring by the government, (1) privatization, (2) restructuring (investments) by the acquirer, and (3) investments by the non-acquirer. Would our result that the government has a stronger incentive to restructure than the acquirer still hold if this assumption were changed? In the subsections below, we study two other reasonable timings of the game.

5.2.1. Simultaneous investments by the acquirer and the non-acquirer

Let us first examine how things would change if the acquirer and the non-acquirer invested simultaneously, i.e. stages 2 and 3 in Figure 2.1 were to occur simultaneously. From Section 4.1, we know that when having a first-mover advantage in the investment game,

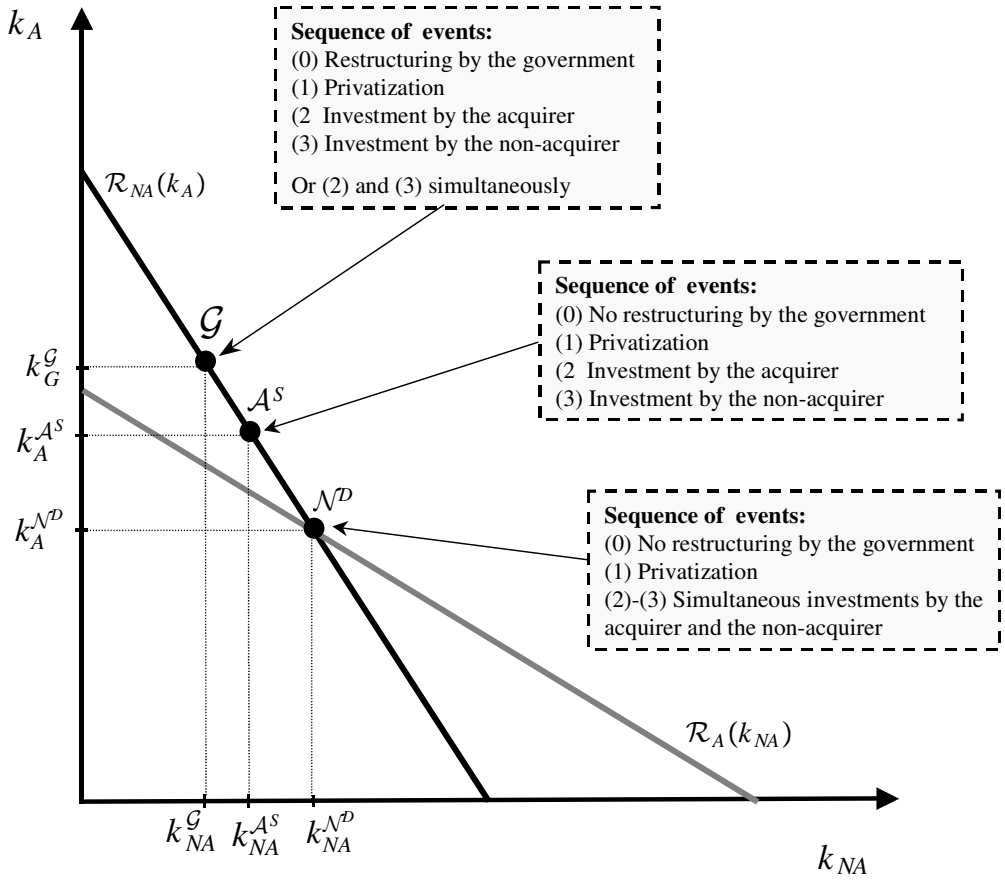

Figure 5.1: Comparing restructuring for the government and the acquirer in the linear Quadratic Cournot model.

the acquirer can commit to a larger investment as illustrated by points A^S and N^D in Figure 5.1, where $k_A^{\mathcal{A}^S} > k_A^{\mathcal{N}^D}$ holds from Lemma 2. As illustrated in Figure 5.1, it then directly follows that the government's incentive to restructure relative to that of the acquirer would increase further when private investments occur simultaneously, since the government then has a possibility of committing to larger investment, a commitment not available to the private buyer. Using Lemma 2 and Lemma 4**,** we can thus state the following Lemma:

Lemma 5. *In the Linear-Quadratic model,* $k_A^{\mathcal{G}} > k_A^{\mathcal{A}^S} > k_A^{\mathcal{N}^D}$.

Thus when comparing points $\mathcal{G}$, $\mathcal{N}^D$ and $\mathcal{A}^S$ in Figure 5.1**,** the government and the acquirer have a "symmetric" first-mover advantage in $\mathcal{G}$ and $\mathcal{A}^S$ in that these investments occur before the investment by the non-acquirer. Thus, the difference in restructuring $k_A^{\mathcal{G}} - k_A^{\mathcal{A}^S} > 0$ is *solely* due to the difference in the objective functions, as illustrated by the first-order conditions (3.6) and (3.10).

5.2.2. Opening for private new investments before privatization and privatization in mixed oligopolies

In some liberalization programs, the market is first deregulated allowing for private investment and the privatization takes place thereafter. Yet, in other markets, private and state-owned firms have competed for a long time before the privatization takes place, i.e. private and state firms compete in a mixed oligopoly before the event. The state ownership might, for instance, be due to the rescue of a failing firm or simply political preferences for state ownership. Then, note that if the private firms did not foresee the privatization and the associated restructuring, our analysis would be valid since the post-acquisition investment would then be seen as an investment conducted in reaction to the privatization. That the privatization comes as a partly unforeseen shock in many industries seems reasonable, given the findings in Bortolotti et al (2003), which provides evidence of many privatization decisions being subject to fiscal imbalances and political preferences.

However, the situation would be more complicated if the privatization were foreseen. The firms would then have an incentive to invest so that the bidding competition for the

privatized firm were weakened. This could by achieved by the private firms investing in such a way that the state assets become obsolete or such that only one firm would have use of the state assets. However, such strategies would need sophisticated coordination devices and possible transfers of money and thus, seem less likely. Assuming that firms cannot coordinate on such strategies and that the state assets would be of value for them, it follows that the government would restructure more also in such an environment. To see this, note that the privatization now takes place in the third last period, the possible restructuring by the acquirer in the second last period, and the product market competition in the last period. It then follows that our above analysis is valid.

5.3. Asymmetric firms: Oligopoly and monopoly

The private firms' valuations of the state assets might differ substantially. For example, the acquirer might have firm-specific assets particularly well matching the assets for sale. The acquirer might then have a stronger incentive to restructure than the government. To see this, note that the acquisition price equals the valuation of the state assets for the firm with the second highest valuation. This firm's valuation might then not be so sensitive to restructuring, while the acquirer's profit is. However, also note that the opposite might be true. It then follows that the government's incentive to restructure relative to that of the acquirer increases even further.

It should be noted, however, that if the non-acquirer were substantially smaller than the former state-owned firm, also absent restructuring, the government's incentive to restructure would be similar to that of the acquirer. The reason is that the privatized firm will essentially become a monopolist and the sales price will then basically become the monopoly profit, and the incentives to restructure then converge. Consequently, our results are valid for the oligopoly case, but not for the monopoly case or a dominant firm with a competitive fringe case.

6. Concluding discussion

In this paper, we have shown that government policies used in times of investment liberalizations, such as restructuring and the timing of sales, can be explained through their strong effect on the sales price of the privatized assets. We have shown that a net revenue maximizing government can have a stronger incentive to restructure than a profit maximizing buyer of the privatized firm, since a restructuring acquirer only takes into account how much its own profit will increase. The government, on the other hand, takes into account how the sales price increases; it increases due to an increased profit for the acquiring firm, but also due to a lower profit for the non-acquiring firm, whose profits decrease as a result of its rival's restructuring.

While this provides an argument for restructuring programs, a quick sale of the domestic assets is also shown to be important. A slow sale of domestic assets might imply that the first-mover advantage from entering by the acquisition of a privatized firm is reduced. The slow sale will then reduce the sales price for two reasons: (i) it reduces the acquiring firm's product market profit, and (ii) it increases the non-acquiring firm's product market profit and thus reduces the non-acquirer's willingness to pay for the assets.

To summarize, we have thus shown that government restructuring can be rationalized as a way of taking advantage of market rivalry and bidding competition to extract a higher acquisition price. However, if such a strategy fails or is too prolonged, the same forces can also considerably reduce the acquisition price. Whether a government should opt for the potential rewards associated with restructuring, or simply sell while the state assets are in demand, is highly case-specific and will depend on the nature of the state assets, the degree of competition on the relevant market, the government's ability to restructure etc. In the Mexican privatization program, it seems that restructuring was counterproductive as indicated by the following quote from Lopez-de-Silanes (1997): "A key lesson in privatizations is: do not do too much. Just sell".

It might be questionable whether the government has the ability to restructure as efficiently as the buyer. In particular, it seems reasonable to believe that governments abstain from restructuring in situations where their own technology is substantially inferior

to that of the potential buyer. However, the above finding might explain why a government does restructure, even though it is inferior in this area.

To focus on strategic product market effects, we have assumed that the government maximizes the revenues from the sale of the state assets. However, in a welfare analysis, effects on consumers and other domestic firms might also be taken into account. The consumer effect would be likely to increase the government's incentive to restructure, since restructuring would be likely to lead to lower prices. However, business stealing from domestic rivals will decrease the incentive for government restructuring, the total effect then being ambiguous.

A. Appendix:

A.1. Discussion of Assumption 1

Denoting $\frac{d\Pi_i}{dk_i}$ and $\frac{d\Pi_i}{dk_j}$ as total derivatives, we are hence assuming that:

$$\frac{\partial R_i}{\partial k_i} = \frac{d\Pi_i}{dk_i} = \frac{\partial \Pi_i}{\partial x_i}\frac{dx_i^*}{dk_i} + \frac{\partial \Pi_i}{\partial x_j}\frac{dx_j^*}{dk_i} + \frac{\partial \Pi_i}{\partial k_i} > 0 \tag{A.1}$$

$$\frac{\partial R_i}{\partial k_j} = \frac{d\Pi_i}{dk_j} = \frac{\partial \Pi_i}{\partial x_i}\frac{dx_i^*}{dk_j} < 0. \tag{A.2}$$

Hence, the total effect for firm i from obtaining more capital is positive, which from (A.1) implies that the sum of the *indirect* effect (which cancels through the envelope theorem, $\frac{\partial \Pi_i}{\partial x_i} = 0$), the *strategic* effect (where an increase in k_i affects firm j*:s* optimal product market action, $\frac{dx_j^*}{dk_i}$, affecting the profits through $\frac{\partial \Pi_i}{\partial x_j}$) and the *direct effect* (the term $\frac{\partial \Pi_i}{\partial k_i}$), is positive. Conversely, (A.2) implies that the strategic effect when a competitor obtains more capital (where an increase in k_j affects firm i*:s* optimal product market action, $\frac{dx_j^*}{dk_i}$, affecting profits through $\frac{\partial \Pi_i}{\partial x_j}$), is negative.

From section 4, we can note that using (4.1)-(4.4), $\frac{dx_i^*}{dk_i} > 0$, $\frac{dx_j^*}{dk_i} < 0$, $\frac{\partial \Pi_i}{\partial k_i} > 0$, $\frac{\partial \Pi_i}{\partial x_i} > 0$ and $\frac{\partial \Pi_j}{\partial x_i} < 0$ holds (noting that $x_i^* = q_i^*$), which implies that (A.1) and (A.2) and hence Assumption 1 are fulfilled in the Linear-Quadratic Cournot model. This can also be checked by a direct calculation from (4.5).

A.2. Proof of Lemma 1

Let $v_i > v_j$ without loss of generality. First, consider the equilibrium candidate where firm i acquires the state assets. Consider the equilibrium candidate $\mathbf{b}^*$, where $b_i^* > b_j^*$, $j \neq i$. Let owner i be the owner obtaining the state assets. Note that $b_i^* > v_i$ is a weakly dominated strategy, since no owner will post a bid over its maximum valuation of obtaining the assets. If $b_i^* < v_j$, firm j benefits from deviating to $b_j^{**} = b_i^* + \varepsilon$, since it then obtains the assets and pays a price for the assets lower than its valuation of obtaining them. Last, consider candidate $b_i^* = v_j$, $b_j^* = v_j - \varepsilon$. Then, no owner has an incentive to deviate. Thus, this is a Nash equilibrium and the only NE where firm i obtains the assets.

Let us now show that this is the only Nash equilibrium. First, consider the situation where firm j obtains the assets. Consider the equilibrium candidate $\mathbf{b}^*$, where $b_j^* > b_i^*$, $j \neq i$. But we know that in equilibrium, $b_j^* < v_j$, since firm j otherwise plays a weakly dominated strategy. But if $b_j^* < v_j$, firm i benefits from deviating to $b_i^{**} = b_j^* + \varepsilon$, since it then obtains the assets and pays a price lower than its valuation of obtaining them. Thus, firm j obtaining the assets is not an equilibrium.

Second, note that the situation where neither firm i nor firm j obtains the assets cannot occur if there is no reservation price at the auction. ■

A.3. Proof of Lemma 2

Using (4.14) and (4.10), we have :

$$k_A^{\mathcal{A}^S} - k_A^{\mathcal{N}^D} = 8\frac{\Lambda\left(3b\mu-4\right)\left(9b\mu-8\right)b\mu}{\left(160b\mu-216b^2\mu^2+81b^3\mu^3-32\right)\left(3b\mu-4\right)\left(9b\mu-4\right)} > 0. \tag{A.3}$$

It then follows from the reaction function (4.9) that $k_{NA}^{\mathcal{A}^S} < k_{NA}^{\mathcal{N}^D}$.

A.4. Proof of Lemma 4

$$k_A^{\mathcal{G}} - k_A^{\mathcal{A}^S} = 2b\mu\frac{\Lambda\left(9b^2\mu^2-20b\mu+8\right)}{(3b\mu-2)(3b\mu-4)(9b\mu-4)(160b\mu-216b^2\mu^2+81b^3\mu^3-32)} > 0, \tag{A.4}$$

where $\left(3b\mu-2\right)\left(3b\mu-4\right)\left(9b\mu-4\right) > 0$ by the second-order condition for the government's maximization problem (3.10), $\frac{d^2\mathcal{P}}{dk_G^2} = -\frac{(3b\mu-2)(3b\mu-4)(9b\mu-4)}{(9b\mu-8)b} < 0$, where $160b\mu - 216b^2\mu^2 + 81b^3\mu^3 - 32 > 0$ by the second-order condition for the acquirer's maximization problem

(4.13), $\frac{d^2\pi_A}{dk_G^2} = -\frac{160b\mu-216b^2\mu^2+81b^3\mu^3-32}{(9b\mu-8)^2b}$, and where $9b^2\mu^2 - 20b\mu + 8 > 0$ is required for $k_{NA}^{\mathcal{A}^S} > 0$ in (4.15).

References

[1] Bennett, J. and Maw, J., 2000, "Privatization and Market Structure in a Transition Economy", Journal of Public Economics, 77, 357-382.

[2] Bennett, J. and Maw, J., 2003, "Privatization, Partial State Ownership, and Competition, Journal of Comparative Economics v31, n1, 58-74.

[3] Bortolotti, B., Fantini, M, and Siniscalco D., 2003, "Privatization around the world: evidence from panel data", Journal of Public Economics, 88, 305-332.

[4] d´Aspremont, C. and A. Jacquemin, 1988, "Cooperative and noncooperative R&D in duopoly with spillovers," *American Economic Review*, 78(5), 1133-1137.

[5] Deneckere, R. and Davidson, C., "Incentives to Form Coalitions with Bertrand Competition," *Rand Journal of Economics*, Winter 1985, Vol. 16, 473-486.

[6] Dixit, A. and Shapiro, C., 1986, "Entry Dynamics and Mixed Strategies." In The Economics of Strategic Planning: Essays in Honor of Joel Dean, edited by L. G. Thomas. Lexington Books.

[7] Djankov, S. and Murrell, P., 2002, "Enterprise Restructuring in Transition: A Quantitativ Survey", Journal of Economic Literature, vol. XL, 739-792.

[8] Djankov, S. and Pohl, G.,1997, "Restructuring of Large Firms in the Slovak Republic," Policy Research Paper No. 1758, The World Bank, Washington, DC.

[9] Estrin S., "Competition and Corporate Governance in Transition." Journal of Economic Perspectives Vol. 16, No. 1, (Winter 2002) p. 101-124.

[10] Farrell, J and Shapiro, C, 1990b, "Asset Ownership and Market Structure in Oligopoly," *RAND Journal of Economics*, Vol. 21, 275-292.

[11] Gupta, N., Ham J. C., and Svejnar J, 2000, "Priorities and sequencing in Privatization:Theory and Evidence from Czech Republic", William Davidson Institute, Working Paper 323, University of Michigan Business School.

[12] Jehiel, P. and Moldovanu, B., 1996, "Strategic Nonparticipation," *RAND Journal of Economics*, Vol. 27, pp. 84-98.

[13] Jehiel, P., Moldovanu, B., and Stacchetti, E., "How (Not) to Sell Nuclear Weapons," *American Economic Review*, September 1996, Vol. 86, 814-829.

[14] Kamien, M. I. and Zang, I., "The Limits of Monopolization Through Acquisition," *Quarterly Journal of Economics*, May 1990, 2, 465-99.

[15] Klemperer, P., 1995, "Competition when consumers have switching costs: an overview with applications to industrial organization, macroeconomics and international trade," *Review of Economics Studies*, 62(4), 515-539.

[16] Koenings, J., Van Cayseele, P. and Warzynski, F., 2004, "The Effects of Privatization and Competitive Pressure on Firm's Competitive Price-Cost Margins: Micro Evidence from Emerging Economies", forthcoming in The Review of Economics and Statistics.

[17] Lopez-de-Silanes, F., 1997, "Determinates of Privatization Prices," *Quarterly Journal of Economics*, Vol. CXII, 965-1025.

[18] Megginson, W. L. and Netter, J. M., 2001, "From State to Market: A Survey of Empirical Studies on Privatizations", Journal of Economic Literature, vol. XXXIX, pp. 321-389.

[19] Leahy, D. and P. Neary, 1997, "Public policy towards R&D in oligopolistic industries," *American Economic Review*, 87:4, 642-662.

[20] Neary, J. P, 2002 "Foreign competition and wage inequality", *Review of International Economics*, 10:4, 680-693.

[21] Roland, Gerard,1994, "On the Speed and Sequencing of Privatisation and Restructuring," *Economic Journal*, v104, n426 : 1158-68.

[22] Roland, Gerard, 2000, "Transition and Economics, Politics, Markets and Firms," The MIT Press, Cambridge, Massachusetts, USA.

[23] Roland, Gerard; Sekkat, Khalid, 2000, "Managerial Career Concerns, Privatization and Restructuring in Transition Economies," *European Economic Review,* v44, n10 : 1857–72.

[24] Schmidt, K., M. and Schnitzer, M., 1997, "Methods of Privatization: Auctions, Bargaining and Give-aways," CEPR Discussion Paper 1541.

[25] UNCTAD, World Investment Report 2000, (United Nations Conference on Trade and Development, Geneva).

[26] Vickers, J and Yarrow, G., 1991, "Economic Perspectives on Privatization", *Journal of Economic Perspectives*, Vol.5, No. 2, 111-132.