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Privatization when Workers Control Firms: Mass Privatization versus MEBO

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Abstract

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In many transition economies, insiders controlled state-owned firms, *de facto*. For such firms, we model the decision about privatization method, focusing on the choice between free distribution (so called 'mass privatization') and management-employee buyouts. We incorporate a political feasibility constraint that the revenue-maximising government cannot pay insiders to take firms off its hands. Although mass privatization apparently conflicts with revenue maximization, we show that nonetheless it may be the preferred method, and if so it will be complementary with the state continuing to own shares. Mass privatization is more likely to be chosen if the government is politically weak.

Keywords: Privatization methods, Transition economies

JEL Classification: L33, P21

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Privatization When Workers Control Firms: Mass Privatization versus MEBO

1 Introduction

Transition from communism to capitalism entails privatization of the state-owned sector, which typically constitutes the bulk of the economy. As a result, privatization policies have been at the heart of the reforms in Central and Eastern Europe since 1989. However, since so many firms had to be privatized in a short period of time, reforming governments used a variety of privatization methods, both within and across countries, in addition to the standard approach developed in the West based on auction to the highest bidder (Megginson, 2005). The portfolio of privatization methods also included restitution, transfer to municipalities, 'mass' or voucher privatization - by which state-owned assets were transferred free or at nominal prices through the distribution of certificates (Estrin, 2002) - and sale to insiders through management-employee buyouts (MEBOs). If we consider the broad classifications of privatization developed by the European Bank for Reconstruction and Development (EBRD), of the twenty-five transition economies covered in the 1998 *Transition Report*, sales are reported as having been the primary method of privatization in only seven countries (though they were a secondary method in a further nine). However, mass privatization was the primary method in eleven of the twenty-five economies, and a secondary method in a further eight; and MEBOs were the primary method in seven countries, and a secondary method in a further six. Our aim in this paper is to analyse the selection of privatization method for a firm in a transition economy, focusing on the choice between the two empirically-relavant cases of mass privatization and MEBOs.

Both MEBOs and mass privatization have been rationalized in terms of political expediency (see, e.g., Berg and Sachs, 1992). Both can be implemented quickly, so that the reform process becomes more difficult for opponents to reverse, and may be used as a means of obtaining the political support of managers and workers. Our objective, however, is to explain the choice of mass privatization, even though it generates no revenue, in terms of rational economic behavior by a transition government. The analysis starts with the assumption that the government aims to maximize its net revenue. Since a MEBO generates revenue for the government, but mass privatization, by definition, does not, this may appear to tilt the choice in favor of MEBOs. We choose the assumption of revenue maximization largely because it is the one apparently least consistent with a free distribution of state assets through mass privatization, for we shall then show that under some circumstances mass privatization is still optimal. In fact, budgetary pressures would have figured significantly in the decision-making of transition governments. The transition process placed serious strains on state budgets and severe fiscal imbalances obtained in much of the region during the 1990s. Between 1993 and 1996, which was the period in which privatization activity was most intense, the general government balance was negative each year in eighteen transition countries analyzed by the EBRD in at least three years out of the four for which data are available (EBRD, 2001).

We model the sale of a state-owned firm that is *de facto* controlled by its insiders (managers and workers). This appears to have been the case in many transition countries, where the sudden and unexpected collapse of the central planning system left managers and workers with control rights in the context of nominal state ownership (Blanchard *et al.*, 1990). This may explain the widespread use of MEBOs, with privatization acting to legitimize *de facto* insider ownership rights. Thus, Earle and Estrin (1996) report that in the mid-1990s insiders held a majority of shares in Poland, Russia and Romania, and Blasi *et al.* (1997) find that insiders on average owned 65% of shares in Russia in 1994, with 25% owned by managers and 40% by workers. Similar figures obtained in other countries of the former Soviet Union (Estrin and Wright, 1999).

We formulate privatization in terms of a generalized Nash bargain between the government and buyers. In principle, the mass privatization of a firm could be implemented by free distribution to its insiders or to the population as a whole. Since our focus is partial equilibrium, however, we focus on the former case. An important contribution of our work is to incorporate a non-negative price constraint into the bargaining process. This is because, whatever the optimal price from the bargain, we argue that it would have been politically infeasible in the early years of transition, when most privatization occurred, for reform governments to pay buyers to take firms off their hands. Governments in transition economies inherited from the communist era a particularly low level of trust by the population, and it would have been impossible for them to explain to their electorates the payment of economic agents to assume the ownership of former state assets. Privatizations were anyway deeply contentious, and such behavior would have been interpreted as graft. In practice, despite the very low valuations placed in many cases by outside observers, formal negative prices have not been observed.[1]

We show that, even for a government whose aim is to maximize net revenue, mass privatization can be optimal, and it will then be complementary with the retention of some shares by the state. The effect of the non-negative price constraint is not merely to raise an equilibrium price to zero when it would otherwise have been negative. Even if the entire assets of the firm could be sold to insiders at a positive price, the government might be able to gain more revenue through retaining state ownership of some portion of shares while selling the remainder at a zero price. This result occurs because, by choosing the proportion of shares to sell such that the constraint will bind, the government reaps a benefit that is similar in effect to an increase in its bargaining power: the price paid becomes higher. This result does not depend on the future returns to the government being enhanced by the greater productivity of privatized firms, as in Bolton and Roland (1992). A similar argument for outsider-controlled firms is made briefly in Bennett, Estrin and Maw (2005). We now extend this analysis to the more common case of insider privatization, also providing a fuller justification and a diagrammatic exposition of our approach.

The paper is organized as follows. In the Section 2 we outline the model, and in Section 3 we establish the outcome when price is unconstrained. A non-negative price constraint is introduced in Section 4, and the central proposition is presented and illustrated. We

[1] However, there may have been cases of implicit negative prices. For example, in the former East Germany, where the process of privatization there was managed by the politically stable institution of West Germany, buyers were sometimes given subsidies in their purchase of state assets (Bös, 1993). Also, in the Czech Republic the majority state owned banks may have used non-perfoming loans to subsidise notionally privatized firms. We would like to thank an anonymous referee pointing out this example.

consider the implications of privatization enhancing productive efficiency in Section 5, while conclusions are drawn in Section 5. An appendix provides proofs of the propositions.

2 The Model

Consider a state-owned enterprise (SOE) that is under insider control and is now to be privatized.[2] Our analysis relates to the choice of privatization method in countries where insiders effectively control firms, the choice of privatization method being between sale to insiders (MEBOs) and mass privatization to insiders. The government's objective is to maximize its expected net revenue.

The alternative to privatization is assumed to be for the firm to operate as an SOE in the market system. Blanchard (1997) models an SOE in the early years of transition as retaining as many workers as possible, subject to the constraint that the firm's budget, including state subsidies, is balanced (see also Roland, 2000). We model the alternative to privatization as for the firm to continue operating as an SOE this way. However, privatization transfers ownership and thus enables the new owners to receive the firm's net revenue. We assume that the owners are then willing to sack some of their own membership, the number sacked being chosen to maximize profit.

Assuming that at the start of the privatization process there are L insiders in the firm, privatization is formulated as a three-stage game, the sequencing of which is as follows:

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[2] We focus on the case in which a sale can be arranged that yields both the government and the buyer(s) positive net payoffs, so that privatization does actually occur (the required condition on parameter values is specified below).

- **Policy Stage** The government chooses the ownership share s to sell, where $s \in [\bar{s}, 1]$ and $\bar{s} \in (0, 1]$ is the minimum stake required for transfer of control.

- **Sale Stage** The share s is sold to the L insiders for the aggregate price P. Each of the L insiders is allocated an equal ownership share.

- **Restructuring Stage** The L insiders choose how many of their own number to retain, production takes place, sales revenue is received, and profit is distributed.

  We consider the three stages in reverse order.

2.1 The Restructuring Stage

At this stage share s has already been bought. The decision-problem facing the L insiders is to choose the size of workforce l to retain. We assume L is 'large:' $l < L$. The firm's output q is given by the production function

$$q = Q(l, k); \quad Q_l, Q_k > 0; \quad Q_{ll}, Q_{kk} \leq 0, \tag{1}$$

where k is its fixed capital stock.

Inverse demand for the firm's output is $p(q)$, where p is unit price and $p'(q) \leq 0$. Its total revenue is

$$R(l, k) = p(q)q; \quad R_l \geq 0, R_{ll} < 0. \tag{2}$$

Any of the L insiders becoming unemployed obtains private sector employment with probability $\xi \in [0, 1)$. The private sector wage is w^p, while unemployed individuals receive state benefit b $(0 \leq b < w^p)$. The expected income of an insider who loses his or her job is therefore

$$y = \xi w^p + (1 - \xi) b. \tag{3}$$

We assume that individuals are risk-neutral and that the identity of those who lose their jobs is chosen randomly among the L insiders.[3] Individuals who are separated involuntarily are assumed to sell back their ownership share to those who remain in employment. This is a common requirement in employee-owned firms to prevent the emergence of outsider ownership (see Bonin, Jones and Putterman, 1993). Such resale is a transfer, and so does not affect the aggregate payoff to the L insiders at the restructuring stage, which, with the price of capital normalized to unity, is

$$E_L(s) \equiv s\,(R - k) + (L - l) y. \tag{4}$$

The first term on the right-hand side is the insiders' share of profit, and he second is the expected income from outside the firm.

Maximizing $E_L(s)$ subject to (1)-(3), the first-order condition for an internal solution is

$$sR_l = y. \tag{5}$$

In a traditional labor-managed firm, where ownership is 'social' and average earnings are maximized, the marginal revenue product is equalized with average earnings (Meade, 1972). However, in an insider-owned and -managed firm with initial over-employment, the share of the marginal revenue product received by the insiders is equated to expected alternative

[3] Instead, it might be assumed that there is a predetermined rule identifying the individuals to be fired for any value of l that is chosen. If the model is reformulated with this alternative assumption our main conclusions still hold.

income (see Prasnikar *et al.*, 1994). Since $y > 0$, (5) implies that $R_l > 0$ in the solution. The second-order condition is $R_{ll} < 0$, which is satisfied by assumption. Henceforth, when we refer to l and R we shall mean their equilibrium values.

Using (1), (2) and (5),

$$\frac{dl}{ds} = -\frac{R_l}{sR_{ll}} > 0. \tag{6}$$

A larger ownership share raises the benefit from staying in the firm, and so employment is set at a higher level.

We assume that

$$s(R-k) \geq ly \tag{7}$$

at the solution (hence $R - k > 0$), for otherwise the marginal insider prefers to lose his or her job. Let s' denote the value of s at which (7) holds with equality. Thus, for $l(s) > 0$ it is necessary that

$$s \geq s' \equiv l(s')y/\{R[l(s')] - k\}. \tag{8}$$

It is assumed throughout that (8) is satisfied and that $s' \leq 1$.[4]

Given that the government receives the proportion $1 - s$ of the firm's net profit, its expected net revenue at the restructuring stage is therefore

$$E_G(s) \equiv (1-s)(R-k) - (1-\xi)(L-l)b. \tag{9}$$

[4] We might have assumed that all L insiders, not just the $L - l$ sacked, may obtain private sector employment (at wage w^p) with probability ξ. Those not sacked would be willing to take private sector employment if $w^p > s(R-k)$, i.e., if $s < s_e$, where $s_e = w^p/\{R[l(s'), k]\}$. Provided our firm never faces a shortage of labor ($l \leq (1-\xi)L$), the first-order condition (5) would then be replaced by $sR_1 = b$. The relative attractiveness of being chosen to continue in employment in the firm would be increased by the additional earning opportunity, so l would be greater than in the text. However, our propositions would still hold.

If the firm is not sold, it continues to operate as an SOE. It then pays wage rate w^s, where $w^p \geq w^s \geq b$. We follow Blanchard (1997) in assuming that an SOE in a transition economy maximizes employment subject to a non-negative profit constraint. The constraint binds in our model, profit being zero. Since $w^p \geq w^s$, each worker prefers private- to state-sector employment, and so, if the firm operates as an SOE, the proportion ξ of the L workers obtain jobs in the private sector. The supply of workers wishing to remain with the firm is therefore $(1-\xi)L$. However, the firm will choose to employ only l^s workers (we assume that $l^s < (1-\xi)L$), where l^s is the larger solution of[5]

$$R(l^s, k) - l^s w^s - k = 0. \tag{10}$$

The government's expected net revenue is minus its expected total benefit payments,

$$T_G = -[(1-\xi)L - l^s]b, \tag{11}$$

and the expected payoff for the L insiders is

$$T_L \equiv l^s w^s + \xi L w^p + [(1-\xi)L - l^s]b. \tag{12}$$

The first two terms on the right-hand side of (12) are the insiders' total expected earnings from employment, either in the firm or in jobs in the private sector. The third term is the total expected unemployment benefit for the remainder. The terms $\{T_L, T_G\}$ are the respective threat points for the buyers and the government in the Nash bargain for the sale of the firm.

[5] Note the distinction between L and l^s. L is the number of insiders in the firm when it operated as an SOE at the end of the socialist era. l^s is the number retained if it operates as an SOE in the market system.

We define $\{\Pi_L(s), \Pi_G(s)\}$ to be the net gains to the buyers and government, respectively, if the firm is sold; that is,

$$\Pi_L(s) \equiv E_L(s) - T_L = s\{R(l,k) - k\} - l[\xi w^p + (1-\xi)b] - l^s(w^s - b); \quad (13)$$

$$\Pi_G(s) \equiv E_G(s) - T_G = (1-s)\{R(l,k) - k\} + [(1-\xi)l - l^s]b. \quad (14)$$

2.2 The Sale Stage

We initially assume that the sale price P of the firm is determined by a generalized Nash bargain and that P is unrestricted in sign. The owners of the firm and the government each wish to maximize their expected net payoffs for the sale and restructuring stages taken together. For simplicity, we disregard discounting, and so the expected net payoffs are $\Pi_L(s) - P$ and $\Pi_G(s) + P$, respectively. P is then chosen to maximize

$$\Psi \equiv [\Pi_G(s) + P]^{1-\alpha}[\Pi_L(s) - P]^{\alpha}, \quad 0 < \alpha < 1, \quad (15)$$

where $1-\alpha$ represents the government's bargaining power and α that of the insiders.

Differentiating (15) and using (13), the equilibrium price is

$$\begin{aligned} P^*(s) &= (1-\alpha)\Pi_L(s) - \alpha\Pi_G(s) && (16) \\ &= (s-\alpha)(R-k) - (1-\alpha)[\xi l(s)w^p + l^s w^s] + [l^s - (1-\xi)l]b, \end{aligned}$$

which exists if

$$N(s) \equiv \Pi_L(s) + \Pi_G(s) = R[l(s), k] - k - \xi l(s)w^p - l^s w^s \geq 0, \quad (17)$$

that is, if the net surplus $N(s)$,the expected net amount received from sources outside the bargain, is non-negative.[6] (17) is the condition that must be satisfied for privatization to benefit the government and insiders. A necessary condition for $N(s) \geq 0$ is that $l(s) > 0$, and therefore that $s \geq s'$. Using (3) and (5),

$$\frac{dN(s)}{ds} = \frac{1}{s}[\xi w^p(1-s) + (1-\xi)b]\frac{dl}{ds}, \quad s \geq \max(s', \bar{s}). \tag{18}$$

Therefore, for $\max(s', \bar{s}) \leq s \leq 1$, we have from (6) that $dN(s)/ds > 0$. Let s_m denote the minimum value of s at which (17) is satisfied. Since $N(s') < 0$, $s_m > s'$. The assumption that $N(s) \geq 0$ for some $s \in [s', 1]$ is equivalent to assuming $s_m \leq 1$. Let Ω denote the set of s-values in the range $[\max(s_m, \bar{s}), 1]$. For privatization to take place, it is necessary that $s \in \Omega$.[7]

To this point, we have placed no constraints on the price at which the firm is sold. However, in Section 4, we shall analyze the consequences of incorporating a non-negative price constraint (NNPC) into the bargain. We have argued that this may arise because it was not feasible politically for transition governments to pay insiders to take SOEs off their hands. As a result, price becomes

$$\hat{P}(s) \equiv \max\{P^*(s), 0\}, \quad \text{provided } \Pi_L(s) \geq 0. \tag{19}$$

Hence, if the unconstrained price $P^*(s) < 0$, then the sale price is zero; that is, price is raised to the non-negative level closest to $P^*(s)$. However, this raises the government's net payoff

[6] Once privatized, the firm earns profit $R - k$, while $\xi l w^p$ is the expected outside earnings that the l employed individuals forgo by staying in the firm. The term $l^s w^s$ relates to continuation as an SOE. Although the firm does not yield a profit as an SOE, it generates this amount in wages, which are forgone if it is privatized.

[7] Totally differentiating (17) and using (5), s_m is found to be increasing in all constituents of y and in w^s. The sign of ds_m/dk is the same as that of $1 - R_k$.

from $\Pi_G(s) + P^*(s)$ to $\Pi_G(s)$, while lowering the insiders' net payoff from $\Pi_L(s) - P^*(s)$ to $\Pi_L(s)$. Although $\Pi_L(s) - P^*(s) > 0$, it is possible that $\Pi_L(s) < 0$, in which case an equilibrium sale price does not exist at the given value of s. Thus, the side condition in (19) is needed.

2.3 The Policy Stage

At this stage the government chooses s to maximize $\Pi_G(s)+\hat{P}(s)$, anticipating how behavior depends on s in the sale and restructuring stages. As the NNPC may or may not bind, using (16), we have

$$\begin{aligned} \Pi_G(s) + \hat{P}(s) &= (1-\alpha)[\Pi_L(s) + \Pi_G(s)] = (1-\alpha)N(s) \text{ if } \hat{P}(s) = P^*(s); \qquad (20) \\ &= \Pi_G(s) \quad \text{if } \hat{P}(s) = 0. \end{aligned}$$

3 The Rationale for MEBO Privatization

We first analyze the outcome of the game when bargaining is unconstrained, so that both insiders and the state can accept any price, including a negative one. Under these circumstances, the following proposition holds.

Proposition 1 *For insider privatization, if price P is unrestricted in sign, the optimum ownership share for the government to sell is $\hat{s} = 1$.*

For the sale and restructuring stages taken together, its expected net revenue is $(1-\alpha)N(s)$, and hence the government wants to maximize $N(s)$. We have seen that insiders set l such that $R_l > 0$ and also that $dl/ds > 0$, so that $dR/ds > 0$. Setting $s = 1$ maximizes R for $s \in \Omega$. Since the insiders would only choose to add increments to l for which the resulting increase in total revenue exceeds that of expected alternative income, $N(s)$ is thus maximized; that is, $s = 1$ maximizes N (irrespective of the value of α).

Proposition 1 is illustrated in Figure 1 for $\alpha = .5$. From (3), (5) and (13),

$$\frac{d\Pi_L(s)}{ds} = R - k > 0; \qquad \frac{d^2\Pi_L(s)}{ds^2} = \frac{-R_l^2}{sR_{ll}} > 0 \qquad (s \in \Omega). \tag{21}$$

For $s \geq s_m$, Π_L is increasing in s for two reasons. First, the insiders' share of $R - k$ rises. For given R, $\Pi_L(s)$ thus would have a constant positive slope. Second, since $dl/ds > 0$, R is increasing in s, and this gives $\Pi_L(s)$ positive curvature.

From (3), (5), (13), and (14),

$$\frac{d\Pi_G(s)}{ds} = -(R-k) + \frac{A}{s}\frac{dl}{ds}, \qquad \frac{d^2\Pi_G(s)}{ds^2} = \frac{-y}{s^2}\frac{dl}{ds} + \frac{A}{s}\frac{d^2 l}{ds^2} \qquad (s \in \Omega), \tag{22}$$
$$\text{where } A \equiv (1-s)\xi w^p + (1-\xi)b.$$

A higher value of s has conflicting effects on $\Pi_G(s)$. Since the state's share of any given level of $R-k$ is smaller, $\Pi_G(s)$ is negatively affected. However, the higher s causes l to be greater, both raising R and reducing expected total unemployment benefit, with a positive effect on $\Pi_G(s)$. Provided R_{lll} does not take a relatively large positive value, $d^2\Pi_G(s)/ds^2 < 0$.[8] We assume this curvature for illustrative purposes, but it is not required for our propositions.

[Figure 1 about here]

[8] $\Pi_G(s)$ does not necessarily have a turning point in the range $s \in \Omega$. From (6), $d^2l/ds^2 = [R_l R_{ll} - (R_{ll}^2 - R_l R_{lll})s(dl/ds)]/(sR_{ll})^2$. If $R_{lll} < 0$, $d^2l/ds^2 < 0$. For the assumption that $d^2\Pi_G(s)/ds^2 < 0$ to be violated d^2l/ds^2 would have to take a sufficiently large positive value (see (22)). For this, R_{lll} would have to take a relatively large positive value.

From the definition of s_m, $\Pi_L(s_m) = -\Pi_G(s_m)$. Our illustration is for $s_m > \bar{s}$.[9] Using (16), $P^*(s_m) = \Pi_L(s_m)$, while the $P^*(s)$-curve cuts the s-axis where $\Pi_L(s) = \Pi_G(s)$. Note that $P^*(s) \gtreqless 0$ and is not monotonic in s. The value of s at which $P^*(s) = 0$ is denoted by s_0. We also plot the government's objective function at the sale stage, $\Pi_G(s) + P$, which, for $P = P^*(s)$ and $\alpha = .5$, becomes $.5N(s)$. This has positive slope and passes though the $\Pi_L(s)$:$\Pi_G(s)$ intersection. When the government sets the optimum value $s = 1$, the corresponding price, $P^*(1)$, is positive as drawn. We could instead have drawn the $\Pi_G(s)$-curve lying above the $\Pi_L(s)$-curve at $s = 1$, in which case $P^*(1) < 0$; that is, the solution then involves selling the firm at a negative price.

For $s = 1$, l is given by (5), and the equilibrium price $P^*(1)$ is independent of the initial number of insiders L.[10] If, therefore, a positive increment is added to L, all of this increment will be lose their jobs, irrespective of whether the firm is privatized or operates as an SOE, and the *net* payoff for the insiders is unaffected. Similarly, although, when L is greater, the government expects to pay out more in unemployment benefit, the additional expected payments are the same if the firm is privatized as if the firm remains an SOE, so that the net payoff for the government is unaffected. Hence, although a firm in which L is greater can be regarded, *ceteris paribus*, as needing more restructuring, this has no effect on the

[9] If $\Pi_L(s_m) < 0$ it is possible that, unlike in the case depicted in Figure 1, $P^*(s)$ will intersect the s-axis twice for $s \in \Omega$. However, this does not affect our conclusions.

[10] The effect on $P^*(1)$ of variation of k, ξ, w^p, b or w^s can be of either sign. The sign of $dP^*(1)/dk$ is the same as that of $R_k - 1$: if, for example, $R_k > 1$, the firm having 'too little' capital, an increment to the capital stock is associated with a higher price $P^*(1)$. Variation of ξ, w^p and b is discussed in the text. Variation of w^s affects l^s (see (10)), with repercussions that make $dP^*(1)/dw^s$ unclear in sign. However, from (16), $dP^*(1)/d(1-\alpha) > 0$: if the government's bargaining power is greater, it receives a higher price for the firm.

price $P^*(1)$ at which it is sold. Note, however, that since $dl/dL = 0$, 'restructuring,' whether measured by the number or by the proportion of insiders who lose their jobs, that is, by $L - l$ or $(L - l)/L$, respectively, is increasing in L.

We can also examine the effect of better 'outside opportunities' for insiders, as represented by a higher expected wage rate y (due to a higher value of ξ, w^p or b). This leads to a lower privatization price $P^*(1)$, because of a reduced willingness to pay for the firm. However, the effect on the government's net payoff through the endogenous variation of l must also be allowed for. From (5), $dl/dy = 1/sR_{ll} < 0$. A higher $\bar{w}$ causes insiders to set l lower, thereby reducing the government's net payoff $\Pi_G(1)$, and thus generating a higher price $P^*(1)$ from the Nash bargain. Hence, better outside opportunities may not lead to a lower price for the firm, though they are more likely to do so if employment l (and thus restructuring, as measured by $L - l$ or $(L - l)/L$) is not much affected.

4 A Non-Negative Price Constraint

If the government faces a NNPC, there may be significant implications for the choice of s, even if $P^*(1) > 0$. We start with some definitions. Consider Ω, the set of s-values for which, without a NNPC, privatization is feasible. We partition Ω into subsets Ω^u, Ω^c and Ω^n. Ω^u is the set of s-values for which $P^*(s) > 0$, that is, the NNPC does not bind. Ω^c is the set for which both the NNPC binds and $\Pi_L(s) \geq 0$, so that (19) holds. Ω^n is the set for which the NNPC binds, but $\Pi_L(s) < 0$, so that sale does not occur. Denote the value of s that maximizes $\Pi_G(s)$ over Ω^c by s^c, that is,

$$s^c = \arg\max_{s\in\Omega^c} \Pi_G(s). \tag{23}$$

With the NNPC included in the model, the optimal value of s for the government may fall below unity, in which case the firm is sold for a zero price, as stated in the following proposition. This is the same result as obtained by Bennett, Estrin and Maw (2005, Proposition 3)) for the simpler case of outsider privatization.

Proposition 2 *For insider privatization in the presence of a NNPC, provided $\Omega^n \neq \Omega$, the optimum value of s for the government is $\hat{s}$, where (i) if $\alpha\Pi_G(s) > (1-\alpha)\Pi_L(s) \forall s \in \Omega$, then $\hat{s} = s^c$ and $\hat{P}(\hat{s}) = 0$; (ii) if $\alpha\Pi_G(s) \leq (1-\alpha)\Pi_L(s)$ for some but not all $s \in \Omega$, then $\hat{s} = s^c$ and $\hat{P}(\hat{s}) = 0$, or $\hat{s} = 1$ and $\hat{P}(\hat{s}) = P^*(1) \geq 0$; (iii) if $\alpha\Pi_G(s) \leq (1-\alpha)\Pi_L(s)$ $\forall s \in \Omega$, $\hat{s} = 1$ and $\hat{P}(\hat{s}) = P^*(1) \geq 0$.*

Part (i) of the proposition applies when the NNPC binds for all $s \in \Omega$; part (ii) applies when the NNPC binds for some, but not all, $s \in \Omega$; and part (iii) applies when the NNPC never binds, so that the analysis of Section 3 holds.

Part (ii) of the proposition is perhaps the most interesting. Consider Figure 1 again. Here, neither Ω^u nor Ω^c is empty. For $s \in \Omega^u$, the government maximizes $.5N(s)$, setting $s = 1$, so that $\tilde{P} = P^*(1) \geq 0$; while, for $s \in \Omega^c$, it maximizes $\Pi_G(s)$, setting $s = s^c$, so that $\hat{P} = 0$. We therefore obtain the value of the government's maximand over all $s \in \Omega$, which is shown by the vertical co-ordinate of $\Pi_G(s)$ for $s^c \leq s < s_0$, and by the vertical co-ordinate of $.5N(s)$ for $s_0 \leq s \leq 1$. The government will compare $.5N(1)$ with $\Pi_G(s^c)$; that is, it will compare the vertical co-ordinates of points A and B. As drawn, B is higher than A, so that $s = s^c$ is chosen, though if A were higher than B, $s = 1$ would be chosen.[11]

[11] If the alternative to privatization were liquidation, our general conclusions would still hold. T_L and T_G would change, but, in diagrammatic terms, all that would happen is that the $\Pi_L(s)$- and $\Pi_G(s)$-curves would

Thus, the government may gain from retaining partial ownership and 'selling' the rest at a zero price - even if it could obtain a positive price by instead selling off the entire ownership. By choosing a value of s such that the NNPC binds, there is an effect equivalent to a rise in the government's bargaining power. When the constraint binds for a given s, the price is pushed up to zero. The gains from making the NNPC bind can outweigh the advantages of a full sell-off for a positive price because a zero price is associated income for the government from its retained share ownership.

The factors conducive to the government choosing sale at a zero price are complex, largely because the value of s^c is endogenous. However, a government with lower bargaining power is more likely to sell for a zero price. If its bargaining power $1-\alpha$ is smaller, then, by setting $s=1$, in which case an unconstrained Nash bargain obtains, falls, the government's payoff falls. But its payoff from setting $s=s^c<1$, causing the NNPC to bind, is unaffected.

Also, the solution is independent of the size of the firm's endowment of insiders L. From (3), (9), (13), (17), and (20), note that $\Pi_G(s)$, $\Pi_L(s)$ and $\Pi_G(s)+P^*(s)$ are all independent of L. Therefore, if the NNPC binds, the government's chosen ownership share s^c is independent of L. A similar conclusion follows if the government can choose, through the value of s it sets, whether to make the NNPC bind. In terms of Figure 1, the vertical co-ordinates of points A and B are independent of L. Consequently, the relative merit of these two potential solutions is unaffected.

be displaced vertically. The propositions would be unaffected, but the values of s_0 and s^c would generally change. However, the government would always prefer continuation to liquidation because continuation is associated with lower total expected unemployment benefit payments.

As an example of the effect of the NNPC, suppose that demand for the firm's output is given by $p = 35 - q$, the production function is $q = l^{0.75}k^{0.25}$, and $k = 100$, $w^p = 10$, $w^s = 9$, $b = 2$, $\xi = .5$ and $\alpha = .5$. The relevant curves are then similar to those shown in Figure 1: the government could set $s = 1$ and get a positive price, but since point B is above point A it sets $s = s^c$, which here takes the value .8. If, however, the value of α were reduced below .32 the solution would be $s = 1$, a positive price being obtained.

We can also comment on the relative amounts of restructuring undertaken with partial state ownership and with 100% sale. Consider the situation in Figure 1. Since $dl/ds > 0$, employment l is greater when the government sells all ownership than if it retains a share. Hence, restructuring, as measured by either $L - l$ or $(L - l)/L$, is greater when the firm is sold for a zero price.

5 Privatization Increases Labor Efficiency

Suppose that the number of efficiency units supplied by any given number of individuals l employed in the firm is increasing in s. This effect may occur, especially in insider-controlled firms, because of the incentive that a larger ownership share gives for greater work effort or for effective mutual monitoring (Jones and Svejnar, 1985). Specifically, let

$$q = Q[\beta(s)l(s), k]; \qquad Q_1, Q_2 > 0; \quad Q_{11}, Q_{22} \leq 0, \tag{24}$$

where $\beta(s)$ is a shift parameter such that $\beta'(s) > 1 \; \forall s \in \Omega$. The first-order condition (5) still holds, though now $R_l \equiv \partial R[\beta(s)l(s), k]/\partial l$. We therefore obtain

$$\frac{dl}{ds} = \frac{l}{s}\left[\frac{1 + \epsilon(s)}{\beta(s)\gamma(s)} - \epsilon(s)\right], \tag{25}$$

where $\epsilon(s) \equiv s\beta'(s)/\beta(s)$ is the elasticity of the efficiency parameter $\beta(s)$ with respect to s, and $\gamma(s) \equiv -R_{ll}l/R_l$.

If labor efficiency is independent of s, $dl/ds > 0$. When, however, $\beta'(s) > 1$, a greater value of s is equivalent in (24) to a higher level of l. Given that the marginal revenue product of labor is diminishing, if insiders ignored this effect on β they would set l past the level that maximizes $E_L(s)$. Hence, the effect of labor efficiency being positively related to s is that when s is greater, insiders either do not raise l so far or, if $\gamma(s)$ or $\epsilon(s)$ is large enough, they set l at a lower level. However, (17) still holds and so, using (20) and (24),

$$\frac{d[\Pi_G(s) + P^*(s)]}{ds} = \frac{1}{2s}\left\{[\xi w^p(1-s) + (1-\xi)b]\frac{dl}{ds} + \frac{w^s l\epsilon(s)}{s}\right\}. \tag{26}$$

Using (26), our propositions are found to generalize to this case.

Proposition 3 *Propositions 1 and 2 continue to hold when private ownership has a positive effect on labor efficiency,*

Proposition 1 still holds because, although dl/ds may be negative for some $s \in \Omega$, the right-hand side of (26) is positive. In the absence of a NNPC, $\beta(s)$ is maximized over $s \in \Omega$ by setting $s = 1$. If l were fixed, this might cause the firm's marginal revenue to be negative, thereby restricting the government's expected revenue. However, a negative marginal revenue is avoided because insiders adjust l endogenously in their own interests. If Proposition 1 holds, Proposition 2 follows, though the existence of the efficiency effect $\beta(s)$ generally alters the values of s^c and s_0. Thus, although the efficiency effect is greater for $s = 1$ than $s = s^c$, the government may nonetheless gain by setting $s = s^c$ and selling the firm for a zero price.

6 Conclusions

We have analyzed the choice of privatization method for insider-dominated firms, and have tried to understand why the governments of the transition economies might have chosen to distribute their assets at a zero price, despite their extensive budgetary needs, when a revenue-enhancing alternative method of privatization was available. We have assumed that it would not have been possible for a government in a recently-established democracy, whose political legitimacy was tenuous, to pay insiders to take state-owned firms off its hands. Using this assumption, we have shown that circumstances exist in which, by giving some of the shares away at a zero price, a government can exploit this political feasibility constraint to improve its bargaining position; it thereby raises the revenue it obtains from the privatization process.

The intuition behind the result is as follows. If the Nash bargain is unconstrained, the government's payoff is a fixed share of the surplus generated by the bargain. Since the surplus is increasing in the private share, the government always prefers to sell its entire ownership share. However, when a non-negative price constraint is added to the bargain, a different, second-best, solution may obtain. The greater the ownership retained by the government, the less the insiders will be willing to pay. Suppose that if the entire ownership stake were sold, the bargain would yield a positive price while, if the government retained some ownership share, the price would be negative and so the constraint would bind. Realizing this, the government may choose to sell only part of the shares, in which case, since the non-negative price constraint is invoked, these shares are distributed free. The effect is analogous to an increase in the government's bargaining power. Since the government receives profit distributions from its retained ownership share, the overall revenue it earns from the privatization may exceed the amount that would acrrue if the entire ownership stake were sold.

Our framework predicts that mass privatization will be associated with retained state shareholdings, and several explanations already exist for that phenomenon in the literature. The closest to the one we provide relates to the stock-flow constraint (Sinn and Sinn, 1991; Demougin and Sinn, 1994). The argument is based on the limited ability of agents to pay for the stock of firms being privatized, because private wealth accumulation was severely restricted under communism. Non-cash payment, in the form of giving the government some shares, is regarded as a way of expediting the privatization program. Whereas a non-negative price constraint imposes a lower bound on the price at which a firm is sold, the stock-flow constraint places an upper bound so that, as in our model, when the constraint binds, a second-best solution obtains, with partial state ownership. However, the approach is less general than ours. While the stock-flow constraint suggests that prices may be relatively low, it does not provide a rationale for mass privatization, nor does it suggest that partial state ownership and mass privatization will be associated. The approach also does not give a role to some key elements in the privatization process, such as the government's bargaining power.

Our approach generalizes the political economy explanations of mass privatization in the literature, such as that of Boycko, Shleifer and Vishny (1995), which hinges on the view that mass privatization was required in order quickly to break the links between the state and firms, and to commit the managerial class to reform. We have shown that this objective could be achieved without undermining the government's revenue objectives. Moreover, our model suggests that mass privatization will be associated with retained state shareholding, a phenomenon not obviously consistent with the desire to break the links between the enterprise sector and the state.

Our model predicts that the private ownership share will be less than unity when mass privatization occurs. In fact, there is some evidence that in the transition economies the state has continued to hold shares in the companies that it has privatized, despite the declared objective of cutting the links between the enterprise sector and the state. For example, in Russia, which used mass privatization, the state only sold its entire stake in less than half of all privatized firms. It retained a more than 20% share in 37% of privatized firms, and a more than 40% share in 14% of them (Commander *et al.*, 1996). Further empirical work is needed to test the empirical validity of the propositions.

Appendix: Proofs

Proposition 1. Assume that Ω is not empty. From (17) and (20), $\Pi_G(s) + P^*(s) = (1-\alpha)N(s)$. Since $dN(s)/ds > 0$ for $s \in \Omega$, $d[\Pi_G(s) + P^*(s)]/ds > 0$. The proposition follows.

Proposition 2. (i) Ω^u is an empty set. Given that $\Omega^n \neq \Omega$, Ω^c is non-empty. $\alpha\Pi_G(s) > (1-\alpha)\Pi_L(s)\forall s \in \Omega^c \Rightarrow \hat{P}(s) = 0 \forall s \in \Omega^c$. Therefore $\Pi_G(s) + \hat{P}(s) = \Pi_G(s) \forall s \in \Omega^c$, so that, from (23), $\hat{s} = s^c$.

(ii) Neither Ω^u nor its complement is empty; but Ω^c or Ω^n may be empty. If Ω^c is not empty then for any $s \in \Omega^c$, $\hat{P}(s) = 0$, so that, from (23), s^c maximizes $\Pi_G(s) + \hat{P}(s)$ over Ω^c. If $P^*(1) \geq 0$, then, for any $s \in \Omega^u$, Proposition 1 holds, and so $arg\ max_{s \in \Omega^c}[\Pi_G(s) + \hat{P}(s)] = 1$. We show in the text by example that either $s = s^c$ or $s = 1$ may make $\Pi_G(s) + \hat{P}(s)$ greater. If $P^*(1) < 0$, Proposition 1 cannot apply. From (16), $(1 - \alpha)\Pi_L(1) - \alpha\Pi_G(1) < 0$, and so $(1 - \alpha)[\Pi_L(1) + \Pi_G(1)] < \Pi_G(1) \leq maximum \Pi_G(s)$. Therefore, provided Ω^c is not empty, $\tilde{s} = s^c$ and $\tilde{P} = 0$. To establish Ω^c is not empty, note that since $\exists\ s \in [s_m, 1)$ such that $\alpha\Pi_G(s) \leq (1 - \alpha)\Pi_L(s)$, while $N(s) = \Pi_L(s) + \Pi_G(s) \geq 0 \forall s \in \Omega$, at these values of s $\Pi_L(s) \geq 0$. But $d\Pi_L(s)/ds > 0$. Hence, $\Pi_L(1) > 0$, and, since $P^*(1) < 0$, Ω^c is not empty.

(iii) If $\alpha\Pi_G(s) \leq (1 - \alpha)\Pi_L(s)\ \forall s \in \Omega$ the NNPC never binds, so Proposition 1 holds.

Proposition 3. Using (3) and (25) to eliminate b and dl/ds, the r.h.s. of (26) becomes $[(\bar{w}/s)(1 + \epsilon) - \xi w^p(1 + \epsilon - \epsilon\beta\gamma)]l/2s\beta\gamma$. Using (3), this is positive, so the government maximizes s on Ω, Proposition 1 holding. Proposition 2 follows.

References

Bennett, J., Estrin, S., Maw, J., 2005. Why did transition economies mass privatize?' Journal of the European Economic Association Papers and Proceedings, forthcoming.

Berg, A., Sachs, J., 1992. Structural adjustment and international trade in Eastern Europe: the case of Poland, Economic Policy, 14, 117-73.

Blanchard, O., 1997. The Economics of Post-Communist Transition, Clarendon Press, Oxford.

Blanchard, O., Dornbusch, R., Krugman, P., Layard, R., Summers, L., 1990. Reform in Eastern Europe. MIT Press, Cambridge, MA.

Blasi, J., Kroumanova, M., Kruse, D., 1997. Kremlin Capitalism. Cornell University Press, Ithaca.

Bolton, P., Roland, G., 1992. Privatization in Central and Eastern Europe. Economic Policy, 15, 276-309.

Bonin, J., Jones, D., Putterman, L. 1993. Theoretical and empirical studies of producer cooperatives: will ever the twain meet?, Journal of Economic Literature, 31, 1290-320.

Bös, D.,1993. Privatization in East Germany, in Vito Tanzi, (Ed.), Transition to Market, IMF, Washington D.C.

Boycko, M., Shleifer, A., Vishny, R., 1995. Privatizing Russia. MIT Press, Cambridge, Mass., and London.

Commander, S., Fan, Q., Schaffer, M., 1996. Enterprise Restructuring and Economic Policy in Russia. The World Bank, Washington D.C.

Demougin, D., Sinn, H.-W., 1994. Privatization, risk-taking and the communist firm. Journal of Public Economics, 55, 203-231.

Earle, J., Estrin, S., 1996. Employee ownership in transition, in: Frydman, R., Gray, C.W., Rapaczynski, A., (Eds.), Corporate Governance in Central Europe and Russia, Volume 2: Banks, Insiders and the State. Central European University Press, Budapest, pp. 1-61.

Estrin, S., 2002. Competition and corporate governance in transition, Journal of Economic Perspectives, 16, 1, 677-691.

Estrin, S., Wright, M., 1999. Corporate governance in the former Soviet Union: an overview, Journal of Comparative Economics, 27, 398-421.

European Bank for Reconstruction and Development (EBRD). Transition Report, various years. EBRD, London.

Jones, D., Svejnar, J., 1985. Participation, profit sharing, worker ownership and efficiency in Italian producer cooperatives, Economica, 52, 449-65.

Meade, J., 1972, The theory of labour-managed firms and profit sharing, Economic Journal, Supplement, 82, 402-28.

Megginson, W. L., 2005, The Financial Economics of Privatization. Oxford University Press, Oxford.

Roland, G., 2000, Transition and Economics: Politics, Markets and Firms. MIT Press, Cambridge, MA.

Prasnikar, J., Svejnar, J., Mihaljek, D., Prasnikar, V., 1994. Behavior of participatory firms in Yugoslavia: lessons for transforming economies, Review of Economics and Statistics, 76, 728-741.

Sinn, G., Sinn, H.-W., 1991, Kaltstart, Tübingen: J.C.B.Mohr (Paul Siebeck). English translation, Jumpstart. MIT Press, Cambridge, Mass.,1993.