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Private Sector Development in State-Dominated Economies

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Abstract

The development of a competitive private sector is widely viewed as a central element in the economic transformation of central and eastern Europe. Despite significant reforms in these economies, however, state enterprises continue to produce a substantial share of output. This paper considers how the profitability of private firms is affected by the size of the state-owned sector. Closures that result in a decrease in the number of state-owned firms reduce total industrial output in the short run, but encourage the entry of private firms into the industry in the longer run and lead to an increase in total output. Policies that result in a depreciation of the real exchange rate or an improvement in the efficiency of credit markets will tend to increase output in the short run, but their effect may be attenuated in the long run.

JEL Classification Numbers:
P42, L20, L32, D21

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I. Introduction

A centerpiece of the economic transformation of central and eastern Europe is the expansion of the private productive sector. This includes not only the privatization of state-owned enterprises (SOEs), but also the removal of controls in order to encourage the establishment of private sector firms and allow them to respond to market signals. For a variety of reasons, however, SOEs cannot be turned over to the private sector all at once, and the development of the private sector can be of critical importance even while state ownership of part of the productive sector continues. An important question to ask, then, is how the presence of SOEs in an economy affects the behavior and competitiveness of private firms. In attempting to address this issue, the aspects of SOE behavior that impact on private firms must be identified.

A prominent characteristic of SOEs in former centrally planned economies is the "soft budget constraint"--SOEs are kept alive by subsidies when receipts from the sale of their output fail to cover the total cost of inputs. 1/ While the rhetoric about "hardening" state enterprises' budget constraints is familiar in central and eastern European countries, it is not easy for governments to confront the political consequences of shutting down large SOEs. Such action would be even less likely if adverse shocks were widespread and necessitated the simultaneous closure of a large number of firms.

Analytical work on the behavior of SOEs facing soft budget constraints has argued that these firms tend to over-employ factors of production relative to private firms that cannot rely on state assistance or intervention. Goldfeld and Quandt (1988), for example, present a model in which SOEs can increase the probability of a bailout by employing a specific factor devoted to lobbying government agencies. The use of this factor raises the optimal level of employment of other factors of production as well. Hillman, Katz, and Rosenberg (1987) relate the probability of a government bailout to the quantity of labor employed by the firm. This induces additional employment of labor and, under certain circumstances, capital. Viewing this problem from a different angle, Farmer (1984) argues that the possibility of bankruptcy induces risk-neutral firms to employ fewer inputs than the level that would maximize expected operating profits. Hence, firms that face the possibility of bankruptcy choose to purchase fewer inputs than firms that rely on the government to protect them from having to shut down. 2/

1/ State support for SOEs is also common in developed market economies, as well as in developing countries. The analysis here also applies to these cases, especially in economies where SOEs produce a significant share of total output.

2/ See also Goldfeld and Quandt (1990) and Hardy (1992) for models that capture excessive employment of inputs by SOEs.

Whatever the underlying cause, overemployment of, or excessive demand for, factors of production by SOEs raises the market price of such factors, thereby affecting the competitiveness and profitability of private firms that also employ these factors. For example, excessive employment of skilled labor by SOEs raises the wage that private firms must pay to hire skilled workers, thereby eroding private firms' profit margins.

The model presented in this paper captures precisely this effect. Both SOEs and private firms use a homogeneous nontraded factor to produce a single homogeneous good that is traded on world markets at a given price. Input employment choices of both private firms and SOEs are analyzed and linked through the market for inputs. Excessive employment of inputs by SOEs reduces the competitiveness of private firms by raising input costs relative to output prices. The loss in competitiveness reduces both the scale of operation of firms that are already in the industry and the number of new private firms that choose to enter the market. The larger the state sector, the greater the negative impact on the competitiveness of private firms. The analysis in this paper describes the process by which SOE closures that result in a decrease in the number of SOEs in the industry, while reducing total output in the short run, induce the entry of private firms into the industry in the long run and result in an increase in total industrial production.

The framework developed here also allows for an interesting analysis of the impact of changes in the real exchange rate and the degree of credit market development on the external competitiveness of the private sector. To the extent that financial policies can be designed to bring about a sustained depreciation of the real exchange rate or to improve the efficiency of credit markets, such policies will have a different effect on the private sector than on SOEs. It turns out, however, that while such potential policy-induced changes have a positive short-run impact on output, the long-run effect is unclear.

The remainder of this paper is organized as follows: Sections II and III describe the optimal input choices of private firms and SOEs, respectively. Section IV describes input supply. Equilibrium in the input market is discussed in Section V, and Section VI contains an analysis of industry size. The effects of a change in the real exchange rate are discussed in Section VII, while Section VIII is devoted to credit market developments. Conclusions are presented in Section IX.

II. The Private Firm

An entrepreneur who is faced with the opportunity of launching a private firm into productive activity must first pay a fixed cost C to enter

the market. 1/ Once the firm is established, the entrepreneur must choose the optimal level of inputs (I) to employ. For the moment, suppose that inputs cost w per unit. 2/ Inputs are assumed to be a nontraded factor of production. 3/ The production technology is described by the three times continuously differentiable concave function $f(\cdot)$, which satisfies the Inada conditions, and $f(0) = 0$. The firm's output is sold on world markets at the price P which is uncertain at the time the entrepreneur chooses the firm's input level. P is assumed to vary within the interval $[\underline{P},\bar{P}]$ and has a probability density function h(P) and mean $\hat{P}$ (normalized to unity for convenience).

The entrepreneur pays for inputs at the start of the production process. Once output has been produced and the world market price observed, the firm earns profits if operating revenue is sufficient to cover costs. If revenue falls short of costs, however, the firm must declare bankruptcy and shut down. Bankrupt firms, of course, cannot continue to produce in future periods, and their owners must pay the entry cost C again if they wish to reenter the market.

Once a firm has entered the industry, it must choose its optimal utilization of inputs to maximize its stream of profits. Expected operating profit ($E\{\pi^O\}$) in the current period is:

$$E\{\pi^O(I)\} = \left[\int_{\underline{P}}^{\bar{P}} Ph(P)dP\right] f(I) - wI \quad . \tag{1}$$

For a given chosen volume of inputs I, the firm earns positive profits if and only if the realized world market price is above P_b, where:

$$P_b(I) = \frac{wI}{f(I)} \quad . \tag{2}$$

1/ C may be interpreted as the cost of purchasing the firm's capital stock, which is firm-specific and has no scrap value.

2/ All variables are in real terms. Input supply and input market interactions are analyzed below. Each firm takes w as given, but in equilibrium w equates input demand with supply.

3/ Labor, particularly skilled labor, serves as a good example of a nontraded factor of production. In addition, the analysis can also apply to manufactured intermediate goods. Distortions associated with the intermediate goods market are beyond the scope of this paper; they are analyzed in Husain and Sahay (1992).

If the world market price of the output falls below P_b, the firm must declare bankruptcy and shut down. 1/ Hence, P_b may be interpreted as the bankruptcy price, and the assumption of strict concavity, together with $f(0) = 0$, ensures that P_b increases as I is increased. The probability of bankruptcy, then, is:

$$pr(I) = Prob(P < P_b(I)) = \int_{\underline{P}}^{P_b} h(P)dP = 1 - \int_{P_b}^{\bar{P}} h(P)dP \quad . \tag{3}$$

Note that pr(I) increases monotonically in I over the unit interval. It is further assumed that $pr''(I) > 0$. 2/

As long as the actual world market price is greater than the bankruptcy price, the firm not only earns profits in the current period but also retains the option of producing and earning profits in future periods. The probability of remaining in the industry--that is, the probability of not going bankrupt--depends on the firm's input choice in the current period. The optimization problem of a private firm that maximizes its expected total profit stream ($E\{\pi\}$) may be expressed as:

$$\max_I \; E\{\pi(I)\} = E\{\pi^O(I)\} + [1 - pr(I)]V \quad , \tag{4}$$

where V is the value of expected future profits. 3/

1/ Private firms are assumed to be able to meet their immediate costs in the event of bankruptcy. Relaxing this assumption would make the comparison with SOEs more complex. Suppliers of inputs, for example, would demand a higher price from private firms than from SOEs in order to compensate for the possibility of nonpayment, or partial payment. The effect of SOEs on the input cost faced by private firms, however, would still be similar to what is captured here.

2/ Conditions under which this holds are derived in the Appendix. The assumption allows us to capture a "bankruptcy aversion" effect that induces a private firm to choose a lower input level than it would if it were unconcerned about bankruptcy. The purpose here is to use this effect to distinguish between private firms and SOEs, and to study their responses to policy changes.

3/ For simplicity, future profits are not discounted in this formulation. All the results presented here can easily be replicated for discount rates within the interval (0,1].

Competition ensures that the value of the stream of expected future profits in any period is exactly equal to the fixed cost of entry (C). Thus, V may be replaced by C in expression (4), and the maximized value of (4) is also equal to C. In a competitive equilibrium, then, (4) simplifies to: 1/

$$f(I) - wI - pr(I)C = 0 \quad . \tag{5}$$

Expression (5) may be interpreted as a zero profit condition.

Turning back to the firm's optimization problem (4), the optimal input choice (I_V) of a private firm satisfies the first order condition:

$$f'(I_V) = w + pr'(I_V)C \quad . \tag{6}$$

The firm equates the expected marginal value product with the (constant) marginal cost of inputs plus the marginal expected loss associated with bankruptcy.

Simple comparative statics analysis of expression (4) indicates that the demand for the factor of production (I_V) is decreasing in w and C. 2/ As expected, the quantity of inputs required to maximize expected profits declines as the cost of inputs rises. Also, a larger entry cost--and hence the cost of foregone future profits in the event of bankruptcy--reduces the quantity of inputs demanded. A private firm's optimal input choice, then, may be expressed as a decreasing function of w and C:

$$I_V = \phi(w,C) \quad . \tag{7}$$

III. The State-Owned Enterprise (SOE)

State-owned enterprises are assumed to behave in a manner identical to private firms, except in one respect: firms owned by the state face a soft budget constraint--they are bailed out by the state if they fail to make

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1/ Recall that the expected value of P is normalized to unity.
2/ These derivations are relegated to the Appendix.

non-negative operating profits. 1/ Thus managers of SOEs do not face the possibility of bankruptcy and choose inputs to maximize expected profits: 2/

$$\max_{I} \; E\{\pi_S\} = \left[\int_{\underline{P}}^{\bar{P}} Ph(P)dP\right] f(I) - wI \quad . \tag{8}$$

The optimal input choice (I_S) of a SOE satisfies:

$$f'(I_S) = w \quad . \tag{9}$$

As in the case of private firms, an increase in the cost of inputs (w) reduces the SOE's input demand. The SOE's input choice may be expressed as a decreasing function of w:

$$I_S = \phi(w,0) \quad . \tag{10}$$

Factor employment by SOEs can be compared to that by private firms through conditions (4) and (6). The possibility of bankruptcy and the associated loss of future profits induces private firms, for a given input price, to demand a smaller quantity of inputs than SOEs.

IV. Factor Supply

The next step in completing the picture of this industry is a description of the input market. Having derived the demand for inputs by firms, we now turn to input supply. Assume that the function $I^S(w)$ describes the supply of inputs for a given price w, and that I^S is strictly increasing in w. The equilibrium price of inputs equates supply with

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1/ SOEs need not produce the same good as private firms, although this assumption is made here for convenience. The results derived below continue to hold as long as both types of firms experience similar shocks and use the same inputs.

2/ This assumption allows for a simple yet appealing analysis of the behavior of SOEs. Managerial inefficiencies that induce excessive employment of inputs could also be added to the framework.

demand. If there are m SOEs and n private firms in the industry, equilibrium requires: 1/

$$I^S(w) = I^D(w,C) = mI_S(w) + nI_V(w,C) \quad , \tag{11}$$

where I^D is total industry demand for inputs.

Holding fixed the number of private and public firms in the industry, an increase in the cost associated with bankruptcy (C) lowers market demand for the factor of production, thereby reducing its market clearing price (w). Similarly, holding C fixed a decrease in the number of firms, either public or private, results in a reduction in demand for inputs and lowers their equilibrium price.

V. The Industry

Equilibrium in this industry may be characterized by combining the first order conditions for profit maximization (expressions (6) and (9) for private firms and SOEs, respectively) with the input market clearing condition (11) and the zero profit condition (5). This yields a system of two equations in two unknowns--input cost (w) and the number of private firms (n):

$$\begin{aligned} n\,\phi(w,C) + m\,\phi(w,0) &= I^S(w) \\ f[\phi(w,C)] - w\,\phi(w,C) - pr[\phi(w,C)]C &= 0 \quad . \end{aligned} \tag{12}$$

The input price adjusts so that the input market clearing condition holds at every instant. The number of private firms in the industry, on the other hand, is fixed at any given moment. The zero profit condition, then, holds in the long run.

Figure 1 illustrates equilibrium in this industry. The panel on the right contains input supply and demand curves. The panel on the left traces out the input market clearing condition (labelled II) and the zero profit condition (labelled FF) for different combinations of w and n. An increase in the number of private firms increases input demand. To equate input supply with demand, the input cost must rise. Thus, the II curve slopes upward. The FF curve indicates that for a given number of SOEs in the

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1/ Note that since all private firms are identical, they all produce at the same scale. Similarly, all SOEs produce at the same scale. The scale of production of SOEs and private firms, however, differs.

industry (m) and given cost of entry of private firms (C), the level of w at which each private firm's profits exactly equal the fixed cost of entry does not depend on n. The intersection of the II and FF curves indicates the long run equilibrium input cost and number of private firms.

VI. Industry Size and the Number of SOEs

The model assumes that all SOEs are identical and takes the number of SOEs in the industry (m) as exogenous. The effect of an increase (or reduction) in m--brought about, for example, through government policy efforts--on the equilibrium number of private firms and the equilibrium input cost can be analyzed. In addition, the effect on total industrial output can also be gauged.

Totally differentiating the system of equations in (12), we obtain:

$$\begin{bmatrix} \Delta & \phi(w,C) \\ -\phi(w,C)\left[1 + \frac{P_b h(P_b) C}{w\,\phi(w,C)}\right] & 0 \end{bmatrix} \begin{bmatrix} \frac{dw}{dm} \\ \frac{dn}{dm} \end{bmatrix} = \begin{bmatrix} -\phi(w,0) \\ 0 \end{bmatrix} , \tag{13}$$

where

$$\Delta = n\,\phi_w(w,C) + m\,\phi_w(w,0) - I_w^S(w) \quad . \tag{14}$$

Substituting from expressions (6) and (9) and applying Cramer's rule, the effects of a change in m on w and n are:

$$\frac{dw}{dm} = 0 \quad \text{and} \quad \frac{dn}{dm} = -\frac{I_s}{I_v} < 0 \quad . \tag{15}$$

These results can also be illustrated graphically, as in Figure 2. In the short run, when the number of private firms is fixed and only w can adjust, the increase in m increases the industry's input demand, pushing up the equilibrium input cost. This short run effect is captured in the figure by the shift of the II curve to I'I' and the outward shift in input demand. The new short run equilibrium, then, moves from point A in both panels to point B. However, at this point all firms in the industry are making losses and, in the long run, private firms leave the industry until expected

Figure 1: Equilibrium

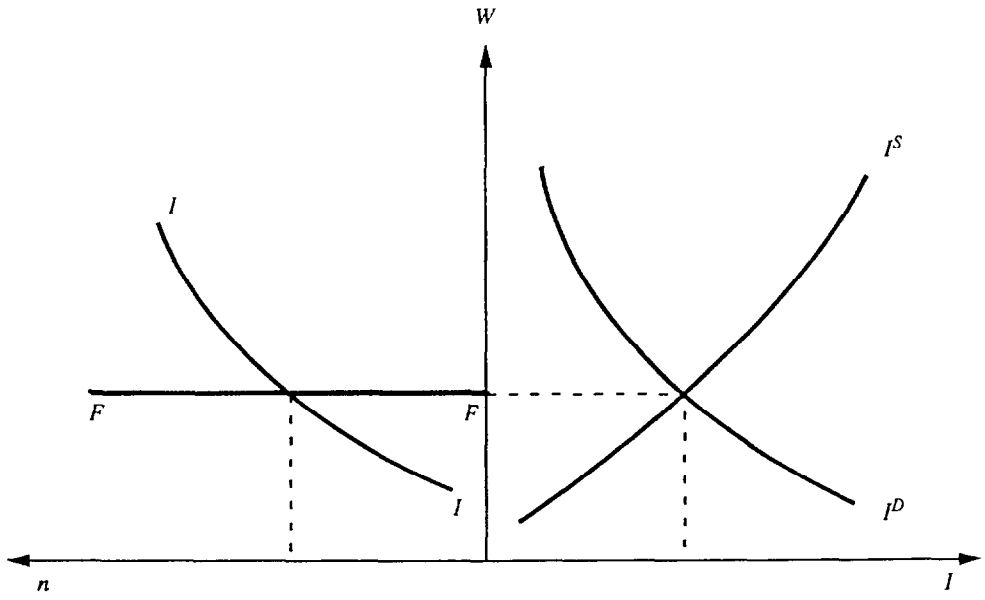
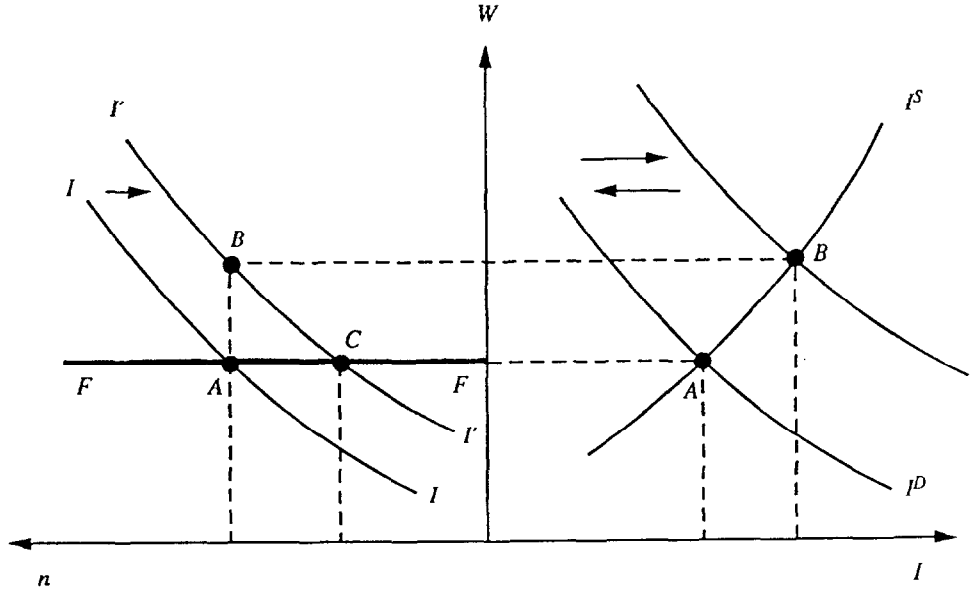


Figure 2: An Increase in the Number of SOEs



profits become nonnegative. 1/ The industry moves along the I'I' curve to point C. Input demand contracts because fewer firms remain in the industry and the long run equilibrium input price declines back to w.

The effect of a change in m on total industrial output (Q), where:

$$Q = n f(I_V) + m f(I_S) \quad , \tag{16}$$

is:

$$\frac{dQ}{dm} = f(I_V) \frac{dn}{dm} + \left[n f'(I_V) \frac{dI_V}{dw} + m f'(I_S) \frac{dI_S}{dw} \right] \frac{dw}{dm} + f(I_S) \quad . \tag{17}$$

In the short run, n is fixed and the sign of expression (17) depends on the elasticity of input supply and the concavity of the production function. If input supply is very elastic or if the marginal product of inputs is low, total industrial output increases in the short run in response to a rise in m. On the other hand, if input supply is inelastic or if the marginal product of inputs is high, industrial output declines in the short run.

In the long run, w does not change and expression (17) simplifies to:

$$\frac{dQ}{dm} = I_S \left[\frac{f(I_S)}{I_S} - \frac{f(I_V)}{I_V} \right] < 0 \quad . \tag{18}$$

This expression is negative since the average product of private firms, which employ fewer inputs than SOEs, is higher than that of SOEs. An increase (decrease) in the number of SOEs, then, unambiguously decreases (increases) total output of the industry in the long run.

VII. Real Exchange Rate Changes

A straightforward extension of the model facilitates analysis of the effect of an exogenous real exchange rate change on the external competitiveness of private firms. As before, the price of output (P) is uncertain when production decisions are undertaken, but the price now is in foreign currency units. If policymakers design a set of measures that

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1/ While the model does not formally address exit decisions of private firms, the reduction in n may be interpreted as a situation in which fewer new firms replace firms that shut down in response to a low price shock.

influence the level of the real exchange rate and these policies are implemented before input levels are chosen, how does the change in the real exchange rate influence the behavior of private firms? 1/

The expected domestic currency price of output is:

$$E\{eP\} = e\int_{\underline{P}}^{\bar{P}} Ph(P)dP = e\hat{P} = e \quad , \tag{19}$$

where e is the exchange rate (expressed in units of domestic currency per unit of foreign currency), and all price variables are as defined above, except that they are in units of foreign currency. Since all variables in the model are real quantities and prices, e is the equilibrium real exchange rate. Real depreciation of the domestic currency (an increase in e) in this model may be interpreted as a nominal depreciation in which input supply does not respond to the change in the nominal exchange rate.

Optimal input choices of private firms (I_V) and state-owned firms (I_S) obey the following conditions: 2/

$$ef'(I_V) = w + pr'(I_V)C \quad \Rightarrow \quad I_V = \phi\left(\frac{w}{e}, \frac{C}{e}\right) \tag{20}$$

$$ef'(I_S) = w \quad \Rightarrow \quad I_S = \phi\left(\frac{w}{e}, 0\right) \quad . \tag{21}$$

A real depreciation of the domestic currency raises the expected marginal value product of inputs, thereby increasing the demand for inputs by both types of firms. In addition, for a given input cost, a real depreciation also reduces the possibility that operating revenue falls short of costs,

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1/ The purpose here is not to discuss what policies lead to a depreciation of the equilibrium real exchange rate. Rather, the analysis has to do with the effects of such a depreciation. A discussion on the impact of various policy changes, including trade liberalization and fiscal reform, on the equilibrium real exchange rate may be found in Aghevli, Khan, and Montiel (1991).

2/ For analytical convenience, the fixed cost of entry (C) is assumed to be in foreign currency units. The results are similar even if C is partly or entirely denominated in home currency units.

hence reducing the probability of bankruptcy and inducing private firms to demand more inputs. 1/

The effects of a change in e on industry size, the number of private firms, and the equilibrium input cost may be analyzed by totally differentiating the modified system of equilibrium conditions (12) (with the exchange rate included):

$$\begin{bmatrix} \gamma & I_V \\ -I_V\left[1 + \frac{P_b h(P_b) C}{w I_V}\right] & 0 \end{bmatrix} \begin{bmatrix} \frac{dw}{de} \\ \frac{dn}{de} \end{bmatrix} = \begin{bmatrix} \omega \\ -f(I_V)\left[1 + \frac{P_b h(P_b) C}{e f(I_V)}\right] \end{bmatrix} , \tag{22}$$

where

$$\gamma = \frac{n}{e}\phi_w\left(\frac{w}{e}, \frac{C}{e}\right) + \frac{m}{e}\phi_w\left(\frac{w}{e}, 0\right) - I_w^S(w) \tag{23}$$

and

$$\omega = n\,\phi_w\left(\frac{w}{e}, \frac{C}{e}\right)\frac{w}{e^2} + m\,\phi_w\left(\frac{w}{e}, 0\right)\frac{w}{e^2} + n\,\phi_C\left(\frac{w}{e}, \frac{C}{e}\right)\frac{C}{e^2} . \tag{24}$$

The effects of a change in e on w and n are:

1/ Derivations of the change in optimal input choices of both private and state-owned firms are contained in the Appendix. It is shown, under fairly general assumptions about the production function and the probability density function of the (foreign) price level, that the increase in input demand by private firms in response to a real depreciation of the domestic currency exceeds that of public firms. This implies that the "bankruptcy effect"--the effect of a decline in the probability of bankruptcy--induces private firms to increase production in response to a real depreciation.

$$\frac{dw}{de} = \frac{f(I_v)}{I_v}\left[\frac{1 + \frac{P_b h(P_b)C}{ef(I_v)}}{1 + \frac{P_b h(P_b)C}{wI_v}}\right] > \frac{f(I_v)}{I_v} \qquad (25)$$

and

$$\frac{dn}{de} = \frac{-f(I_v)\gamma}{I_v^2}\left[\frac{1 + \frac{P_b h(P_b)C}{ef(I_v)}}{1 + \frac{P_b h(P_b)C}{wI_v}}\right] + \frac{\omega}{I_v} \overset{?}{\underset{<}{>}} 0 \quad . \qquad (26)$$

The gain in competitiveness (an increase in e) raises all firms' demand for inputs, thereby pushing up the market clearing price of inputs (w). The equilibrium number of private firms, however, may increase or decrease.

Figure 3 illustrates the case in which n increases. In the short run, the gain in competitiveness causes the input demand curve to shift away from the origin. In order for the input market to clear, the II curve must shift to I'I'. The short run equilibrium involves a move from points A to points B in the figure. Since the cost of bankruptcy declines relative to the output price and thereby induces private firms to employ more inputs, firms' profits increase and, in the long run, the zero profit condition holds at a higher level of w. Hence, the FF curve shifts up to F'F'. In the case illustrated in Figure 3, firms enter the industry in the long run, moving the equilibrium to points C.

Figure 4 illustrates the case in which the long run equilibrium number of private firms declines in response to a real exchange rate depreciation. This occurs when the "bankruptcy effect"--which induces private firms to increase input employment--is small. This may be represented graphically as a small shift of the FF curve. In this case the increased demand for inputs resulting from the gain in competitiveness pushes up the input price by so much that private firms exit the industry in the long run. Once again, the equilibrium moves from points A to points B in the short run, and to points C in the long run.

The effect of a real depreciation on total industrial output is:

Figure 3: Real Exchange Rate Depreciation
with an Increase in the Number of
Private Firms

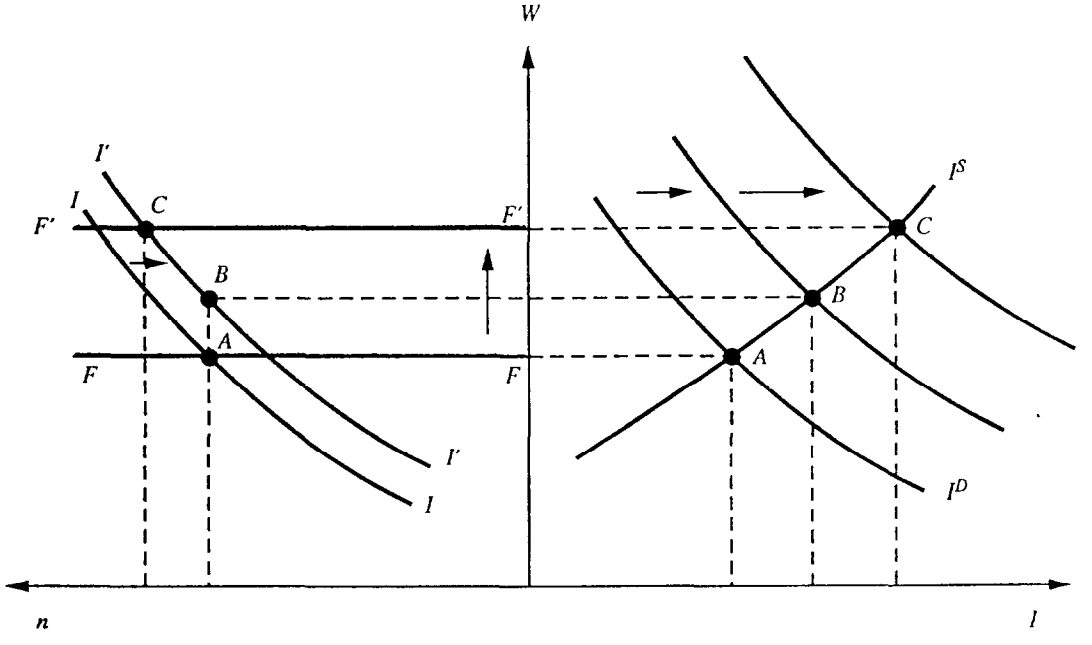
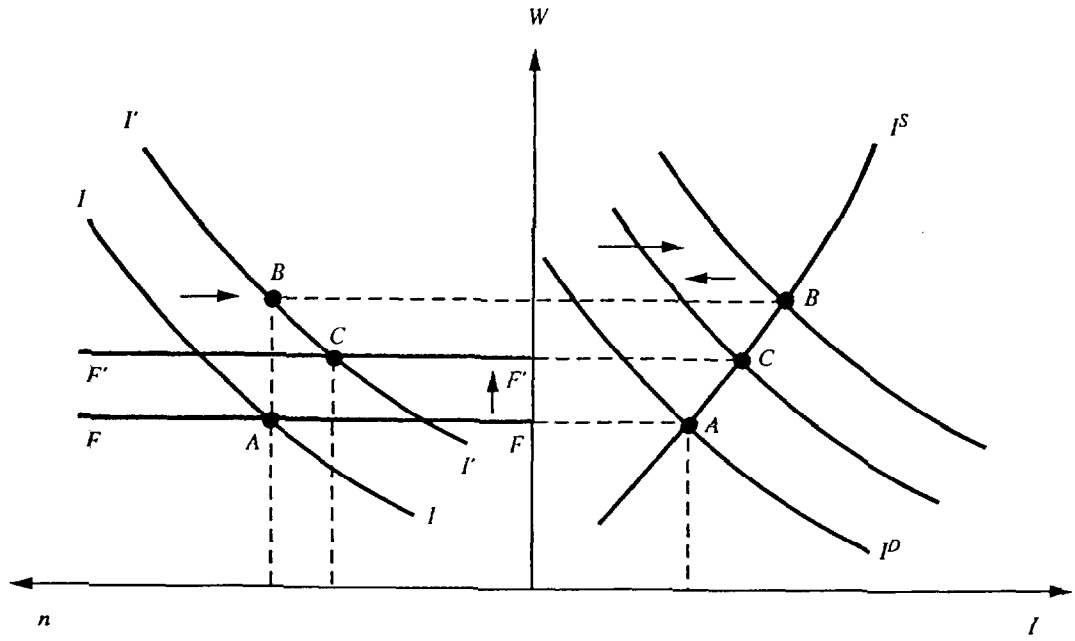


Figure 4: Real Exchange Rate Depreciation
with a Reduction in the Number of
Private Firms



$$\frac{dQ}{de} = nf'(I_V)\left\{\frac{dI_V}{dw}\left[\frac{1}{e}\frac{dw}{de} - \left(\frac{w}{e^2}\right)\right] - \frac{dI_V}{dC}\left(\frac{C}{e^2}\right)\right\} \tag{27}$$

$$+ f(I_V)\frac{dn}{de} + mf'(I_S)\frac{dI_S}{de}\left(\frac{1}{e}\frac{dw}{de} - \frac{w}{e^2}\right) ,$$

where the first two terms on the right hand side of expression (27) represent the change in private sector output and the last term is the effect on the output of SOEs. State sector output increases if and only if real input cost (that is, input cost expressed in foreign currency units) declines. 1/ The change in private sector output in response to domesic currency depreciation is ambiguous and depends not only on whether real input costs increase or decline, but also on whether the equilibrium number of private firms increases or decreases. 2/

VIII. Credit Market Developments

If the fixed cost involved in establishing a private firm (C) is large and potential entrepreneurs are constrained in their ability to borrow against future earnings, the number of private firms that choose to enter the industry is likely to be affected. Accordingly, an exogenous improvement in the efficiency of domestic credit markets is treated as a decrease in the fixed cost of entry. By reducing the cost of entry, then, improved credit market efficiency could potentially increase industrial output by increasing the number of firms. 3/

1/ Note that this holds if and only if the elasticity of w with respect to e is less than one.

2/ The results may also be interpreted more generally. If, for example, there are several inputs--some traded and some nontraded--the real depreciation not only improves competitiveness but also alters firms' desired input mix. In such a case, the ensuing change in total output also depends on the degree of substitutability between traded and nontraded inputs.

3/ While a complete analysis of the role of credit policy would include a discussion of the allocation of credit as well as the design of incentive-compatible repayment mechanisms, the objective here is to focus on the potential output effects of a lower entry cost (C), in the absence of incentive problems. Such a reduction in C may, inter alia, be associated with an improvement in the efficiency of credit markets. Han (1992) studies incentive-compatible tax/subsidy schemes designed to induce productive but credit-constrained SOEs to expand production while encouraging less productive SOEs to reduce their scale of operation.

Returning to the model in Section V, the effect of a reduction in the cost of entry on the equilibrium number of private firms and the market clearing input price may be analyzed by differentiating the system of equations in (12):

$$\begin{bmatrix} \Delta & I_v \\ -I_v \left[1 + \frac{P_b h(P_b) C}{w I_v} \right] & 0 \end{bmatrix} \begin{bmatrix} \frac{dw}{dm} \\ \frac{dn}{dm} \end{bmatrix} = \begin{bmatrix} -\phi_C(w,C) \\ pr(I_v) \end{bmatrix} , \tag{28}$$

where Δ is as defined in expression (14). Using Cramer's rule, the comparative statics results are:

$$- \frac{dw}{dC} = \frac{pr(I_v)}{I_v} > 0 \tag{29}$$

and

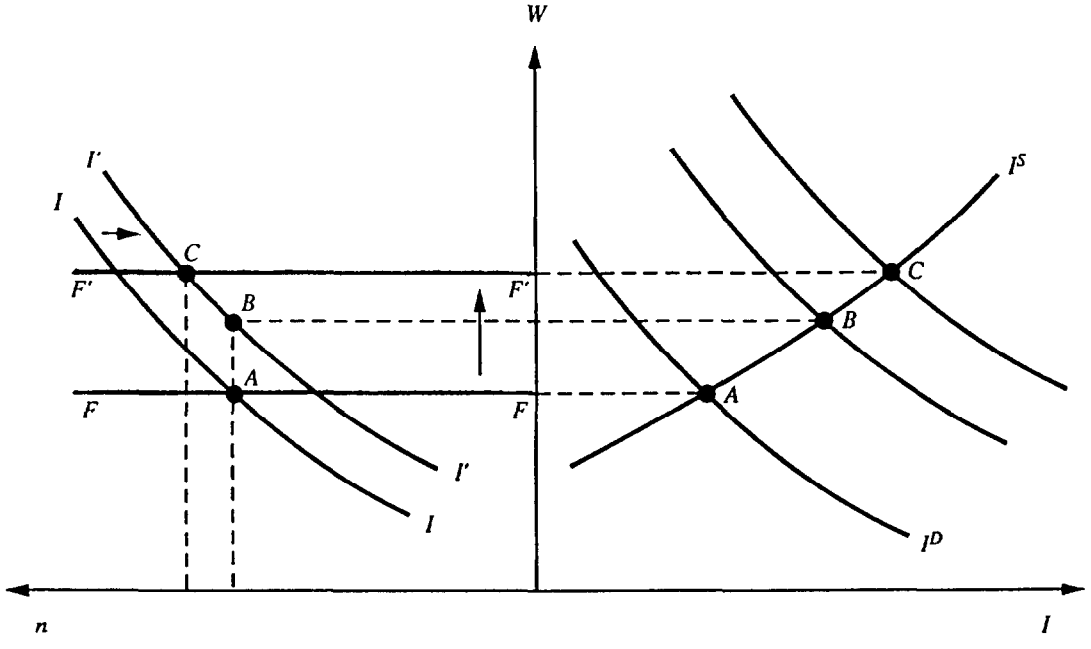
$$- \frac{dn}{dC} = - \frac{\Delta \, pr(I_v)}{I_v^2} + n \, \phi_C(w,C) \left[1 + \frac{P_b h(P_b)}{w I_v} \right] \begin{matrix} ? \\ > \\ < \end{matrix} 0 \quad . \tag{30}$$

A reduction in C raises the market clearing price of inputs, but has an ambiguous effect on the equilibrium number of private firms in the industry.

These results are illustrated in Figure 5. In the short run, the reduction in entry costs reduces the loss associated with bankruptcy and induces private firms to increase their employment of inputs. This is reflected in an outward shift of the input demand curve in the right hand panel of the figure, and an upward shift of the II curve in the left panel.

In the long run the FF curve shifts up as well, reflecting the zero profit condition with smaller entry costs. There are two effects, which work in opposite directions, influencing the equilibrium number of private firms. First, the entry cost is lower and more firms can enter the market and still earn nonnegative profits. On the other hand, the lower cost associated with reentry after bankruptcy induces firms already in the industry to employ more inputs, and the resulting increase in w makes it less profitable for new firms to enter. On balance, the effect on the number of private firms (n) depends on the relative magnitudes of the shifts of the FF and II curves, and on the elasticity of input supply (which

Figure 5: Reduction in the Cost of Entry



affects the slope of the II curve). Figure 5 illustrates the case in which a reduction in C results in an increase in n. 1/

The effect of a decrease in the cost of entry faced by private firms, reflecting an improvement in the efficiency of credit markets, has an ambiguous effect on output. The short run impact is associated with an increase in private firms' output. The ensuing rise in the price of inputs reduces SOE output, but since private firms have a higher marginal product, total output increases. In the longer run, the overall impact on output depends on whether private firms enter or exit the industry. If new firms enter, output increases further. On the other hand, if the price of inputs rises by so much that private firms exit, total production may actually decline in the long run.

IX. Conclusions

As the economies of central and eastern Europe undergo transformation, reform will surely be pointed in the direction of a growing role for the private productive sector. Privatization of existing state enterprises as well as the establishment of new privately-owned firms will be a key element of successful transformation. During the transition, however, SOEs are likely to continue to contribute a substantial share of total production.

The framework developed here is useful for analyzing the development of the private productive sector during such a transition. In particular, the profitability of private firms is seen to depend on the size of the state sector, even after prices have been freed and markets for inputs as well as outputs have emerged. The behavior of SOEs--expected profit maximization subject to a soft budget constraint--provides a simple and interesting way of gauging this effect.

The implication of state involvement in production for the competitiveness of the private sector is relevant not only for former centrally planned economies, but also for many developing countries in which SOEs use a significant share of nontraded factors of production. Overemployment of nontraded factors of production by SOEs pushes up the cost of such inputs and reduces the profit margins of private firms. This effect could also be due to other types of inefficiencies associated with state ownership. For example, if SOEs receive a political payoff by hiring an excessive amount of labor, overemployment of other factors could also prove to be optimal. This may even be true if SOEs are simply less productive

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1/ The case in which a reduction in C leads to a decrease in n is exactly analogous to the case of a real depreciation of the domestic currency illustrated in Figure 4.

than similar private firms. 1/ Whatever its underlying causes, excessive employment of factors of production by SOEs reduces the size and output of the private sector. Closures of SOEs, while reducing total output of the industry in the short run, increase the firms' profitability and induce the entry of new private firms into the industry. In the long run, industrial production increases in response to a reduction in public sector activity.

Because of differences in the behavior of private firms and SOEs, macroeconomic policies are likely to have an asymmetric impact on the two types of firms. While the formulation of sound financial policies must take into account many characteristics of the economy which are beyond the scope of this paper, their effects on the competitiveness of the private sector vis-a-vis the state sector should also be kept in mind. Policies which result in a sustained real depreciation of the domestic currency or which improve the efficiency of credit markets benefit the competitive position of private firms, but whether they can lead to an increased level of industrial production in the long run is ambiguous.

Finally, the model presented here does not provide a dynamic analysis of entry and exit by private firms. Rather, the model is used to analyze equilibrium levels of input use, output production, and industry size, for a given size of the state sector. The addition of firm-specific shocks to the economy-wide shock would make the framework richer but would not affect any of the equilibrium results presented here. For example, if a permanent appreciation in the real value of the domestic currency were to occur, the equilibrium number of firms would decline. The economy would gradually approach this equilibrium as individual firms that experienced adverse shocks shut down. A formal analysis of the dynamics of private sector growth in response to policy changes remains on the agenda for future work.

1/ In their study of SOEs and privatization, Hemming and Mansoor (1988) review the problems associated with government ownership and observe that "a growing body of evidence claims to show that when the public and private sectors can be compared in terms of the cost of producing similar outputs, the private sector outperforms the public sector."

I. Bankruptcy

The probability of bankruptcy, as defined in expression (3), depends on the chosen level of inputs (I). The effect of an increase in I on pr(I) is:

$$pr'(I) = H'(P_b)\,\frac{w}{f(I)^2}\left[f(I) - If'(I)\right] = h(P_b)\,\frac{dP_b}{dI}\ , \tag{31}$$

where H is the cumulative distribution function of P. Since f(0) = 0 and f is concave, pr'(I) is always positive. Furthermore:

$$pr''(I) = h'(P_b)\left[\frac{dP_b}{dI}\right]^2 + h(P_b)\,\frac{d^2P_b}{dI^2}\ . \tag{32}$$

The first term is positive as long as $h'(P_b) > 0$. This is the case, for example, if $P_b < \hat{P}$ and P is normally distributed. If P is distributed uniformly, $h'(P_b) = 0$. The sign of the second term may be obtained by noting that:

$$\frac{d^2P_b}{dI^2} = -\frac{2wf'(I)}{f(I)^2} - \frac{wIf''(I)}{f(I)^2} + \frac{2wIf'(I)^2}{f(I)^3}\ , \tag{33}$$

This expression is positive if f" is sufficiently negative.

II. Input Choices

The responsiveness of private firms' optimal input choices (I_v) to changes in input cost (w) and entry cost (C) is:

$$\frac{dI_v}{dw} = \frac{1 + C\left\{h'(P_b)\,\frac{I_v}{f(I_v)}\,\frac{dP_b}{dI_v} + h(P_b)\,\frac{\left[f(I_v) - I_v f'(I_v)\right]}{f(I_v)^2}\right\}}{f''(I_v) - C\left\{h'(P_b)\left[\frac{dP_b}{dI_v}\right]^2 + h(P_b)\,\frac{d^2P_b}{dI_v^2}\right\}} \tag{34}$$

$$\frac{dI_v}{dC} = \frac{\rho h(P_b)\,\frac{dP_b}{dI_v}}{f''(I_v) - C\left\{h'(P_b)\left[\frac{dP_b}{dI_v}\right]^2 + h(P_b)\,\frac{d^2P_b}{dI_v^2}\right\}} \quad . \tag{35}$$

The numerators in expressions (21) and (22) are positive, while the denominators in both are negative if pr"(I) is positive.

SOEs' optimal input choice responds to w in the following way:

$$\frac{dI_s}{dw} = \frac{1}{f''(I_s)} < 0 \quad . \tag{36}$$

III. Real Depreciation of the Domestic Currency

The change in SOEs' input choice resulting from an exogenous depreciation of the domestic currency (a rise in e) is:

$$\frac{dI_s}{de} = -\frac{f'(I_s)}{ef''(I_s)} > 0 \quad . \tag{37}$$

The input choice of private firms, on the other hand, responds as follows:

$$\frac{dI_v}{de} = \frac{-f'(I_v) + C\,\frac{dP_b}{de}\left\{\alpha + h(P_b)\,\frac{\left[f'(I_v) + \frac{f(I_v)}{I}\right]}{f(I_v)}\right\}}{ef''(I_v)\left\{1 + \frac{P_b h(P_b) C}{ef(I_v)}\right\} + C\,\frac{dP_b}{dI_v}\left\{\alpha + h(P_b)\,\frac{2f'(I_v)}{f(I_v)}\right\}} \quad , \tag{38}$$

where

$$\alpha = h'(P_b)\frac{dP_b}{dI_v} \quad . \tag{39}$$

Since the last term in curly brackets in the denominator is positive while the entire denominator is negative (in keeping with the assumption of pr"(I) < 0):

$$\frac{dI_v}{de} > \frac{-f'(I_v)\left\{1 + \frac{P_b C}{e}\left\{\alpha + h(P_b)\frac{\left[f'(I_v) + \frac{f(I_v)}{I}\right]}{f(I_v)}\right\}\right\}}{ef''(I_v)\left\{1 + \frac{P_b h(P_b) C}{ef(I_v)}\right\}} \quad . \tag{40}$$

As long as $h'(P_b) > 0$, we have:

$$\frac{dI_v}{de} > \frac{-f'(I_v)\left\{1 + \frac{P_b h(P_b) C}{ef(I)}\left[f'(I_v) + \frac{f(I_v)}{I}\right]\right\}}{ef''(I_v)\left\{1 + \frac{P_b h(P_b) C}{ef(I_v)}\right\}} \quad . \tag{41}$$

The term in the square brackets of the numerator in (27) exceeds unity if there is positive value added in the production process. Hence:

$$\frac{dI_v}{de} > -\frac{f'(I_v)}{ef''(I_v)} > 0 \quad . \tag{42}$$

Finally, if f''' < 0, then:

$$\frac{dI_v}{de} > \frac{dI_s}{de} \quad . \blacksquare \tag{43}$$

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