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Privatization and Accumulation in Mixed Economies[1]

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A dynamic macromodel is employed to discuss the feasibility of the mixed economy in the long term. There are two sectors, state and private. Both accumulate capital, but, when profits are high and private sector demand for assets is strong, the state privatizes a fraction of its capital stock. Privatization reduces the growth of the money supply and increases the real wage. This reduces the incentive to the private sector to purchase state assets. Both stable and unstable patterns of growth are possible depending upon the responsiveness of the privatization function to profitability. It is seen that so long as the state remains a major player in the economy, private sector investment not coordinated with state accumulation may well be counterproductive to a transition to a mixed economy. *J. Comp. Econom.* March 1993, **17**(1), pp. 1–22. University of Notre Dame, Notre Dame, Indiana 46556. © 1993 Academic Press, Inc.

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1. INTRODUCTION

Privatization in the previously predominantly socialist economies of Eastern Europe raises important questions regarding the feasibility of the mixed economy, i.e., an economy that has both significant state and private sectors.

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Jeffrey Sachs has argued that the first requirement for the transition in Poland is the rejection of "any lingering ideas about a 'third way' " between a Soviet-style command economy and American-style capitalism, explicitly rejecting the possibility of a mixed economy (Sachs, 1990). While Sachs recognizes that the transition may imply high unemployment and low wages, he argues that it is the price to pay for a healthy, efficient economy. But many observers have noted that the egalitarian traditions of Eastern Europe will not permit a full restoration of capitalist relations of production and distribution with its attendant problems of unemployment and inequality.[2] Sachs' admonition notwithstanding, most analysts agree that, for some time to come, these economies will fall between the two extremes of the traditional centrally planned and the well-established market economies.[3]

This paper develops a dynamic macromodel in which the state does not fully and immediately accept all the principles of the market mechanism. While the state is ideologically committed to a larger and more dynamic private sector, for various reasons it does not necessarily intend an immediate transition to a completely market economy. Its political mandate is to maintain approximately full employment, and, despite a commitment to a substantially increased private sector share, the state remains to a degree paternalistic in the sense of Kornai (1980). However desirable this attitude may or may not be, it appears at this point a quite reasonable assumption about the behavior of transitional economies of Eastern Europe.[4]

In the formal model there are two sectors, one private and one socialist. Both produce the same good using both capital and labor in fixed proportions. There is an unlimited supply of labor such that capital stock is the binding constraint on the output of each sector. The private sector produces for profit and accumulates capital according to an investment function that depends upon the rate of public investment and profits as well as having an autonomous component to capture the inherent uncertainty of transitional economies. To keep matters of public finance as simple as possible, it is assumed that the state sector profits are used to finance current state expenditure only, so that the budget is in continuous balance. Real net public sector accumulation is thus governed by the excess of private saving over investment.

[2] Jon Wiener recently quipped in the *Nation* that the goal of the Sachs plan is to turn Poland into a "Slavic Sweden," but a "Baltic Bolivia" is the much more likely outcome.

[3] See Hare, 1990. Even those most stridently against state participation recognize that the transition will be lengthy. Kornai (1990, p. 101), for example, suggests that a dual economy will have to be reckoned with for the next 2 decades.

[4] Throughout, we take the mixed economy as a given desideratum; no attention is given to the question of the superiority of market-based allocational systems over mixed or centrally planned economies.

The dynamics of the model develop as follows: sales of public-sector capital stock to the private sector reduce the money supply. The price level follows changes in the money supply as does the real wage inasmuch as nominal wages are assumed to move exogenously. The increase in the real wage reduces the incentive of the private sector to purchase assets from the state. The principal finding is that long-run stability is sensitive to the slope of a privatization function that captures the responsiveness of the private sector to offers to sell off public-sector capital stock.

The paper proceeds as follows: Section 2 describes the model in more detail while section 3, the crux of the paper, discusses the model's dynamic behavior. There the specific criteria for stability are identified under several different assumptions about the nature of the relationship between the state and the emerging capitalist class. Section 4 concludes the paper.

2. THE MODEL

The fundamental question addressed here is: once the process of privatization is initiated, will it set in motion forces that will necessarily lead to the complete dissolution of the state sector? The alternative hypothesis is that there exists an intermediate position such that the privatization effort leads to a stable equilibrium in which both the state and the private sectors coexist. In identifying a stable equilibrium for a mixed economy, we do not argue that it is necessarily desirable. On the other hand, state ownership of an important fraction of the capital stock may well be the only politically acceptable compromise available. After only a few years of reform, it is evident that the commitment to making the transition to a fully privatized economy is not without its political opponents and may well weaken when problems become more acute. High levels of unemployment, poor distribution of income, and falling real wages will all put pressure on the state to slow the pace of reform. Despite advice from the West, the state will remain a major player in most transitional economies in the foreseeable future.

The principal concern of this paper is the role of the privatization of state assets in this process. The model as it is developed below does not pretend to capture all aspects of what will undoubtedly be a messy, complex and contradictory process. Nor does it consider all possible options available to transitional economies in resolving many of the thorny issues they will face. The model is based on what are perceived as new rules of the game governing the relationship between the state and the private sector.

There are several key assumptions governing the behavior of each player. As owner of the majority of the means of production, the state is overburdened with the technical and administrative problems involved in production. It is criticized for its inefficiency and poor incentive structure. For ideological as well as practical reasons, the state accepts the need to divest

itself of some substantial fraction of its capital stock. The problem arises on the demand side. The nascent private sector lacks the financial capital, entrepreneurial skills, and capacity to absorb large quantities of public-sector capital stock. The state perceives correctly that it is a buyers' market. If it can find a buyer for its capital, the state will gladly sell.

One reason that the state is willing to privatize its capital is that privatization reduces the public sector deficit. Under the new rules of the game, the state's ability to tax is severely circumscribed. For analytical simplicity there are no direct or indirect taxes in the model and current government operating budgets are funded from public sector profits such that the current budget is always in balance. This allows government expenditure to grow with output.

The treatment of the budget greatly simplifies the formal structure of the model and allows us to separate the use of trade in assets as a means to combat unemployment from the usual mechanisms of the current government account. The assumption that current government expenditure grows with public sector revenues implies that the government may be fighting unemployment in a number of other ways that are not explicitly accounted for in the model. There may be a social safety net in place, direct employment subsidies or training and educational programs set up by the state. The adequacy of these current account programs, however, will be linked to the rate at which privatization is taking place since privatization reduces fiscal revenues and therefore the base from which the current account programs are funded.

State capital expenditure is fully monetized. While there is no political support for the monetization of public sector current account deficits, capital spending can be defended as contributing to national interests. The rate of growth of the money supply is then equal to the capital account deficit defined as the rate of new public sector investment less privatization. While it would not be difficult to allow public investment to be financed by public sector profits, nothing would be gained analytically and a good deal of the simplicity of the model would be sacrificed.

Workers remain the principal clients of the state. The state has an interest in keeping inflation low since nominal wages adjust only with a substantial lag. While a slow-down in privatization causes real wages to fall, falling real wages increase the attractiveness of public sector capital to the private sector. As the rate of privatization increases, real wages can again rise. It is explicitly assumed that capital is used more efficiently in the private sector than in the state sector. For simplicity, we assume equal capital coefficients, but the labor coefficient in the public sector is higher than the labor coefficient in the private sector. Privatization implies not only higher wages, but also more unemployment.

A final issue is how firms to be privatized are chosen by the state. In what

follows, capital is considered in its aggregate and the focus of the model is on ownership, private versus public. How the state decides which firms are to be put up for sale and privatized is a complex issue, entirely beyond the scope of the model. In practice, the trade in assets between the public and private sector, especially in the current environment of transitional economies, is a matter of political economy, relative bargaining strength, and persuasion. None of these important issues is addressed within the confines of the growth model presented below.

To begin to investigate the dynamics of this arrangement more rigorously, consider a closed economy in which both the state and the private sector produce the same good.[5] The good can be either consumed or invested and is sold at a uniform price. Both sectors hire labor and produce for a profit. Profits of the state defray current government consumption. Each sector produces using fixed-coefficients technology with a_i and b_i as the output–capital and labor–output ratios in sector i = p, s, where p denotes the private and s the state sector. Throughout the paper we abstract from technological change and assume that these coefficients remain fixed. The working assumption is that the capital coefficients are the same, while the state sector employs more labor per unit of output.

Unemployed labor exists so that the labor supply is never a constraint on production. For convenience, the common money wage, w, is assumed to be fixed institutionally, although it could be allowed to grow at some exogenous rate without consequence to the analysis. There is always sufficient effective demand for full capacity utilization, so that

$$X_i = a_i K_i, \tag{1}$$

where X_i is output and K_i the capital stock of sector i.

Capitalists in the private sector save a fraction, s, of their income while workers in both sectors consume their entire income. The aggregate supply–demand balance for the economy can thus be written,

$$(1 - s)rK_p + wb_p a_p K_p/P + wb_s a_s K_s/P + G + I_p + I_s = X_p + X_s, \tag{2}$$

where P is the price level, G is current government expenditure, and I_i is investment in sector i. The private profit rate, r, is given by

[5] A more complex and realistic model would allow the state to produce a different good that competes with the private sector. Elasticities of substitution would then determine the output mix, terms of trade, and relative profitability of state versus private production. Since the latter would be crucial to the rate at which capital is shifted between the two sectors, it would seem that the assumption of a single good is a drastic simplification. In fact, much of the ensuing complexity is implicitly accounted for in the parameters of the privatization function introduced below and, thus, the assumption is not completely unwarranted.

$$r = (1 - wb_p/P)a_p. \tag{3}$$

Other than the surplus above the wage bill in the state sector, there are no taxes. By assumption as discussed above, the current budget is always in balance with

$$(P - wb_s)X_s/P = G, \tag{4}$$

that is, real profits in the state sector just balance real government current expenditure.

Desired private sector investment, I_p^d, depends upon a mix of short- and long-run factors. Given that an entrepreneurial class is just beginning to develop, it is particularly difficult to speculate on the determinants of private sector investment. In the short run, it is assumed that investment will increase with excess holding of money by private sector firms over and above their money demand. In the longer term, expectations of profitability will depend on how state investment is viewed. If public investment proceeds in infrastructure and backwardly linked industry, public investment is likely to crowd in or encourage private investment. Infrastructural projects that spur local investment are the most straightforward examples (Taylor, 1988).

As the capital market becomes more developed, crowding out may become more important. There will also be some component of private investment not linked to future profitability but rather to animal spirits that may involve nationalism, local entrepreneurship, and other variables difficult to model formally. The private investment function might then take the form

$$I_p^d = \tau_0 K_p + \tau_1 I_s + \tau_2(M_p/P - \beta_p K_p), \tag{5}$$

where τ_0, τ_2, and β_i are positive parameters, M_p is the money balances held by private firms, and τ_1 is a parameter that can take on either sign. The first term on the right is the autonomous investment term while the second reflects the dependence of private investment on the rate of public sector accumulation. If τ_1 is negative, there is crowding out, while a positive τ_1 accounts for complementarities between public and private capital accumulation.[6] In what follows, we reasonably assume $|\tau_1| < 1$. This implies that the indirect effect of state on private investment is weaker than its direct effect on total investment demand.

The last term shows that investment is stimulated by an excess of desired demand for real money balances held by firms. The latter is assumed to be a constant fraction, β_p, of private-sector capital. This real balance effect will be

[6] A negative relationship could also arise from financial considerations such as quantity restrictions or implicit interest rate movements or a confidence effect in which higher levels of public investment frighten capitalists. This effect may be more important in Third World mixed economies.

TABLE 1

THE FINANCIAL ACCOUNTS

	Capitalists	Government	Capital	Government	Banks	Central bank	Total assets
Firms							
Private			PK_p		D_p		A_p
Government			PK_s		D_s		A_s
Wealth	W_p	W_s					W
Banks	B_p	B_s				H	M
Central bank				F			H
Liabilities	L_p	L_s	PK	F	M	H	

seen to provide the transmission mechanism by which changes in the money supply cause changes in the price level. In the short run, τ_2 is zero, since the effect operates with a lag. In the medium run considered below, however, τ_2 can be positive.

Desired public investment also depends on excess money balances

$$I_s^d = I_s + \tau_s(M_s/P - \beta_s K_s), \tag{6}$$

where I_s^d denotes desired investment, M_s the money balances held by state enterprises, and β_s the ratio of their desired real balances for working capital needs to their stock of capital.

The monetary side of the model is simplified, again for manageability. As already described, the real demand for money for both private and state sectors is proportional to capital stock and is only for working capital needs. For simplicity's sake, there is no other demand for money and, in particular, no asset demand. There is no currency in circulation. Firms hold deposits with commercial banks in amounts D_i $(= M_i)$, so that the money supply equals the sum of deposits.

Banks maintain a constant reserve–deposit ratio and lend the rest to government and private sector firms in amounts B_i. The Central Bank holds government debt, F, which balances its liability, H, to the banking sector. The financial structure of the economy is shown in Table 1 with assets, A, listed across rows and liabilities, L, listed down columns. Wealth, W, is held by the state and private sectors and is defined as the sum of assets, physical capital, and deposits, less loans from commercial banks. Further, we abstract from all interest payments.

Deposits stand in a fixed relation to the monetary base

$$D_p + D_s = M = \mu H$$

where μ is the money multiplier, the reciprocal of the reserve deposit ratio.

To complete the description of the model, we define the state variables of the system as $k = K_s/K$, the ratio of state capital to the total capital stock, and

$m = M/K$, the ratio of the money supply to total capital stock. The equations of motion for k and m are then

$$\hat{k} = \hat{K}_s - \hat{K} \tag{7}$$

$$\hat{m} = \hat{M} - \hat{K}, \tag{8}$$

where the hats denote time rates of change. Assuming away depreciation for simplicity, the rate of growth of total state sector capital is given by the real investment less capital stock privatized. When normalized by K, we have

$$\hat{K}_s = g - \pi, \tag{9}$$

where $g = I_s/K_s$, the rate of growth of state stocks due to new capital formation. The last term on the right is the fraction of public sector capital stock, K_s, that is privatized per period.[7] It is assumed that this privatization function depends primarily upon the expected profitability of state assets. For manageability, static expectations are assumed such that the rate at which the private sector is willing to acquire public sector assets depends upon the current real wage. Since the nominal wage and the labor coefficient are taken as fixed, profitability is proportional to the price level. Thus, the privatization function can be written

$$\pi = \pi(P) \qquad \pi' > 0,$$

where π is a continuous, differentiable function of the price level. A small absolute value of the derivative, π', indicates that large changes in profitability will be required as an incentive for the private sector to purchase state assets and vice versa.

As mentioned above, the privatization function is far too concise to capture the richness of negotiations over the transfer of assets between the public and private sectors. In reality, many other variables would play a role in determining this key behavioral equation of the model. Hence, the privatization function is written in the most general possible form to allow for full parameterization to account for the political economy involved. But even so, the function is inadequate in that it is assumed continuous and differentiable. To the extent that the privatization function allows repurchase of assets by the state from the private sector it may be, in reality, neither.

3. ACCUMULATION PATTERNS

Analytically, the model is broken down into three time frames, one in which the goods market clears, a second in which enough time has passed

[7] We make the simplifying assumption that capital transfers take place at the price of new capital goods, that is, the current price level, P.

such that prices can respond to higher quantities of money, and a third in which capital stocks adjust. Over the shortest time horizon, it is assumed that the money market may not clear due to the persistence of administered prices.

In the near term, managers of previously state-owned enterprises will continue as the managers of the newly privatized organizations. Many raw materials as well as capital goods may be available only through the state at relatively fixed prices. At least for the transitional period, it seems prudent to model a mixed economy with fixed prices and an adjustment lag due to excess demand. In historical time, the lag need not be long.

With the magnitude and distribution of the capital stock known in the short run, the output of the state and private sector is determined. Both private and public consumption is also known since prices and wages are fixed in the short run. Investment must therefore adjust. Here we assume that private investment demand is satisfied first, with public investment lastly adjusting to clear the goods market.

The model is thus determined by the supply side, with savings driving investment; it only differs from a standard macromodel by having the private part of investment determined independently so that the excess of private saving over private investment is what drives the balance of investment. An alternative, but more complicated closure would assume that the desired consumption and investment plans of other agents would also be partially frustrated. The assumption here is for analytical simplicity. The saving–investment balance, derived from Eqs. (1) through (5), is written

$$\tau_0 K_p + I_s(1 + \tau_1) = s(1 - wb_p/P)a_p K_p. \tag{10}$$

This equation is key to the evolution of the dynamics of the model and one can appreciate the great simplicity achieved by way of the assumption of a balanced current budget. Given that the public sector does not contribute to savings, public and private investment on the left must balance private sector saving on the right. The model assumes that the private sector will be the provider of savings in the economy, but will only mobilize a fraction of those savings for its investment. The state prints money to finance its purchases of capital stock and in the short run, I_s adjusts to maintain saving–investment equality.[8]

In the medium run, the financial side of the model provides an additional equation to determine P. With the money supply given, the price level ad-

[8] Note that private firms must observe I_s before they decide on their level of investment, which in turn determines I_s. A more rigorous approach would let private investment depend upon expected government investment with the latter adjusting adaptively. The savings–investment balance then implies that, even in the short run, expectations are realized.

justs according to excess demand. Excess demand is measured by the excess of desired investment over actual saving. The adjustment mechanism is

$$dP/dt = \theta[I_s^d + I_p^d - s(1 - wb_p/P)a_pK_p], \tag{11}$$

where θ is the speed of adjustment constant.

To see how the medium-run setup works, let $\tau_2 = \tau_s = \tau > 0$ and $\beta_s = \beta_p = \beta$, for simplicity. The state and private firms now have identical money demand functions and investment response to excess money holding. Substituting Eqs. (5), (6), and (10) into (11) yields

$$dP/dt = \theta\tau(M/P - \beta K) \qquad \theta > 0,$$

where $K = K_p + K_s$. Thus, excess money demand raises the price level by causing excess demand for investment goods. Once prices have had time to adjust, firms hold no excess money and desired equals actual state investment.

With high-powered money, H, and the capital stock given in the medium run, a rise in P reduces dP/dt. This implies that the adjustment of the price level to its medium-run equilibrium,

$$P = m/\beta, \tag{12}$$

is stable.

To more fully characterize the equilibrium, first normalize the savings–investment balance in Eq. (10) by K

$$g = [s(1 - wb_p/P)a_p - \tau_0](1 - k)/(1 + \tau_1)k. \tag{13}$$

Equation (13) says that rate of growth of public sector capital stock, g, is just the surplus of private sector saving over private sector investment. The equilibrium, then, involves solving Eqs. (12) and (13) for the variables P and g as functions of the state variables k and m.

An increase in the public sector share of capital stock, k, leaves the price level unchanged in Eq. (12), but reduces the absolute value of growth of public sector capital stock in (13). A higher state share of capital implies a lower private share which reduces output and savings. To confirm this latter assertion, differentiate Eq. (13) w.r.t. k,

$$g_k = -g/k(1 - k), \tag{14}$$

where the subscript k indicates partial differentiation.

The effects of a change in m are also straightforward. A rise in the money supply relative to the capital stock will increase the demand for goods and push up the price level. The consequent reduction in the real wage raises both the rate of profit and private-sector saving. Hence, the medium-run equilibrium growth rate in the state sector increases with the money supply. This can be easily seen by differentiating (12) and (13):

$$P_m = 1/\beta > 0$$
$$g_m = swb_p a_p \beta(1 - k)/(1 + \tau_1)km^2 > 0. \tag{15}$$

Note from Eq. (13) that a higher money wage will reduce the growth rate of state capital by reducing profits in the private sector. Higher rates of autonomous private sector investment will have the same effect since less is left over to lend to the state. Given that private saving determines state investment in this model, neither a change in money wages nor private investment affects the price level. As seen above, public sector investment always adjusts; there is no excess demand effect independent of changes in the money supply at work in the model.

In the long run, of course, the state variables H and K are free to adjust. The rate of growth of total capital on the r.h.s. of Eq. (7) is given by the sum of the investment rates of the two sectors, since privatization merely implies a change in the ownership of capital. Normalizing total investment on the r.h.s. of Eq. (10) by the capital stock,

$$\hat{K} = gk(1 + \tau_1) + \tau_0(1 - k). \tag{16}$$

Equation (16) says that growth in capital stock is a weighted average of state and private accumulation rates with the instantaneous distribution of the capital stock providing the weights.

Substituting Eqs. (9) and (16) into (7) gives the equation of motion for public-sector capital as a share of the total

$$\hat{k} = g\Gamma - \pi - \tau_0(1 - k), \tag{17}$$

with $\Gamma = [1 - k(1 + \tau_1)]$.

To determine the growth rate of the money supply, assume the government finances its investment less privatization by borrowing from the central bank. The change in high-powered money is then

$$dH/dt = (g - \pi)PK_s,$$

which implies

$$\hat{M} = k\mu(g - \pi)/\beta$$

or

$$\hat{m} = (k\mu/\beta)\{g[1 - (1 + \tau_1)\beta/\mu] - \pi\} - \tau_0(1 - k). \tag{18}$$

Equations (17) and (18) are now the equations of motion for the dynamic system in the state variables k and m.

The steady state for this system occurs when the r.h.s. of these two equations are simultaneously zero. Solving for k:[9]

[9] Note that for the long-run equilibrium to be interior, i.e., with $1 > k > 0$, β must be less than μ. If the desired money–capital ratio of firms is greater than the money multiplier, a corner solution with $k = 0$ or 1 could still exist. Here we simply assume that β is less than μ.

$$k = \beta/\mu. \tag{19}$$

Together with either (17) or (18), Eq. (13) may be solved simultaneously for the steady-state values of g and m.

Equation (19) shows that the steady-state government share of the capital stock depends only upon the monetary parameters of the model. If money demand rises, the state share will rise with it since a higher level of money demand will allow monetary emissions to rise with a constant price level. Similarly, an increase in the money multiplier will be consistent with a smaller fiscal deficit for the same level of money demand. From Eqs. (12) and (13), it is easy to see that an increase in money demand causes g to fall since, by lowering the price level, it causes both profits and the private-sector share of capital (in (19)) to fall. Both reduce saving, which reduces g.[10]

Even though the model is highly simplified, it remains too complex for an analytical solution. It is more insightful to make use of phase plane geometry in $\langle k, m \rangle$ space. To plot the isoclines and examine the stability of the system, it will be helpful to obtain the Jacobian of the r.h.s. of the equations of motion,

$$J[J_{ij}] = \begin{bmatrix} \tau_0 - g(1 + \tau_1) + \Gamma g_k & \Gamma g_m - \pi'/\beta \\ \tau_0/k + \Gamma g_k & \Gamma g_m - \pi'/\beta \end{bmatrix},$$

where the partial derivatives, g_k and g_m, are given by Eqs. (14) and (15) and all variables and derivatives are evaluated at the long-run equilibrium. It is not easy to sign the elements of the Jacobian without some additional assumptions.

First, note that it is entirely reasonable to assume that $\Gamma = [1 - k(1 + \tau_1)] > 0$ for all k. While this is assured if there is crowding out ($\tau_1 < 0$), crowding in values ($1 > \tau_1 > 0$) could produce a negative Γ. But by Eq. (17), $\Gamma > 0$ only rules out excessive crowding in, that is, an increase in g causing a fall in the state share of capital stock.[11] The assumption $\Gamma > 0$ says nothing more than the indirect effect of crowding in on private investment cannot outweigh the direct effect on government capital stocks.

A second reasonable assumption is that the growth rate of the public-sector capital stock, g, is positive at the long-run equilibrium. Certainly if the economy is to remain mixed, and at the same time growing, this condition will hold. From Eq. (13) it is easy to see that g will indeed be positive so long as private saving is greater than autonomous private investment.[12] The as-

[10] The effect on the overall growth rate is indeterminate, however, since it is increased by the rise in k.

[11] To see this, partially differentiate the r.h.s. of (17) w.r.t. g.

[12] This assumes, of course, that the earlier assumption $|\tau_1| < 1$, is still in force.

sumption that g is positive places an upper limit on the value of τ_0 and at the same time ensures that g_k will be negative from Eq. (14).

Whether privatization continues in the steady state is a matter to be decided endogenously. The r.h.s. of Eq. (17) shows that if τ_0 is zero, π will be positive. There will be continuous privatization in the long-run equilibrium. It is easy to see that

$$\text{sgn } \pi = -\text{sgn } J_{21},$$

so that an equivalent condition for privatization in the long run is that the sign of J_{21} be negative.[13]

Continuous privatization implies that the government invests only to sell off the stock to the private sector. This is due to the abundance of private saving that drives the level of government investment. The new capitalist class is willing to save but unwilling to undertake new real investment that fully utilizes the savings. The state steps in to fill the gap in order to achieve macroeconomic consistency.

On the other hand, if τ_0 is relatively high, and J_{21} positive, the state will have to acquire part of the private capital stock to ensure that the economy remains mixed in the long run. Is there any reasonable interpretation of such an equilibrium in which π is negative?

While $\pi < 0$ might not be desirable in the minds of many reformers, it cannot be ruled out a priori in the model. Profits decline to the point that the incentive to purchase state assets dwindles and some private firms may decide to cease production altogether. If there are no buyers for bankrupt firms, the state faces three options. First it could simply allow the demise of the

[13] If $J_{21} = 0$, the private and public rates of investment are the same so that no privatization takes place. To see this, set the r.h.s. of Equation (17) to zero:

$$\pi = g\Gamma - \tau_0(1 - k).$$

Substituting the definition of g_k in Equation (14),

$$\pi = -(g_k k\Gamma + \tau_0)(1 - k) = -J_{21}k(1 - k),$$

shows that the sign of π depends on the sign of J_{21}. Again from (17),

$$\pi = g - \tau_0(1 - k) - gk\tau_1 - gk.$$

Now multiply this by K,

$$K\pi = -I_s/k - I_p - I_s;$$

thus if $\pi = 0$,

$$k = I_s/(I_p + I_s),$$

i.e., real investment must be balanced. If τ_0 is low, then I_p will be low and $\pi > 0$. Thus, if $J_{21} < 0$ there will be privatization in the long run and vice versa.

private sector firm and withstand the political pressure caused by higher unemployment. Second, it could decide to subsidize the firm until it recovered. Finally, the state may decide to nationalize the capital stock, reversing its predisposition toward privatization.

In the past, it was the soft budget constraint with its set of implicit and explicit subsidies that was the mechanism by which socialist governments prevented the demise of their important enterprises. But as the economy becomes increasingly private, it will be politically difficult for the state to subsidize the private sector in the same way that it was able to subsidize its own enterprises. There will be charges of favoritism to which the state will be unable to respond.

Privatization will continue to be acceptable politically so long as unemployment stays within some reasonable level. Despite recent bankruptcy laws, it is unlikely that the transitional economies will allow a catastrophic collapse of firms with a significant impact on employment. The more realistic assumption is that the state will continue in its historical role as an employer of last resort, at least in the foreseeable future.[14] After an initial period of privatization, with its attendant problems of unemployment, the state may be forced to repurchase some of the capital stock it has sold in order to maintain its political legitimacy.

The direction of capital transfer is linked to the slope of the m-isocline. To see this, consider the slopes

$$\left.\frac{dm}{dk}\right|_{\dot{k}=0} = -J_{11}/J_{12} = -\frac{\tau_0 - g(1+\tau_1) + \Gamma g_k}{\Gamma g_m - \pi'/\beta} \tag{20}$$

$$\left.\frac{dm}{dk}\right|_{\dot{m}=0} = -J_{21}/J_{22} = -\frac{\tau_0/k + \Gamma g_k}{\Gamma g_m - \pi'/\beta}. \tag{21}$$

From these expressions, it is clear that the two key parameters that shape the phase plane are τ_0 and π'. A low τ_0 is interpreted here as corresponding to an early phase in the transition in which new private investment is weak. The entrepreneurial talents of the private sector are underdeveloped and private investment is primarily crowded in by the state or fed by privatizing existing assets. When new autonomous investment is high, on the other hand, the private sector is more developed and private investment is driven by its own internal forces.

The second parameter of interest is the slope of the privatization function, π'. A high level of π' indicates that the private sector is responsive to profitabil-

[14] See Mitchell (1990) for a recent discussion of bankruptcy laws and the tendency of the state to bail out private firms in Eastern Europe. Schaeffer (1989) provides a game-theoretic two-period model in which the center finds it difficult to make credible commitments to not bail out firms in financial trouble.

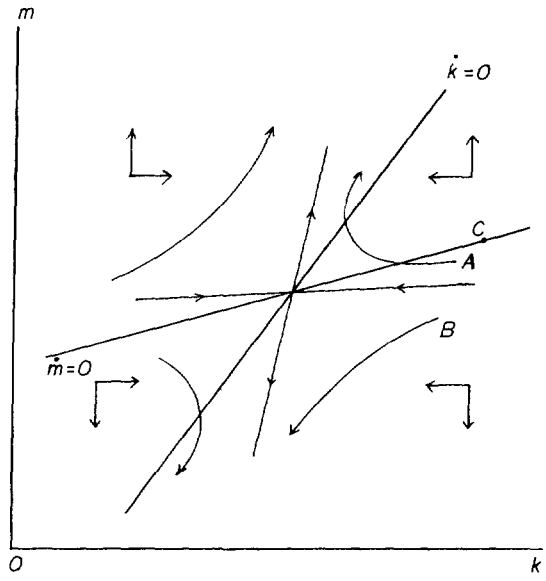

FIGURE 1

ity as an incentive to purchase public sector capital stock. In what follows, we distinguish two basic cases for different combinations of the two parameters τ_0 and π'. The two cases considered far from exhaust all available combinations, and some additional subtleties will also be pointed out in the discussion that follows.

Case I: Saddle-point instability. $\tau_0 < k|\Gamma g_k|$ and $\Gamma g_m - \pi'/\beta > 0$. New private autonomous investment is weak and large changes in profitability are required to induce a shift in capital between the state and private sectors. This case corresponds to a strong, centrally planned economy or an economy in the early stages of the restoration of capitalism.

The phase diagram for Case I is shown in Fig. 1. Note first that by Eqs. (20) and (21), the slopes of the isoclines are both positive in the neighborhood of the long-run equilibrium and that the k-isocline must have the steepest slope.[15] Since under the assumptions of Case I, J_{11} is negative, k falls (rises) at k to the right (left) of the k-isocline. J_{22}, on the other hand, is

[15] The denominators in (20) and (21) are identical; subtracting the numerator of the expression for the m-isocline's slope from that of the k-isocline yields

$$g(1 + \tau_1) + \tau_0(1/k - 1) > 0,$$

Which confirms that the k-isocline's slope is steeper.

positive and, hence, m rises (falls) at m above (below) the m-isocline. Since J_{21} has the same sign as J_{11}, there will be continuous privatization in the steady state.

Unfortunately, it is highly unlikely that the steady state will be reached since the long-run equilibrium is a saddle point.[16] This suggests that the idea of a mixed economy as set forth here is not compatible with an anemic private sector, both in the sense of autonomous investment and in its response to offers to privatize the capital stock. Consider how the economy might diverge.

In Fig. 1, the initial conditions of trajectories A and B are such that the ratio of state to total capital is initially decreasing toward the unstable long-run equilibrium.[17] For A, however, the ratio of money to the capital stock is relatively higher with the result that the economy eventually returns in the direction of full state ownership. It is not difficult to see how this takes place.

Along A, the price level initially falls and real wages rise. The transition appears to be going smoothly with privatization strong. But as the real wage rises, π falls and, from Eq. (17), it becomes clear that with τ_0 small, k must eventually increase. With falling k, the impact of a change in the money supply on public sector capital growth increases until ultimately there is a turnaround. As the economy crosses the m-isocline, money growth turns positive and real wages begin to fall. Private-sector saving, which finances state accumulation according to Eq. (13), rises causing state investment to accelerate. With the private sector profitability increasing, some state capital is privatized, but at a rate which is insufficient to reduce the government's share in total capital. The real wage falls continuously as k approaches unity. The private sector's contribution to the economy diminishes and the project of reform has failed.

If the initial conditions were such that the trajectory labeled B were appropriate, k would fall continuously and the economy would eventually become entirely private. There is constant contraction in the money supply and the price level falls with m. The real wage will continue to rise to the point that the profit rate in the private sector approaches zero. The rate of privatization slows down, but this cannot keep pace with the contraction in state investment brought about by the fall in private saving due to declining profits. Eventually, accumulation as a whole stops because there is no private saving

[16] It is easy to see from the Jacobian that the formal conditions for stability are not satisfied for Case I. The sign of the trace is indeterminate and the determinant,

$$\det = J_{11}J_{22} - J_{21}J_{12} = (J_{11} - J_{21})J_{12} = [\tau_0(1 - 1/k) - g(1 + \tau_1)]J_{12},$$

is clearly negative.

[17] Trajectories to the left of the steady state are not considered explicitly since they correspond to increasing public sector participation in the economy.

to drive it.[18] Again, reform fails, but this time due to a strong labor movement that is able to defend a nominal wage in the face of a slowdown in government investment and rising unemployment.

How realistic are either of these two unstable equilibria? Certainly if along trajectory A the price level were to continue to rise with a constant-growth nominal wage, there would eventually be some real wage resistance. As the private sector expands, k falls, the level of unemployment is presumably rising, which, in reality, would put downward pressure on the nominal wage rate. One would also have to account for changes in incentives on productivity as the state became the sole owner of the means of production. Similarly, as the economy becomes increasingly privatized beginning at B, the trade-off between higher wages and employment maintenance could become unacceptable to workers. Political support for continued privatization might well wane and the institutional structure assumed in the model would have to change.

No dynamic model is capable of precise predictions far from the steady state and this one is no exception. There is nevertheless some insight to be gained from the study of the unstable trajectories. First, it is quite reasonable that a socialist economy might embark upon a period of reform in which privatization is featured only to take a sharp turn back toward state ownership. Private sector participation and responsiveness is the key. A second major conclusion is that privatization that takes place at too brisk a pace can also lead to stagnation and a breakdown in the institutions of the mixed economy and would doubtlessly provoke some response not accounted for in the model.

Case II: Stable equilibrium. $\tau_0 < k|\Gamma g_k|$ and $\Gamma g_m - \pi'/\beta < 0$. Here private investment is still not strongly independent of the state, but with π' large, the privatization function is more responsive. Equations (20) and (21) show that the slopes of the isoclines are now both negative with the k-isocline still steeper. Since J_{11} is negative, k continues to fall (rise) at k to the right (left) of the k-isocline. J_{22} is now negative, however, so that m also falls (rises) at m above (below) the m-isocline.

Since J_{21} remains negative, Case II also exhibits continuous privatization in the steady state. But the system now has a stable long-run equilibrium as seen in Fig. 2.[19] A trajectory that begins at A in Fig. 2, will continuously shed state capital along the path that leads to long-run equilibrium. As the economy approaches the steady state along A, monetary expansion raises the price level and causes the real wage to fall. Private saving rises and state

[18] The state withers away completely as government spending, funded by government profits, also disappears.

[19] The formal conditions for stability are now happily satisfied since both J_{11} and J_{22} are negative and $[\tau_0(1 - 1/k) - g(1 + \tau_1)]J_{12} > 0$.

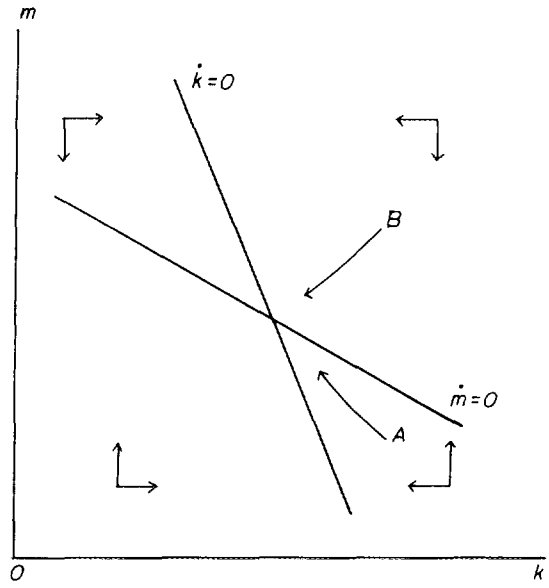

FIGURE 2

accumulation increases. But now the sell-off of state assets is sufficient to keep the government's share of the capital stock from rising.

Note that along the trajectory beginning at A, the growth rate of government capital stock, g, actually rises since the main contributor to aggregate saving, the private sector, is now increasing its weight in the economy. This result may come as somewhat of a surprise to those who see the dismantling of centrally planned economies as a steady divestiture of state assets. Nonetheless, there is strong privatization since the real wage is falling and the private sector responds accordingly. If we assume that the labor coefficient in the private sector is less than that of the state, employment is also falling and thus the distribution of income unambiguously deteriorates during this period in which capitalism is restored.

Were the initial conditions at B, however, the fiscal deficit would be growing less rapidly than the capital stock. Consequently, the price level falls and the real wage increases. In both cases, A and B, there will be rising unemployment throughout the transitionary period. Strong privatization is associated with falling real wages along A while privatization at a more reduced rate is associated with rising real wages along B. Note that in both cases, A and B, government spending is declining along with output of the public sector. The restoration not only requires regressive redistribution of income, but presumably fewer government services as well. This is where the transitional economies will face the maximum political exposure in reform.

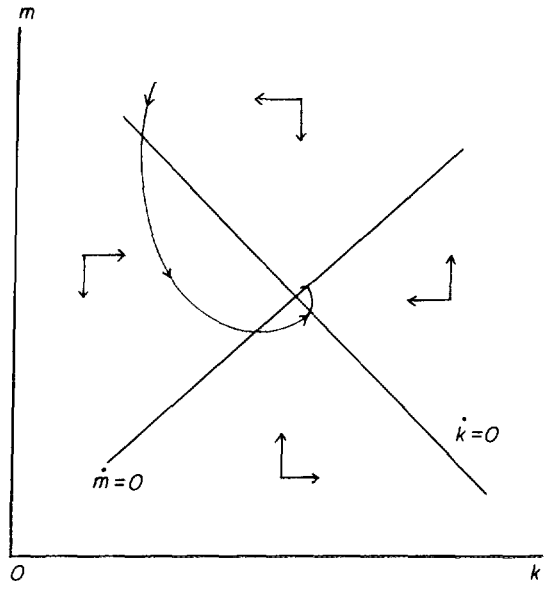

FIGURE 3

Is it possible that autonomous private investment is so great that the state may have to nationalize the capital stock in the long run? Assume that $\tau_0 > k|\Gamma g_k|$ but is low enough to ensure that J_{11} remains negative. Private sector responsiveness to offers to privatize is sufficiently high such that $\Gamma g_m - \pi'/\beta$ remains negative. As shown in Fig. 3, the long-run equilibrium is stable, but it is approached cyclically. The k-isocline continues to have a negative slope but the slope of the m-isocline is positive. There will be cycles toward and away from a greater private share of total capital until the economy eventually settles down to its long-run equilibrium.[20] The problem is that J_{21} is not positive, which implies steady-state nationalization of capital stock accumulated by the private sector.

We conclude that stable cyclical patterns of growth are unlikely in a transitional economy since this would require nationalization of private sector assets. The adverse effect of paternalism is one of the targets of reform, and it is somewhat implausible that the institutional structure would be sufficiently flexible to allow this pattern of growth to emerge. While there is no logical

[20] Should π' drop to the point that $J_{12} = J_{22}$ is negative, the k-isocline's slope is positive, but the m-isocline is now negatively sloped. The system reverts to a saddle point and again the mixed economy is infeasible.

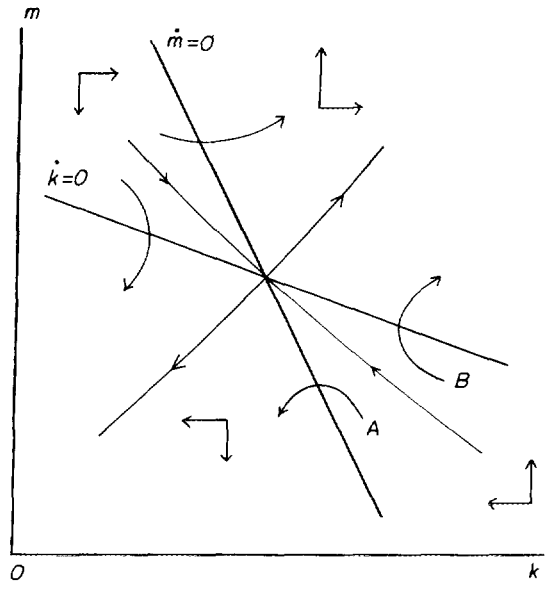

FIGURE 4

reason to exclude cyclical patterns of growth in mixed economies, we can rule out cyclical convergence as unrealistic.

One very relevant question is how the model would respond to a more independent and dynamic capitalist class when privatization weakly responds to the incentive of higher profits. This can be approximately modeled by considering an increase in the autonomous component of private investment. If τ_0 increases to the point that J_{11} turns positive, while the denominators, J_{12} and J_{22}, remain positive, both isoclines will be downward sloping as shown in Fig. 4. Once again the model is saddle-point unstable. As before, it is easy to show that the m-isocline is steeper than the k-isocline. Under the current set of assumptions, k rises (falls) above (below) the k-isocline and m rises (falls) to the right (left) the m-isocline.

With an increase in τ_0, there is less saving left over to allow growth in government capital. This implies that g will be low and thus money growth will be rapid only if there is strong nationalization. Trajectory A illustrates such a path. Along this trajectory, private capital stock begins to build, but then, despite the rise in profitability due to higher monetary growth, weak private sector demand for public assets causes an increase in state accumulation.

Figure 4 suggests that under the conditions likely to apply to the previously socialist economies, in particular an important role for state investment,

large autonomous private investment will probably not contribute to a stable transition to a mixed economy. Rather than concentrate on the need for an autonomous and dynamic private entrepreneurial class, it is much more important that the private sector cooperate with the state in a program of integrated accumulation. This is clearly true if the state is to remain an important factor in growth.

A comparison of Figs. 1 and 4 shows that economies beginning to the right of the steady state will more likely diverge in the direction of state ownership when the fixed coefficient of new private investment, τ_0, is large. To see this rather counterintuitive result, consider some given level of distribution of the capital stock k and a point on the m-isocline such as C in Fig. 1. As the slope of the m isocline falls there is left and upward pressure at C. The fall in k increases private saving, and the rise in m causes the price level to increase. The first effect raises the money supply and the second contracts it, through the increase in privatization, but the latter is weak by assumption and is eventually overpowered by the increase in the money supply due to rising saving. The rise in profitability that produces higher private saving is cumulative since it forces the money supply even higher. Eventually the economy diverges to a fully state-owned system. The initial burst of private investment has turned counterproductive because private investment was not then sufficiently flexible to respond to changes in profitability and thus in saving.[21]

4. CONCLUSIONS

The principal conclusion of this paper is that the successful restoration of a private capitalist sector in previously socialist economies hinges upon the responsiveness of the capitalist class, measured here by the slope of the π function, to the opportunities for privatization. At the same time, the state must be sincere in its desire to achieve a mixed economy in that it must offer to privatize public sector enterprises despite high levels of profitability. This will be especially difficult when high state-sector profits fund current government spending. Moreover, autonomous private investment unresponsive to either state investment or profitability, which would seem to yield the most rapid pace of restoration, may well impede the process and, at worst, pose a barrier to the successful development of a mixed economy.

[21] Note that even if π' is large, the model will not tolerate a value of τ_0 which allows J_{11} positive. With J_{22} negative by virtue of a large π', the model can still be unstable. The determinant

$$\det = [\tau_0(1 - 1/k) - g(1 + \tau_1)]J_{12}$$

is clearly positive, but the trace condition may not be met. It is easy to see that the chances of stable cycles are increased if the acquisition function is more responsive. In any case, since a positive J_{11} implies a positive J_{21}, there will be nationalization in the steady state.

In using the word successful, it should perhaps be stressed that the intention of this paper has not been to evaluate the comparative performance of centrally planned, mixed and market economies. So much has been written on the topic that there is little to be gained in rehearsing the well-worn debate. We leave open the question of whether the economy might be better off if the proportion of the capital stock owned by the state did in fact diverge to either extreme.

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