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# Patterns of Economic Transition and Structural Adjustments

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## Abstract

Economic liberalization is premised usually on the assumption that the private sector would spearhead the process of required structural adjustments. However, since in no economy the private sector operates in isolation, it is necessary to specify the patterns of economic interaction between the private and the public sector under which this may be feasible. This paper attempts to provide a formal framework to examine this problem and, explores how issues like public investment in infrastructure and the regime of property rights can be dealt with analytically during the process of economic transition and structural adjustments.

**Key words**: Economic transition, structural adjustment, property rights, evolutionary biology, public and private sector interaction.

# Patterns of Economic Transition and Structural Adjustments*)

## I. The framework

The current state of the debate on macroeconomic "stabilization" and "structural adjustment" has an exceptionally unclear theoretical basis. It is often implicitly assumed, if not explicitly stated, that the various policies of economic liberalization would tend to strengthen private initiative in relation to the public sector in order to spearhead the process of transition to a more efficient, market-oriented economy. This paper presents a general analytical scheme for identifying the circumstances under which this could be feasible.

While both the public and the private sector coexist in any economy, the nature of their economic interaction can be varied depending on the particular structure of the economy. The method of enquiry followed in this paper consists of capturing formally the possible patterns of interaction and analysing their dynamic implications from the point of view of economic transition.

Economic interaction entails that each sector's revenues as well as costs are influenced by the economic activities of the other sector. Let subscripts 1 and 2 stand for the public and the private sector respectively. Assuming for simplicity that the level of economic activity of a sector is proxied by the level of output of that sector, the equations defining the profits of the two sectors are

$$\pi_i = R_i\,(Y_1,\ Y_2) - C_i\,(Y_1,\ Y_2),\ i = 1,2 \qquad (1)$$

where, $\pi_i$ = profit, $R_i$ = revenue, $C_i$ = cost, and $Y_i$ = output, of sector i.

Total differentiation of (1) yields the increment in profit in each sector as,

$$\begin{aligned} d\pi_1 &= m_{11} \cdot dY_1 + m_{12} \cdot dY_2 \\ d\pi_2 &= m_{21} \cdot dY_1 + m_{22} \cdot dY_2 \end{aligned} \qquad (2)$$

where,

$$m_{ij} = \left(\frac{\partial R_i}{\partial Y_j} - \frac{\partial C_i}{\partial Y_j}\right),\ i,j = 1,2.$$

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Thus, the diagonal elements $m_{ii}$ represent the difference between marginal revenue and marginal cost in a sector i, when the other sector j has an unchanged level of economy activity. The off-diagonal elements $m_{ij}$ ($i \neq j$) capture the nature of economic interaction between the two sectors, e.g.

$$m_{12} \equiv \left(\frac{\partial R_1}{\partial Y_2} - \frac{\partial C_1}{\partial Y_2}\right)$$

shows how the marginal revenue and the marginal cost of (public) sector 1 are affected when, despite its own output level remaining unchanged, its marginal revenue and cost are affected due to changes in the level of output of (private) sector 2. A symmetrical interpretation holds also for $m_{21}$.

Economic interactions captured by the non-zero off-diagonal terms ($m_{ij} \neq 0$, $i \neq j$) are possible through different routes. Broadly speaking, purely demand-side interactions, e.g. through substitutability or complementarity between the goods produced by the two sectors, affect the marginal revenues through price or quantity competition affecting the price elasticity of demand. More importantly, demand and marginal revenues are also influenced by the "size of the market", so that the level of economic activity of each sector contributes to aggregate demand. Pure supply-side interactions influence costs. However, most important liberalization policies do not operate exclusively either on the demand- or, on the supply-side. Let a few examples suffice to illustrate the point. A contractionary domestic credit policy – a typical component of "financial programming" in IMF-style stabilization policy – reduces demand to depress marginal revenue, but may also increase marginal cost through higher cost of borrowing finance for working capital (cf. Bhaduri, 1993; Calvo and Coricelli, 1992). A restrictive fiscal policy resulting in lower government budget deficit, not only depresses marginal revenue through the lowering of aggregate demand, but may also lower marginal costs, especially if it also results in a lower interest rate.[1)] Devaluation of the domestic currency is known to increase domestic revenue per unit of export as well as domestic costs of the imported inputs. Finally, price liberalization may depress marginal revenue through international price competition, but also domestic costs through the assured availability of cheaper or better quality imported inputs and reduction in inventory holdings (Kornai, 1993; Winiecki, 1992). In short, macroeconomic policies operate typically both on the demand- and, on the supply-side and, thus affect both marginal revenue and marginal cost of a sector, directly (i.e. through the diagonal elements $m_{ii}$) as well as indirectly (i.e. through the off-diagonal elements $m_{ij}$, $i \neq j$). Consequently, evaluation of macroeconomic policies within the present framework is feasible only to the extent we can predict how the coefficients $m_{ij}$ change in response to such policies.

## II. Transitional dynamics

Economic transition would generally require structural adjustments in the pattern of production of an economy, especially through the creation of new capacities in particular lines of production.[2] If the private sector is to play a leading role in this process, private investments must respond to the stimuli offered by the various policies of economic liberalization. In a market environment, at least as a first approximation this could be interpreted as the response of the composition of public to private investment to the differences in the profit expectations of the two sectors.[3]

Since we presume that structural adjustments proceed through additional capacity creation in different branches of production, incremental output in a sector results from investments carried out in that sector. Assuming constant incremental output capital ratios, equation (2) is transformed into

$$d\pi_1 = a_{11}X_1 + a_{12}X_2$$
$$d\pi_2 = a_{21}X_1 + a_{22}X_2 \qquad (3)$$

where, $a_{ij} = m_{ij}b_j$ and, the incremental output capital ratio of a sector, $b_j = (dY_j/X_j)$, and $X_j$ = investment in sector j (j = 1,2).

From equation (3), the rates of return on investments in the two sectors are defined in terms of their investment composition, i.e.

$$r_1 = a_{11} + (a_{12}/x)$$
$$r_2 = a_{21}x + a_{22} \qquad (4)$$

where, the rate of return on investment in a sector, $r_j = (d\pi_j/X_j)$ and, $x = (X_1/X_2)$. If the pattern of investment responds to differences in the rates of return on investment then,[4]

$$(\dot{X}_1/X_1) - (\dot{X}_2/X_2) = (\dot{x}/x) = k(r_1 - r_2),\ k>0,\ x>0 \qquad (5)$$

We set k = 1 without any loss of generality in the present context for notational simplicity, to obtain from (4) and (5),

$$\dot{x} = -a_{21}x^2 + (a_{11} - a_{22})x + a_{12},\quad x > 0 \qquad (6)$$

The dynamics depicted by (6) are easy to examine if we assume that (marginal) revenue and cost conditions remain roughly constant during the process of transition. Because, this means that additional outputs resulting solely from new investments are not subject to economies of scale leaving all the coefficients $a_{ij}$ constants.[5] Thus,

changes over time in the investment composition of the two sectors are guided by a simple quadratic equation on the right hand side of (6).

Nevertheless, even this simple case provides some interesting economic insights that can be more easily described by drawing analogies from evolutionary biology.[6)]

Somewhat like two interacting biological species, when the public and the private sector are in a mutually supportive role of symbiosis, the profit of each sector would tend to increase due to a higher level of economic activity of the other. For instance, this may happen on the supply side through the creation of external economies which reduce marginal costs

$$(i.e.\ \frac{\partial C_i}{\partial Y_j} < 0,\ i \neq j)$$

or, on the demand side because marginal revenue is increased through an expansion of the market of one sector due to higher activity in the other

$$(i.e.\ \frac{\partial R_i}{\partial Y_j} > 0,\ i \neq j).$$

As a result, in such cases of *mutual symbiosis* all the off-diagonal terms would have positive signs. It is easy to check from (6) that, with both $a_{12}$ and $a_{21}$ positive, there is only one positive root at $x = x^*$ which defines a stable composition of public to private investment[7)]. Because to the left of $x^*$, x increases, while to its right x decreases.[8)]

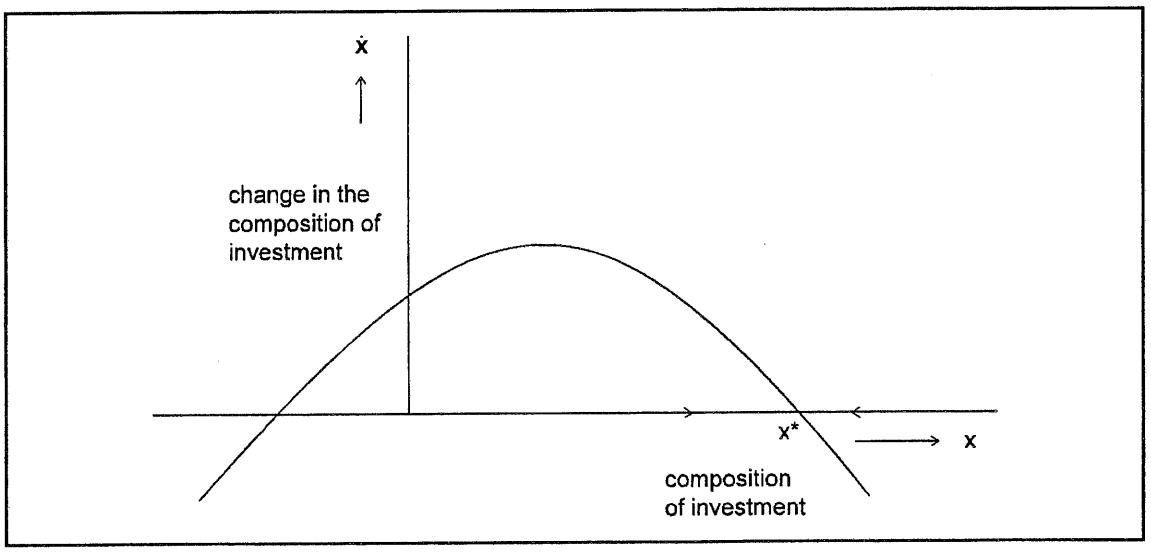


**Figure 1:** Mutual symbiosis between the public and the private sector, leading to a stable composition of investment and incomplete economic transition

Figure 1 illustrates this case of mutual symbiosis between the two sectors. It also shows that, in a cooperative economic arrangement of mutualism, economic transition is necessarily incomplete, as both sectors coexist and settle to a steady composition of investment at $x = x^* > 0$.

In the polar opposite case, the two sectors are in fierce *competition* because an increased level of economic activity in either sector reduces the level of profit of the other sector. With the off-diagonal elements $a_{12}$ and $a_{21}$ both negative, the only positive root at $x = x^*$ is unstable in the entire range $x > 0$, as shown in Figure 2. This implies that relentless competition leads to the "competitive extinction" of one sector by the other, resulting in complete economic transition. This occurs in favour of (the private) sector 2 if initial investment composition $x_0 < x^*$, but in favour of (the public) sector 1 if $x_0 > x^*$.[9)]

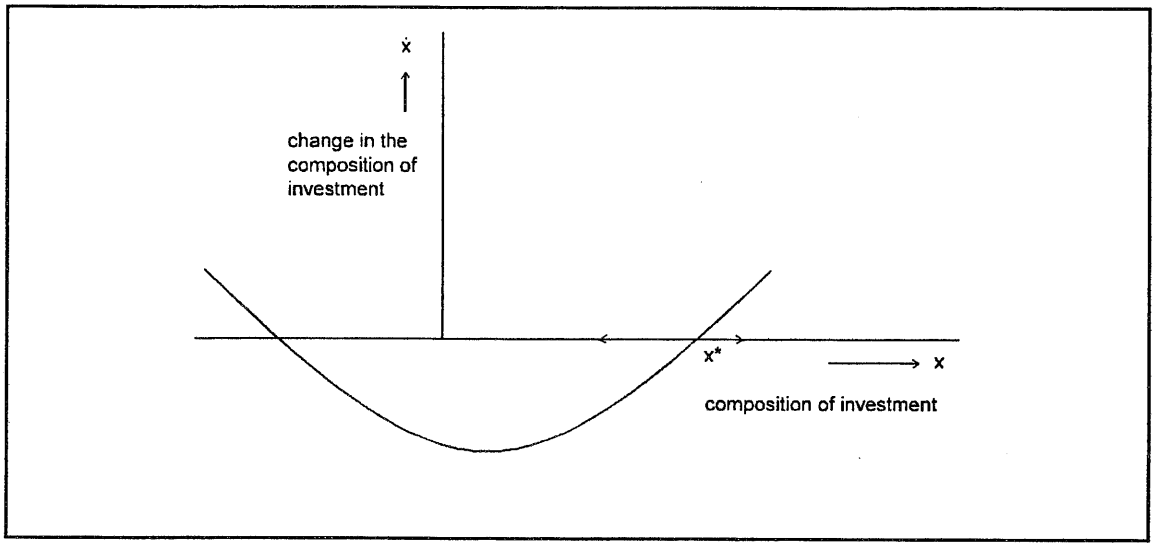


**Figure 2:** Fierce competition between the public and the private sector, leading to the "competitive extinction" of one sector by the other and complete economic transition

Between the polar extremes of unambiguous economic cooperation and conflict between the public and the private sector leading from incomplete (Figure 1) to complete (Figure 2) economic transition, more ambiguous cases may arise. For instance, when the profits of (the public) sector 1 are increased as a result of higher economic activity in (the private) sector 2, e.g. through the generation of higher demand for the former's output, coefficient $a_{12}$ is positive. However, higher output of (the public) sector 1 may reduce at the same time private profits, e.g. through discriminatory allocation of credit in favour of the public sector to make $a_{21}$ negative. Similarly, one could think of examples of economic interaction in the obverse case with $a_{12} < 0$ and $a_{21} > 0$.

In all such cases of mixed or ambiguous interaction where the two sectors are partly in a cooperative and partly in a conflictive economic relation, the off-diagonal elements ($a_{12}$ and $a_{21}$) have mixed signs.[10] It is easy to check from equation (6) that, this may result in multiple equilibria, i.e. two positive, real roots, $x^*$ and $x^{**}$, of which one is stable but the other unstable. For instance, with $a_{21} > 0$ but $a_{12} < 0$, we would have Figure 1a, while Figure 2a holds in the obverse case, $a_{21} < 0$ but $a_{12} > 0$. Moreover, real (positive or negative) roots may not even exist, as is shown by the corresponding broken curves in the two diagrams. Note in particular that, if both the sectors have roughly the same rate of return on investment without interaction, i.e. $a_{11} = a_{22}$, then in *all* cases characterized by mixed signs for the off-diagonal elements, roots are conjugate complex and real solutions do not exist. However, since x continuously increases or decreases in all these cases, *complete* economic transition could result.

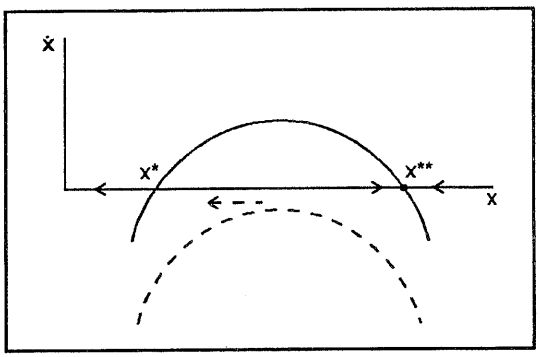


**Figure 1a:** (Private) sector 2 has beneficial symbiosis with (public) sector 1, i.e. $a_{21} > 0$. But the latter has a competitive relation with the former, i.e. $a_{12} < 0$. Only the larger root $x^{**}$ is stable. With no real root (broken curve), x continuously decreases, i.e. the relative size of the private sector increases.

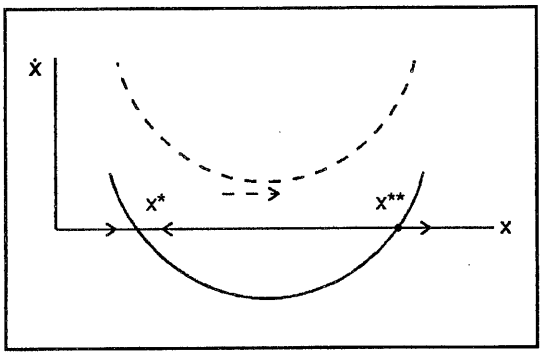


**Figure 2a:** (Private) sector 2 has a competitive relation with (public) sector 1, i.e. $a_{21} < 0$. But the latter has beneficial symbiosis with the former, i.e. $a_{12} > 0$. Only the smaller root $x^*$ is stable. With no real root (broken curve), x continuously increases, i.e. the relative size of the public sector increases.

## III. Economic implications

Before the preceding somewhat abstract characterization of the different patterns of transitional interaction between the public and the private sector can be applied to specific problems, some economic implications of equation (3) which provided the basis for the transitional dynamics, need to be highlighted.

Equation (3) implies a distinction between the commercial and the social profitability of a sector. While the commercial rates of return ($r_j$) were obtained in equation (4), the social return on investment in either sector can be obtained by summing up the

corresponding column elements of (3).[11] Social profit generated per unit of investment in (the public) sector 1 and (the private) sector 2 respectively are,

$$n_1 = (a_{11} + a_{21})$$

$$n_2 = (a_{22} + a_{12}) \tag{7}$$

The difference between the generation of social profit in equation (7) and its commercial appropriation in equation (4) per unit of investment in a sector characterizes the nature of its economic interaction with the other sector. More explicitly, from (7) and (4),

$$f_1 = (n_1 - r_1) = (a_{21}X_1 - a_{12}X_2)/X_1$$

$$\textit{and,}\quad f_2 = (n_2 - r_2) = (a_{12}X_2 - a_{21}X_1)/X_2 \tag{8}$$

The right hand side of (8) shows the *net* positive or negative contribution made to the other sector per unit of investment in a sector. Moreover, this difference between the generation and the appropriation of profit by a sector does not depend only on the investment decision made by that sector, but also on the investment by the other sector. Thus the appropriability of the benefits of investment depends on the particular regime of property rights, which may be biased in favour of either sector (see, section IV).

Our framework was deliberately simplified by restricting the dynamic analysis to only positive values of x (e.g. equation 5). Since *gross* investment including depreciation is necessarily non-negative, this restriction could be justified when $X_j$ is gross investment in sector j.[12] But it obscures the role that depreciation might play through disinvestment resulting in declining productive capacity in some sectors during the process of structural adjustment. Since the concept of the incremental output capital ratio is meant to relate causally incremental (capacity) output to *net* investment, we have,

$$v_j = dY_j/I_j$$

with,

$$X_j = I_j + D_j;\quad j = 1,2$$

where, $v_j$ = the (engineering) ratio of incremental output to net investment, assumed constant

$I_j$ = net investment

$D_j$ = depreciation and, $X_j$ = gross investment.

Since $b_j = (dY_j/X_j)$ in equation (3), we have

$$b_j = (1 - u_j)\, v_j; \quad j = 1,2 \tag{9}$$

where, $u_j = D_j/X_j$.

Therefore, so long as $I > u_j$ implying positive net investment, the signs of the corresponding coefficients $a_{ij}$ in (3) are unchanged and, the dynamics of economic transition presented in the last section do not change qualitatively. However for $u_j > I$, net investment in sector j becomes negative and the signs of corresponding $a_{ij}$'s are reversed. This reversal of the relationship between the two sectors due to declining productive capacity in a particular sector becomes useful for analysing problems like shrinking military sector and sudden loss of the traditional export markets (section V).

## IV. Specific applications

Our framework is used to analyse some specific problems that have arisen during the process of economic transition, especially in some former centrally planned economies trying to transform themselves into market-oriented systems.[13)]

### A. Infrastructural investments by the public sector

The ideology of a "minimalist state" suggests that the economic role of the public sector needs to be limited only to infrastructural investments in economic and social overheads like health and education. At most, its role should extend temporarily to some areas requiring very large investments, e.g. energy or communication when private investment is found wanting. In our framework, this would allow (the private) sector 2 to appropriate part of the externalities created by infrastructural investments by (the public) sector 1, since both reduction in costs and expansion in the demand for private sector's output could take place, i.e. from (2)

$$m_{21} \equiv \left(\frac{\partial R_2}{\partial X_1} - \frac{\partial C_2}{\partial X_1}\right) > 0$$

Also from (3) and (9)

$$a_{21} = m_{21} b_1 = m_{21} (1 - u_1)\, v_1 > 0$$

so long as net public investment in infrastructure remains positive.

If (the public) sector 1 benefits also from investment by (the private) sector 2 then $a_{12}>0$. This would be the case of mutual symbiosis of Figure 1, indicating *incomplete* transition in the sense that positive investments by both sectors continue over time in the ratio of $x = x^*$. However, if the public sector is disadvantaged by private investment, i.e. $a_{12}<0$ then it leads to Figure 1a: either incomplete transition results at $x = x^{**}$; alternatively, in the case of conjugate complex roots of the broken curve in Figure 1a, the economy heads for a complete transition with x decreasing and, private investment dominating over time. Interestingly, the larger is the benefit rendered by public infrastructural investment to private profit the more likely appears this latter tendency towards a complete transition. Formally, the discriminant T in the quadratic equation (6) tends to become negative when $a_{12} < 0$ but $a_{21}$ assumes large, positive values because,

$$T = [(a_{11} - a_{22})^2 + 4a_{12}\, a_{21}]^{1/2} \qquad (10)$$

However, such a process of complete transition would be economically difficult to sustain. Equation (4) shows why: with $a_{21}>0$ and $a_{12}<0$, the rates of return on investment decrease in *both* the sectors as x decreases in Figure 1a. Consequently, the *relative* domination of private over public investment has to take place in an economy with indefinitely declining profit expectations all around, hardly a suitable investment climate for structural adjustments. The moral is clear: the private sector cannot continue to bite the public hand (i.e. $a_{12}<0$) which feeds it so generously (i.e. $a_{21}>0$ and "large") and yet, succeed in making the complete transition to the "free enterprise" system!

### B. Biased property rights and privatization

Equations (7) and (8) in section III captured how a wedge could be driven between the generation of profit and its commercial appropriation by a sector due to economic interactions between the sectors. Nevertheless, accounting identity for the economy as a whole requires that total profit generated equals total profit appropriated. Or, in terms of increments in economy-wide profits, $d\pi = = d\pi_1 + d\pi_2 = n_1 X_1 + n_2 X_2 = r_1 X_1 + r_2 X_2$ which implies from (8),

$$X_1 f_1 + X_2 f_2 = 0, \quad X_j > 0\,(j = 1,2) \qquad (11)$$

i.e. the net appropriation of profits by one sector equals the net contribution to profits by the other sector.

In this framework property rights may be considered *biased* in favour of a sector i if $f_i < 0$ allowing sector i to be a *net* appropriator of profits. Market-oriented reforms are usually based on the supposition that, not only would (the private) sector 2 have a higher commercial rate of return than (the public) sector 1, but this tendency may even need strengthening through a bias in property rights in favour of the private sector. Measures such as privatization often have this implicit objective.[14)]

Therefore, a configuration supposed to be working in favour of market-oriented reforms may be characterized by,

$$r_2 > r_1 \quad and, \quad f_2 < 0, \quad i.e.\ r_2 > n_2 \tag{12}$$

implying from (11),

$$f_1 > 0, \quad i.e.\ n_1 > r_1$$

Note the above set of inequalities are *sufficiently* satisfied if,

$$n_1 > n_2 \tag{13}$$

i.e. (the public) sector 1 has a higher social rate of return, despite being less profitable commercially.

Since the total rate of return can be written as a sectoral weighted average of either commercial or social profit, i.e.

$$\begin{gathered}(d\pi / x) = r = (r_1 x + r_2)\,(1 + x)^{-1} \\ and, \quad r = (n_1 x + n_2)\,(1 + x)^{-1}\end{gathered} \tag{14}$$

where, $x(1 + x)^{-1}$ and $(1 + x)^{-1}$ are the shares of sector 1 and 2 respectively in total investment, we have

$$(dr / dx) = (n_1 - n_2)\,(1 + x)^{-2} \tag{15}$$

Equations (5) and (12) to (15) depict a process of transition propelled by market-oriented reforms, in which the commercial rate of return on private investment is higher (equation 12) driving in turn, the composition of investment in favour of the private sector (equation 5). Accordingly, x falls over time which, from (13) and (15), implies a falling overall rate of return r in the economy. Moreover, under the classical assumption that domestic saving is a constant fraction only of profit, this implies a declining rate of growth in total saving and investment in a self-financing economy. With no change in net capital inflow from abroad, incremental investment is financed from incremental profit,[15)]

$$dX = s \,.\, d\pi, \quad 1 > s > 0$$

which yields,

$$(dX/X) = g = sr \tag{16}$$

Consequently a falling rate of return through (15) also implies a declining growth in total investment due to (16).

However the above scenario may be considered over-simplistic. It may be argued that the propensity to save out of private profit is usually higher than that out of public profit, especially when the growth of the private "black" economy escapes the tax net. Under these circumstances, it would appear that a higher commercial rate of return enjoyed by the private sector also helps in generating more savings in the economy. In order to analyse this situation, equations (14) and (16) are reformulated as,

$$g = (s_1 r_1 x + s_2 r_2) \,.\, (1 + x)^{-1} \tag{17}$$

where, $r_2 > r_1$ and $1 > s_2 > s_1 > 0$, i.e. (the private) sector 2 has both a higher commercial rate of return and a higher propensity to save out of profit. Using (4) and (17), we obtain,

$$(dg/dx) = [s_1(a_{11} - a_{12}) - s_2(a_{22} - a_{21})]\,(1 + x)^{-2} \tag{18}$$

Since in view of (8) a bias in favour of private property rights involving $f_1 > 0$ and $f_2 < 0$ reduces to

$$a_{21} x > a_{12} \tag{19}$$

the persistence of this bias throughout the process of transition implies that inequality (19) would hold for all positive values of x, a condition *sufficiently* satisfied if

$$a_{21} > 0 \quad \textit{and}, \quad a_{12} < 0 \tag{20}$$

where configuration (20) corresponds to the dynamics depicted in Figure 1a.

Relations (18) and (20) together imply that,

$$(dg/dx) > 0 \quad \textit{if}, \quad (s_1/s_2) > (a_{22} - a_{21}) / (a_{11} - a_{12})$$

Since $(s_1/s_2)$ is a positive fraction less than unity by assumption, the satisfaction of the above inequality *necessarily* requires,[16] $(a_{11} - a_{12}) > (a_{22} - a_{21})$ or, $n_1 > n_2$, as in condition (13). Therefore, as the higher commercial rate of return on private investment assumed in (12) keeps driving the composition of investment in its favour through the decreasing value of x in equation (5), the growth of total investment declines, if (13) holds in a regime biased persistently in favour of the property rights of the private sector. To reemphasize, this possibility exists even if the private sector has a higher propensity to save and enjoys a higher commercial rate of return on its investment (equation 17). This apparently paradoxical result follows from the *persistent bias* in

property rights in favour of a sector allowing it to be *always* a net appropriator of profits (e.g. conditions 19 and 20). Such a strategy during transition runs the danger of being counter-productive in so far as higher commercial profitability due to biased property rights (e.g. condition 12) may at times hide the fact that a sector is socially less profitable (e.g. condition 13).

### C. Disinvestment: demilitarization and asset-stripping

Production may be disrupted seriously from different types of "shocks" during the process of transition. It could result from a sudden loss of external markets (e.g. CMEA) or discontinuing largely "useless" production of armaments or extremely poor quality products which find superior and, at times even cheaper substitutes in a more liberalized regime of imports and prices.[17] More interestingly, it could also result from uncertain property rights in many public enterprises during the process of transition which separates de jure public rights from de facto rights of inside groups like managers, workers representatives or, in some cases local authorities (Olson, 1992; Schmieding, 1993). The de facto use-rights to property would then escape the control of de jure ownership-rights of the State in these public enterprises.

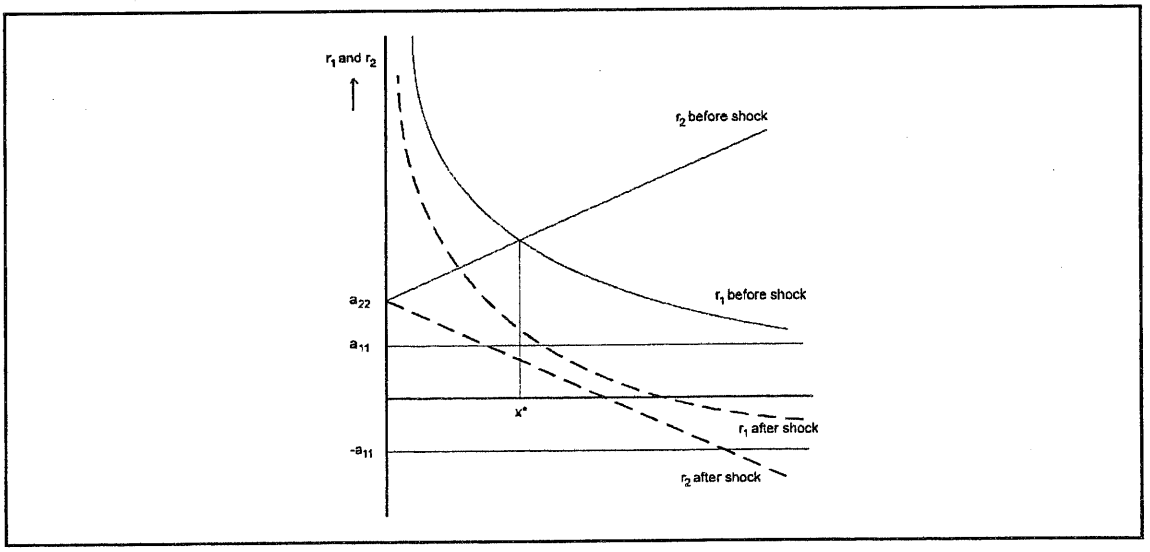


**Figure 3:** (Public) sector 1 and (private) sector 2 are in mutual symbiosis with all $a_{ij}$'s positive prior to the shock and, initial equilibrium at x*. The mutual symbiosis is destroyed after the shock (represented by broken lines), but results in (the public) sector 1 having higher return than (the private) sector 2, even though both suffer decline in profitability after the shock.

While any such "large" disruption resulting from whatever source cannot be captured satisfactorily in terms of the "small" cumulative changes of our model, it suggests a more systematic way of confronting these problems. Serious disruptions usually mean

decline in the productive capacity in particular branches of production. In our framework, this is analysed by assuming that, gross investment although positive, stays significantly below replacement and depreciation requirements in those particular branches and, by some constant fraction.[18] In particular, this corresponds roughly to the case of asset-stripping, where the inside groups in some public enterprises try to "consume" the assets through various devices like fictitious sale of assets or diversion of enterprise funds to private uses.

Consider the case where all such disinvestments are concentrated entirely in (the public) sector 1. This means that the signs of the coefficients along the first column in equation (3) (i.e. $a_{11}$ and $a_{21}$) are reversed since $u_j > 1$ in equation (9). If prior to the disruptive shock both these coefficients were positive, they turn negative after the shock. As a result, from (4), the rates of return in both the sectors decline at any given value of x. Generally, this would create no additional problem for transition towards the private enterprise system, so long as private return $r_2$ exceeds public return $r_1$, after the shock.[19] However, this need not be always the case. For instance, if $a_{12}>0$ prior to the shock, the decline in $r_2$ may be even greater than that in $r_1$ for all $x>0$ (with the initial positive value of $a_{21}$ turning negative through disinvestment in sector 1) after the shock. This possibility is diagramatically exhibited in Figure 3 by plotting $r_1$ and $r_2$ from equation (4), both before and after the shock.[20] In such a case depicted in Figure 3, the shock would tend to change the composition of (gross) investment in favour of the public sector over time through equation (3), steering the economy in an unintended opposite direction. The moral of the story deserves emphasis: if the public and the private sector initially happen to be in an arrangement of mutual symbiosis prior to the shock (note both $a_{12}$ and $a_{21}$ are assumed positive prior to the shock in Figure 3), a strong disruptive shock to the public sector leading to its disinvestment may turn out to be even more disastrous for the profitability in the private sector.

## V. Summary and observations

Economic liberalization is premised usually on the assumption that the private sector would spearhead the process of required structural adjustments. However, since in no economy the private sector operates in isolation, it is necessary to specify the patterns of interaction between the private and the public sector under which this may be feasible. This paper attempts to provide an analytical framework to examine this problem.

The framework captures formally various possibilities. Somewhat in analogy with the biological evolution of two interacting species, the economic interplay between the

public and the private sector could span the whole range, from mutual symbiosis of cooperation to relentless competition. Not surprisingly, coexistence of the two sectors is possible only with some degree of cooperation between them. Otherwise, under relentless competition, one sector would completely dominate the other. Thus, economic transition towards the private enterprise system would be "incomplete" or "complete" depending largely on the pattern and extent of economic interaction between the public and the private sector (section II).

The pattern of economic interaction between the sectors also differentiates the "social" from the "commercial" return on investment in a sector. The social profit generated by a sector differs from the profit appropriated by that sector, depending on the particular regime of property rights (section III). This idea has important consequences when applied to some specific problems that arise during the process of transition like, a programme of public investments in economic and social infrastructure, persistent "bias" in property rights in favour of a sector or massive disruptions in investment by a sector. Counter-examples were deliberately chosen in these problem-areas to highlight a general proposition: policies that *appear* to favour the private sector may fail to do so in reality, if the pattern of economic interaction between the sectors is not taken into account (section IV).

These ideas became analytically tractable in the context of a simplified model. Two simplifying assumptions deserve special emphasis. First, the pattern of interaction between the sectors were examined in terms of their investments, but not output changes. While this translation is easy to make from equation (2) to (3) by means of incremental output-capital ratios it implies that additional output results only from the creation of new capacities, but not from changes in degree of utilization of existing capacities. This assumption may be justified in the present context in so far as structural adjustments deal with changes in the structure of productive capacities in the economy. However, it must be emphasized that this simplification amounts to concentrating solely on the longer run problem of structural adjustments, ignoring the short run problem of changes in output through capacity utilization.

The second simplifying assumption is linked to the first. The analytical simplicity of the model depends critically on assuming the constancy of the coefficients of economic interaction between the sectors (i.e. $a_{ij}$ in equations 3 to 6) which, in turn, require marginal costs and revenues to be roughly constant. This assumption may be more palatable when changes in the *scale* of operation through investment, rather than changes in the degree of utilization of existing capacities are considered. However, in principle, increasing or decreasing returns to scale as well as other factors

(e.g. technical progress) leading to variable coefficients of economic interaction ($a_{ij}$) could be considered at the cost of greater mathematical complexity. It would introduce sharper non-linearities in the analysis (beyond the simple quadratic equation 6). And the reason why we do not wish to examine such non-linearities is not simply its mathematical complexity. One needs to have good economic reasons for introducing non-linearities in the relevant form. It also deserves emphasis here that only the model with constant interaction coefficients ($a_{ij}$) becomes easily generalizable to the case of many sectors.

## Endnotes

1) A contractionary fiscal policy coupled with an unchanged monetary policy would lead to lower interest rates in standard IS-LM analysis, e.g. Branson (1989).

2) We concentrate on the problem of creation of new capacities rather than the utilization of existing capacities during transition - an issue commented upon at some length in section V. For a discussion focusing on the problem of capacity utilization and aggregate demand (in the context of east European transition) see, Vienna Institute for Comparative Economic Studies (1993).

3) While the private sector may be assumed to consist of both domestic and foreign firms, problems of balance of payments associated with foreign investment are not considered in this paper.

4) For simplicity, it is assumed that expected return is governed by realized return on investment in the simplest manner (e.g. static expectations).

5) See section V for a discussion on this point. Also note from equations (2) and (3) that the diagonal coefficients ($a_{ii}$) can be interpreted simply as constant profit margin per unit of sale, under the assumption of cost-determined prices. See Kalecki (1971) for a classic statement of the theory of cost-determined prices.

6) Various attempts at modelling formally different aspects of evolutionary biology and "stability" of ecosystems have become common. See, in particular Nicolis and Prygogine (1977), Rescigno and Richardson (1967), May (1976) as well as the classic work of Lotka (1956).

7) The roots are necessarily real and, of opposite signs.

8) We restrict the analysis to $x > 0$ and do not discuss the singularity at $x = 0$. Economically, this is plausible if investment is gross and not net - a point discussed in greater detail in section III.

9) See previous footnote.

10) The constancy of the coefficients ($a_{ij}$) do not permit reversal of interaction e.g. from conflict to cooperation at different levels of x. This requires introducing "significant non-linearities" (see section V) without which the model has little mathematical richness, e.g. compared to the celebrated predator and prey dynamics due to Volterra and Lotka, see Hirsch and Smale (1974).

11) The definition of social profit is independent of the sectors which appropriate it. Commercial profit, on the other hand, depends precisely on the ability to appropriate it through interaction.

12) See also previous footnote 8.

13) Although this has been the focus of our enquiry, the analysis presented in the paper could also find some applications to problems of structural adjustments in developing countries, especially under economic liberalization programmes encouraged by the Bretton Woods institution.

14) Privatization does not necessarily imply a regime of *biased* property rights in favour of the private sector. However, in so far as commercial incentives to the private sector are strengthened through altering property rights, this entails increasing its power of appropriating profits, although it might still not make it a *net* appropriator.

15) In an open economy, investment equals savings plus current account deficit, with no changes in international reserves. By a self-financing economy, we mean a constant current account deficit being financed by a constant inflow of capital, so that additional investment has to be financed by additional profits yielding equation (16).

16) If $a_{11} > 0$ which means $r_1 > 0$ for at least a range of positive values of x.

17) The conventional approach is to distinguish between a "demand" and a "supply" shock, depending on the nature of shift in either curve, e.g. Borensztein, Dimitri and Ostry (1993).

18) There is no economic reason why the fraction $u_j$ should be treated as constant. This is the price we pay for simplicity.

19) Some of the problems of transition with declining rates of return have been discussed in the preceding paragraphs of section IV.

20) In an early attempt to capture economic interaction in a different context, I had used similar diagramatic analysis, e.g. Bhaduri (1981).

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