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Uneven Development in Alternative Models of North-South Trade

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INTRODUCTION

There is a voluminous literature on issues relating to trade between rich and poor nations, also called North-South trade. Much of this is concerned with the phenomenon of uneven development, the process by which the rich North becomes richer and the poor South becomes poorer as a result of their economic interaction. The contributors to this discussion comprise a diverse group, and include Amin (1977), Baran (1957), and Braun (1984), Emmanuel (1972), Frank (1975), Galtung (1971), Kaldor (1979), Lewis (1969, 1978), Myrdal (1957), Prebisch (1963), Singer (1975) and Wallerstein (1974).

This discussion has not been formal, and has hardly any connection with the formal theory of international trade which has been dominated by the neoclassical Heckscher-Ohlin-Samuelson (HOS) type theory, which has tended to create the presumption that countries gain from trade. The major differences between the uneven development literature and formal trade theory seem to lie in the nature of assumptions reflecting their world view, and the way they evaluate the consequences of trade. Formal trade theory typically assumes that economies are perfectly competitive, and in particular, that all markets are cleared by price variations.[1] The uneven development literature, not being formal, does not make its assumptions clear; however, the discussions show that its analysts do not always share the assumptions of the HOS model.[2] Formal trade theory evaluates the consequences of trade by examining utility streams derived from consumption bundles, while the uneven development literature usually discusses long run development tendencies focussing on patterns of capital accumulation.

A number of formal models of North-South trade have recently been developed which formalize some of the verbal arguments of the uneven development school, dropping neoclassical assumptions where necessary, and focusing on accumulation patterns rather than utility streams. Among these are the models of Findlay (1980, 1981), Taylor (1981, 1983), Dutt (1984a, 1987c), Vines (1984) and Conway and Darity (1985).[3] Some effort has also been made to incorporate specific mechanisms which result in uneven development (Dutt, 1988a, 1988b). All of these models assume a two country world, with a given pattern of complete specialization, but they usually make different assumptions about the structures of the North and South. They may thus have different implications for the rule of particular mechanisms in causing uneven development.

The purpose of this paper is to provide a general framework for studying different types of North-South models, so that the analytical properties of each type of model may be explored and compared, and the dynamics of uneven development better understood. This is done to show that ones' view of the evolution of the international economy, and in particular, of the nature of Southern development, depends crucially on ones' view of the structure of the world economy. The paper will have served its purpose if it can make contributors to debates in this area more aware of their view of that structure by being able to see what exactly they are assuming about the world, and how their assumption differ from those who view it in some other way.

The method adopted will be to construct an underdetermined model which can be closed using alternative closing rules, following the approach pioneered by Sen (1963) and exhaustively pursued by

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Marglin (1984a, 1984b) in the analysis of alternative models of growth and income distribution. Three preliminary remarks regarding the method are in order.

First, except for a few remarks regarding short-run behavior, our approach will be to examine long run (steady state) equilibria, and to study the effects of shifts in it due to parametric changes. This is not to deny the importance of short run phenomena. If the economy takes a long time to converge to steady state, short run phenomena may be of greater practical importance; also, without studying short run phenomena, we cannot be sure that the long run equilibria are stable. Our rationale for studying long run equilibria arises from the fact that uneven development issues are typically long run issues, and our different models are compared easily using this approach, their short run behavior possibly being diverse. The short run behavior or several models of the type to be explored have already been studied, and the rest can be explored in the way suggested below if the models are found interesting.

Second, in the analysis of one economy it is not difficult to have a general underdetermined framework with little economic content. Indeed in the work of Marglin, as extended in Dutt (1987a), the only economic assumption introduced in the general model is that of fixed coefficients (and constant returns to scale) technology, the rest comprising of accounting identities. In our general North-South model to be used here, some more special (simplifying) economic assumptions will be used. These include, but are not confined to, the South being unable to produce capital goods, and Southern workers consuming only Southern goods. In the model the only interaction between the North and the South is through free trade, no factor movements being allowed. The specificity of the general framework rules out the examination of several kinds of interesting models, some of which have already been studied, but hopefully is general enough for analyzing a variety of models and illustrate the general points of this paper.

Third, in his discussion of alternative closures, Marglin discussed three: a neoclassical, a neo-Keynesian, and a neo-Marxian; a neo-Kaleckian one was added in Dutt (1987a). The crucial feature of the neoclassical one is the assumption of full employment growth; that of the neo-Keynesian one, investment depending on desired accumulation rates of firms; and that of the neo-Marxian one, the real wage fixed at some "subsistence" level. While all assume full capacity (due to perfect or some other form of competition), the neo-Kaleckian one allows for excess capacity.[4] The models of this paper are premised on two countries, and encapsulate sixteen different closures on the basis of the four alternatives identified above. In practice, some models are logically ruled out given our framework of analysis.[5] There is, on the other hand, the possibility that new types of closures not meaningful in a single economy model may now become possible. Instead of undertaking the tedious task of discussing each possible closure, some cases which have been discussed in the literature will be examined. Most contributions, drawing on the analysis of Lewis (1954), make the South a neo-Marxian type of an economy. Findlay's models make the North neoclassical, those of Taylor and Dutt, neo-Kaleckian, and that of Vines, neo-Marxian; we will also develop a model with a neo-Keynesian North. To examine the implications of giving up the neo-Marxian closure for the South, a closure with a neoclassical North and a neo-Keynesian South will be examined. A model with a neo-Kaleckian North, but a South which does not correspond completely to any of the four categories is also examined to illustrate how additional closures become possible.

The rest of the paper proceeds as follows. Section 2 examines the general framework. Section 3 examines the alternative models to show how long run equilibrium is determined in each of them and how that equilibrium responds to parametric shifts. Section 4 relates our models to the literature on uneven development.

THE GENERAL FRAMEWORK

Assume that there are two countries, a rich North and a poor South, which each produce a single good—the N good and the S good—respectively. Each good is produced with a Leontief technology, using two homogeneous factors of production, capital and labour. The S good is only a consumption good, but the N good is a consumption good and the investment good (both in the North and the South). These assumptions imply that we can write two quantity equations and two price equations, one for each country,

as follows:

$$X_n = c_n^n L_n + c_n^s L_s + g^n K_n + g^s K_s \tag{1}$$

$$X_s = c_s^n L_n + c_s^s L_s \tag{2}$$

$$P_n = W_n a_0^n + r_n P_n (K_n/X_n) \tag{3}$$

$$P_s = W_s a_0^s + r_s P_n (K_s/X_s) \tag{4}$$

with

$$K_i/X_i \geq a_1^i , \qquad i = n,s \tag{5}$$

where X_i denotes the level of output, P_i the price level, a_0^i and a_1^i the technologically required labour-output and capital output ratios, L_i the labour employed, K_i the amount of capital installed, W_n the money wage, r_i the rate of profit, and g^i the rate of growth of capital stock; the indices n and s denote North and South; and c_j^i denotes the consumption of good j in country i per worker employed in country i. Prices are measured in terms of a common currency (with the exchange rate fixed and set equal to one); this assumption is irrelevant in models which determine only relative prices. (5) implies that excess capacity of installed capital may exist, but the actual capital output ratios cannot exceed the technologically required ones.

We will assume that workers do not save and receive only wage income; capitalists do not work and only earn profit income. In the North, capitalists save a constant fraction s_n of their income; the combined consumption expenditure of workers and capitalists is then split between the North and South goods, with a constant fraction, a, being spent on the N good. In the South workers only consume the Southern good; capitalists save a constant fraction s_s and spend a constant fraction, b, of their consumption expenditure of the N good, the rest going to the Southern good. Labour and capital are internationally immobile. These assumptions imply that we can write

$$c_n^n L_n P_n = a[W_n L_n + (1 - s_n) r_n P_n K_n] \tag{6}$$

$$c_s^n L_n P_s = (1 - a)[W_n L_n + (1 - s_n) r_n P_n K_n] \tag{7}$$

$$c_s^s L_s P_s = W_s L_s + (1 - s_s)(1 - b) r_s P_n K_s \tag{8}$$

$$c_n^s L_s P_n = (1 - s_s) b r_s P_n K_s \tag{9}$$

Substitution of (6) through (9) in (1) through (4), after some simple manipulations, yields

$$1 = a[(W_n/P_n)a_0^n + (1 - s_n) r_n (K_n/X_n)] + [(1 - s_s) b r_s + g^s](K_s/K_n)(K_n/X_n) + g^n (K_n/X_n) \tag{10}$$

$$1 = (1 - a)[(W_n/P_n)(P_n/P_s)a_0^n (X_n/K_n)(K_n/K_s)(K_s/X_s) + (1 - s_n) r_n (K_n/K_s)(K_s/X_s)(P_n/P_s)] + (W_s/P_s)a_0^s + (1 - s_s)(1 - b) r_s (P_n/P_s)(K_s/X_s) \tag{11}$$

$$1 = (W_n/P_n)a_0^n + r_n (K_n/X_n) \tag{12}$$

$$1 = (W_s P_s)a_0^s + r_s (P_n/P_s)(K_s/X_s) \tag{13}$$

Without any capital flows, balance of payments requires balanced trade, which implies

$$(1 - a)[W_n L_n + (1 - s_n) r_n P_n K_n] = g^s P_n K_s + (1 - s_s) b r_s P_n K_s \tag{14}$$

which, in turn, implies

$$(1 - a)[W_n/P_n)a_0^n (X_n/K_n)(K_n/K_s) + (1 - s_n) r_n (K_n/K_s)] = g^s + (1 - s_s) b r_s \tag{15}$$

Substitution of (15) and (3) in (1) implies

$$s_n r_n = g^n \tag{16}$$

while substitution of (15) and (4) in (2) implies

$$s_s r_s = g^s \tag{17}$$

which simply show that the balanced trade, in each country, total income must equal total expenditure, so that saving must equal investment.

The framework examined so far can be represented by five equations, that is, equations (10), (12), (13), (16) and (17).[6] However, it has ten variables, that is, W_n/P_n, W_s/P_s, r_n, r_s, g^n, g^s, K_n/X_n, K_s/X_s, K_s/K_n, and P_s/P_n.

In the short run, we may choose to fix K_s/K_n, assuming stocks of capital to be fixed in that run. But since attention is being confined to long run equilibria, one more equation is obtained by treating K_s/K_n as a variable to be determined, which implies that K_n and K_s must be growing at the same rate, or that

$$g^n = g^s \tag{18}$$

which is the condition for long run (steady state) equilibrium for the international economy. Note that equation (18) implies, after substituting it, (12), (16) and (17) in (10),

$$K_s/K_n = [(1 - s_s)b/s_s + 1]^{-1}(1 - a)[(1/g(K_n/X_n) - 1] \tag{19}$$

where g is the common rate of growth of capital stock.

Four more equations are now needed to "close" our model. Alternative sets of four equations are considered below.[7]

The effects of parametric shifts on the variables of the models are also examined for each type of closure. We shall be interested in the effects on the rates of growth, the rates of profits, the real wages, the terms of trade, and K_n/K_s. Note that the real wage in the North, in terms of the true cost of living index is given by

$$V_n = W_n/(P_n^a P_s^{1-a})$$

which can be written as

$$V_n = (W_n/P_n)(P_n/P_s)^{1-a} \tag{20}$$

The real wage in the South is given by W_s/P_s.

ALTERNATIVE CLOSING RULES

This section considers alternative models resulting from alternative closures of the general model.

Neoclassical North with Neo-Marxian South

This model assumes full capacity utilization in long run equilibrium, full employment growth in the North as in neoclassical growth models, and a fixed real wage in the South. The assumption of full capacity utilization requires

$$K_n/X_n = a_1^n \tag{21}$$

$$K_s/X_s = a_1^s \tag{22}$$

Competitive conditions in the markets for both goods would suffice to result in full capacity utilization. The rate of growth of labor supply in the North is assumed to be fixed at n, and full employment growth requires

$$g^n = n \tag{23}$$

Sufficient wage flexibility, at least in the long run, can bring about full employment growth. The Southern

wage assumption is

$$W_s/P_s = V_s \tag{24}$$

where V_s is the fixed real wage. This fixity can be the result of the wage being fixed at subsistence by the existence of a reserve army of unemployed, or by class struggle. For underdeveloped economies it might make the most sense to assume it to be fixed along the lines suggested by Lewis (1954), by the average income in the subsistence sector.

Substitution of (22) and (24) into (13) implies

$$1 = V_s a_0^s (P_s P_n) + r_s a_1^s \tag{25}$$

which gives a relation between r_s and the terms of trade shown by OT in the first quadrant of Figure 1. Equation (17) expresses the relationship between the southern growth rate and r_s shown by OS in the second quadrant. Equation (16) is the relationship between the northern growth rate and r_n shown by ON in the third quadrant. Substitution of (21) in (12) yields

$$1 = (W_n/P_n)a_0^n = r_n a_1^n \tag{26}$$

which establishes the Northern wage-profit frontier shown as AB in the fourth quadrant. From (23), the level of g^n is fixed at rate n, and the third quadrant thus determines g^n and r_n. From (18), we can extend the horizontal line from this quadrant into the second, which determines g^s and r_s; the first quadrant then determines P_s/P_n. The fourth quadrant determines W_n/P_n. K_s/K_n then becomes determinable by substituting equations (21), and (23) in (10) to get

$$K_s/K_n = [(1 - s_s)b/s_s]^{-1}(1 - a)[(1/a_1^n n) - 1] \tag{27}$$

The Northern real wage, given by (20), is also solved since (W_n/P_n) and (P_s/P_n) have already been solved. The long run equilibrium for this model is thus completely determined.

The effects of variations in parameters may now be examined. This can be done by examining how the curves of Figure 1 shift, which show the determination of all relevant variables, except for V_s and K_s/K_n, which can be studied from equations (20) and (27), respectively. A rise in n will not shift any of the curves, but will have its effects by pushing up g^n. A rise in V_s will rotate the OT curve of the first quadrant updards. A rise in s_n will rotate ON in the third quadrant upwards, while a rise in s_s will rotate OS in the second quadrant upwards and affect (27). Changes in a and b will affect the diagrams, but will (27); the change in a is not relevant in studying the impact on the Northern real wage, which should be measured in terms of a given cost of living index. Technological changes in the South, shown by declines in a_0^s and a_1^s will rotate OT downward. Technological changes in the North will shift the AB curve outward: when a_0^n falls the curve will rotate anchored at B; when a_1^n falls it will rotate anchored at A and affect (27).

Among the North-South models available in the literature this one resembles most those of Findlay (1980, 1981). Findlay's model, like the one here, assumes full employment growth in the North at a given rate, and a fixed real wage in the South. However, his model allows for factor substitution with smooth technologies, while ours assumes fixed coefficients. His model also does not distinguish between Northern classes, assuming the same saving behavior for all Northerners, while ours allows for two classes, and allows them to have different saving propensities. Thus, if his is a Solow-Lewis model, ours may be called a Kaldor/Pasinetti-Lewis model. Notice our model proceeds without factor substitution, without differences in saving patterns among Northern classes; no general steady state is possible: i.e. Harrod's long run problem would emerge. The differences in our assumptions from Findlay's also imply differences in results.

Neo-Marxian North and Neo-Marxian South

In this model we assume full capacity utilization in both the North and the South, so that equations (21) and (22) are used in this model. The South has a given real wage as in the previous model, so that (24)

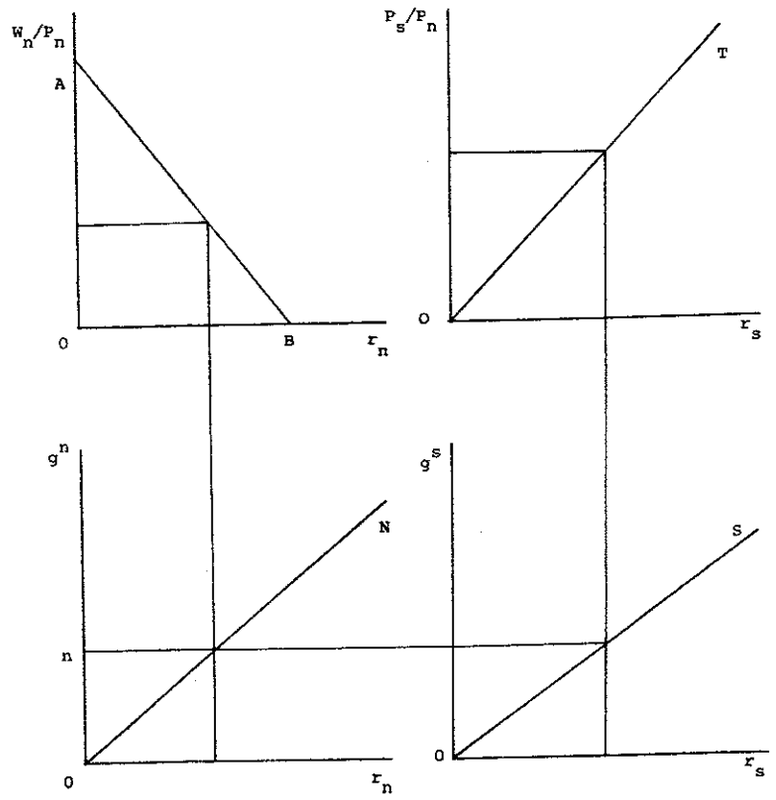

Figure 1. Neoclassical North and neo-Marxian South

still applies. Instead of (22), however, we assume a given real wage in the North, so that

$$(W_n/P_n) = V_n(P_s/P_n)^{1-a} \tag{28}$$

is assumed with a given V_n. The real wage in the North can be fixed by factors related to the state of the class struggle, or Lewis type factors, although the former assumption may make more sense for advanced countries.

Using (22) in (13) implies (25) as in the previous model; this gives the OT line in the first quadrant in Figure 2 exactly in the same way as in Figure 1. From equations (16) through 18 we get

$$r_n = (s_n/s_s)r_s \tag{29}$$

which gives us curve OR in the second quadrant, which combines the second and third quadrants of Figure 1. Substitution of (21) in (12) again gives (26), which gives the Northern wage-profit frontier as in the fourth quadrant of Figure 1. Equation (28) is plotted in the fourth quadrant as curve ON for a given V_n. Curve CD in the first quadrant is derived from the three curves in the other three quadrants: it shows combinations of the terms of trade and southern profit rate which satisfy equations (26), (28) and (29). It is easily seen to be downward sloping: a higher r_s results in a higher r_n in the second quadrant, which results in a lower W_n/P_n in the third, which results in a lower P_s/P_n in the fourth. Steady state P_s/P_n and r_s resolved for at the intersection of OT and CD in the first quadrant, and r_n and W_n/P_n can be read off the others. Substitution of the rates of profit in (16) and (17) give the rates of growth, g*. Substitution of this

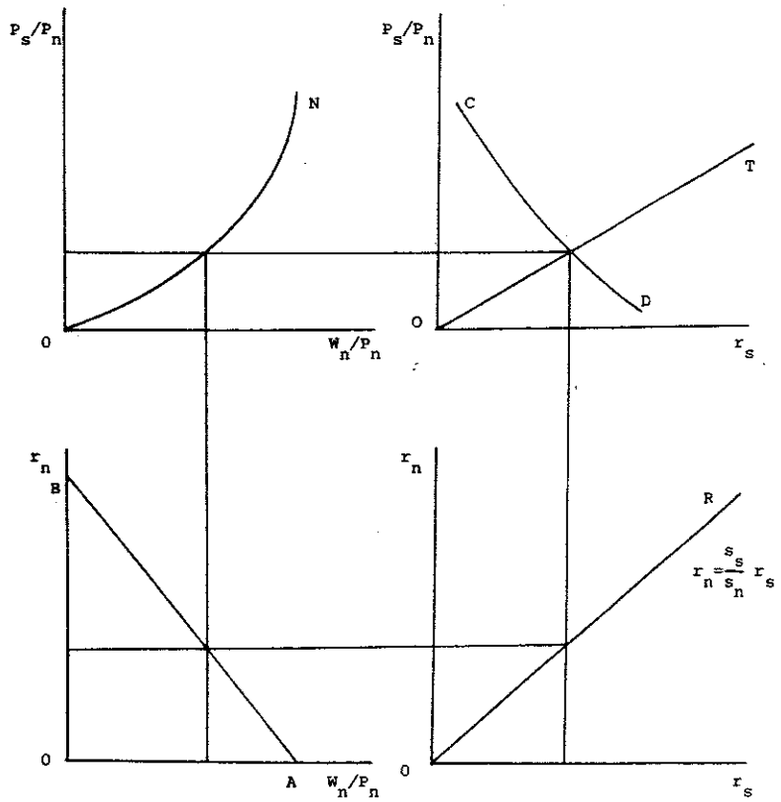

Figure 2. Neo-Marxian North and neo-Marxian South

value and (21) in (19) implies

$$K_s/K_n = [(1 - s_s)b/s_s + 1]^{-1}(1 - a)[(1/g^*a_1^n) - 1] \tag{30}$$

which solves for the steady state value of K_s/K_n.

The effects of parametric variations follow from examination of shifts in the curves of Figure 2, and from (16), (17) and (30). A rise in V_n pushes the ON curve to the left, and this implies that CD is pushed to the left; the rates of profit fall, which implies, from (16) or (17), that g* falls. From (30), K_s/K_n rises. The effects of the other parametric variations can be studied in the same way; to verify this, note the following facts about Figure 2. A rise in the Southern real wage rotates OT upwards, leaving CD unchanged. A rise in s_n rotates OR downward, shifting CD to the right, while a rise in s_s rotates OR upwards, shifting CD to the left; since g* rises and so does s_s, from (30) it is not possible to sign the effect of K_s/K_n—it can be shown to depend on expenditure patterns. A rise in a twists the ON curve of the fourth quadrant, pushing it leftward above $P_s/P_n = 1$, rightward below it, and unchanged at $P_s/P_n = 1$; this implies the twisting of CD in a clockwise direction. The effects in the table are shown assuming an initial equilibrium $P_s/P_n = 1$.[8] Reduction in a_0^s and a_1^s rotate OT downward; reductions in a_0^n and a_1^n rotate AB and shift CD to the right.

Among the North-South models to be found in the literature, this model comes closest to the Vines's model (1984) which formalizes Kaldor's work, though there are several differences in assumptions. Vines allows the capital-output ratio in the South to depend on the amount of land, and that there is diminishing

returns to land; rental income thus emerges as a third category of income in the South, and this is the source of the differences between his long run results and ours. Thirlwall (1986) considers a closed economy model (with two sectors—an agricultural and a manufacturing) which in essence is the same as the model considered here, with differences due to the fact that he ignores the distinction between classes in the agricultural sector (our South), fixes the real wage in terms of the agricultural good ($W_n/P_s = V_n$ in our notation) and asumes that $s_n = 1$. Conway and Darity (1985) consider neo-Marxian fixed wage assumptions for what they call their short run and intermediate runs; but for their long run they revert to neoclassical assumptions.

Neo-Keynesian North and Neo-Marxian South

This model assumes full capacity utilization in the two countries, so that we assume (21) and (22); the South is still neo-Marxian, so that we assume (24). The North is now neo-Keynesian: its investment driven by animal spirits represented by a desired accumulation function which makes the rate of Northern investment depend positively on the Northern rate of profit, so that we have

$$g^n = g^n(r_n) \tag{31}$$

where $g^n(0) > 0$ (some investment is forthcoming even at a zero rate profit), $g^{n\prime} > 0$ and $g^{n\prime\prime} < 0$ (the rate of investment rises, but at a diminishing rate with the rate of profit).

In Figure 3, the first quadrant shows equation (16) as line ON, and (31) as the desired accumulation function DD. Their intersection solves for the Northern growth rate and the rate of profit. The wage-profit

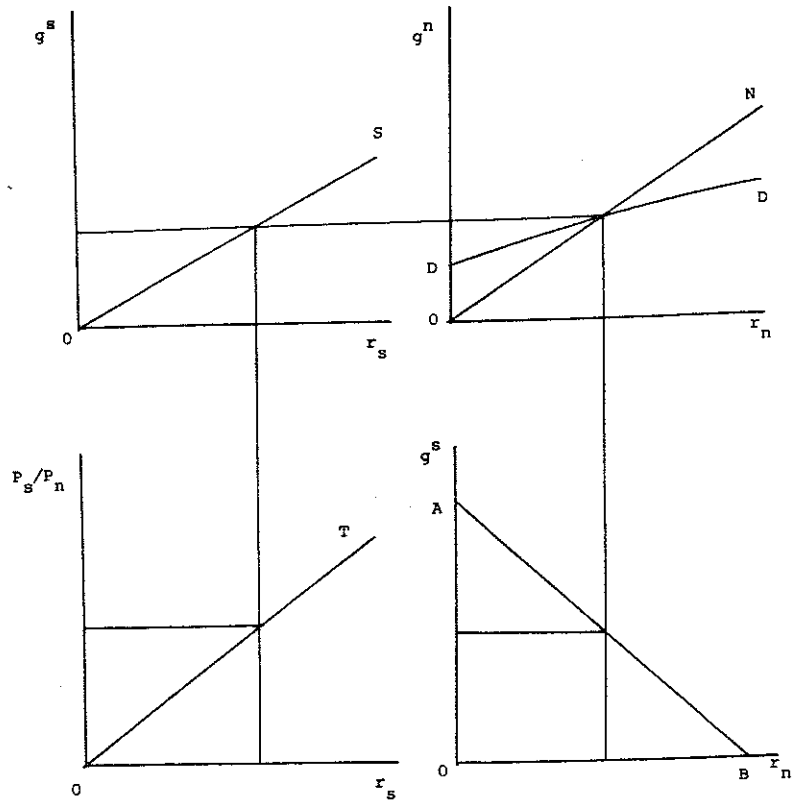

Figure 3. Neo-Keynesian North and neo-Marxian South

frontier AB, obtained from substituting (21) in (12), in the second quadrant then solves for W_n/P_n. The fourth quadrant solves for the Southern growth rate and the rate of profit (line OS shows equation (17)). OT shows the relation between the terms of trade and the rate of profit of the South given by equation (25), which must hold in this model, and solves for the terms of trade. The ratio of the stocks of capital is then determined from (30), where g^* is the common rate of growth of capital stock determined in the first quadrant. The real wage in the North is determined from (20).

While this model has not yet been examined in the literature on North-South models, its appeal is likely to be widespread among those of a neo-Keynesian persuasion.

Neo-Kaleckian North and Neo-Marxian South

This closure assumes full capacity utilization in the South, so that (22) is assumed, but allows for the existence of excess capacity in the North, so that (21) is *not* assumed; it is assumed that in (5) the strict inequality applies for $i = n$. We thus have three degrees of freedom to close. The first is provided by the assumption of a neo-Marxian South, which implies equation (24). The second is provided by a desired accumulation function

$$g^n = g^n(r_n, X_n/K_n) \tag{32}$$

where both partial derivatives are positive. The second argument is an index of capacity utilization, and is included to formalize the assumption that greater capacity utilization results in a higher rate of investment, along the lines discussed in Dutt (1984b). A third is provided by a markup pricing equation

$$P_n = W_n a_0^n(1 + z) \tag{33}$$

where z is the fixed markup rate, given, perhaps, by the degree of concentration in the Northern industry. Markup pricing implies the existence of monopoly power; indeed, it is this monopoly power which prevents the achievement of full capacity utilization through Northern price reductions.

Substitution of (33) in (12) implies

$$r_n = [z/(1 + z)](X_N/K_n) \tag{34}$$

Inversion of this function and substitution in (32) implies that g^n is a rising function of r_n, which we assume to be concave; it is drawn as DD in the first quadrant of Figure 4. Its intersection with the ON curve (representing (16)) solves for g^n and r_n. In the second quadrant AB is the wage-profit frontier of our earlier models. In this model the economy must be inside it, due to the existence of excess capacity. From (33) we solve for $W_n/P_n = 1/(1 + z)a_0^n$, so that the economy must be at point C; since C is inside AB, the inequality in (5) for $i = n$ is satisfied. This can be shown to impose a lower limit on the value z can take. OS in the fourth quadrant shows equation (17) and solves for r_s and g^s. In the third quadrant OT represents equation (25) and solves for the terms of trade. Substituting for the solved value of r_n in (34) and inverting gives the value of X_n/K_n; substitution of this value and of the solved value of the common rate of growth, gives the value of K_s/K_n. Finally, the real wage in the North is obtained from (20).

The long run effects of parametric variations are shown in Figure 4. Notice that a rise in z, the rate of markup, implies a downward shift in the DD curve. To obtain explicit solutions for the rate of growth we have assumed a linear form of (32) given by

$$g^n = c_0 + c_1 r_n + c_2(X_n/K_n) \tag{35}$$

where the c_is are positive constants. Under this assumption we can show, from (19), that

$$K_s/K_n = s_n^{-1}[(1 - s_s)b/s_s + 1]^{-1}(1 - a)[1/z + (1 - s_N)] \tag{36}$$

which shows, among other things, that $dg/dz < 0$, and $d(K_s/K_n)/dz < 0$.

This model resembles the models of Taylor (1981, 1983) and Dutt (1987c, 1988a, 1988b), which are all fixprice/flexprice models with excess capacity and quantity adjustment in the North and full capacity and price adjustment in the South. Taylor's model differs somewhat in allowing for a third country,

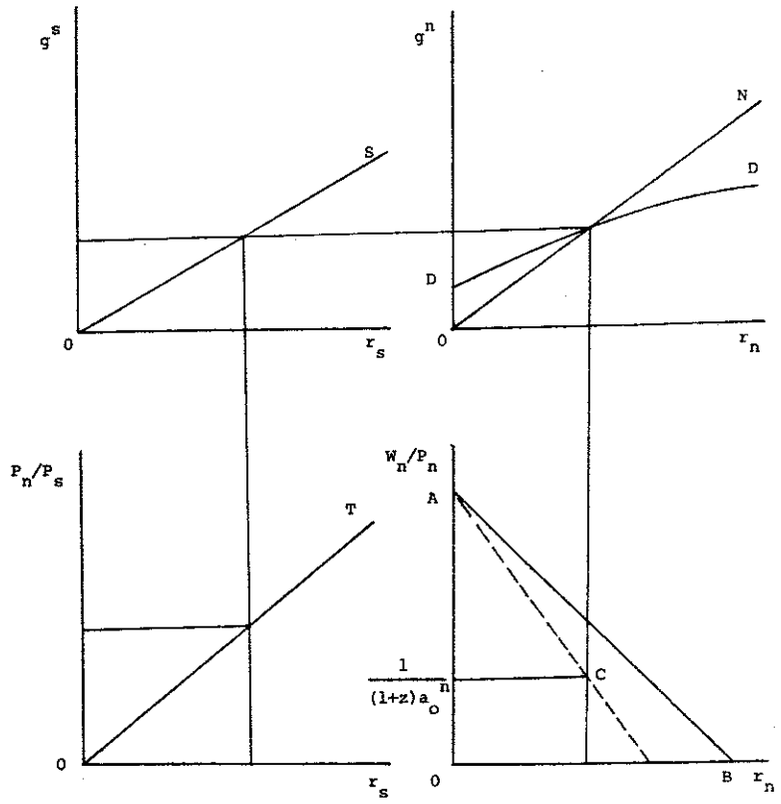

Figure 4. Neo-Kaleckian North and neo-Marxian South

OPEC, and allows the North to import "oil" as an intermediate input. Dutt (1988b) extends the model of this section to consider endogenous taste changes and Dutt (1988a) examines the relationship between the model and Baran's (1957) analysis.

Neo-Kaleckian North and South with Excess Capacity

The model of the previous section could have been derived from an assumption of competitive conditions for the S goods market. We now consider a closure which allows monopoly power to exist in the South as well, with excess capacity firms setting the price as a markup on prime costs as did Northern firms in the previous model. Southern firms, however, will not have a desired accumulation function, but will invest all savings. The South therefore does not fit into any of the four closures discussed above; the North will be assumed to be neo-Kaleckian.

For the North we shall assume (32) and (33). For the South we forsake (22) and assume markup pricing, so that

$$P_s = W_s a_0^s(1 + z_s) \tag{37}$$

where z_s is the fixed markup in the South. To determine the levels of P_n and P_s, which are in fact necessary to know the terms of trade, we shall assume given levels of W_n and W_s.[9]

The first quadrant of Figure 5 is exactly the same as that of the first quadrant of Figure 4, and r_n and

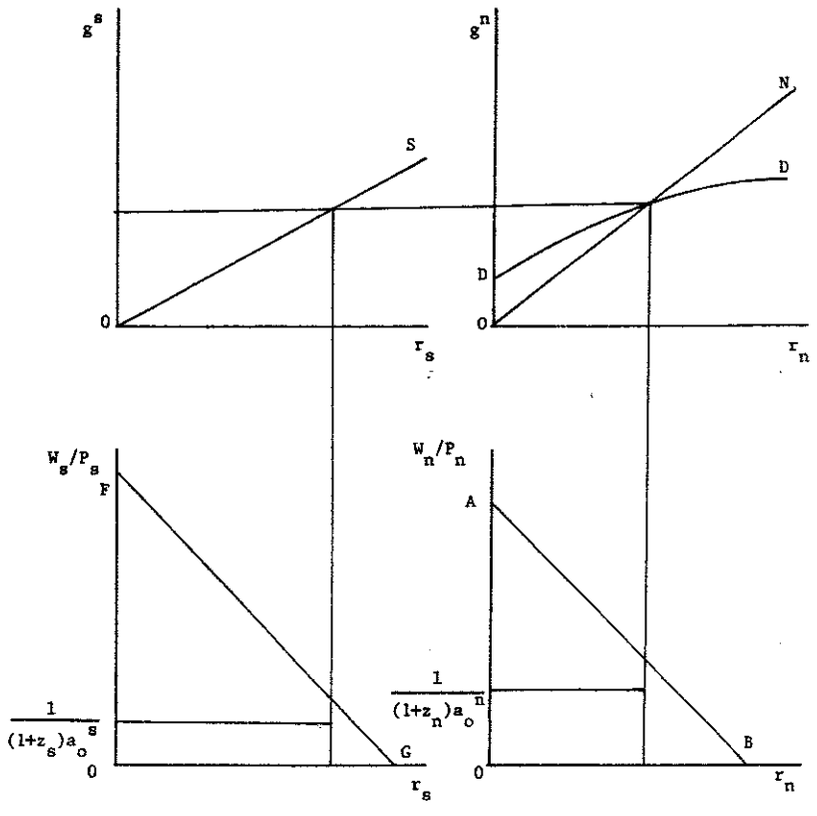

Figure 5. Neo-Kaleckian North and South with excess capacity

g^n are determined in it. The second and the fourth are the same as well: g^s and r_s are determined in the fourth, and the value of W_n/P_n found from (33) shows in the second quadrant which point inside the potential wage-profit frontier the Northern economy is on (exactly as in the previous Figure). In the third quadrant FG shows the potential wage profit frontier for the South. With $W_s/P_s = 1/a_0^s(1 + z_s)$ found from (37), the point within the frontier that the South will be at is determined; operation within the frontier ensures the existence of excess capacity there. The Southern rate of profit is given by

$$r_s = [W_s z_s a_0^s/(1 + z_n)W_n a_0^n](X_s/K_s) \tag{38}$$

which can be inverted to solve the X_s/K_s, the degree of Southern capacity utilization. The terms of trade derived from (33) and (37) are

$$P_s/P_n = W_n a_0^n(1 + z_n)/W_s a_0^s(a + z_s). \tag{39}$$

Assuming the linear investment function given by (35) it can also be shown that

$$K_s/K_n = s_n^{-1}[(1 - s_s)b/s_s + 1]^{-1}(1 - a)[1/z_n + (1 - s_n)]. \tag{40}$$

Finally, from (20) and (39), the Northern real wage becomes

$$V_n = W_n^{1-a}/[a_0^n(1 + z_n)]^a W_s a_0^s(1 + z_s). \tag{41}$$

In this model money wages become parameters as well. This model is developed more fully in Dutt (1984a).

Neo-Marxian North and Neo-Keynesian South

The models discussed above, with the exception of the previous one, had a neo-Marxian South. To explore the significance of that assumption, consider a model which makes the North neo-Marxian, but lets the South be neo-Keynesian: the exact opposite of the model of section 5. Assume equations (21) and (22), ensuring full capacity utilization everywhere. Assume also (28), with a fixed V_n, which renders the North neo-Marxian. Finally, assume a desired accumulation function given by

$$g^s = g^s(r_s) \tag{42}$$

where $g^{s\prime} > 0$, $g^{s\prime\prime} < 0$ and $g^s(0) > 0$.

In Figure 6 DD (the Southern desired accumulation function given by (42)) and OS, given by (17), determine g^s and r_s. Line ON, representing (16) determines r_n. AB, the Northern wage-profit frontier determines W_n/P_n and OT, representing (28) determines the terms of trade. In the top diagram, the Southern wage-profit frontier determines W_s/P_s, once its slope has been fixed after the terms of trade is known. The ratio of the stocks of capital is given by (30), where g* is the common growth rate determined in the figure.

The effects of parametric shifts in P_s/P_n will change the slope of the Southern wage-profit frontier—improvements in the terms of trade are analogous to increases in the productivity of capital. The rise in g refers to shifts in the desired accumulation curve for the South. Among the results notice, in particular, that the effects of technological progress are very different from what they were in the other models.

CONCLUSION

This paper has developed a general framework in which several different models of North-South trade can be looked upon as special cases. Some of the models developed have close relatives existing in the formal literature, while others may have somewhat less close relatives (who may disown them, uncharitably perhaps!) in the informal literature. We have examined the long run equilibrium positions of several models using simple diagrammatic techniques, and analyzed the impact of exogenous changes in them.

Among the variables we have solved for is K_s/K_n, the ratio of Southern to Northern capital stock, and we have explored how this variable changes with parametric changes. A fall in K_s/K_n is a mechanism of uneven development that is represented as a parametric shift. Note that a fall is K_s/K_n implies a shift in the dynamic path from one long run equilibrium to another (both of which are consistent with equal North-South growth rates), which implies that the North, on average, must have grown (in capital stock) more than the South.

Using this definition of uneven development, we can use our formal models to understand the nature of North-South interactions in a more rigorous manner than was possible in the verbal literature. One issue that has attracted much attention here concerns the secular decline of the Southern terms of trade. Our results give some support to the view that terms of trade deterioration is linked with uneven development. As Singer (1975) and Prebisch (1963) argued, shifts in expenditure patterns in Northern countries towards Northern goods (reflected in our models by increases in a) results in both terms of trade deterioration and uneven development in almost all our models. Moreover, the Singer-Prebisch effects of technological change—with the North retaining the fruits of its technological change and the South losing its benefits through terms of trade deterioration—are also found to exist in several of our models. Finally, our models are capable of formalizing some of the arguments of Baran (1957) and Emmanuel (1972) by exploring the implications of changes in the real wage in the North in the models with a Kalecki-Steindl North.[10] But our analysis also suggests that the controversy over the terms of trade issue was to some extent misplaced. In a model in which the terms of trade are endogenously determined, it is not true that its deterioration for the South is necessarily associated with uneven development. In some of our models we in fact find a marked inverse correlation between terms of trade deterioration and uneven development.

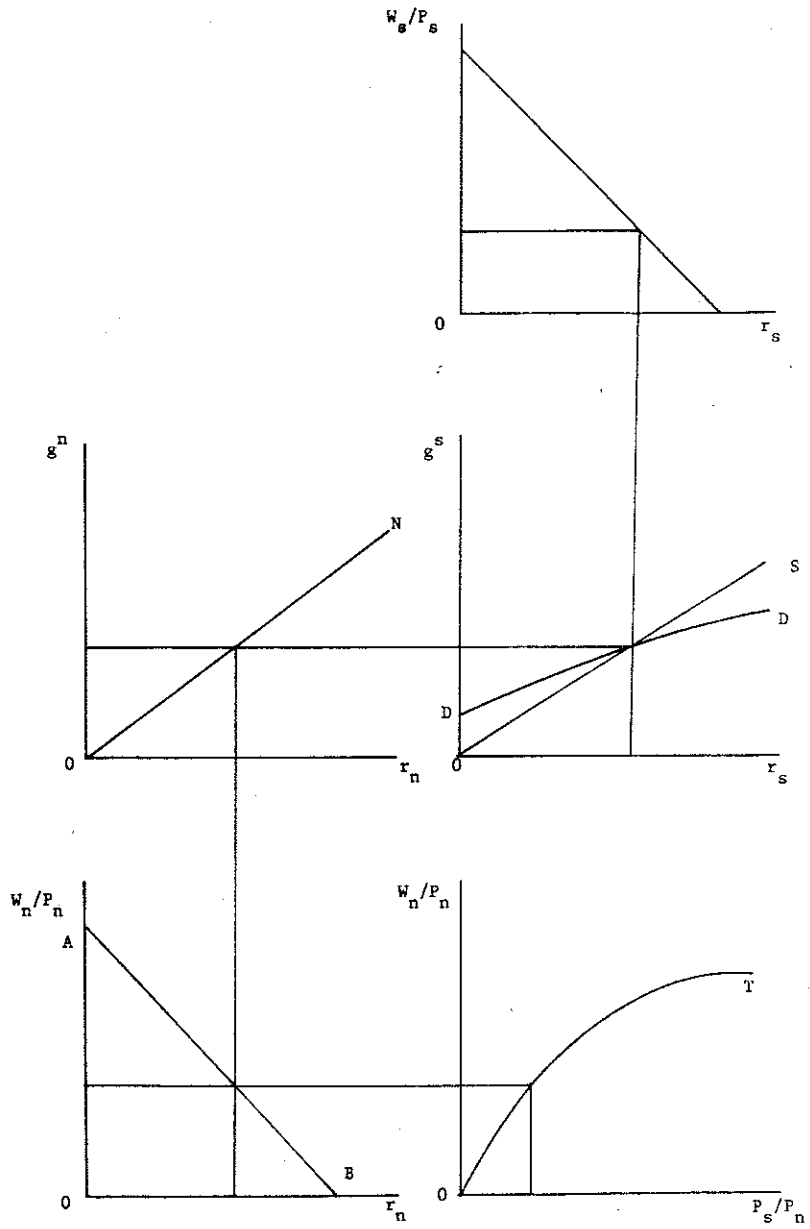

Figure 6. Neo-Marxian North and neo-Keynesian South

For the model with the neoclassical North and the neo-Marxian South, for instance, there is no parametric shift which leads to both terms of trade deterioration and uneven development.

It may be objected that it is inappropriate to study the phenomenon of uneven development by examining comparative dynamic effects which compare long run equilibria in which North and South grow at the same rate. It can be argued that uneven development implies some type of cumulative process of unstable growth which does not lead to a stable long run equilibrium (as modelled in Krugman (1981)

and Dutt (1986); or that the long run equilibrium should allow the North and South to grow at divergent rates. However, our method offers simplicity. Further, endogenization of some of the long run parameters of the model could easily give rise to inequalizing cumulative processes in the context of wider models (see Dutt, 1988b).[11]

It may also be objected that our models are too special, in consequence of the restrictive nature of their general framework. For example, a given pattern of specialization is assumed (see Dutt (1987b) for a defense of this assumption), the South is not allowed to produce investment goods, there are no intermediate goods, particular saving and spending patterns are postulated, fixed coefficients of production are assumed, and capital movements are abstracted from. Our defense is that our purpose here is to show how different models can be treated as alternative closures to a general model; if one does not like the general model, suitable alterations can be made. Some relatively simple extensions would not modify our conclusions substantially: substitution in production and different saving and spending assumptions belong in this category. Capital mobility could also be introduced into the analysis by modifying our general framework.

NOTES

1. There have, of course, been many contributions in the formal trade theory literature which have assumed various departures from an undistorted perfectly competitive economy, and indeed, these contributions have shown the possibility of losses from trade. The approach, nevertheless, has been that of finding optimal policies to get rid of the distortions and imperfections and reaping the benefits of trade—implicitly assuming that the optimal policies are what governments will want to and be able to pursue.
2. This is not to imply that models using completely neoclassical assumptions cannot be constructed to study North-South interaction. See, for example, Jones (1965, 1971), a variant of which is used by Darity (1982b) in his analysis of the 18th century Atlantic slave trade.
3. The literature on North-South models has become substantial and multiplying rapidly, and this paper does not discuss anywhere near all the contributions since the structure of many models is very different from ours. The contributions of Bacha (1978), Chichilnisky (1981, 1984), Spraos (1983) and Dixit (1984) are not dynamic in the sense of studying accumulation patterns of time; and that of Darity (1982a) does not explicitly introduce details regarding the terms of trade and the saving-investment process. Krugman (1981) and Dutt (1983, 1986) deal with learning processes and do not assume a given pattern of specialization as is done in the papers referred to in the text. Brewer (1985) differs from the models we look at here in not allowing for fixed capital (capital is only a wage fund), and in allowing the international mobility of capital (ours not allowing for this, as described below). Capital mobility has also been introduced in Burgstaller and Saavedra-Rivano (1984). For a survey of these and other North-South models, see Dutt (1987b).
4. Discussion of the appropriations of the names given to different models is not relevant here (but see Dutt 1987a and b). For example, one may legitimately argue that all neoclassical models do not assume perfect competition or full employment, and in fact the more interesting ones do not. Moreover, Marglin's characterization of the neo-Marxian model as one with a fixed real wage can be criticized; perhaps a more appropriate assumption would be to assume a given wage *share* (which results from a given rate of exploitation).
5. Given our steady state reference, in equilibrium, the North and the South have to grow at the same rate. This implies that in general we cannot have both economies being neoclassical or neo-Keynesian; nor can we combine a neoclassical economy with a neo-Keynesian one. It should be made clear that some of these models are ruled out because of the assumptions made in our general framework; they can become possible if modifications in it are made. For example, Conway and Darity (1985) allow for long run equilibrium with both the North and the South being neoclassical and having different rates of growth of labour supply. This is possible in their model because, unlike what is postulated in our general model, they assume non-constant returns to scale (the North exhibits increasing and the South decreasing returns to scale), and allow factor substitution in production.
6. Equation (11) can be derived from these five.
7. We could examine the dynamics out of long run equilibrium using the dynamic equations $dK_i/dt = g^iK_i$, replacing equation (18) by the condition that K_i are given in short run equilibrium, but otherwise maintaining the other equations both for the short and the long run. Other models could have different equations for the short run and the long run, as in Conway and Darity (1985). There is no guarantee, of course, that the long run equilibrium for any model would be stable. If the model is stable, then eventually the economy will settle at a long run equilibrium with a constant K_s/K_n, as analyzed in the text. This remark should make it clear that our notion of long run equilibrium is purely an analytical contruct, with no relation to the classical notion of long period position, which entails equalized profit rates between sectors and regions, reflecting the operation of the classical competitive process.
8. When the initial (Southern) terms of trade exceeds 1, the rise in a will raise it further, and raise g^*; the profit rates will rise and the ratio of Southern to Northern capital stock will fall. When it is less than 1, the terms of trade will fall, g^* will fall, and the effect on the capital stocks ratio cannot be definitely signed.
9. We have in effect been treating the Northern wage as the price of the numeraire. We now need another equation, to show that the Southern wage is fixed in terms of that numeraire.
10. These issues are discussed in Dutt (1988a, 1988b, 1988c).
11. Some of the short run models could also show the long run equilibrium to be unstable; these could also be interpreted as showing uneven development.

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