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 interactions. The contributors to this discussion comprise a diverse group, and include Ankie (1977), Baran (1957), and Stien (1984), Emmerman (1972), Frank (1975, 1979), Galtung (1970, 1971), Kaldor (1970), Lewis (1960, 1974), Myrdal (1975), Prabha (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. 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. 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 focusing 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 Frisch (1963, 1983), Taylor (1981), Dutt (1984a, 1984b), Vines (1984a) and Conway and Derry (1983). 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 role 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 one’s view of the evolution of the international economy, and in particular, of the nature of Southern development, depends crucially on one’s 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 (1964a, 1964b) 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 empirically 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 (1978a), 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 specific (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 intersection between the North and the South is through free trade, with 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 allowing a variety of models and illustrating 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 (1978a). The crucial feature of the neoclassical one is the assumption of full employment growth; that of the neo-Keynesian one, investment depending on desired acceleration rates of firms; and that of the neo-Marxian one, the rest 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. The models of this paper are premised on two countries, and encompass 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.4 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 economy. Finally, our model makes the North neoclassical, those of Taylor and Dutt, neo-Keynesian, 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.

UUNEVEN DEVELOPMENT IN ALTERNATIVE MODELS

as follows:

\[ X_N = c_1 + c_2 X_N + g_XK_N \]

\[ X_S = c_1 + c_2 X_S \]

\[ P_N = wN + r_P(K_N/X_N) \]

\[ P_S = wS + r_P(K_S/X_S) \]

with

\[ K_N/X_N \geq n_0 \]

where \( X \) denotes the level of output, \( P \) the price level, \( a \) and \( b \) the technologically required labour-output and capital-output ratio, \( L \) the labour employed, \( K \) the amount of capital installed, \( w \) the money wage, \( r \) the rate of profit, and \( g \) the rate of growth of capital stock; the indices \( n \) and \( s \) denote North and South; and \( c_1 \) denotes the consumption of good \( j \) in country \( j \) per worker employed in country \( j \). 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. (3) 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 \( s \) of their income; the combined consumption expenditure of workers and capitalists in then split between the North and South goods, with a constant fraction \( s \), being spent on the North good. In the South workers only consume the Southern good; capitalists save a constant fraction \( s \) and spend a constant fraction \( 1 - s \) of their consumption expenditure of the North good; the rest going to the Southern good. Labour and capital are internationally immobile. These assumptions imply that we can write

\[ c_1P_N = \alpha [W_N + 1 - s_1]r_P(K_N) \]

\[ c_1P_S = \alpha [W_S + 1 - s_1]r_P(K_S) \]

\[ c_1P_N = \alpha [W_S - s_1]r_P(K_N) \]

\[ c_1P_S = \alpha [W_S - s_1]r_P(K_S) \]

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

\[ 1 - \alpha [W_N/P_N]n + (1 - s_1)r_P(K_N/X_N) + (1 - s_1)s_1r_P(K_N/K_N) + g_X(K_N) \]

\[ (1 - 1 - \alpha) [W_N/P_N]r_P(K_N/X_N) + (1 - s_1)r_P(K_N/K_N) + (1 - s_1)s_1r_P(P_N/P_N) + wN/P_N = 1 - s_1]r_P(K_N/K_N) \]

\[ 1 - (W_S/P_S)n + (1 - s_1)s_1r_P(K_S/X_S) \]

\[ 1 - (W_S/P_S)n + (1 - s_1)s_1r_P(K_S/K_S) \]

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

\[ (1 - a)[W_N + (1 - s_1)s_1r_P(K_N/K_N) + g_X(K_N) + (1 - s_1)s_1r_P(K_S/K_S)] = 0 \]

which, in turn, implies

\[ (1 - a)[W_S + (1 - s_1)s_1r_P(K_N/K_N) + g_X(K_N) + (1 - s_1)s_1r_P(K_S/K_S)] = 0 \]

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

\[ 4s - 0 \]
wage assumption is

\[ \frac{W_s}{P_r} = V_r \]

where \( V_r \) is the fixed real wage. This fixes one of the terms of the wage equation by reference to the existence of a reserve army of unemployed, or by class struggle. For underdeveloped economies it might make 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 (15) implies

\[ 1 = V_0 \beta \left( \frac{P_s}{P_r} \right) + \eta \delta \]

which gives a relation between \( \delta \) 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 \( r_s \) shown by OH in the third quadrant. Substitution of (21) in (12) yields

\[ 1 = \left( \frac{W_s}{P_s} \right) \beta \delta \]

which establishes the Northern wage-profit frontier shown as AB in the fourth quadrant. From (23), the level of \( g^* \) is fixed at rate \( s \), and the third quadrant thus determines \( g^* \) and \( r_s \). From (18), we can expand the horizontal line from this quadrant into the second, which determines \( g^* \) and \( r_s \). The fourth quadrant determines \( W_s/P_r \), \( K_s/K_r \), and then becomes determinate by substituting equations (21), and (23) in (10) to get

\[ K_s/K_r = \left( \frac{1}{1 - \alpha} \right) \frac{\lambda}{\alpha (1 - \alpha) [1/\alpha (1 - \alpha) - 1]} \]

The Northern real wage, given by (20), is also solved since \( (W_s/P_s) \) and \( (P_s/P_r) \) 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 \( V_0 \), and \( K_s/K_r \), which can be solved from equations (20) and (27), respectively. A rise in \( V_0 \) will shift any of the curves, but will have its effect by pushing \( g^* \) up. A rise in \( V_0 \) will rotate the OT curve of the first quadrant upwards. A rise in \( V_0 \) will rotate OT in the third quadrant upwards, while a rise in \( V_0 \) 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 analyzing 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 \( \alpha \) and \( \beta \) will rotate OT downward. Technological changes in the North will shift the AB curve outward. When \( \alpha \) falls the curve will rotate clockwise, but when \( \alpha \) falls it will rotate clockwise at A and affect (27).

Among the North-South models available in the literature this one resists the nature 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 this is a Seldon-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. Harrold'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 (a both) in 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)
still applies. Instead of (22), however, we assume a given real wage in the North, so that

\[(W_N/P_N) = \frac{V}{P/P_N}\]

is assumed with a given \(V\). 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

\[t_n = \left(\frac{a}{\gamma}\right)_n\]

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 front as in the fourth quadrant of Figure 1. Equation (28) is plotted in the fourth quadrant as curve ON for a given \(V\).

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 (20), (28) and (29). It is easily seen to be downward sloping: a higher \(t_r\) results in a higher \(t_n\) in the second quadrant, which results in a lower \(W_N/P_N\) in the third, which results in a lower \(P_r/P_r\) in the fourth. Steady state \(P_r/P_r\) and \(t_r\) resolved for at the intersection of OT and CD in the first quadrant, and \(t_n\) 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, \(\gamma^*\). Substitution of this

value and (21) in (19) implies

\[K_r/K_s = \left(1 - \frac{\alpha}{\beta} + 1\right)^{-\frac{1}{\alpha}} + \left[1 - \frac{\alpha}{\beta}(1/1 + \gamma^*)\right]^{-1}\]

which solves for the steady state value of \(K_r/K_s\).

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 \(V\) 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 \(\gamma^*\) falls. From (30), \(K_r/K_s\) 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 \(t_r\) rotates OR downward, shifting CD to the right, while a rise in \(t_n\) rotates OR upwards, shifting CD to the left; since \(\gamma^*\) rises and so does \(t_s\); from (30) it is not possible to sign the effect of \(K_r/K_s\); it can be shown to depend on expenditure patterns. A rise in \(\theta\) shifts the ON curve of the fourth quadrant, pushing it leftward above \(P_r/P_r = 1\), rightward below it, and unchanged at \(P_r/P_r = 1\); this implies the twisting of CD in a clockwise direction. The effects in the table are shown assuming an initial equilibrium \(P_r/P_r = 1\). Reduction in \(q_1\) and \(q_2\) 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. Thriftwell (1986) considers a closed economy model (with two sectors—agricultural and 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), finds the real wage in terms of the agricultural good \( W_s/P_s - V_s \) in our notation) and assumes that \( s = 1. Coneway and Darity (1985) consider neo-Marxian lead 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

\[
g^u = g^u(\tau_s)
\]

where \( g^u(0) = 0 \) (some investment is forthcoming even at a zero rate of profit), \( g^u > 0 \) and \( g^u < 0 \) (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) at the desired accumulation function DO. Their intersection solves for the Northern growth rate and the rate of profit. The wage-profit frontier \( AB \), obtained from substituting (21) in (12), is the second quadrant then solves for \( W_s/P_s \). 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 \( g^s \) 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

\[
g^u = g^u(t_n, \frac{X_n}{K_s})
\]

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 (1988b). A third is provided by a markup pricing equation

\[
P_s = W_s(1 + z)
\]

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 (32) implies

\[
t_n = \left[\frac{z}{n(1 + z)}\right](\frac{X_n}{K_s})
\]

Inversion of this function and substitution in (32) implies that \( g^u \) is a rising function of \( t_n \), 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 \( g^u \) and \( \tau_n \). In the second quadrant AB is the wage-profit frontier of our earlier model. The assumption that the economy must be inside it, due to the existence of excess capacity. From (33) we solve for \( W_s/P_s - 1/(1 + z) \), 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 of \( z \) can take. OS in the fourth quadrant shows equation (17) and solves for \( \tau_n \) and \( g^u \). The third quadrant of OT represents equation (25) and solves for the terms of trade. Substituting for the solved values of \( t_n \) in (34) and inverting gives the value of \( \frac{X_n}{K_s} \); 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

\[
g^u = \alpha + \beta \sigma + \gamma \frac{X_n}{K_s}
\]

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

\[
\frac{K_s}{K_n} = \frac{\sigma [1 - \beta (\sigma + 1)]}{\alpha [1 - \beta (1 - \alpha)]}
\]

which shows, among other things, that \( \frac{dX_n}{K_n} < 0 \), and \( \frac{d(K_s/K_n)}{dt} < 0 \).

This model resembles the models of Taylor (1981, 1983) and Dutt (1987a, 1988a, 1988b), which are all (price/price 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.
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 Burns'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 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 forsaue (22) and assume markup pricing, so that

$$ P_s = W_s(a_1 + \pi_s) \tag{37} $$

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

The first quadrant of Figure 5 is exactly the same as that of the first quadrant of Figure 4, and $s$ and g' are determined in it. The second and the fourth are the same as well; g' and $s_1$ are determined in the fourth, and the value of $W_n/P_s$ 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 TD shows the potential wage-profit frontier for the South. With $W_s/P_s = 1/a_2(1 + \pi_s)$ 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

$$ s_1 = [W_s(a_1 + \pi_s)]W_s/a_1[K_s/K_o] \tag{38} $$

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

$$ P_s/P_n = W_s(a_1 + \pi_s)/W_n(a_1 + \pi_s) \tag{39} $$

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

$$ K_s/K_o = s_1(1 - s_1a_1a_2) \tag{40} $$

Finally, from (30) and (39), the Northern real wage becomes

$$ V_s = W_s[a_3(1 + \pi_s)]W_s(a_1 + \pi_s) \tag{41} $$

In this model money wages become parameters as well. This model is developed more fully in Dutt (1984d).
Neo-Marxist North and Neo-Keynesian South

The models discussed above, with the exception of the previous one, had a non-Marxian South. To explore the significance of that assumption, consider a model which makes the North neo-Marxist, 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 $V_c$ which renders the North neo-Marxist. Finally, assume a desired accumulation function given by

$$g^* = g^*(r_c)$$

where $g^* > 0$, $g^* = 0$ and $g^*(0) = 0$.

In Figure 6 DD (the Southern desired accumulation function given by (42) and OE, given by (17), determine $g^*$ and $r_s$. Line ON, representing (16) determines $s$, AB, the Northern wage-profit frontier determines $W_s/P_s$ 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 $P_s/P_t$ will change the slope of the Southern wage-profit frontier—improvements in the terms of trade are analogous to 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 in $K_s/K_n$ 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 (1965) 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 (1973) by exploring the implications of changes in the real wage in the North in the models with a Kaltecki-Beinell North. However, 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.

For the model with the neoclassical North and the neo-Marxian South, for instance, there is no parametric shift that 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 methods offer simplicity. Furthermore, we are concerned with some of the long run parameters of the model could easily give rise to inequitable cumulative processes in the context of wider models (see dutt, 1988b). it may also be objected that our models are too special, in consequence of the restrictive nature of their general frameworks. For example, given a pattern of specialization is assumed (see dutt 1987a) for a defense of this assumption, the north 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 clutters 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 to the formal trade theory literature which have assumed various departures from an unlimitedly perfect competitive economy, and indeed, these contributions have shown the possibilities of gains from trade. The approach, however, hitherto, has been that of finding empirical policy determinants and implications and, in that respect, implicitly assuming that the optimal policies are what governments will want to do and are able to pursue.

2. This is not to imply that models using completely neoclassical assumptions cannot be extended to study north-south interaction. See, for example, jones (1961, 1971), a variant of which is used by dutt (1986c) 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 beets (1978), chichilnisky (1981, 1984), sprag (1983) and dutt (1984) are not dynamic in the sense of studying accumulation patterns of time, and that of dutt (1986c) does not explicitly introduce details regarding the terms of trade and the saving-investment process. krugman (1981 and dutt, 1985, 1986) deal with learning processes and do not assume a given pattern of specialization or wages as does the paper referred to in the text. beets (1985) differs from the models we look at here in not allowing for fiscal capital (capital is only a wage fund), nor in allowing the international mobility of capital. we think that international capital mobility has also been introduced in burgstaller and davoudi-riparo (1984). for a survey of these and other north-south models, see dutt (1987a).

4. discussion of the appropriateness of the same 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, margin's characterization of the neo-marxian model as one with a fixed wage curve can be criticized; perhaps a more appropriate assumption would be to assume a given wage curve (which results from a given wage 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-kaleckian, nor we can have a neoclassical economy with a neo-kaleckian 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 modification is made. For example, conway and darty (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 constant returns to scale (north the north) increasing and the south decreasing returns to scale), and allow factor substitution in production.

6. equation (11) can be derived from these lines.

7. we could examine the dynamics of long run equilibrium using the dynamic equations, [de/dt = δk, replacing equation (18)] by the condition that k is 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 is in conway and darty (1986). There is no guarantee, of course, that the long run model will be stable. If the model is stable, then eventually the economy will settle at a long run equilibrium with a constant k, k sides, as in the north-south model. The world economy is purely an analytical construct, with no relation to the climatic notion of long period position, which entails equalized profit rates between north and regions, reflecting the operation of the classical competitive process.

8. when the initial (bouguen) terms of trade exceed 1, the rate will rise further, and raise g, the profit rates will rise and the ratio of southern to northern capital stocks 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 tracing the northern wages as if the price of the cottons. We now adopt another question, to show that the southern wages is fixed in terms of that numeraire.

10. These issues are discussed in dutt (1984a, 1985a, 1986b).

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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The Interest Elasticity of Money Demand: Further Evidence

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INTRODUCTION

In recent years, autonomous and induced market developments, financial deregulation, and the spread of cash-management techniques, have made available a richer array of financial assets. Some assets have both investment and transaction capabilities and blur the distinction between "money" held for transactions and assets held for portfolio purposes. It has been suggested that these developments may have altered the traditional relationship between the money stock, interest rates, and GNP (Judd and Scauldin 1982, Roley 1985).

Thus, the growth of money substitutes is often held to increase the interest elasticity of the money demand function, a proposition initially advanced by Garley and Shaw (1960). In an empirical study covering the period 1913.1-1979.4, Hafer and Hein (1984) found no increase in the interest elasticity of demand for M1 and rejected the Garley and Shaw ideas. However, we would expect that in the 1980s, a period characterized by deregulation as well as financial innovation, several factors, such as increased flows of funds within and between monetary aggregates and redenomination of these aggregates, proliferation of money substitutes, and contamination of M1 by more interest sensitive portfolio balances, would lead to an increased interest elasticity. In fact, we show that when the sample period is extended to 1987.1, this elasticity does increase. Moreover, when explicit interest paid on M1 balances is incorporated into the demand function (a variable which Hafer and Hein did not deal with), we find that the elasticity of M1 with respect to the net opportunity cost of holding such balances has also increased.

An important related question concerns the impact of deregulation on the LM schedule as well as on the interest elasticity of money demand. Although empirical evidence on the slope of the LM schedule is inconclusive, we show in section 3 that any effect of deregulation on the slope depends on the specification of the money demand function, and on the manner in which interest is paid on M1.

ESTIMATION RESULTS

We use the same money demand function specification employed by Hafer and Hein,

\[ \ln(M/P) = a_1 + b_1 \ln y + c_1 \ln RCP + d_1 \ln (M/P)_{-1} + e \]

where \( M \) is nominal balances (currency plus all checkable deposits), \( P \) is the GNP deflator (1972 = 100), \( y \) is the real GNP (1972), and RCP is the interest rate on 4-6 month commercial paper.

We estimate equation (1) over the period 1950.1-1987.1I. As in Hafer and Hein, a "log-rolling" procedure is adopted: we start with the sample 1950.1-1963.1 IV and increment this sample by adding years to the start and end points. This enables us to estimate five equations, the last of which covers 1970.1-1987.1 IV. Then we estimate two additional equations covering 1974.1-1987.1I and 1978.1-1987.1I. It is in these periods of financial innovation and deregulation that a change in the interest elasticity may occur.

The regression results are presented in Table 1. A dummy variable, with a value of zero until 1974.1 and a value of one otherwise, is used, when appropriate, to account for the shift in the demand function.

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