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OIL PRICE AND ORGANIZATIONAL ASYMMETRIES IN A NORTH-SOUTH-OPEC CONTEXT

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ABSTRACT

The object of this paper is to highlight the contribution that a dual economy in the South as organizational asimmetry makes to the oil price rise process and its effects on welfare, first, when the North is Neoclassical, secondly, when the North behaves à la Taylor.

The model shows that when the oil price rises, despite the improvement of the Southern terms of trade vis-à-vis the North, welfare in the South may deteriorate due to a decline in the levels of output and employment in the modern-advanced sector. When the North is Neoclassical, employment in the modern sector unambiguously falls. In the "structuralist" perspective, when the North is Neokeynesian, the South's level of employment in the modern sector will fall whenever OPEC's marginal propensity to import is sufficiently low. Whereas in the first framework, the oil intensiveness of Southern output is critical to the results, in the second the critical parameter is OPEC's recycling coefficient.

In general, the analysis increases our understanding of why region respond differently to the same external shock and how from different organizational asimmetries we should derive alternative policy implications. With the current fall in oil prices, the topic promises to be relevant for some time, although the direction of the shocks has been reversed.

1. INTRODUCTION

In the North-South context, one of the "structural" features most often used to characterize a Southern economy is the dual economy concept [Findlay (1980), Taylor (1981), McIntosh (1984), Burgstaller (1985)]. This assumption was put forward by Lewis (1954) and implies the explicit acknowledgement of a type of dualism which is descriptive of the domestic economic structures within many developing countries -for instance, Taiwan [McIntosh (1978)]. It concerns the labour supply in the South, specifically, it emphasizes that the South's economy faces surplus labour because of the existance of a subsistence sector which continuously supplies workers to the modern-advanced sector at a parametrically given Lewis-wage whose floor is set by the alternative earnings in the hinterland.

In contrast,the North has been traditionally modelled as a Neoclassical economy [Findlay (1980), Chichilnisky (1981), Burgstaller (1985)]. However, Keynesian unemployment is ruled out by definition in these models. Yet a high and rising unemployment trend has been a feature of OECD economies since the first oil price shock in 1973-74. While providing a useful benchmark, it should be clear that a Neoclassical model would not be the appropriate vehicle to investigate the impact of an oil price increase on effective demand, employment and welfare in a world of Keynesian rigidities.

The realization that Keynesian rigidities are a important aspect of macropolicy in the world economy has spurred a number of authors to put forward models in the "structuralist" perspective. These derive from Taylor's work and very representative papers in the area are Taylor (1981), Kanbur and Vines (1986) and Gõnzalez-Romero and Kanbur (1986).

Furthermore, the consideration of a Keynesian view of the world economy will permit us to explore the critical role of OPEC's recycling coefficient being less than one. Alternatively, in a full competitive market world economy, OPEC's recycling coefficient will necessarily equal one since otherwise Walras' Law would not prevail.

In this paper, we examine the alternative effects on the Lewisian economy of the South of a rise in the world price of oil (which is set monopolistically by OPEC). Firstly, at the time when the North's economy is at full-employment and, secondly, at the time when the North exhibits Keynesian rigidities and unemployment. Thus, we will be able to understand the contribution that the Lewis' assumption as organizational asymmetry of the South makes to the character of the model. Bringing this together with a particular asymmetry taking place in the North, we will also be able to pinpoint the contribution of each to the results of the analysis. With the current fall in oil prices, the topic promises to be relevant for some time, although the direction of the shocks has been reversed.

The plan of the paper is as follows. In section 2 we set out the structure and properties of the model when the North is neoclassical and explore the comparative static properties of the model when the oil price changes. In section 3, we do the same in the case that the North is Keynesian. Section 4 concludes the paper.

2. A Neoclassical-Lewisian Model

We assume a three regions, North-South-OPEC, view of the world. All three regions are each specialized in their production activities. The North produces manufactures, the South a primmary product and OPEC specializes in oil. These three regions are linked through trade channels. The North and the South employ an intermediate imported input, oil, from OPEC, whereas manufactures and primmary products are consumed by the three regions.

A distinguishing feature between the North and the South is taken to be the elasticity of labour supply. Usually, labour supply seems to be inelastic in the North whereas it seems fairly elastic in the South, see for instance McIntosh (1978). A simplifying assumption is incorporated here. We assume that the North exhibits a perfectly inelastic labour supply, that is labour supply is fixed in the North. Alternatively, the South is assumed to be a dual economy of the Lewisian (1954) type, therefore, the modern-advanced sector of the Southern economy faces a perfectly elastic labour supply from the subsistence sector at a parametrically given product wage rate. Let us specify the behavioural relationships of the model.

The North presents a linear technology using two inputs, labour and oil. The introduction of capital would not alter the essence of the analysis , see for instance Taylor (1981,1983) and González-Romero and Kanbur (1986). Profit-maximizing behaviour of the Northern firms under perfect competition and constant returns to scale generate the following supply price equation.

$$p_I = a_{RI}\, p_R + w_I\, l_I \qquad (1)$$

where p_I , p_R and w_I denote the price of the Northern commodity, the price of oil and the wage rate in the North, respectively. a_{RI} and l_I designate the oil- and labour-output coefficients.

As we mentioned above, labour supply in the North is fixed, so that

$$L_I^S = \bar{L}_I \tag{2}$$

We also assume a regime of labour factor inmobility across regions. In consequence, the equilibrium condition for the labour market in the North will be

$$\bar{L}_I = l_I\ Q_I \tag{3}$$

where Q_I designates the level of output in the North.

Let us now examine the behaviour of the Southern economy. We assume that the Southern technology in the modern-advanced sector is also linear employing two inputs, labour and oil. Perfect competition pricing on the part of Southern entrepreuners generates the zero marginal profit condition for maximization, that is,

$$p_A = a_{RA}\ p_R + w_A\ l_A \tag{4}$$

where p_A and w_A denotes the price of the Southern output and the wage rate in the South, respectively. a_{RA} and l_A denote now the oil- and labour-output coefficients, also respectively. However, as we noted earlier, the modern-advanced sector in the South faces a perfectly elastic labour supply at a parametrically given wage rate in terms of its output (see, Findlay (1980) and Taylor (1981,1983)),

$$\frac{w_A}{p_A} = \lambda_A \tag{5}$$

Employment in the modern sector of the South will therefore be given by:

$$L_A = l_A . Q_A \tag{6}$$

We now draw attention to the demand side of the two regions. We assume that the pattern of preferences of Northern (Southern) agents leads to a proportional expenditure system, where a fraction $\alpha_I (\alpha_A)$ of expenditure goes on primmary products whereas the rest $1 - \alpha_I (1 - \alpha_A)$ goes on manufactures; similarly, OPEC's oil revenue is assumed to be entirely devoted to the consumption of primmary products and manufactures in proportions α_R and $1 - \alpha_R$, respectively. We also assume that oil extraction costs are negligible; the introduction of such costs would be a routine exercise that would not illuminate the analysis futher.

Free trade is assumed, hence the "law of one price" will hold. In consequence, the world markets equilibrium conditions for manufactures, primmary products and oil are:

$$Q_I = \frac{(p_I - a_{RI}\, p_R)}{p_I} Q_I (1 - \alpha_I) + \frac{(p_A - a_{RA}\, p_R)}{p_I} Q_A (1 - \alpha_A) + \frac{p_R}{p_I} Q_R (1 - \alpha_R) \tag{7}$$

$$Q_A = \frac{(p_I - a_{RI}\, p_R)}{p_A} Q_I\, \alpha_I + \frac{(p_A - a_{RA}\, p_R)}{p_A} Q_A\, \alpha_A + \frac{p_R}{p_A} Q_R\, \alpha_R \tag{8}$$

$$Q_R = a_{RI}\, Q_I + a_{RA}\, Q_A \tag{9}$$

where Q_R designates OPEC's oil supplies which, according to (9), adjusts instantaneously to any given level of world demand for oil.

To summarize, the parameters of the model are the technical coefficients. l_I , l_A , a_{RI} and a_{RA} , the preference parameters. α_A , α_R and α_I , the North's labour supply $\bar{L}_I$, and the fixed Southern product wage rate λ_A . Furthermore, the price of oil, p_R , is assumed parametrically given in order to explore the comparative static properties of the model across equilibria.

The model can be seen as a general equilibrium system given by eight equations (1)-(8) in eight unknowns. Walras' Law is satisfied, so that the system should be solved out when we consider one good as a numeraire. Thus, the model collapses in a system of seven linearly independent equations in seven endogenous variables and a numeraire p_I . The endogenous variables are p_A , w_I , w_A , Q_I , Q_A , Q_R and L_A .

Before exploring the comparative static properties of the model, we examine the crucial properties of the equilibrium: existance, uniqueness and stability. Thus, the strength of the results will lie on that we, with the help of the model, are able to investigate the basic interrelationships between supply and demand factors in the oil price rise process.

First, let us find out the solutions of the model. From equation (1), we obtain the solution for w_I [1], noticing that money wages in the North are an increasing function of labour productivity. From equations (4) and (5), we obtain p_A and w_A in equilibrium; noticing thus, the higher the fixed product wage rate in the South, the higher the Southern commodity prices. Also clearly, higher labour productivity in the South will improve the North-South terms of trade p_A and the wages in the South.

From the labour market equilibrium conditions in the North, equation (3), we obtain the volume of Northern commodities in equilibrium. Finally, from equations (7) and (9) and substituting for Q_I and p_A from the equilibrium values obtained above, we have then the equilibrium solution for Q_A ,

$$Q_A = \frac{\bar{L}_I}{l_I} \cdot \frac{[\alpha_I + a_{RI}\, p_R(\alpha_R - \alpha_I)]\,(1 - \lambda_A l_A)}{a_{RA}\, p_R\,[(1 - \alpha_R) - (\alpha_A - \alpha_R)\,\lambda_A l_A]} \tag{10}$$

Notice that the South's output depends positively upon the North's preferences for primmary products and negatively upon the OPEC's preferences for Northern commodities. Moreover, it can be easily shown that the higher the labour productivity in the South, the higher the level of output supply; if the patterns of preferences across regions are identical this relationship also holds.

Given Q_A , from (6) we now obtain L_A in equilibrium. Notice that higher levels of output supply in the North will have positive effects on the South's levels of output and employment in equilibrium. Finally, given Q_A and Q_I , from (9) we compute the oil supply from OPEC.

Thus, we have found the equilibrium solutions of the model for a given set of parameters. Specifically, the equilibrium of the model is uniquely determined for a given price of oil. Since the model also exhibits Walrasian stability, see Appendix 1, we can now study the comparative static properties of the model when the price of oil changes.

First of all, from equations (4), (5) and (1), it is inmediate that

$$\frac{d\log p_A}{dp_R} = \frac{d\log w_A}{dp_R} = \frac{1}{p_R} \tag{11}$$

and $$\frac{d\log w_I}{dp_R} = - \frac{a_{RI}}{1 - a_{RI}\, p_R} \tag{12}$$

Thus, in this specific model an oil price rise, and therefore higher marginal costs, will improve the Southern terms of trade since the product wage rate in the South is fixed, thus decreasing the wage rate in the North. Notice also that, as expected, p_A and w_A will change in the same direction and their percentage change will also be the same in oder to keep invariant the product wage rate in the South.

Moreover, from equations (3), (10) and (6), we obtain the responses of the output supplies in the North and the South and, therefore, that of Southern employment, when we move to a new equilibrium with a higher price of oil

$$\frac{dQ_I}{dp_R} = 0 \tag{13}$$

$$\frac{d\log Q_A}{dp_R} = \frac{\alpha_I}{[\alpha_I + a_{RI}\, p_R(\alpha_R - \alpha_I)]p_R} \tag{14}$$

and $$\frac{dL_A}{dp_R} = l_A \cdot \frac{dQ_A}{dp_R} \tag{15}$$

Hence, the North's output is completely unaffected when the oil price rises since labour supply in the North is fixed and the labour market is always in equilibrium. On the contrary, the Southern output supply response is always negative. The argument is the following: wit a fixed product wage in the South, the increase in the oil price rises the Southern terms of trades vis-à-vis the North; the rise in p_A creates, since the system is Walras stable, an excess supply of primmary products and consequently the output supply must fall in order to balance the supply and the world demand for Southern commodities. Labour demand of Southern firms will correspondingly fall, thus leading to a decrease in the level of employment in the South's advanced sector.

It is convenient to continue our discussion by examining the oil price rise effects on each region's economic welfare. Economic welfare will be measured here through changes in the level of real consumption in the North and South [see Kanbur and Vines (1986) and González-Romero (1986)]. Thus, the real consumption in each region will depend upon both the level of nominal consumption and the ideal cost of living index for each's region consumption basket, $p_A^{\alpha_i} \, p_I^{1-\alpha_i}$. Let us denote real consumptions in the North and South as W_I and W_A, thus

$$W_I = \frac{(1 - a_{RI}\, p_R)\, Q_I}{p_A^{\alpha_I}} \tag{16}$$

$$W_A = \frac{(p_A - a_{RA}\, p_R)\, Q_A}{p_A^{\alpha_A}} \tag{17}$$

and the changes in real consumption levels when the oil price rises will then be

$$\frac{d\log W_I}{dp_R} = - \frac{a_{RI}}{1 - a_{RI} p_R} - \frac{\alpha_I}{p_A} \frac{dp_A}{dp_R} \tag{18}$$

$$\frac{d\log W_A}{dp_R} = \left(\frac{1}{p_A - a_{RA}p_R} - \frac{\alpha_A}{p_A}\right)\frac{dp_A}{dp_R} - \frac{a_{RA}}{p_A - a_{RA}p_R} + \frac{d\log Q_A}{dp_R} \qquad (19)$$

Therefore, when the oil price rises and hence the Southern terms of trade improve, the North's real consumption will unambiguously fall, though the North's output is invariant and the labour market in the North clears at the existing real wage rate. Alternatively, the South's real consumption may or may not fall. Here, two crucial impacts on the South's welfare take place: firstly, the workers in the modern sector may or may not experience a reduction in their real wage -the first two terms of the RHS of (19)-. But the South will always experience an unambiguous decline in output -the third term of the RHS of (19)-; in consequence, a fraction of Southern workers will be laid off and bound to return to their family's farm where they will enjoy the "alternative earnings" of the subsistence sector, which normally falls far below the income in the advanced sector. Obviously, the higher the fall in the South's modern sector levels of output and employment, the more detrimental to the South a rise in the price of oil will be.

This model is relatively similar to that of Taylor (1981) since here we also assume surplus labour in the South at a fixed Lewis wage; but critical differences are that, firstly, the South's output does employ oil as an input, so that $a_{RA} > 0$, and secondly, Southern output is not supply side constrained. Consequently, our results differ from those of Taylor; thus, as the oil price rises the Southern terms of trade improve rather than deteriorate due to the fact that oil is an input in Southern production and a constant Lewis wage must be maintained; therefore, the relative price responses of each region's demand will lead to an excess supply in the world market for corn; in consequence, Southern output supply will fall so as to equilibrate the market. The results also differ from those of Adams and Marquez (1983) since these two authors also obtained a deterioration of the Southern terms of trade rather than an improvement. Sumarizing, the conclusion is that the impact on the South's welfare is ambiguous rather than detrimental as in Taylor (1981) and Adams and Marquez (1983); if we also assume, as these authors do, that

OPEC recycles only into purchases of Northern products, $\alpha_R = 0$, then the negative impact on Southern welfare will be even stronger, since Southern output and employment will fall even further, see equation (14) and set $\alpha_R = 0$.

3. A Neokeynesian-Lewisian Model

Here, the North presents some typical Keynesian features. It is a "fix-price" economy with excess capacity. The price of the Northern commodity is determined by a stable markup over the variable cost:

$$p_I = (1+\pi)(a_{RI}\, p_R + l_I\, \bar{w}_I) \tag{15}$$

where π designates the markup rate, $\bar{w}_I$ represents the rigid nominal wage in the North. We can think of a situation where the North's economy experiences an excess supply of labour; since the money wage is invariant, the economy gets stuck with a real wage that is too high and with a level of employment below the quantity of labour supplied for the workers. In consequence the level of employment in the North will be derived from the demand for labour of the firms, that is

$$L_I^D = l_I\, Q_I \tag{16}$$

Turning to the demand side, we assume that a fixed fraction c_I of Northern income is consumed and that consumption expenditure is allocated, as before, in proportions α_I and $(1-\alpha_I)$ between Southern and Northern commodities, respectively[1]. Moreover, Northern demand also presents an autonomous component G(N).

With respect to the South and OPEC, we assume that these economies behave similarly as in Section 2, though now each region's effective demand may be lower than demand for full employment, thus $c_A, c_R < 1$, being $(1-c_A)$ and $(1-c_R)$ the fixed fractions of income saved in the South and in OPEC[2]. Market equilibrium conditions for the two commodities and oil require the excess demand in each market be zero; therefore

$$ED_I = - p_I Q_I + c_I(1-\alpha_I)(p_I - a_{RI} p_R) Q_I + G(N) p_I + \\ + c_A(1-\alpha_A)(p_A - a_{RA} p_R) Q_A + c_R(1-\alpha_R) p_R Q_R = 0 \tag{17}$$

$$ED_A = - p_A Q_A + c_I \alpha_I (p_I - a_{RI} p_R) Q_I + c_A \alpha_A (p_A - a_{RA} p_R) Q_A + \\ + c_R \alpha_R p_R R = 0 \tag{18}$$

$$ED_R = - Q_R + a_{RI} Q_I + a_{RA} Q_A = 0 \tag{19}$$

In sum, the parameters of the model are the same as in the Neoclassical-Lewisian model of section 2, though three more parameters are now included: the autonomous demand in the North G(N),the marginal propensities to consume c_i , and the fixed money wage in the North $\bar{w}_I$. The price of oil p_R is also assumed parametrically given in order to solve the model.

The model is thus a system of eight independent equations in eight unknowns. The equations are (4)-(6) and (15)-(19) and the endogenous variables are p_I , p_A , w_A , Q_I , Q_A , L_A , L_I and Q_R . Substituting (4),(6),(16) and (19) into (17) and (18), we get

$$Q_I = \frac{c_A(1-\alpha_A)\frac{p_A}{p_I} + a_{RA}\frac{p_R}{p_I}(c_R(1-\alpha_R) - c_A(1-\alpha_A))}{\Delta_1} Q_A + \frac{G(N)}{\Delta_1} \tag{20}$$

$$Q_I = \frac{(1-c_A\alpha_A)\frac{p_A}{p_I} + a_{RA}\frac{p_A}{p_I}(c_A\alpha_A) - (c_R\alpha_R)}{\Delta_2} Q_A \tag{21}$$

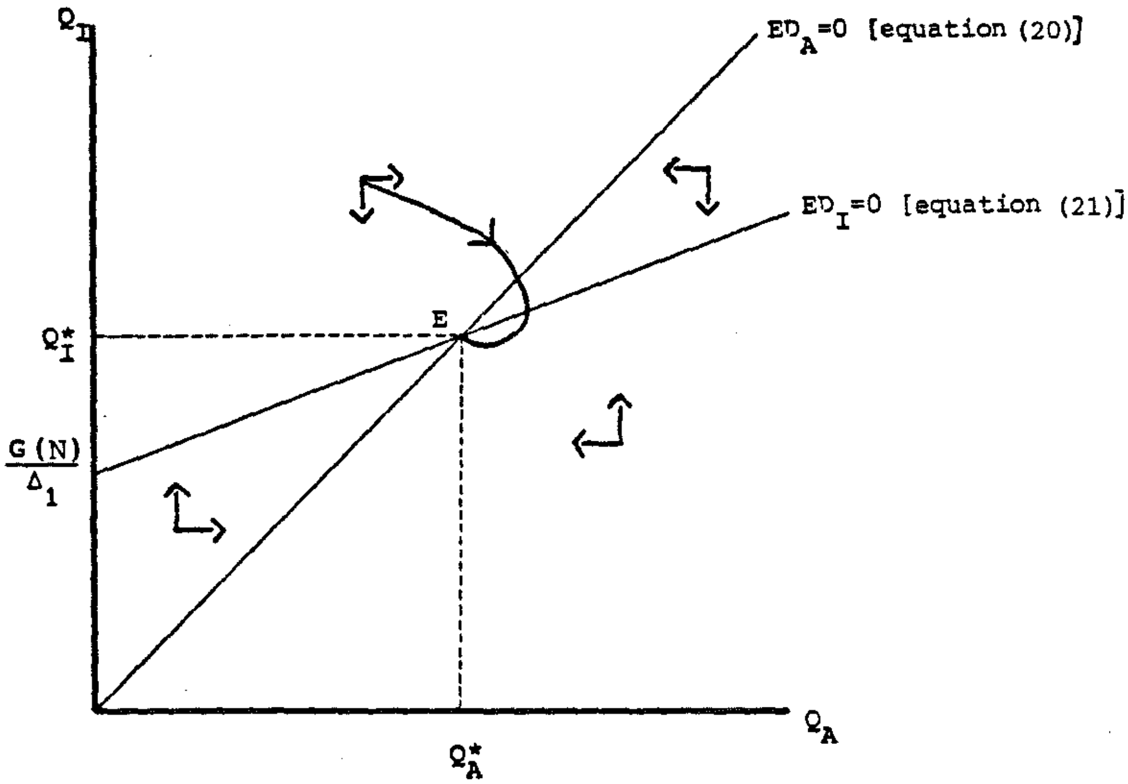
where the symbols Δ_1 and Δ_2 are defined as follows:

$$\Delta_1 = 1 - c_I(1-\alpha_I) + a_{RI}\frac{p_R}{p_I}(c_I(1-\alpha_I) - c_R(1-\alpha_R))$$

$$\Delta_2 = c_I\alpha_I + a_{RI}\frac{p_R}{p_I}(c_R\alpha_R - c_I\alpha_I)$$

Equations (20) and (21) can be solved simultaneously for Q_I and p_A/p_I . Notice that the second term in equation (6) denotes the Keynesian multiplier in operation for a given level of Southern output. Equation (21) shows the positive dependence of the Southern output upon Northern demand.

The two linear equations in Q_I and Q_A are diagramatically represented in Figure 1. Equation (21) presents a greater slope than equation (20), since $\Delta_1 > \Delta_2 > 0$; moreover the numerator in (21) is greater than the numerator of the first term in (20)[3]. Given these slopes and since equation (20) presents a positive intercept with the vertical axis, then the equilibrium exists and is unique:



Notice that Figure 1 also illustrates the stability of the model; the stability of the model is formally analyzed in Appendix 2.

We can now solve the two fundamental equations of the model, (20) and (21), to find the expressions of the values of Q_I and Q_A at equilibrium. We obtain

$$Q_I = \frac{G(N)\cdot\left[\frac{p_A}{p_I}(1-c_A\alpha_A)+a_{RA}\frac{p_R}{p_I}(c_A\alpha_A-c_R\alpha_R)\right]}{\Delta_1\left[\frac{p_A}{p_I}(1-c_A\alpha_A)+a_{RA}\frac{p_R}{p_I}(c_A\alpha_A-c_R\alpha_R)\right]-\Delta_2\left[\frac{p_A}{p_I}c_A(1-\alpha_A)+a_{RA}\frac{p_R}{p_I}(c_R(1-\alpha_R)-c_A(1-\alpha_A))\right]} \tag{22}$$

$$Q_A = \frac{G(N)\cdot[c_I\alpha_I+a_{RI}\frac{p_R}{p_I}(c_R\alpha_R-c_I\alpha_I)]}{\Delta_1\left[\frac{p_A}{p_I}(1-c_A\alpha_A)+a_{RA}\frac{p_R}{p_I}(c_A\alpha_A-c_R\alpha_R)\right]-\Delta_2\left[\frac{p_A}{p_I}c_A(1-\alpha_A)+a_{RA}\frac{p_R}{p_I}(c_R(1-\alpha_R)-c_A(1-\alpha_A))\right]} \tag{23}$$

Given p_I in equilibrium from equation (15) and substituting it into equations (22) and (23), we can solve simultaneously for Q_I and Q_A also in equilibrium, and then the values of the remaining variables in equilibrium are easily found.

Since the equilibrium of the model exhibits the three fundamental properties we looked for, we can now draw our attention to the comparative static properties of the model when the economy shifts to a world equilibrium with a higher price of oil. First, from equations (4),(5) and (15) we obtain the impact on the North-South terms of trade

$$\frac{d\log(p_A/p_I)}{dp_R} = \frac{a_{RA}(1+\pi)\bar{w}_I\, l_I}{p_I\, p_A(1-\lambda_A\, l_A)}$$

Therefore, the rise in the price of oil has a positive impact on the South's terms of trade vis-à-vis the North. Initially, the oil price increase will bring about a rise in commodity prices, p_A and p_I ; in the North, the money wage is fixed, therefore the rise in p_I will simply depend upon the technical coefficient a_{RI} and the markup rate π . In the South, the rise in p_A will depend upon the technical coefficient a_{RA} ; however the rise in p_A will in turn increase the South's money wage w_A in order to keep a fixed product wage rate in the South, p_A will therefore be pushed further up thus dominating the evolution of the North-South terms of trade.

Thus, initially welfare in the South seems to be positively affected whereas welfare in the North is negatively affected. However, the analysis of the total impact on welfare also requires us to consider the oil price rise impact on output supplies and employment levels in the North and South.

In order to investigate the latter impact, we first examine the simplest case where patterns of consumption demand across regions are identical, that is $c_A = c_R = c_I = c$ and $\alpha_A = \alpha_R = \alpha_I = \alpha$. In this case, the two fundamental equations of the model become,

$$Q_I = \frac{c(1-\alpha)\frac{p_A}{p_I}}{1-c(1-\alpha)} Q_A + \frac{G(N)}{1-c(1-\alpha)} \tag{20b}$$

$$Q_I = \frac{(1-c\alpha)\frac{p_A}{p_I}}{c\alpha} Q_A \tag{21b}$$

since $d(p_A/p_I)/dp_R > 0$ always, the slopes of the two equations will rise; however, the slope of equation (21b) will increase by more than the slope of equation (20b), since $1-c(1-\alpha) > c\alpha$ and $(1-c\alpha) > c(1-\alpha)$ always. In this simple case, the oil price shock and the subsequent deterioration of the North-South terms of trade lead, through substitution effects, to higher world demand for Northern commodities and also to lower world demand for corn. The lower world demand for corn will depress Southern output supply and this will have a negative impact on the world demand for Northern goods. The final impact will therefore be an unambiguous fall in Southern output and employment and an indeterminate response in Northern output and employment.

A diagrammatic representation of these two cases is given in Figures 2 and 3. Figure 2, shows the case when the South's output reduction is sufficiently large so as to promote a fall in the North's output. The world economy moves from an initial equilibrium E^0 to a new equilibrium E' . The second case is depicted in Figure 3. Here, the fall in Southern output supply is not too large; so that, the positive impact on Northern demand, due to the lower terms of trade with the South, dominates

Figure 2

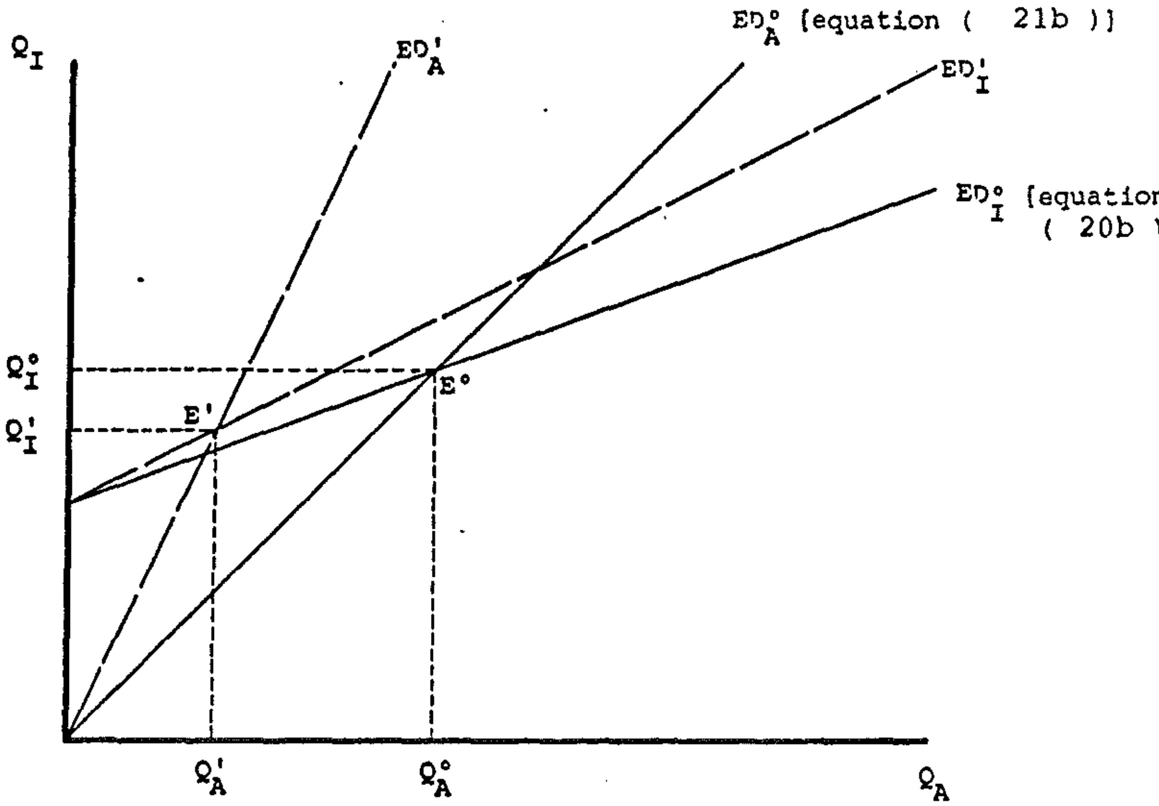
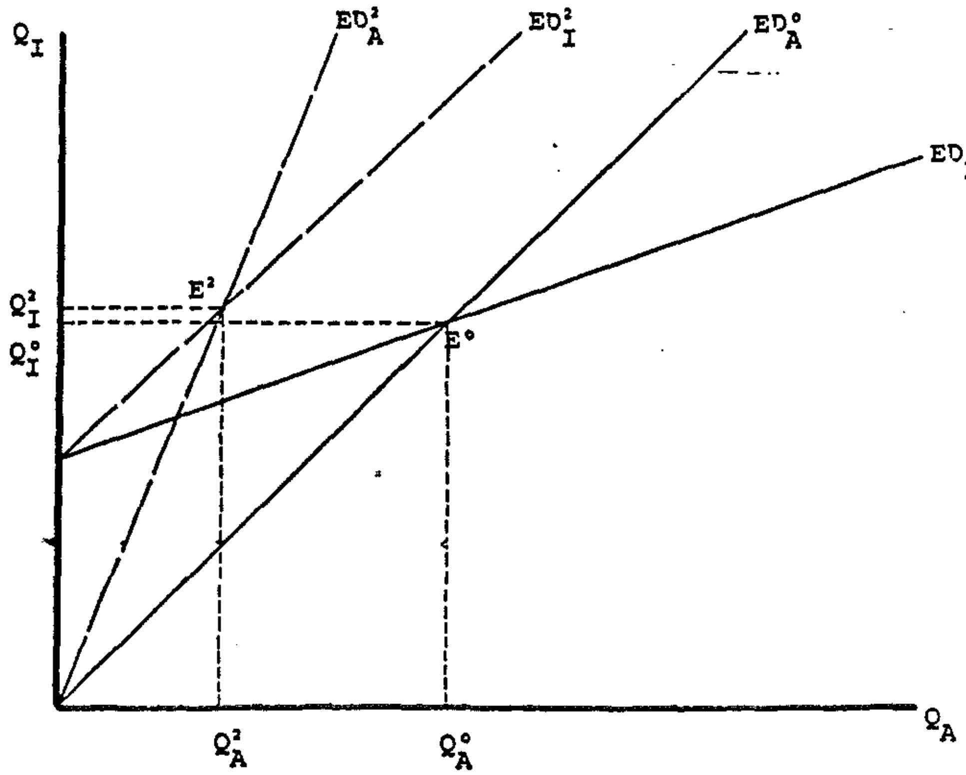


Figure 3



and hence Northern output increases slightly. The world economy moves from an initial equilibrium E^0 to a new equilibrium E^2 .

The conclusion then, is that the model under the assumption of identical patterns of consumption demand across regions shows that an oil price rise will always have a positive effect on the South's terms of trade, a negative effect on the Southern output and an ambiguous effect on Northern output supply. Thus, an oil price rise will therefore be detrimental to the North whenever the North's output falls, in the sense of deteriorating equilibrium terms of trade and real consumption. Conversely, if the North's output rises, an oil price rise will have an ambiguous impact on the North's welfare, since though its terms of trade deteriorate, its levels of output and employment will improve. The impact on Southern welfare will always be ambiguous, since though its terms of trade improve, its levels of output and employment fall; notice that a very large fall in output may dominate the impact on real consumption and the impact may therefore be detrimental to the South.

Finally notice that from the two solutions for Q_I and Q_A , equations (22) and (23), if we set $c_A = c_R = c_I = c$ and $\alpha_A = \alpha_R = \alpha_I = \alpha$, we obtain:

$$\frac{dQ_I}{dp_R} \gtrless 0 \qquad \text{and} \qquad \frac{dQ_A}{dp_R} < 0$$

We now relax the assumption of identical patterns of consumption demand across regions. Thus, the marginal propensities to consume may now differ but pattern of preferences are still assumed to be identical, that is $c_A \neq c_R \neq c_I$ and $\alpha_A = \alpha_R = \alpha_I = \alpha$. The two fundamental equations of the model now become

$$Q_I = \frac{c_A(1-\alpha)\dfrac{p_A}{p_I} + a_{RA}\dfrac{p_R}{p_I}(1-\alpha)(c_A-c_R)}{1-c_I(1-\alpha)+a_{RI}\dfrac{p_R}{p_I}(1-\alpha)(c_I-c_R)}\,Q_A + \frac{G(N)}{1-c_I(1-\alpha)+a_{RI}\dfrac{p_R}{p_I}(1-\alpha)(c_I-c_R)} \qquad (20c)$$

$$Q_I = \frac{(1-c_A\alpha)\dfrac{p_A}{p_I} + a_{RA}\dfrac{p_R}{p_I}\alpha(c_A-c_R)}{c_I\alpha + a_{RI}\dfrac{p_R}{p_I}(1-\alpha)(c_I-c_R)}\,Q_A \qquad (21c)$$

Here, the oil price rise initially leads to an improvement of the Southern terms of trade; hence, as we have just discussed, the South's output will fall and the North's output change will remain ambiguous. Furthermore, if OPEC's marginal propensity to consume primmary products is smaller than the South's, then the Southern transfer to OPEC due to a higher oil bill, will determine a negative impact on world demand for primmary products and hence, a further fall in Southern output which, in turn, will have negative effects on the world demand for manufactures and hence, on North's output. Also, if OPEC's propensity to consume is also smaller than the North's, then the North's transfer to OPEC due to a higher oil bill will induce a fall in demand for the two commodities. Thus, Southern output will fall even further and so will the world demand for manufactures and the North's output. We come to the conclusion that if OPEC's proportion of expenditure relative to its income is smaller than in the North and in the South, then the oil price rise will lead to a fall in world demand for the two commodities and to a severe reduction in output supplies and employment levels.

Nevertheless, the North's economy presents a mechanism to fight the recession, they are its deteriorated terms of trade vis-à-vis the South. It will depend upon the size of the deterioration in the North-South terms of trade and the value of OPEC's marginal propensity to consume that the final impact on the North's output and employment be either a rise or a fall. If it rises, the Southern output and employment fall will be shrinked because of higher Northern demand for Southern commodities, but not sufficiently.

In sum, the final impact will be a reduction in Southern output supply and an ambiguous response of the North's output supply. Notice that the higher the budget deficits in the North the less negative the impact on the North's economy. The impacts on each region's real consumption level will be identical to those maintained earlier when the patterns of consumption demand across regions were assumed to be exactly the same.

Figures 4 and 5 depict the two possible alternative equilibria

Figure : 4

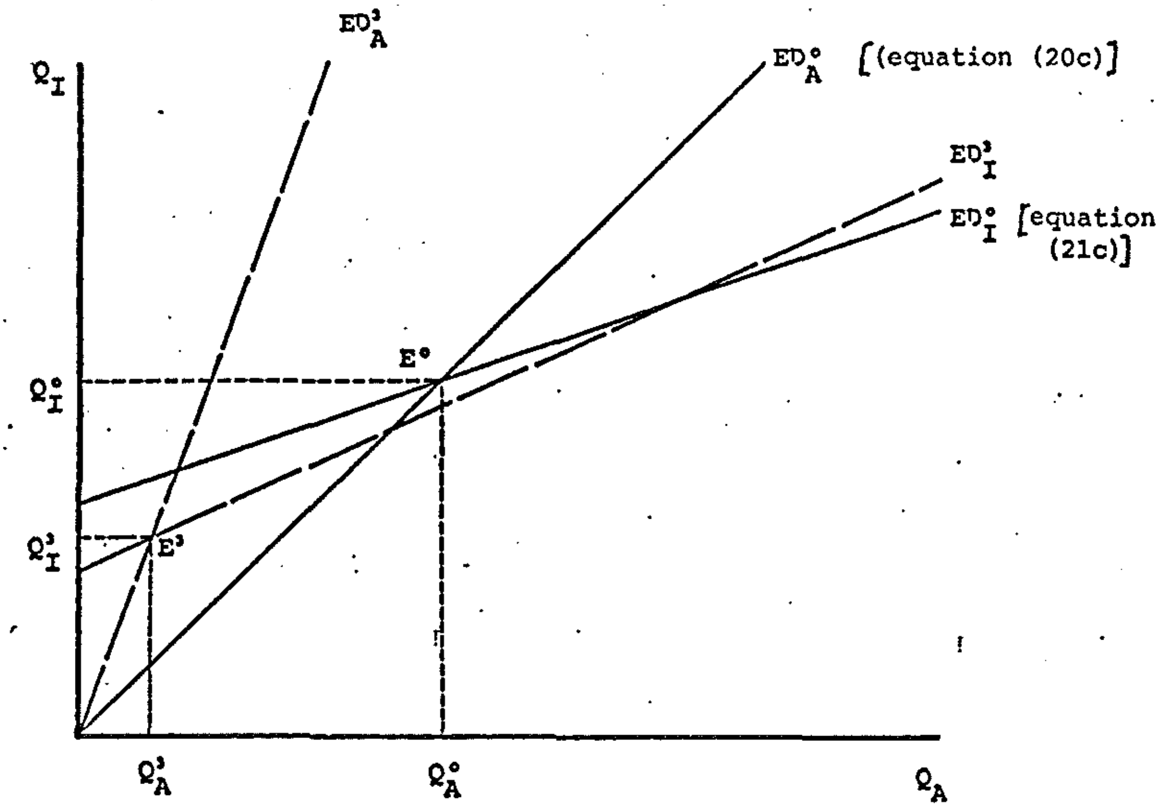
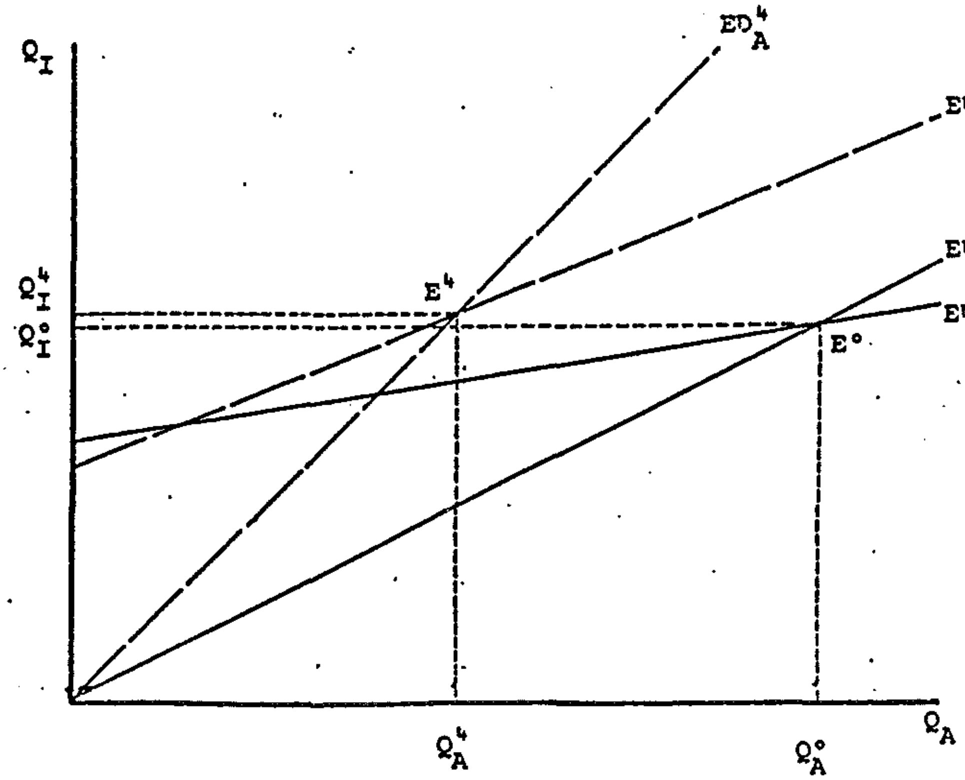


Figure : 5



As we noted earlier, the oil price rise deteriorates the North-South terms of trade, thus leading to a positive impact on Northern output and to a negative impact on Souther output. However, if OPEC's marginal propensity to consume is smaller than the South's, then the Southern transfer to OPEC due to a higher oil bill, will determine a negative impact on world demand for the two commodities and hence, a further fall in Southern output. The new fall in Southern output will have negative effects on the world demand for Northern goods and hence, on the North's output. Also if that the world economy may attain in the case considered above. Notice that $d(p_A/p_I)/dp_R > 0$ and $dp_I/dp_R > 0$ always; then, since we are thinking of a world pattern of consumption such that $c_I, c_A < c_R$, we conclude that the rise in the slope of equation (21c) will be greater than the rise in the slope of equation (20c). Furthermore, since $c_I < c_R$, the intercept of equation (20c) will shift downwards. Figure 4 represents the case when the South's output and the North's output decrease; in this case, the terms of trade effect is not powerful enough so as to cause an increase in Northern demand capable of reversing the oil price rise negative effects on the North. The world economy shifts from an initial equilibrium E^0 to a new equilibrium E^3. Figure 5 shows the opposite case when the change in the terms of trade and the size of the North's budget deficit preclude the recession in the North. The world economy moves from an initial equilibrium E^0 to a new equilibrium E^4.

Formally, from the two equations that solve for Q_I and Q_A equilibrium values, equations (22) and (23), if we set $\alpha_A = \alpha_R = \alpha_I = \alpha$, we then have

$$\frac{dQ_I}{dp_R} \gtrless 0 \qquad \text{and} \qquad \frac{dQ_A^*}{dp_R} < 0 .$$

We go on to focus on the most general case, so that now each region's behaviour involves spending a share α_i of its expenditure c_i on Southern commodities, and a share $1-\alpha_i$ on Northern commodities. Formally, $c_A \neq c_R \neq c_I$ and $\alpha_A \neq \alpha_R \neq \alpha_I$. We now turn our attention to equations (22) and (23); collecting terms, the two equations become:

$$Q_I = \frac{G(N)\cdot\left[\frac{p_A}{p_I}(1-c_A\alpha_A) + a_{RA}\frac{p_R}{p_I}(c_A\alpha_A - c_R\alpha_R)\right]}{\frac{p_A}{p_I}\cdot\psi_2 + a_{RI}\frac{p_R}{p_I}\frac{p_A}{p_I}\psi_3 - a_{RA}\frac{p_R}{p_I}\psi_4 - a_{RI}\frac{p_R}{p_I}a_{RA}\frac{p_R}{p_I}\psi_5} \tag{22b}$$

$$Q_A = \frac{G(N)\cdot[c_I\alpha_I + a_{RI}\frac{p_R}{p_I}(c_R\alpha_R - c_I\alpha_I)]}{\frac{p_A}{p_I}\psi_2 + a_{RI}\frac{p_R}{p_I}\frac{p_A}{p_I}\psi_3 - a_{RA}\frac{p_R}{p_I}\psi_4 - a_{RI}\frac{p_R}{p_I}a_{RA}\frac{p_R}{p_I}\psi_5} \tag{23b}$$

Since $d(p_A/p_I)/dp_R > 0$ and $d(p_R/p_I)/dp_R > 0$ always, Then, we can draw the following proposition: whenever $\alpha_A > \alpha_R > \alpha_I$,

if $c_R\alpha_R < c_I\alpha_I$, $\psi_3 > 0$, $\psi_4 < 0$ so that $c_R\alpha_R < c_A\alpha_A$ also holds and $\psi_5 < 0$

then $\frac{dQ_I}{dp_R} \gtrless 0$ and $\frac{dQ_A}{dp_R} < 0$

these conditions can be rearranged in the following way and the proposition therefore becomes:

if $c_R\alpha_R < c_I\alpha_I$

$$c_R(1-\alpha_R) < c_I(1-\alpha_I) - c_Ac_I(\alpha_A-\alpha_I) + c_Rc_A(\alpha_A-\alpha_R)$$

$$c_R\alpha_R < c_A\alpha_A - c_Ic_A(\alpha_A-\alpha_I) - c_Ic_R(\alpha_R-\alpha_I)$$

$$c_R\alpha_R < c_I\alpha_I\frac{(c_R-c_A)}{c_I-c_A} + c_A\alpha_A\frac{(c_I-c_R)}{c_I-c_A}$$

then $\frac{dQ_I}{dp_R} \gtrless 0$ and $\frac{dQ_A}{dp_R} < 0.$

It is worth commenting briefly on these conditions. Comparing them with those of the "structuralist" model of González-Romero and Kanbur (1986), we note that a deterioration of the Southern terms of trade vis-à-vis the North in the model of González-Romero and Kanbur (1986) takes place under indentical conditions that a decline in South's output in this model. Therefore, in both models a sufficiently low OPEC's marginal propensity to consume Southern and Northern commodities has always negative effects on the South's welfare. On the contrary, here we cannot find a set of sufficient conditions to ensure a negative response of the North's output to an oil price shock. The reason why, lies in the terms of trade effect; since the Southern terms of trade improve when the oil price increases, then the North's Keynesian economy will experience an unambiguous positive impact on its demand side. World demand for Southern commodities will fall because of better terms of trade whereas the world demand for Northern commodities will rise; the world market for primmary products present an excess supply and, consequently, the world market for manufactures will show an excess demand since Walrasian stability holds (see Appendix 2). Therefore, the South's output will tend to reduce whereas, on the contrary, the North's output will rise. This positive impact on the North always exists and will depend upon the importance of the North-South terms of trade deterioration that finally dominates the negative impacts on Northern demand due to excessively low OPEC marginal propensities to consume the two commodities. Consequently, an oil price shock will of course under certain conditions promote "recession" but always stimulates aggregate demand. This fact illustrates how the North has an endogenous mechanism available to deal with deflationary shocks.

We should note that if we set the OPEC's recycling coefficient equal to zero, i.e. $c_R = 0$, we obtain that the above conditions on OPEC's marginal propensities to import will always hold, so that Southern output will unambiguously fall whereas Northern output change would remain ambiguous. If we assume that OPEC's recycling coefficient larger but still sufficiently small so as to fulfil the above conditions, then an oil price rise will lead to an unambiguous fall in Southern output whereas the effect on

Northern output will still be ambiguous since the North-South terms of trade deteriorate slightly, thus having positive relative price effects on world demand for Northern commodities.

In the alternative polar case when we set $c_R = 1$, so that OPEC's recycling of its oil revenue is complete, then, if patterns of demand across regions differ, the conditions on page 20 to obtain an oil price rise impact on output and employment negative for the South and ambiguous for the North will still hold, but now depending only upon the configuration of OPEC's pattern of preferences; thus, for instance, if the configuration is such that $\alpha_A > \alpha_R > \alpha_I$, then the first inequality will not hold any more and therefore the results just mentioned may or may not take place. Alternatively, if patterns of preferences are assumed to be identical throughout the world, $\alpha_A = \alpha_R = \alpha_I = \alpha$, then all of the inequalities on page 20 will hold in the opposite sense, and therefore the oil price rise impact on output and employment will still hold ambiguous for the North but now it will be positive for the South.

This model is more similar to Taylor (1981) than the Neoclassical-Lewisian model of section 2 since the North is also here modelled as a Neokeynesian economy. Furthermore, we also assume surplus labour in the South at a parametrically given Lewis wage; the critical differences with Taylor's model lies in the South, since here we include oil as an input and Southern output supply is not bounded. This model also differs from Adams and Marquez (1983) in assuming a Lewisian South. Consequently, our results are more general than those of the above cited authors. Thus, if we impose in our model that the South does not use oil in production, then the Southern terms of trade improvement will be averted and the above proportion established, concerning the direction in the changes of Northern and Southern output supplies, become:

if $\psi_3 > 0$ then $\dfrac{dQ_I^*}{dp_R} < 0$

IF $c_R\alpha_R < c_I\alpha_I$ and $\psi_3 > 0$ then $\dfrac{dQ_A^*}{dp_R} < 0$

recycling behaviour are not obtained in Taylor and Adams and Marquez.

We should note that the critical variable in this model to obtain the alternative results is OPEC's recycling coefficient c_R as in the Structuralist model of González-Romero and Kanbur (1986); thus, it is in contrast with the Neoclassical-Lewisian model of section 2, where OPEC's recycling coefficient was assumed to hold equal to one so that the critial variables where the oil output coefficients and the different degree of recycling into purchases of Northern and Southern products.

4. CONCLUSIONS

There is no a well-established presumption that the terms of trade for primmary products may or may not deteriorate when the oil price increases. Moreover, the deterioration or improvement of the terms of trade is not a sufficient condition to deteriorate economic welfare of these regions. In this paper, we try to explore this argument in the context of a world economy where the South is considered a dual economy of the Lewis (1954) type. Thus, we develop and examine the impact of an oil price rise in two alternative frameworks, one where the North behaves as a Neoclassical economy, the other when neokeynesian features are introduced into the model (critically in the North). The two three-region models examined here, determine an improvement of the Southern terms of trade via-à-vis the North since the Lewisian wage rate in the South must be kept fixed. However, it is also proved that it is not sufficient condition to affirm that the oil price rise will always benefit the South in the context of a specific measure of welfare, the real consumption.

The model of section 2 shows that when the North is Neoclassical, the oil price rise will always lead to a fall in the levels of output and employment of the South's advanced sector; therefore real consumption in the South may or may not decline. Moreover output supply in the North will also shrink, thus deteriorating its real consumption unambiguously. The model of section 3, where neokeynesian features are incorporated, reflects that if OPEC's marginal propensity to import commodities from the North and South is sufficiently low, then the South's levels of output and employment in the advanced sector will decline. Now, the North's levels of output and employment may or may not decline since it possesses an endogenous mechanism that creates aggregate demand and, in this way, diminishes the extent of the recession, they are its deteriorated terms of trade vis-à-vis the South. Thus, the impacts on real consumption in the North and South are ambiguous and depend upon the size of both output supplies (employment levels) and terms of trade responses.

In general, the analysis increases our understanding of why regions respond differently to the same external shock and shows how sensitive it is with respect to arbitrary assumptions made about the behaviour that the regional economies exhibit at the time that the oil shock takes place. With the current fall in oil prices, the topic promises to be relevant for some time, although the directions of the shocks has been reversed.

NOTES

1.- We do not distinguish between profit and wage income; introducing thus difference would not alter the essence of the analysis which follows, although it would complicate it considerably.

2.- Notice that it we set $c_A = 1$ and only allow $c_R \neq 1$ thus reflecting the fact that OPEC's recycling may not be complete, the forthcoming result also hold.

3.- To show that $\Delta_1 > \Delta_2 > 0$, notice that $\Delta_1 - \Delta_2 = p_I(1 - c_I) - a_{RI}\, p_R(c_I - c_R)$ and it is always positive. To show that the numerator in (7) is greater than the numerator of the first term in (6), notice that the numerator in (7) minus the numerator of the first term in (6) is $\frac{p_A}{p_I}(1 - c_A) + a_{RA}\frac{p_R}{p_I}(c_R - c_A)$ and it is always positive.

4.- At point E, for a given terms of trade, an increase in Northern output will lead to a rise in Southern output supply and demand, which, in turn, will induce a further increase in the North's output but to diminishing extent than the initial rise.

Appendix 1: Stability of the Neoclassical-Lewisian Model

We assume a rather common approach to stability in trade theory literature: factor markets clear and the burden of adjustment is placed on the international commodities markets. Thus, factor prices remain at their equilibrium values and demands for and supplies of these may change because of changes in markets for traded goods. Moreover, the price of oil is fixed and the price of the manufactures is set equal to one, therefore the crucial emphasis of adjustment to equilibrium is finally placed on the price of the primmary product, the remaining traded good. Let us define excess demand in the world market for primary products as follows:

$$\phi(p_A) = Q_A^S(p_A) - Q_A^D(p_A)$$

Walrasian stability in this market requires $\phi'(p_A) > 0$ where

$$\phi'(p_A) = \frac{\partial Q_A^S(p_A)}{\partial p_A} - \frac{\partial Q_A^D(p_A)}{\partial p_A}$$

Through substitution from the model, we obtain:

$$\frac{\partial Q_A^S}{\partial p_A} = \frac{\partial Q_A}{\partial p_A} p_A + Q_A$$

$$\frac{\partial Q_A^D(S)}{\partial p_A} = \frac{\partial Q_A}{\partial p_A} + \alpha_A Q_A$$

$$\frac{\partial Q_A^D(N)}{\partial p_A} = 0$$

$$\frac{\partial Q_A^D(R)}{\partial p_A} = \alpha_R a_{RA} p_R \frac{\partial Q_A}{\partial p_A}$$

Adding up these terms, we get

$$\phi'(p_A) = \frac{\partial Q_A}{\partial p_A}\left[p_A(1-\alpha_A) + a_{RA} p_R(\alpha_A - \alpha_R)\right] + (1-\alpha_A) Q_A$$

where $\partial Q_A/\partial p_A$ is infinite in the polar case, it can also be simply positive due to increasing opportunity costs in primmary products production relative to the production in the subsistence sector, see for instance Burgstaller (1987). Therefore, $\phi'(p_A) > 0$ always and, in consequence, the world market for primmary products is Walras stable.

Appendix 2: Stability of the Neokeynesian-Lewisian Model

Focusing also on the international dimension of the oil shock problem, we continue adopting the appealing simplification of analyzing the stability properties of the model only through the markets for traded goods. The specific adjustment rules of Q_I and Q_A in order to clear the markets will be given by:

$$\frac{dQ_I}{dt} = z_1\,[ED_I(Q_I,Q_A)] \quad , \qquad z_1(0) = 0 \ , \ z_1' > 0$$

$$\frac{dQ_A}{dt} = z_2\,[ED_A(Q_I,Q_A)] \quad , \qquad z_2(0) = 0 \ , \ z_2' > 0$$

To analyze the stability of the model we look at the Jacobian matriz of excess demand functions; if the determinant is positive and the trace negative, global stability holds. The Jacobian matrix J is:

$$J = \begin{bmatrix} -\Delta_1 & c_A(1-\alpha_A)\dfrac{p_A}{p_I} + a_{RA}\dfrac{p_R}{p_I}\,(c_R(1-\alpha_R) - c_A(1-\alpha_A)) \\ \Delta_2 & -\left[(1-c_A\alpha_A)\dfrac{p_A}{p_I} + a_{RA}\dfrac{p_R}{p_I}\,(c_A\alpha_A - c_R\alpha_R)\right] \end{bmatrix}$$

The trace of the matriz is obviously negative since $\Delta_1 > 0$, $(1 - c_A\alpha_A) > (c_R\alpha_R - c_A\alpha_A)$ and $p_A > a_{RA}\,p_R$ always. The determinant of the matrix is positive; the proof is straight forward forward from that in note 3 . Consequently, stability holds.

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