From the South point of view various combinations of factors as described
in Part II could be studied starting with the more ambitious: high growth,
low unemployment, egalitarian income distribution, non-conventional dev-
elopment styles, strong South-South cooperation, which would correspond to
the maximum possible satisfaction of the human needs.

The consequences for the North would be mostly interesting to study
through the modelling exercise. It would be in particular very important
to see whether such a development in the South is made easier by an un-
conventional style of growth in the North. This is by no means obvious
though sentimentally desirable.

SOME RESULTS FROM A MODEL OF TRADE, AID AND THE DEVELOPMENT OF THE SOUTH

Graciela Chichilnisky

Introduction

In this paper I describe certain results that were obtained in the UNITAR
project based on a model I have specified for studying the relationship
between international terms of trade and domestic income distributions of
the exporting countries within the South. In particular, I shall concen-
trate on those countries that have certain characteristics that distinguish
the situation of the underdeveloped world today. I shall discuss the im-
plications of these results about the question of the transmission of
growth from the North to the South through international markets, both
through trade and through aid. The results are of crucial importance to
a proper discussion of the scenarios outlined in the two previous papers.

The description of these results are lengthy as these are new theoretical
results, and especially, because they contradict some of the most est-
ablished orthodox ways of thinking of the relevant international markets
to transmit growth. In particular, I shall present a set of results that
contradict the statement that the growth of the North is necessary or even
at all favorable to the growth of the South, which is central to much
thinking about the New International Economy Order. The results will be
briefly contrasted in the paper, with other existing reuslts in the lit-
erature, for instance, the immiserizing growth literature (cf. Bhagwati
(1968), which implies that in order to prevent the (possible) immiserizing
effect of growth, the South should not attempt to grow more than the North.
Or, put in other words, that the more rapid growth of the North, may pre-
vent what is called immiserizing growth in the South. I shall also briefly
discuss the relation of these results with the more orthodox Stolper-
Samuelson factor price equalization theory.

There is an underlying line of thought that relates in some sense, to the dependencia theory thinkers of Latin America (sometimes called structuralists) starting from the work of R. Prebisch and others and also including the work of W. Arthur Lewis, that have questioned the validity of statements which may be broadly summarized as the 'New International Order for Everybody's Gain'. However, the latter critiques do not present rigorous formalizations, or theorems. Therefore they cannot be contrasted in detail with the results of the neoclassical theorists, with gains from trade or factor price equalization theorems. We shall, by contrast, here present rigorously treated results that follow a general equilibrium analysis of markets.

There is in addition another line of questions that should be presented here with respect to the orthodox Liberal arguments, which are at present largely accepted by both the academic and the international development communities. Underlying this line is the question of the legitimacy of the use of scarce world resources and, moreover, the use of resources at a cheap price of a world basis. The question of the scarcity of natural resources is now widely regarded more a question of success with managing and of market behaviour of the parties, than one of absolute physical scarcity. The 'limits to growth' approach has now been rejected and the Bariloche and Sussex approach have been very widely accepted with respect to this issue. But the question still remains of the pricing of these very scarce resources and that is, of course, an important question. This is especially so since some of the most important resources, such as oil, for geographical reasons and also for marketing reasons have given some relative market power to the countries in the Middle East and in Latin America, like Mexico and Venezuela, that are in the South.

The discussion of the prices of resources and of the legitimacy of the OPEC claims for raising these prices is an ever present issue. Since those prices are established in a monopolistic competitive market negotiation with the international community watching at each deliberation, it becomes quite important for each party to have as much legitimacy in their arguments as possible. In particular, the liberal position that the growth of

the North is important for the growth of the South undermines the legitimacy of the redistribution produced by the pricing policies of the oil rich countries for a number of reasons. If what is desired is greater equality between the North and the South with the international market acting as the transmitter of economic activity and growth, and, if it is necessary for the South to grow that the North grow, then to the extent to which the increases in prices of resources which are in inelastic demand, such as oil, tend to increase inflation and growth within the North, they also tend to decrease growth of the Souht. The argument actually is further refined at this point (trying again to divide the Southern coalition) by implying that it is the oil rich countries who, by increasing the prices of oil, for instance, hurt the possibility of growth in the South. This is seen as produced indirectly through the effect of decreased demand because of decreased growth of the North for their products and their exports but also directly because of the effects of increased direct cost on the imports of energy producing resources by certain resource poor countries within the South.

The second part of the argument is empirical. The negative effects of growth of the South due to the increase in the oil prices by the oil rich countries is not, in fact, well founded. Data from a research project of Sidney Dell at the UN (1979 unpublished) on the effect of resource price increases on developing countries and by Suzanne Paine at the University of Cambridge in England suggest that the effect of increases in oil prices has not had significant effect on the growth of developing countries. Paine also shows that during 73-74-75 prices of food imports by the South were more relevant, and that this was more related to the policy of a few food exporters, in particular, the United States, which have a large effect in the international market for certain staple foodstuffs.

There are therefore, several reasons to question the role of the international market in the transmission of growth and what I propose to do here is to present in a sequence a number of results that link domestic distribution of income with international terms of trade and growth, for certain export led policies and in cases where there is very abundant labour supply

and dualism of the countries which are doing the exporting. Because this paper is relatively sophisticated in terms of economic theory, rather than engage in full detail, I will use four diagrams and three or four equations, in order to show the type cf effects that we are discussing here.[1]

Reversals in the Terms of Trade

I will show first, that under conditions of high dualism and high elasticity of labour supply in the economy of the South in a North-South context an export led policy, if successful in increasing the level of exports, will necessarily decrease the international terms of trade against the good exported by the South, decrease also total revenues from exports and in addition reduce employment real wages and domestic consumption of basic goods in the South. The results are obtained in an equilibrium model with two goods, two factors of production, capital and labour, fixed proportion technologies in which each one of the two regions produces, consumes, imports and exports both goods. One of the goods is a so-called basic consumption good, denoted B, and the other one is called a luxury or investment good, denoted I. The model differs from a Stolper-Samuelson factor price equalization model in that: first, the production technology has fixed coefficients (this is not, in effect, a major difference) but, more importantly, the two factors of production (capital and labour) are not inelastic but somewhat elastic in supply; also, factors have different elasticities of supply in the two regions. In the price factor equalization model labour supply is constant; in our model labour supply will depend instead on real wages, and, in the South, labour supply will be very elastic with respect to real wages. Therefore, labour supply will react strongly to changes in the real wage in the South.

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[1]   For a complete treatment of the results represented here, see Chichilinsky, G. Terms of Trade and Domestic Dibstribution, Harvard Institute for International Development Discussion Paper No. 41, 1979, (to be published in the Journal of Development Economics 1980) and Chichilnisky G. and Cole, S. The Growth of the North and the Growth of the South: Some Results on Export Led Growth, Harvard Institute for International Development Discussion Paper No. 43.

In the North, labour is relatively more inelastic. The North is therefore represented by an economy closer to the orthodox Heckscher-Ohlin theory and the South by an economy closer to those studied by (but not identical with) R. Prebisch and W. A. Lewis. With respect to the other factor, capital, it is assumed to be in more elastic supply in the North than in the South, although, again, this is not crucial to the results obtained. Another important difference of our model with both Heckscher-Ohlin and Stolper-Samuelson is the determination of the demand and the structure of the international market relations. It is assumed here that at the beginning of the period there is a target for exports,[1] a policy which is represented by a (fixed short run) amount of exports that it is planned to export. This target is both transmitted to the producers domestically as demand for their products (say by the government or by a board) and to the international market as export supply in the short run. Therefore, there is an export 'policy' at work here. This is represented in Figures 1a and 1b.

In the short run there is an inelastic supply of exports which is planned at the beginning of the period denoted E_B. As an example, in the case of coffee, the government of Brazil would plan at the beginning of the period a certain amount which it attempts to export; it does so, for instance, because it has an arrangement with the US for a total amount of exports. At the beginning of the period the Brazilian government (or agency in charge) communicates to the producers of coffee that it is going to buy from them a certain total amount of coffee and sell it to the United States. In the longer run the quantity of exports planned by the government or board is allowed to adjust. We can study the implications of an increased amount of exports on the domestic economy and on the international terms of trade as in the legend to Figures 1a and 1b.

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[1] The assumption that there is an agent (board or government agency) that imposes an export target is only needed to explain that there is quantity adjustment in the international market and for stability of the results.

where $D = a_1 c_2 - a_2 c_1$ is the determinant of the matrix of capital and labour output ratios of the 2 sectors. D is very large when there is a high level of duality in the economy.

The labour supply equation for this variable factor supply model relates labour supply to real wages in terms of the basic good:

$$L = \alpha \frac{w}{p_B} + \bar{L}$$

The parameter α represents the response of labour (due to for instance migration) when real wages change. From the above equations we can compute the change in the domestic supply and demand of basic goods as a function of prices of basic goods. The difference between domestic supply and demand yields the amount of basic goods available for exports, quantity of exportable. From the above equations, it can be seen that the change in quantity of exportable with respect to price of basic goods is:

$$\frac{\partial E_B}{\partial p_B} = \frac{\alpha}{D^2 p_B^2} \left[\frac{2c_1^2}{p_B} - c_1 c_2 \right] - \frac{c_1 \bar{L}}{D} + \frac{\bar{K} a_1}{D} - \bar{I}^D$$

From the above equation, when labour supply is very abundant (i.e. very large, and the term in brackets is negative, as the price of basic goods p_B increases, the supply of exportables decreases. The term in brackets is negative, as the price of basic goods p_B increases, the supply of exportables decreases. The term in brackets can be rewritten as follows:

$$\frac{c_2}{D} - \frac{2w}{p_B}$$

Therefore, when the technologies are very dualistic (i.e. when D is very large) and real wages are close to the minimum subsistence wage, the expression above is indeed negative, and the quantity of exportable decreases as the domestic price of the basic goods to the international

market decrease. This is the effect depicted in Figures 2a and 2b below.

Thus it has been demonstrated that, under a condition of high duality in an economy (which is represented by a very different mix of capital and labour in the production of the two goods produced and consumed in the South) it will turn out that while the domestic total output supply of the basic good is upward sloping as a function of prices (see Figure 2) the domestic demand of the basic good (which is derived not only from wage income but also from income from profits in the manner described before) will also be an increasing function of prices. Under the conditions of high duality and very elastic labour supply the demand for basic goods across equilibrium strictly will be an increasing function of prices increasing relatively more as a function of prices than supply of basic goods. Therefore, there is a part of the excess demand function for basic goods in this economy (that appears related to income effects across equilibria of the economy) which is backward bending (see Figure 2). The excess demand function is therefore downward sloping in prices under the condition postulated here. Figure 2 again shows and explains this effect.

All the critical assumptions made above are a reasonable, if very simplified, picture of a typical Southern economy. These results, therefore, has quite significant corollaries for economics. Under the above conditions, as the amount of exports that are offered by the South to the international market increases, the domestic demand and consumption of basic goods decreases, as does real domestic wages (see Figure 2). This determines a domestic price for the basic good in relation with the demand of the government for exports. In Figure 2b a long run price quantity relationship (across equilibria) for exports offered is then constructed on the basis of the domestic supply-demand conditions of Figure 2a; this long run price-quantity locus is also downward sloping in prices. It should be noted that this latter relation in Figure 2b does not coincide with the usual supply function for the international market. It can be described instead as a locus of price quantities that will occur in the long run if each policy of exports by the government is allowed to act and reverberate through the domestic economy producing a domestic equilibrium level of prices together with the level of employment output and real wages.
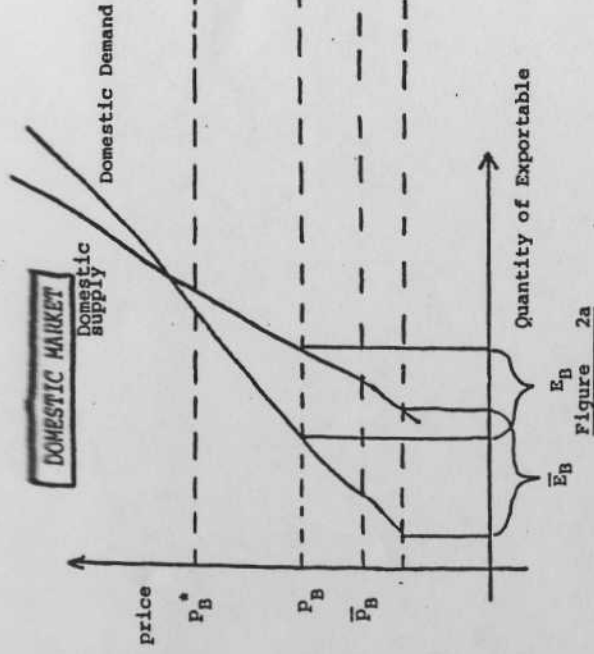
INTERNATIONAL MARKET

World Demand Curves

WD'

WD

long run equilibrium

long run equilibrium with more demand from the North

price

$\bar{p}_B$

E_D

$\bar{E}_B$ E_B

quantity of exportable

Figure 2b

DOMESTIC MARKET

Domestic Supply

Domestic Demand

price

p_B^*

p_B

$\bar{p}_B$

$\bar{E}_B$ E_B

Quantity of Exportable

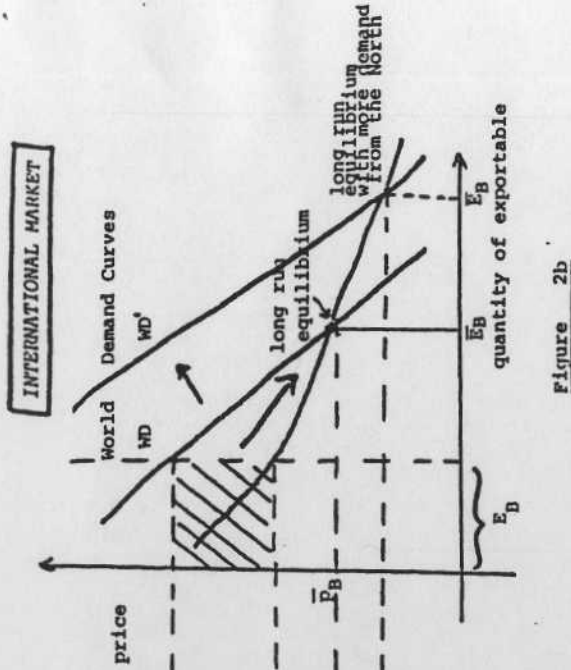Figure 2a

The Dual Economy with Abundant Labor

Figure 2a depicts the domestic market supply and demand functions for basic goods; note that demand is upward sloping. E_B is in Figure 1 the fixed short run amount of exportables target of the government or board. Together with the private domestic demand, E_B determines domestic equilibrium price p_B.

In Figure 2b short run supply of exportables E_B, together with world demand WD determines short run international prices p_B^*, which may be higher than domestic prices. As long as a quasi rent from exports (the shaded area) exists, the incentive to increase the exports targets E_B (even with fixed world demand) will increase E_B until $\bar{E}_B$ is reached and domestic and international prices are equalized at the point denoted long run equilibrium, $\bar{p}_B$. Total domestic supply of B at $\bar{E}_B$ is lower, and domestic consumption of B is also lower than before. The new long run relative price of B is also lower, showing that with increases in the world demand the terms of trade worsen for the South. Together with the terms of trade, real wages, employment and domestic consumption of basic goods in the South all decrease.

We should here distinguish the long run from the short run offer curves. In the short run, with the export policy described here, there is always an inelastic supply of the goods being exported; in the longer run the supply is elastic. If now we have (see Figure 2b) an international demand for the basic good offered we can then determine the short run international price $\bar{p}_B$. This international price may differ from the domestic price ($p_B \neq \bar{p}_B$). The international price is determined by the intersection of the short run inelastic supply (of, say, coffee) with international demand (for coffee). The domestic price is, instead, determined by domestic conditions such as elasticity of factors and technologies, but it is determined not only by production conditions but also by domestic demand conditions, through a general equilibrium approach. For instance, the price of soya domestically will not only be determined by the cost of the production of soya but also by the employment level and the real wages (therefore, the income distribution). As soya is a close substitute at the production level for feijao (a domestically consumed bean in Brazil) then employment and real wages would affect the domestic consumption, and therefore the domestic demand for this good. If the domestic demand is lower, domestic prices are likely to be lower, even with the same production costs (or even a bit higher). So the domestic price is not only linked with the cost of production but also with income distribution and the demand structure of the domestic economy. This is shown, in precise detail, in equations in Chichilnisky (1979) and Chichilnisky and Cole (1979).

It is shown in Figure 2 below that as long as the international price is above the domestic price there will exist a quasi rent from exports (the shaded area in Figure 2) and thus an incentive for producers to increase exports (E_B, moving along the downward sloping long run locus). This eventually produces a solution at the international market that will equate domestic and international prices. (See Figure 2b, long run eqilibrium). This is proven in (4) to have necessarily two effects. One is that increased exports will worsen the terms of trade for the South. Together with this decrease in the terms of trade there will be a decrease in real wages in the South and also of domestic consumption of the basic good in the South. Furthermore, the opposite of the neo calssical case will occur here: as the demand by the North for the basic good shifts upwards, due

for instance, to increased growth in the North, the terms of trade will worsen even more for the South, (contrast Figures 1b and 2b). Terms of trade deteriorate for the South together with the income distribution and the domestic consumption of the basic good for the South.

The last point just explained is shown in Chichilnisky and Cole (1979) to contradict not only the argument of the orthodox trade theories, but also the immiserizing growth literature. This is because if, for instance, more growth of the North implies a higher demand for the basic goods of the South then, in fact, under the conditions of high dualism and very high elasticity of labour described here (which as pointed out earlier are actually quite natural assumptions within the economies of the South) more growth of the North is likely to harm the terms of trade in the South.

The next point is to explore whether even though the price of the good exported by the South decreases it still may not be the case that total revenues from exports by the South increase. This, of course, would depend on relative elasticities of demand. If revenue would increase, then export led policies could in principle be favorable to basic needs provided adequate income redistribution policies are undertaken in the South. This then, would support the point of view that the responsibility for better distribution of income is almost purely domestic. The result shown in Chichilnisky and Cole (1979) is therefore of interest. Under the conditions described: the total revenue of proceeds from exports by the South will also necessarily decrease together with the change in the terms of trade. So if the growth of the North produces an increase in the demand for the products of the South both the total proceeds from exports of the South will decrease and also the terms of trade will deteriorate; furthermore both the domestic distribution and total consumption of basic goods within the South will decrease.

The results just discussed does not occur when labour supply is not very elastic and when there is not a high level of dualism in production. Thus, the result would not in general be obtained from an application of the model of trade between two developed economics. In effect, in the model

just described, it can be shown that when the labour supply and production function are modified, the results of the model are reversed. For example, if labour supply becomes less elastic (through better rural development policies or through better income distribution) or if the level of dualism is decreased through a systematic tendency not to adopt very high capital intensive technology in some of the luxury/capital good sectors together with very labour intensive ones in the basic goods sector then our two initial conditons may be contradicted. Within the same model, in these latter cases, a Stolper-Samuelson-like factor price equalisation result will obtain. Now as exports increase, and thus labour demand increases, the real wages increase and the position of labour with respect to that of capital and the terms of trade are bettered for the South in this process. The total revenues of the South also increase with more trade.

The argument presented for the usual factor price equalisation effect in the existing literature, is based on the assumption that as a country lowers its tariff and so (hopefully) increases exports, this 'pulls' the factor for which the South has a relative advantage and which has a positive impact, both on the distribution of wages and returns to capital . In particular, it tends to equalize the returns to factors in the two regions considered when one of the regions is labour rich and has a relative advantage in production of labour intensive goods. The reason this does not occur in our model is that, because of the high level of duality and of the very high elasticity of labour supply, an attempt to step up output of the basic good domestically is shown to produce an increase in the demand for the basic good. An increase in the production of the basic good increases employment. But if wages are relatively close to a subsistence wage (not fixed, and in this sensethe model differs from Arthur Lewis's model where there is a fixed minimum wage because of infinite elasticity of labour supply) then as real wages change and employment increases (because of the high level of labour intensity of the production of this good) the new wage income goes into increased demand for the basic good. This increase in the domestic demand for the basic good is such that it may thwart an attempt to increase domestic excess supply available

for export unless domestic consumption is controlled. Therefore, in order to have more output available for export in this setting it becomes necessary to curtail domestic consumption and that is why the factor price equalization results, in this case, does not follow.

Perverse Effects of Aid

Having dicussed the reversal of terms of trade with export led policies and the possible negative effects of increase of growth in the North on the South, I will now describe more briefly certain results which again, show how the effect of international markets may be to thwart the intended effects of a transfer from the North to the South of economic aid.

A two good, two region, and three income group model similar to the above is constructed to explore possible effects of aid on welfare.[1] This model is in effect a simplified version of the above model, but contains all the features necessary to show the main lines of the argument. One region, the North, has two income groups characterised by different endowments and proportions of consumption of the basic and the luxury or investment goods. We examine aid policies that result in real transfers from the high income group of the North to the South. In one case, the transfer is of luxury of investment goods, which is shown to produce an increase of the market price of these goods with respect to the basic good leading to an increase welfare of the North and decrease the welfare of the South. In a second case, the high income groups in the North transfers basic goods to the South. It is shown here that an increase in welfare of the South can only occur at the expense of a decrease in welfare of the low income group in the North. Therefore, under the conditions specified by

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1 See Chichilnisky, G. "Basic Goods, the Effect of Aid on New International Economic Order", to be published Journal of Development Economics, 1980, for a full description of these results.

the model, aid cannot be relied upon to equalize overall welfare as there is necessarily a trade-off between more North-South equality and equality with the North. When aid is endorsed to pursue New International Economic Order objectives, a close examination of international and domestic markets seems in order, so as to avoid the conditions studied here.

What both sets of results for aid and trade show is that income distribution policies, say with regard to basic needs, cannot divorce themselves from international market considerations and, especially, from the relationship of international markets with domestic markets. This is true even for small economies that in principle do not have an effect on world prices. This is not to say that trade and aid are necessarily deterious to the South, but that both must be considered as part of a wider development strategy, taking account especially of demestic structures. Both sets of results can either give a neo-classical solution (e.g. a solution that is more consistent with factor price equalization results) or not, depending crucially on certain parameters of the model that may be subject to policy. Therefore, a negative outcome could sometimes be changed to a positive one. For example, if an income redistribution policy (or a basic need policy) would change a situation of very elastic labour supply (say, in Brazil) to more inelastic, and demand specifications, then the reversal of the terms of trade would not occur. In fact, the Samuelson-Stolpher factor price equalisation theorem is proven to occur within the present model.

The importance of the theoretical results is to indicate firstly, that under some conditions conventional policies with regard to international transfer simply may not work and second to identify the relevant parameters to examine if an export policy is to be successful or not. The implication to be drawn from this study for economic policy is the necessity of looking for the right combinations of these crucial parameters. The parameters are: the structure of the demand, the priority that certain groups have on the claim of output, for instance, investment over consumption of basic goods (this refers then to the type of market adjustment which is sort of an institutional feature of the economy) the elasticity of labour supply and, finally, the dualism (which is closely

related in the context of the UNITAR project with technological questions).
With the appropriate values and combinations of these parameters the results
will give a positive value to export led policies; with other combinations
of these same parameters there will be negative results, some results that
we have observed historically or that we fear may occur in the future. As
part of the UNITAR project we are building several data based case studies
(together with Lance Taylor) that we believe will confirm the type of effects
described here. Those are: Argentina eg. Diaz-Alejandro (1970) confirms
the negatively sloped price-quantity long run locus for exports), Egypt,
Bangladesh, the banana exporting countries in Latin America (Ecuador,
Costa Rica, Nicaragua, Panama and some rice and rubber, palm oil and
cocoa growers), which would make a total of about 15 or 20 countries
which the trade model, prima facie, may apply.

The model described here is actually a theoretical spin-off from the
original North-South model built for the UNITAR project and which is now
being enlarged into five region development and trade computer model.
A calibration of the North-South model based on data for Brazil and the
United Kingdom (Clark, Cole and Lucas, 1979) does indeed show the terms
of trade reversals predicted by the theory. However, as pointed out in
Cole's introduction the purpose of all the more detailed work is to
provide a more precise and country specific results. But without the
underlying theoretical understanding and the correct treatment of cru-
cial parameters the major results would not be obtained or would simply
be treated as anomalous. This is in fact exactly the case in Adelman and
Robinson Growth and Distribution in Korea (Oxford University Press 1978)
where results similar to those described here are almost apologetically
presented. In the UNITAR study, too, the anomalous results were first
observed in the result of the computer model, but because they appeared
to confirm the empirically observed findings on terms of trade of (Diaz
Alejandro and others) thus immediately prompted deeper theoretical in-
vestigation. In other global models, however regionally and sectorally
disaggregated, these results simply could not arise. Thus from a method-
ological point of view the importance of this paper is a clear demon-
stration of the need to move from empirical evidence and issues to a clear
theory and only then to move detailed computer analysis.

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