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# Technical Progress in Growth Processes

By Dr Artur Rommel, Bremen

The economic structures of almost all developing countries have one feature in common: — they produce—apart from their own primary products—agrarian and industrial commodities and raw materials for industrial countries. Until now they have few manufacturing industries of their own. Because of this "counter-structure", they are therefore in practice entirely dependent for their sales on the former colonial countries, and it is these countries in turn which more or less influence this trade. An exchange between developing countries exists only to a very limited extent. Nor have they any sizable market of their own for industrial products.

## Little Likelihood of a Rise in Exports

This is all the more evident the more recently these countries have gained their independence, applying therefore above all to the majority of African states. The fact that the former French colonies are linked to the Common Market, while the former British colonies are almost all in the Commonwealth is due to historical developments rather than an expression of the concept of integration. The exports of both these groups of countries to their respective "mother countries" enjoy priority treatment. This in turn is felt by other countries as discrimination against them and has frequently caused them to demand that their exports to industrialised countries should likewise be granted preferential treatment.

On the other hand, there frequently exists a considerable discrepancy between the desire on the part of the developing countries to increase their exports and their own industrial capacity. It will still take most of these countries years, if not decades, to develop beyond the processing of agrarian and industrial products and to build up an industry for finished goods, capable of being exported to the old-established industrial countries.

Another objective may, however, be reached more quickly: the provision of the home market with home products which should lessen the dependence on imports, which are frequently high, and lead to improvements in the balances of payments, which more often than not show a deficit. This objective is being pursued by almost all developing countries, for political reasons, if for no other. Nevertheless these countries will for a long time yet remain dependent on imports of industrial finished goods. At the same time, however, a restrictionist import policy will often eliminate the demonstration effect, i.e. the preferment of foreign products by the buyer.

In this manner support will be given to efforts to reduce the traditional monocultures with the aim of expanding hitherto restricted export possibilities, i.e. of diversifying production. The starting point for this is in most cases the local raw material basis. True, some countries (India for example) wish to work according to plans which, to be carried into effect, require the import of practically all primary and subsidiary materials. With that different production conditions are given. "While it is relatively easy to show cost advantages for such industrial products as depend largely on raw materials and for which there exists an ample supply of local raw materials, it is more difficult to show such advantages for other products, for which raw materials cannot be quickly and relatively cheaply made available locally and which depend to a lesser degree on raw materials. General statements are impossible in this connexion."<sup>1</sup>

## Varying Possibilities of Development

The means of production vary as strongly in different countries as does their state of development. It is therefore an open question and largely arbitrary at what point in time a country may be said to be a developing country. A decision on this point for practical purposes can be reached only by agreement. GATT has therefore classified all countries, grouping all developing countries under "category II". These countries show comparable features even if differences exist in their respective state of development.

Relatively far advanced industrially are the South-American states, while the most backward ones are those of Africa—with the exception of North Africa and the South African Republic, the latter having ceased to belong to the category of developing countries. In the Asian countries the level varies considerably.

At the same time the general backwardness of the developing countries provides them, however, with their very chance to catch up by intensifying their economic growth. "A country with the most modern processes can advance farther only by new inventions and discoveries. A country which is backward technologically can make great advances merely by borrowing from the already existing stock of knowledge. For countries which have a comparative

<sup>1</sup> Hesse, H.: "Die Industrialisierung der Entwicklungsländer in ihren Auswirkungen auf den internationalen Handel" (The Industrialisation of the Developing Countries in Its Impact on International Trade); in "Jahrbuch für Sozialwissenschaft", vol. 14 (1963), issue 3, page 359.

advantage in agriculture despite of the failure to use advanced techniques, it is not a subsidised industrialisation at the expense of agriculture which is the appropriate remedy, but education and training for a modernised agriculture.<sup>2</sup> This realisation is not new, but it is often overlooked—consciously or unconsciously.

It would be a one-sided way of looking at things to equate development with the settling of industry. This, though it is often the case, covers only part of the complex of problems that arise in the course of development processes. It is therefore wrong to assert "that in all cases the development of so-called economically underdeveloped areas can be fostered exclusively by industrialisation. In the majority of cases the first and foremost requisite is to introduce new agricultural methods—new methods of utilising the soil, amelioration of available acreage, extension of irrigation systems or introduction of dry-land farming etc."<sup>3</sup> Fundamentally such development plan aims first and foremost at making use of the country's existing possibilities with a view to creating for a growing population adequate food supplies. Without these—and less still if the threat of periodically occurring famines is not averted—no further development is possible.

Moreover, once an excess of farm products exists, it can be either put to industrial uses or it can be exported and can thus become the starting point for erecting an industrial structure. Here, too, things are not always seen in the right perspective. It strikes one for example that in a country like Tunisia vast areas are nothing but steppe, used as pasture for camels and sheep. And yet, climatically, that country is not at such a disadvantage—apart from the desert-like South—that its agriculture could not be developed further. The dates harvested in the oases of the South are despatched straight from there without the population having much more to do with it than the gathering of the fruit. In the fertile North fruit and vegetables grow in abundance. Now, if agricultural output were to be expanded and linked with such processing industries as canning factories etc., this would give work to more people than does a highly mechanised industry. At the same time, the demand for investment goods would be stimulated. Similar considerations apply to fishing, which is lucrative in the Mediterranean. Up to the present, however, Tunisia has been concentrating almost exclusively on the exploitation of its tourist trade.

#### **Development Processes Can Be Speeded up**

Some developing countries are working according to plans which have as their objectives to industrialise themselves and to raise the standard of living of

their people as quickly as possible, but which are hardly in accord with prevailing conditions. There is no plan that could be generally applied to all developing countries. For that geographical, climatic and demographic conditions vary too greatly. If, for example, Latin America happens to be relatively far advanced in its development, it would seem to be due to the fact that its population consists for a large part of immigrants from Europe. They have come from countries that at the time they immigrated were already advanced, and they were thus able to bring with them, not only their civilisation, but also the technical and scientific knowledge of Europe.

The strongest brake on development is not shortage of capital, but shortage of technical "know-how", i.e. of trained labour. Capital is obtainable from industrial countries, technical know-how is not so easily imported. For this reason development cannot be compressed into a few years, even if it is possible to shorten by a little the process which in the industrialised countries has taken about a century.

The developing countries have this advantage that, to reach a high level of output, they need not pass through all the intermediate stages of evolution in the same form nor need they take same time over it. On the other hand, a high level of output cannot be attained by simply getting the industrial states to put up modern plant in these countries. Evolution is a process which cannot be compressed into one single action. The main factor in this process is man, whose knowledge and ability to learn cannot be increased at short notice, and whose maturing process cannot be hastened.

It is therefore doubtful if success can be achieved through measures which are too closely geared to the standards of the developed economies, without taking existing realities into sufficient account. Apart from some more or less great differences, the developing countries are passing through the same growing process as the industrialised countries have done before them. Speeding up the inevitable process artificially has in the past always resulted in setbacks. Looked at in this light, this is a problem of generations, and it is doubtful if there is any truth in the assumption, which is sometimes made, that it may be possible for the developing countries to catch up with the industrialised states in a matter of twenty to thirty years.

#### **The Basis for a Policy of Development**

In addition, the starting point is an entirely different one from that of the developed economies. "The underdeveloped world today is often implicitly and even explicitly compared to the western world on the eve of the industrial revolution. This is most misleading. As a result of slow but prolonged economic and technical progress, western Europe had reached by the seventeenth and eighteenth centuries a high level of economic and technical attainment, far higher

<sup>2</sup> Viner, J., "The Economics of Development" in Agarwala, A. N. / Singh, S.P. "The Economics of Underdevelopment", New York 1963, page 27 seq.

<sup>3</sup> Koenig, R., "Industrialisierung und patriarchalische Gesellschaft in den Entwicklungsländern" ("Industrialisation and Patriarchal Society in Developing Countries", part of a series broadcast by North German Radio under the title "Problems of Development Aid" and published by Friedrich Ebert Foundation, Hanover 1963, page 20 seq.

than that reached by many underdeveloped countries by the beginning of the twentieth century or in many cases even at present."<sup>4</sup> A comparison of the developing countries with the situation such as existed in the advanced states during their pre-industrial phase "is obviously of wide scope, and touches a field for which testable observations are hard to find. Part of the discussion . . . should help to clarify the differences between the present state of the underdeveloped countries and the earlier situation of the more developed."<sup>5</sup> It is necessary to proceed from this realisation, if one is to attain the politically determined aim to bring the standard of living in these countries into line with that prevailing in the industrial countries of the West.

Much has been written and many discussions have been held on the question of whether the population of quite a number of developing countries would be mentally capable of absorbing the high level of living and production of the industrial nations. Certain it is, however, that the European-American stage of development is unsuitable for all economically backward countries. The reasons for this must be sought, not so much in intellectual shortcomings on the part of the indigenous population, as in a different mentality, in the dominant religion or in climatic conditions. The western countries, too, have in the course of their evolution gone through stages in which progress was retarded rather than facilitated and in which the attitude towards "capitalist" living habits and the corresponding production methods differed completely from that of today. To overlook these facts is to run the risk of incorrectly appraising the possibilities for development and thus to apply development aid on unrealistic assumptions.

#### Competition Induces Technical Progress

Whereas the European countries have forged ahead in their development, using their own resources and without impetus from outside, the developing countries are in a position to avail themselves of the knowledge and the material aid of the developed countries to overcome their backwardness. Rarely

were political and economic conditions for such a course as favourable as they are today. Economic considerations apart, "social development has proceeded fastest under conditions which admitted a large measure of waste . . . Prosperity is a wonderful shield behind which to develop new ideas. A people that has its eyes constantly downcast to look at its own poverty is unable to look up to see the world as it is"<sup>6</sup> and to arrive at a correct estimate of its own chances to develop. Neither grants-in-aid nor increased trade suffice by themselves to bring about development. It is not intended to contest the fact that rising exports can have a stimulating effect in that they increase capacity and revenue. They lead to a growth in production plant. By making for technical progress in the export industry the multiplying and accelerating factors impart additional impulses to the economy with the important result that productivity rises. Technical progress and foreign trade have the same effect on the development of local production capacity.<sup>7</sup> In this manner developing countries are drawn more closely into the international division of labour.

Technical progress is induced by competitiveness on the world markets. At the same time it may be regarded as a determinant—apart from others—of foreign trade so that technical progress and foreign trade stand in a dependent relation to each other. To this must still be added that the mobility of production factors may also bring about technical progress. A change in the production function is caused, not only by inventions or innovations, respectively, but also by imitating existing production processes and goods that exist in the developed economies.

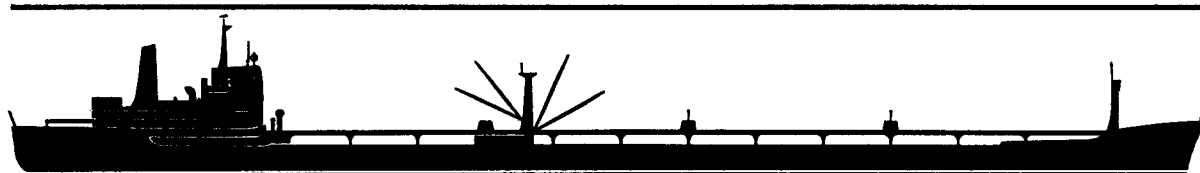
These problems have hitherto been largely disregarded in the theory of foreign trade. It is true, the neo-classical theory proceeds from the correct assumption that countries are provided in varying degree with production factors. But, contrary to fact, it presupposes that these factors remain confined to

<sup>4</sup> Bauer, P.T., "Economic Analysis and Policy in Underdeveloped Countries", London 1965, page 45 seq.

<sup>5</sup> Kuznets, S., "Underdeveloped Countries and the Pre-industrial Phase in Advanced Countries", in Agarwala, A.N./Singh, S.P., "The Economics of Underdevelopment", op. cit. page 135

<sup>6</sup> Hardin, G., "Naturgesetz und Menschenschicksal" (Natural Law and Human Destiny), Stuttgart, Zürich, Salzburg 1962, page 336 seq.

<sup>7</sup> Compare: Lorenz, D., "Über einige Beziehungen zwischen technischem Fortschritt, Aussenhandel und Wachstum" (On Some Relations Between Technical Progress, Foreign Trade and Growth), in: — Schmollers Jahrbuch, vol. 86 (1966), page 260; also Rose, K., "Theorie der Aussenwirtschaft" (Theory of Foreign Trade); second edition, Berlin and Frankfurt/Main 1966.



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their own economy as far as their mobility is concerned. In recent years, however, there has been an increase, not only in the mobility of capital, but also in the labour factor. Through (temporary) employment in other national economies labour forces acquire technical knowledge from the host-country or at least the ability to imitate and elaborate goods and production processes which have been passed on by the industrial states to the developing countries.

### Technical Progress and Production Function

A spreading of technical knowledge through training would appear to be more to the point, because more effective, than development aid in the shape of credits and grants-in-aid whose usefulness is a priori problematical, and for this reason: In our day and age production is conditioned, not only by (numerical) variations in the provision of countries with production factors, but also by qualitative differences. It would be erroneous to proceed from the unrealistic assumption that the production functions required for the manufacture of comparable goods are identical in all countries.

This has undesirable consequences if the production function for the manufacture of a certain article is from a technical point of view invariable. This is the case if ground, labour and capital are used in fixed proportion. In such a case the manufacture of the article can—or cannot yet—be undertaken by the developing country in question. In the latter case the country must give up the idea of producing it, and this happens all the more often the more mechanised the manufacturing process is.

The production functions do not change in all countries at the same time and at the same rate as a result of technical progress, for inventions occur fortuitously; they can be neither planned nor predicted. This means constant adjustments in the structure of production and foreign trade adjustments which mostly mean more specialisation in the individual country in which production can be undertaken under more favourable conditions than in others. Apart from this organisational progress—for structural changes may be regarded as such—yet another form must be mentioned, namely the production of new goods, for this, too, means technical progress as well as the introduction of new production methods does.

### Influence on Foreign Trade Intensity

The aid granted by industrial states often takes the form of the establishment of industrial plant, using local raw materials for the production of goods hitherto not manufactured in the developing country in question. For such goods there frequently exists no home market, either because local purchasing power is insufficient or because foreign goods are preferred. In such circumstance the locally produced

goods are exported, also with a view to obtaining foreign exchange which is urgently required to pay for imports. But the goods thus exported are frequently not competitive on the world market, either because their price is above world market level or because they are not up to western standards. Inability to compete is due much more to these causes than to import duties imposed by the industrial countries of the West, although the contrary is frequently asserted. In the developing countries "prices and costs are often raised to levels much above those prevailing in the industrial countries in the West, although there prices may have been increased to above world market levels by the imposition of duties for the protection of the home market. In such cases even 100% preferences are unable to compensate for lack of competitiveness on the part of the developing countries."<sup>8</sup>

In this manner the stimulating effect of exports on the home economy is impaired. Industrialisation of countries overseas cannot skip any of the stages of evolution, but must be carried out step by step from the simplest production to the most complicated. For this reason structural changes in overseas foreign trade can be hoped for only in the long run.

From the economic point of view only few obstacles stand in the way of spreading technical progress. Whether the intensity of foreign trade is thereby impaired or increased depends on the manner in which technical knowledge is passed on; it depends on whether the passing on takes place unilaterally from the industrial countries to the developing ones or the other way round as well. Separation in space between supply and demand as well as variations in the level of technical knowledge create trade; the spreading of progress impairs it. Up to now the developing countries have had few possibilities to make contributions of their own towards an increase in technical knowledge, being for the most part at the receiving end of the process.

In view of the fact that for the time being they have few compensating exports to offer, the spreading process is one-sided, and these countries are therefore anxious to reduce imports by producing substitutes locally. Such a trade policy, if it is to be carried out in conjunction with a policy aimed at growth, can only be successful, provided the substitution of imports is effected only to the extent to which home production increases. The remaining part of the imports must still be paid for by the export of raw materials. The effect of spreading technical progress, which is to diminish trade, is counteracted by specialisation through division of labour; it is more than compensated for at least in spheres where there are natural variations in production conditions.

<sup>8</sup> Johnson, H. G., "Präferenzen—Ein wirksames Instrument der Entwicklungsförderung" (Preferences—an Effective Instrument with which to Foster Development); in *WIRTSCHAFTSDIENST* vol. 46 (1966), page 375 seq.