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RECENT PROBLEMS OF LATIN AMERICAN INDUSTRY. REACTIVATION AND LONG-TERM POLICIES

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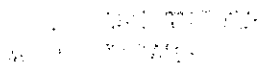

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Summary

Seen in the long-term perspective, the Latin American economy has grown rapidly, particularly by comparison with the moderate growth rates of the developed western economies, with which economic relations have been predominant. This is no doubt related to the fact that the region has gone through a process of intensive industrialization in which the manufacturing sector has played a dynamic and active role, both directly and indirectly.

There are, however, certain global figures which show that this state of affairs has changed since the international economic crisis began during the period 1973-1974. The rate of economic growth has fallen, and there has been an even greater drop in the rate of industrial growth; this phenomenon has partly been due to the fact that policies in that area were weakened and sometimes abandoned as a result of the easy availability of external financing.

Because of this and, to an even greater extent, because of the seriousness of the impact which the widespread recession in the region has had on industry, in which growth rates were negative in 1981, 1982 and especially in 1983, the "degree of industrialization" of almost every Latin American country has been set back considerably.

A look at these developments, however, will reveal certain differences in their nature and in the situations in the different countries. Thus, it will be noted that the abundance of external financing led to a weakening of deliberate industrialization in a good number of countries and, in some, was partly responsible for the establishment of neoliberal systems which often had a disastrous effect on manufacturing. In others, internal disturbances had similar effects.

In any event, the general effect has been that the regressive trends of the economy as a whole have been magnified in industry.

In this respect, the diagnoses that are available hold that this situation is mainly due to the reduction of domestic demand, which affects manufactures, particularly durables, more than total demand. This reduction is usually linked to anti-inflationary policies and policies leading to a recessive adjustment, to external restrictions, and also to the high rates of interest, to the extent that these affect consumers (particularly of durable goods) and the sectors requiring inputs (for example, construction). The diagnoses also point, in many cases, to the loss of markets on the part of domestic industry on account of the more liberal import policies applied before restrictions had to be applied because of indebtedness and balance-of-payments problems. Such imports were sometimes encouraged by trade policies that were deliberately aimed at openness, and often by the lag in the exchange rate that was used as a tool for stabilizing domestic prices.

External demand, which has been hurt by the international recession, by the protectionism of the centres and by the payments problems of the countries of the region, is also mentioned as having had a negative impact on industry,

inasmuch as it affects exports of manufactures and the domestic use of surpluses on the part of the traditional exporting sectors.

On the supply side, the aforementioned policies have tended to reduce public and private investment in industry, while the high interest rates have also affected capital formation and profitability because they raise financial costs. The climate of uncertainty, too, has been an inhibiting factor. External competitiveness has deteriorated for the same reason, and also because obsolescence has increased as fixed investment has diminished. This competitiveness has also been affected, in many cases, by the exchange lag. More recently, policies aimed at dealing with the external problem -including devaluations- have succeeded in rescuing domestic markets and restoring the competitiveness of local enterprises, but at the same time they have created difficulties as regards imports of inputs and have often given rise to serious financial problems for enterprises having debts in foreign currencies.

From the above it may be seen that there is an urgent need to seek ways of dealing with the recent critical trends without detriment to longer-term proposals that view the evolution of Latin American industry in the light of the more far-reaching objectives of economic and social development.

The most important ideas in the spectrum of reactivation policies take into account the sensitivity of industry to overall economic trends and policies, such as those pertaining to the domestic market. Thus, the recovery and growth of industry would to a large extent depend on a general reactivation. An important element of such policies would be the selective reservation of the domestic market, involving the operation of integration agreements or agreements on regional trade preferences. The establishment of a tariff preference has been suggested as a mechanism that would enable the countries to improve their trade with each other by diverting and creating trade flows to the region itself. At the same time, there has been agreement with respect to the idea of trying to utilize State purchasing power to benefit regional suppliers, particularly with respect to the purchase of capital goods.

Financial variables have also been given high priority, as there is a need to bring the cost of credit within reasonable limits, to help enterprises become financially sound and to reinforce financial systems for development. Likewise, there has been concern with respect to the export of manufactures, both as regards financing of production and as regards marketing. There is a need to strengthen and develop mechanisms for financing exports both within the region and to third countries.

One of the most important aspects affecting both reactivation and the external bottleneck is that of foreign trade policy, in which the promotion of exports and the containment of imports has taken on high and urgent priority. Emphasis has been placed on the role that should be played by regional co-operation and economic integration, as well as on negotiations aimed at removing the obstacles that prevent countries from gaining access to the large markets of the developed world. It is also important to apply an appropriate exchange policy which can both help improve external competitiveness and prevent "artificial" external competition brought about by the exchange lag.

Because industrial reactivation calls for a wide variety of measures to be taken, they can only be conceived within the context of overall economic programmes. To this end, it is necessary, on the one hand, to state industrial objectives explicitly and, on the other, to establish specific measures aimed at achieving those objectives, which should be consistent with the economic programme. In this connection, it is essential to strengthen or reinstate public entities specializing in industrial promotion and in State business activities.

It should be noted that the economic prospects of the region, in which the reactivation policies must operate, are not encouraging; it may therefore be asked what the possibilities for industrial growth are under such circumstances. The indications are that around 1990 it will probably be possible to recover the maximum degree of industrialization of the region (25%), with general economic growth rates of the order of 5.5% to 8%. Because these industrial growth rates are given in reference to the depressed activity of 1983, even the highest of these would appear to be "technically" viable in the light of the pre-existing industrial bases.

It should be noted that this observation is valid for the countries of the region in general; a more careful examination should consider, among other things, the fact that in some countries industry has deteriorated to a much greater degree than in others while, on the other hand, some countries have maintained an active industrial and sectoral investment policy. In the latter, recovery could be rapid, and this could enable these countries to go on quickly into a renewed and authentic process of industrialization.

In any event, industrial policy must envisage a long-term horizon, in order to provide for the thorough development of manufacturing. Some of the most important objectives should be the orientation of industry towards broader social strata; the correction of the economic and industrial heterogeneity of the countries of the region, and the improvement of the structure of manufacturing production with a view to offsetting the lag with regard to intermediate and capital goods. In this respect, it should be noted that this latter objective is not entirely viable within the limits of each individual nation or in small markets, so that here again the concepts that have inspired integration agreements become important. This same objective calls for a definition of appropriate technological policies, as in the case of exports of manufactures.

Great emphasis is placed on the industrial processing of natural resources, especially those of agriculture, since as well as tending to increase the benefits from exports on the basis of comparative advantages and giving a higher social value to such products, this can be a decisive element for bringing development and its benefits to extensive poor or marginated strata of society. This point, of course, also involves considerable requirements as regards technology, since the processes of adaptation and creation of technology for the efficient use of natural resources and raw materials -which sometimes have very special characteristics- raises considerable difficulties.

These requirements contrast with the persistence of the main features of industrial and technological development, outstanding among which are technological dependence and the insufficiency and poor level of linkage of scientific and technological activities with those of the production sectors and with the problems and objectives of development in general. At the same time, however, such a "diagnosis" also reveals differences -sometimes very marked- between the countries of the region. Thus, marked and growing differences are to be observed in scientific and technical capacity, in close relation to the economic size of the countries and also to their level of industrial activity.

All this points to the need to take important measures as regards technology and to seek to formulate a scientific and technological development strategy in keeping with the industrial patterns set forth both in the medium term with a view to the reactivation of the sector, and also in the longer term, with a view to consolidating the process and ensuring new contributions by industry to the fundamental objectives of economic and social development.

The great heterogeneity which exists in the structure and technological levels of the industrial sector militates against the making of generalizations. At least one objective can be considered as valid for most of the countries of the region and for the region as a whole, however: that of achieving autonomous capacity to handle technology, that is to say, to use the technology in a way consistent with the development objectives which each country sets itself.

Outstanding among the considerations which must be taken into account in pursuing these objectives are the need to disaggregate technological policies in order to specify actions and mechanisms in line with the sectoral or other features which influence the viability and effectiveness of such policies, and the need to ensure that the technology variable permeates all aspects of policy which affect the technological conduct of the industrial sector. The latter means that in the formulation of industrial policies it is necessary to identify and take into consideration their consequences for the technological development of the sector.

In accordance with the industrial diagnoses and the demands for the reactivation of the sector, a technological development strategy should concentrate its attention on those areas which are seen to be of the greatest importance. Here, mention may be made, inter alia, of: i) the promotion of technological development in the capital goods industry; ii) regulation of the importation of technology, especially as regards public sector purchases of technology; iii) the definition of technological criteria governing the admittance of foreign investments and the appraisal of this channel of technology transfer vis-à-vis other types of contracts which are not necessarily accompanied by external control over the application of the technology; iv) the application of active State purchasing policies; v) mechanisms to strengthen research and development as regards "major" and "minor" innovations and with a view to forging greater links between the scientific and technical and the production sectors; vi) State support for training and technical assistance to industry, and vii) extension of standardization and quality control activities.

Whatever the specific content of the technology policy, the profound consequences which the technological revolution taking place is bound to have on industrial development will make it more difficult to evaluate new projects, make necessary continuous work of analysis and prospection, and even possibly call for a complete reformulation of industrialization programmes and strategies.

Integration and regional and even interregional co-operation must play an essential role in this. They have often been conceived as means for accelerating overall economic development, and their potential as instruments of technological development has frequently received secondary attention. The critical situation through which the region is passing and the indications of the possibilities of technological and industrial complementation which are to be seen in this make it essential to place regional action in the forefront and to define concrete ways of executing it. The heterogeneity of the region can be a source of complementarity for technological exchange, especially between countries of different degrees of relative development.

The promotion of technological development in the capital goods industry calls for special mention because of the extremely important role assigned to this branch of industry, both in terms of the economic and industrial options open in the long term and as part of the reactivation measures identified in order to tackle the serious crisis affecting the region.

It is not necessary to repeat the many very different reasons for the urgent need for accelerating and consolidating the development of the manufacturing sector, which is lagging very much behind in the region a situation which is, moreover, rather paradoxical in view of the magnitude of the Latin American market, which in some categories is internationally significant. In addition, in this sector there is much heterogeneity among the countries in terms of production levels and the amount of diversification achieved, which to some extent is related to the magnitude of the different national markets and, in the case of capital goods, puts serious limitations on development. However, there are other equally important reasons for this differentiation between countries. These reasons are related to the policies each country has followed with respect to the establishment of the sector and to the fact that the degree of importance attached to them within the respective systems of economic development have varied substantially.

The severe economic recession which the region is experiencing has had a particularly sharp impact on the sector producing capital goods in that it has had serious repercussions on the rate of capital accumulation and on the incorporation of new equipment. In some cases this situation has been aggravated by the adoption of neo-liberal systems which have had particularly ruinous effects on the sector. All this has tended to augment the region's lag in production and to increase the differences between countries and in certain cases it has even jeopardized the existence of established enterprises.

The fact that the region will be confronted with limited resources for its supply of investment goods makes it of primary importance to adopt, at both national and regional level, a number of measures and policies to ensure the supply of such goods and to develop and promote the region's own production capacity, nationalize imports from outside the region and seek concrete arrangements for Latin American complementarity and co-operation in the trade and production of investment goods.

To this end, although it must be recognized that the development of the production of capital goods is a complex undertaking involving many factors and the interplay of a variety of conditions, attention should be drawn to some of the activities and policy measures which are regarded as fundamental in coping with the sector's problems in the short and medium term, and in laying the foundations for its future consolidation.

In general, one of the first factors to be taken into consideration is that this is a sector whose development calls for a sustained and prolonged effort, in which the efficiency and permanence of State support can be decisive and that because of its complexity, its policies must be highly specific. Another aspect which should be borne in mind and which is evident from the studies carried out in this field */ is that not only in the larger countries of the region, which have big markets, but also in the medium-sized countries and some small countries, there are possibilities for manufacturing these goods. It may be noted that in the latter countries on the one hand production levels are lower than the real potential of even their limited markets, while on the other hand, capacities exist which could be used in meeting regional needs if they were developed with an eye to the Latin American dimension within complementarity schemes.

Where policy measures are concerned, it is worth drawing attention to those in the field of science and technology to which reference has already been made. Importation from third party countries, from which a significant share of regional supplies of machinery and equipment are drawn, constitutes one of the main channels for the transfer of technology and is largely responsible for the dependence characteristic of Latin America. At the same time as measures are adopted for making the region responsible for meeting a larger share of its own demand, there will be a need gradually to set up the conditions needed for the incorporation of new technologies, particularly in those categories which are technologically the most backward. Some technologies related to automatization in the production of capital goods deserve special attention, particularly because they may prove to be suitable for the production of some capital goods in small lots. In addition, the technological revolution which is resulting in the rapid spread of micro-electronics will undoubtedly affect the options adopted with regard to the production of capital goods. In this connection it is of vital importance to promote every type of information service and technical assistance which makes it possible to evaluate these changes.

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*/ Project entitled "La Situación Actual y las Perspectivas del Abastecimiento y la Producción de Bienes de Capital en América Latina" (RLA/77/015).

The greatest demand for capital goods is in the public sector and therefore the State has an especially relevant role in using its purchasing power to benefit the domestic supply and in ensuring that activity is at the level needed if the manufacture of machinery and equipment is to develop and consolidate. State enterprises are of substantial significance in the Latin American economies, and very positive effects would result if they were unitedly disposed to act as stimuli to local industry. However it should be noted that there are serious obstacles to the taking of this kind of action by the State and also to the enactment of legislation for stimulating the purchase of nationally produced goods and that those obstacles will have to be surmounted. One of them is a financial obstacle, and special attention must be given to it where exports, and particularly domestic sales, of capital goods are concerned since it is in these areas that the financial machinery is notoriously inadequate if it exists at all. There are also limitations which derive from inadequacies in the engineering available at local level and from lack of experience in the administration of the large projects which generate much of the demand for capital goods. The engineering of these products largely determines the origin of the equipment which will be used.

Although the fields of action suggested are very valid for the majority of the Latin American countries, it is undoubtedly at regional level that they offer the most potential. In this connection, vigorous support must be given to joint efforts and co-operation activities of which there is a large variety in this particular field since it is only through such activities that the best results can be obtained and that many of the obstacles to the manufacture of capital goods essential for the region can be overcome.

In the Latin American countries more and more impetus is being given to the implementation of national projects for defining and establishing stable policies with respect to the capital goods industry as an important base for progress in seeking and taking regional action. The agreements reached at the Latin American Economic Conference provide a timely political framework for the joint action needed if the regional capital goods industry is to surmount its present critical stage and resume its role as a basic instrument of economic development. In this connection reference should be made to the decision to strengthen regional industrialization on the basis of the overall demand and to bring about greater participation on the part of local enterprises in the provision of the equipment needed. In this respect, the electricity sector has been singled out as being of priority.

It has also been acknowledged that entrepreneurial co-operation can be of significance for and have a very positive impact on the machinery and equipment sector. The initiative being taken in the region in this regard will in fact constitute an important step in the design and implementation of the action which Latin American countries need to take if the sector is to develop. All these areas constitute a good environment for co-operation which must of course be raised to the level of concrete action. Because of the complex nature of the sector and the unfavourable context in which this co-operation must be carried out, it presents a serious challenge, and the way in which it is met will have a very decisive influence not only on the capital goods sector but also on the region's industrial future and, finally, on its economic and social development.

Introduction

This study has been prepared for consideration at the third Latin American Conference on Industrialization, soon to be convened by ECLA. This regional meeting will be held in preparation for the fourth General Conference of the United Nations Industrial Development Organization (UNIDO), to be held at Vienna from 2 to 18 August 1984.

The meeting is being held in response to the request made in General Assembly resolution 38/192, in which it is recommended, in paragraph 3 of part III, that preparatory meetings should take place at the regional and interregional levels in order that there might be the fullest possible consultation among all States before the convening of the fourth Conference of UNIDO.

It has been felt that the third Latin American Conference on Industrialization should, at the technical level, provide for the consideration of the depressed industrial situation of the region. Thus, special attention should be paid to what has happened since the beginning of the international economic recession, especially since 1980, when the manufacturing sector was particularly hard hit by the weakening of industrialization policies and the general increase in recessive tendencies.

In view of the rather discouraging prospects for the external sector, there would seem to be an urgent need to examine the policies relating to industrial reactivation although of course thought must be given to longer term action including the most suitable action to take in order to meet the most important development objectives. Stress should be laid on the potential for interregional co-operation and on the need for better approaches to insertion in the international economy as well as on such "strategic" items as the development of the capital goods industries (some elements of which can play a role in reactivation) and of technological policies for achieving more dynamic industrialization along new lines.

As these issues are examined, it is hoped to provide the relevant technical data which will allow the Latin American Economic System (SELA) to form the common position to be taken by the member States with regard to the fourth General Conference of UNIDO as established in Decision 157 of the Latin American Council. To make this possible, close co-operation and co-ordination have of course been established between the two organizations.

Chapter I

INDUSTRIALIZATION */

1. Introduction

The central objectives of the present chapter are twofold. The first, in somewhat global terms, refers to industrial developments -and their main causes- that have occurred since the beginning of the 1973-1974 international economic crisis, and especially to the situation from 1980 onwards. Since the rate of industrial growth has declined to a more marked extent than that of overall economic expansion, and levels of manufacturing activity have dropped considerably in recent years in almost all countries of the region, the second central objective is to examine the more significant proposals formulated in connection with reactivation policies.

Such an examination is all the more necessary after a period of ten years during which fluctuations in the world economy have rebounded negatively in the region. In addition, economic policy orientations in several countries have undergone substantial changes, in some cases with noticeable disregard for deliberate industrialization. Integration agreements, mainly inspired by aimes of more advanced manufacturing development, have at the same time either become weaker or reached a state of crisis. Some countries, especially in the Central American zone, have moreover been affected by internal disturbances which have had severe repercussions in the economy and the industrial sector.

It should be pointed out that, in reviewing regional economic and industrial developments, some aspects of a significantly generalized nature throughout the countries concerned come into prominence. If the analysis is confined to the second half of this century an important economic trend may be observed which becomes more evident between the mid-1960s and the early years of the 1970s. This period of active expansion was accompanied by an intensive industrialization process in which the manufacturing sector took a leading part in that it embarked on new activities, became more up-to-date, devoted greater attention to exports and expanded far more rapidly than the economy as a whole. This generally dynamic trend receded noticeably after 1973-1974 and reached a critical stage in 1980-1983 when expansion dropped to minimum (1981) or negative (1982 and 1983) levels. At the same time the process of industrialization came to a halt in relative terms, and in 1980-1983 the sector suffered a decidedly more severe setback than that experienced by the economy in general.

The above sequence is representative of developments in many countries in a situation of generalized crisis, though in some, where preference has been given to policies of a neo-liberal slant, industrial recession has clearly been more critical, protracted and severe.

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*/ The bibliographical references (indicated with numbers in square brackets) and the footnotes are given at the end of this document.

The economic and financial crisis and its consequent deleterious effect on social conditions has been felt in almost all the countries of the region and displays similar characteristics and manifestations in several of them. Its origins would seem to be primarily attributable to external developments although structural problems and internal factors are also acknowledged to have had a restraining effect on development.

In the past three years the national economies of the region have undergone a process of contraction and even of stagnation; immediate prospects of acceleration in the rate of economic growth appear clearly improbable; inflation has increased and instability in exchange markets has worsened in such a manner that panic and speculation have in some instances created situations outside the control of national policies; high foreign indebtedness has given rise to servicing costs which in many countries are unmanageable if fresh capital receipts remain limited and current high interest rates and repayment periods continue; while contraction of external demand, re-aggravation of protectionism and deteriorating terms of trade are creating situations of undoubted asphyxiation in the economic process./10/

External factors responsible for unleashing the crisis throughout the region have in many instances conspired with internal elements such as inadequate policies that have served to aggravate the negative effects of world economic recession and the weakening of international trade. To this are added the structural imbalance of trade with the industrialized world, problems impeding more active trade with the centrally-planned economies, difficulties in the way of the more dynamic development of regional co-operation and economic integration, and relatively limited links with other developing areas./10/

The depth of the crisis and its protracted duration have drastically altered circumstances throughout the region and radically modified medium and long-term prospects. The consequent unfavourable outlook is making it necessary to devise fresh development strategies not yet fully thought out nor put to the test. Urgent financial concerns are understandably having a predominant effect in this context.

Whatever the case may be, all aspects point to the belief that any resumption of former dynamism in Latin America will, among other things, be associated with renewed efforts in the industrial field. It is for this reason that the second central purpose of the present chapter is to re-examine points of view in connection with reactivation policies.

The theory that economic and social development is in general linked with industrialization is therefore once again being mooted, in accordance with ideas and empiric experiences essayed in Latin America over the past decades -and in some instances for a far greater period of time. This concept acquires particular relevance at the present time, shortly after a period in which the weakening of economic expansion and recent recessive trends have coincided with manifest relative "de-industrialization". Of no less impact in this context is the conviction that growth rates will continue at a low level in most of the world's central economies. Technological innovations will at the same time tend to prolong or accentuate the present comparative weakness of international trade in primary products. The same innovations lead to the thought that traditional industries in those economies are

once again becoming highly competitive and that this trend is likely to grow in the case of the more significant manufacturing activities.

Thus, for internal as well as external reasons, the theory in question re-emerges even in diverse circles in countries whose governments deliberately abandoned it in the course of recent years. At the same time, and as pointed out at the end of this chapter, the definition of essential objectives and components of industrial development strategies has constantly been improving, although in practice they may frequently seem diffuse or political circumstances may interfere with their appropriate materialization.

These matters are by no means new (structural improvement, exports of manufactures, technological development, intra-regional co-operation, industrial commitment with a broader range of social strata, etc.), since they have received attention for many years. They are aspects that impinge on the need to continue a process of industrialization that in the past has fulfilled a dynamic role, towards more advanced and relevant solutions to the main persistent economic and social problems.

To consider such questions, even if only briefly and in schematic form, is consistent with the view that the policies of industrial reactivation, that should be introduced at the earliest possible moment, should form part of a wider and more comprehensive spectrum.

2. Prospects for long-term industrial expansion

In a long-term context the Latin American economy is seen to have expanded relatively rapidly in comparison with the world as a whole. During a 30-year period -from 1950 to 1980- the regional product grew far more rapidly than that of the developed western economies with which the region has established its main economic, financial and technological relations (see table 1).

This growth pattern was a generalized feature throughout the countries of Latin America since in only five countries the average rate of economic expansion during those three decades was appreciably lower than the world average and in only two was it considerably lower than the equivalent in the developed western economies. It is acknowledged that the weighted average denoting the speed of growth of the regional product was greatly influenced by the cases of rapid expansion in Brazil and Mexico. Nevertheless, if the arithmetical average is calculated, this is seen to have amounted to almost 5% per annum, a rate which also exceeds the world average (4.7%), and especially that of the western centres (3.7%).

It would thus be reasonable to conclude that the region achieved a certain degree of autonomy in its economic expansion and that this may to a large extent be attributed to the process of industrialization which, in the 30 years referred to, contributed to the fact that the incidence of the manufacturing sector in the product rose from 19% to 25%. Calculations show that more than a quarter of the economic expansion was the direct result of industrial growth, this in turn being responsible for close on a third of the regional increase in per capita income.

Table 1

ECONOMIC AND INDUSTRIAL EXPANSION WORLDWIDE AND IN SPECIFIC REGIONS, 1950 TO 1980

(Average annual cumulative percentages)

Regions	Gross domestic product at 1970 market prices			
	Overall		Per capita	
	Total	Industrial	Total	Industrial
World a/	4.7	5.7	2.8	3.7
North America and Western Europe	3.7	4.0	2.7	3.0
Latin America and the Caribbean	5.4	6.7	2.7	3.9
(Latin America: 19 countries) b/	(5.6)	(6.5)	(2.8)	(3.7)
Rest of the world c/	6.5	9.4	4.4	7.3

Source: ECLA, based on official United Nations publications (especially the Yearbook of National Accounts Statistics and the World Economic Survey) and OECD (National Accounts, Vol. I; Main Aggregates 1951-1980).

a/ These figures do not include China, North Korea, Mongolia or the former Democratic Republic of Vietnam.

b/ ECLA, based on official information from the countries concerned. These figures are not fully consistent with others shown in the table, having been calculated on the basis of product values in US dollars at parity.

c/ The high rates shown are to a large extent influenced by the rapid economic and industrial growth of the centrally-planned economies of Europe and Japan.

The indirect effects of manufacturing development should however also be taken into account since its quantitative and qualitative significance has been outstanding as a factor which, while imparting greater velocity to its growth, has defined the dynamic character of the industrial sector.

Implicit in this concept are the possibilities afforded by industrialization to internalize the technical progress of the western world, this being a process that would undoubtedly have been far more limited had it been based exclusively on the weak long-term performance of primary export products in international markets.

Since these are topics that have been examined on various occasions it would not seem appropriate to revert to them in the present document. Nevertheless, the dynamic autonomy influenced by industrialization has not on the whole alleviated the external vulnerability of the Latin American economies. This is a decidedly significant element in the overall situation which includes recent recessive developments and their amplified impact on the manufacturing sector.

It is above all necessary to bear in mind that the process of industrialization in the region during the thirty-year period in question raised regional participation in worldwide manufacturing activity from a level of 4% to slightly more than 5%. This is admittedly not a noticeably high level compared with that of other countries where exceedingly high rates of industrial development have been achieved such as the centrally-planned economies of Europe and Japan. In the context of the western market economies, however, Latin American industry doubled its relative position: from 4.7 to 9.4% -a significant development since most of the economies of the region took a prominent part in this outcome.

These regional economic and industrial trends nevertheless appear less encouraging if the rapidity of demographic expansion is taken into account. During the three decades referred to the total product on a per capita basis remained unchanged at a level slightly below 60% of the world average, the corresponding figure for the manufacturing industry being 45%. The considerable increases in per capita income in the socialist countries and Japan again undoubtedly affected these results. Furthermore, the region failed to improve its relative position in the western market-economy sphere since the regional income figure referred to remained at a level considerably lower than one fifth of that prevailing in those developed economies. The per capita manufacturing product in Latin America nevertheless showed some comparative progress since it rose from 14 to 17% of the average level ruling in the more advanced economies. This increase again throws into relief the considerable industrial effort made in the region, without which it is most probable that it would not even have been able to maintain its relative income-level position.*/

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*/ Particulars relative to the Latin American position in the world compared with other regions were taken from document E/CEPAL/L.231 (7), and updated mainly in accordance with the sources mentioned at the foot of table 1.

The industrialization process in Latin America and its concomitance with a relatively rapid rate of economic expansion is in any case consistent with a proven fact, namely that its greater intensity is directly associated with a more rapid rate of economic growth. Thus for example, the process in question (industrial rate compared with the total) showed a coefficient of 1.6 in Japan, 1.4 in the combined socialist economies, 1.3 in Latin America, 1.2 in Western Europe, and 1.1 in North America; the corresponding annual average rates of economic expansion in those countries and regions between 1950 and 1973 having been (in the same order) 9.6%, 7.7%, 5.5%, 4.8% and 3.8%.

It is clearly necessary to bear in mind that the figures quoted, which relate positively the velocity of economic growth with the magnitude of the industrial development process, are subject to certain qualifications which limit and at the same time serve to clarify their real significance. Among these are factors associated with the political framework, social and economic strategy, degrees of development, income levels previously attained in those countries or regions, their varying levels of industrialization and, above all, what may be termed the "quality" of industrialization. Since other studies have examined this aspect, it would not appear appropriate to analyse it further on the present occasion.

3. The Latin American "model"

It would perhaps however be relevant to devote a brief comment to review, even if only in schematic form, the essential characteristics of what tends to be referred to as the Latin American model or style of industrialization. This is because it is not a question of manufacturing development having reached a given stage in a process similar to that attained in more advanced countries applying market-economy or centrally-planned policies. Nor, moreover, is it a simple matter to define industrial similitudes between Latin America and other developing regions as, for instance, South-East Asia.

What is involved in this instance is a particular type of industrialization, the resemblance of which to other economies, and particularly to those in a more advanced stage of development being somewhat superficial, even in regard to their forms of evolution since more primitive times. In its salient aspects it is seen to be similar in almost all the countries of the region despite many elements indicative of an undoubted heterogeneity between them.

This is by no means a trivial topic, nor should it be disqualified as a diagnostic factor devoid of significance in the formulation of proposals or consideration of plans relating to future economic and social development strategies or policies. The contrary is in fact the case; it must be borne in mind that clear and accurate analysis is the only sound way of reaching firm conclusions in support of concrete and relevant proposals.

Examination of the Latin American model of industrialization admittedly reveals its underlying concerns with long-term solutions. For this reason it might at first sight be thought to disregard the priorities that should be adopted bearing in mind the recent recessive trends which have affected the manufacturing industry with particular severety. Nevertheless, as will be explained later, a

short-term analysis of those trends would suffer from a certain degree of indefinition if consideration is not given to structural realities exposed to the effects of economic policy and external conditions.

This aspect has of course been the subject of extensive examination./1/, /5/ and /6/ The present occasion, however, seems to call for the consideration of questions of undoubted actuality.

The development policies of most of the Latin American countries have assigned a leading role to industrial development. This may be clearly observed in government policies relating to instruments of support and promotion, institutional arrangements, and the direct entrepreneurial role of the State. Industrial ideology certainly appears in explicit form in government plans and programmes as well as in the conceptual bases of integration agreements and official proposals tabled at international meetings devoted to seeking co-operation for development and industrialization.

Thus, therefore, the range of objectives has continually expanded throughout the process of industrialization -of long-standing roots in some countries and becoming more generalized since the Second World War. Results have naturally differed as between large, medium and small countries although in essence the underlying concepts have been coincidental. Thus, after initial phases of relative spontaneity, manufacturing expansion with a view to internal markets was intensified. In a subsequent phase, constraints imposed by market limitations inspired concern with integration. The wish to export industrial products to the rest of the world also emerged with some force. The expansion of objectives is manifest in their evolution, emphasis having initially been placed on the traditional industries, then on those of a basic nature, and subsequently on those of a more complex character producing durable-consumer, intermediate and capital goods.

In this manner industry has not only contributed to economic growth, but also, most significantly, to technological transformation and the productive structure of the region. Many countries have attained a certain level of industrial maturity together with conditions that hold out possibilities of development towards more advanced stages. Other countries are as yet in a phase of semi-industrialization which may in due course qualify them as new industrial countries. It may be said, however, that examination of the regional panorama throws into relief a great diversity of situations, ranging from the largest and more industrialized countries to the smallest still in a stage of incipient manufacturing development.

Notable advances have nevertheless been made in the development of new industries, even for the manufacture of capital goods, mainly in the larger countries but also in those in the medium and small categories, as will be referred to in chapter III. The growth of exports of manufactures has been significant in reflecting the possibilities afforded by industrial development in terms of generating comparative advantages in accordance with generally held concepts regarding the latter. Similarly, manufacturing development has not only been a significant factor in spreading technical progress but has also induced efforts of creative technological adaptation and, at least in the larger countries, the generation of knowledge in similar fields. Apart from constituting a growing

source of employment, industrialization has contributed substantially to the preparation of qualified labour and the development of specialities at differing technical and professional levels.

These industrialization achievements have admittedly differed in extent and depth in the various countries, whether large, medium or small. It may also be observed that the industrial heterogeneity which differentiates them has become broader. Manufacturing development in the region nevertheless displays some essential characteristics common to most of the countries. In general terms this has been a process forming part of what has come to be referred to as disparate industrialization, apart from evolving within social and economic conditions that have sometimes excluded large segments of society and have far from satisfied the essential needs of the population in general.

The expression "disparate" and others of similar connotation that have come into use involve many and varied concepts. In simple terms they tend to denote inconsistencies in the structure of industrial production, especially when referring to the weakness of technological interrelationships in production processes and backwardness in the manufacture of capital goods. Some activities frequently consist of little more than simple assembly operations, especially in the metal-mechanical field and in the medium-sized or smaller countries. In some instances even this type of industrial operation has been allowed to deteriorate in the framework of trade liberalization policies tending to encourage the importation of inputs.

This characteristic situation is intimately linked with two others: namely technological dependency, and foreign trade in manufactures showing considerable imbalances. The dependency referred to, aggravated by the need from a political standpoint to incorporate central technical progress at the earliest moment, even if only in benefit of the more privileged social classes, involves large imports of intermediate and capital goods -and often also of consumer goods- not produced, at least at the right time, by local industry. This, combined with the fact that the same dependency -with its scant generation of valuable technology- and consequent structural irregularity which fails to favour exports or the regional interchange of manufactures, brings in its wake a considerable imbalance of foreign trade in industrial products. The same circumstance is connected with the prominent participation of transnational corporations in Latin American industry, especially in the more important and dynamic areas, which not only tends to fill technological gaps but also those that, through omission, are left open by the national public or private sectors.

Behind all this, which has been analysed in detail on other occasions, lies the scant -and sometimes non-existent- political support given to national, subregional or regional projects capable of guiding industrial development, in a new phase, along social, economic and technological lines consistent with the problems and more important objectives of development.

In any event, what it is here sought to emphasize is that a simple examination of economic and industrial expansion will reveal little of real substance. This

becomes manifest on making comparisons with the market-economy or centrally-planned centres since such an exercise involves confronting two totally different processes, only similar in appearance. Nor is the present situation of Latin American industry comparable with the past or primitive industrial phases of those centres. The model applied in the region has fulfilled a significant and irreplaceably dynamic role, but does not provide a route conducive to industrial development similar to that of the developed countries. Apart from this, given the trends observed, it would not be realistic to expect any spontaneous change in the model or style in use towards new forms of development wherein manufacturing industry might develop new capabilities to contribute to the solution of the main social and economic problems faced by the region.

These trends, combined with those taking place in the centres, lead to the thought that, unless radical changes of orientation are introduced, what may be termed the peripheral character of regional industry will be aggravated while new and major technological innovations become generalized and bring about what may be tantamount to another industrial revolution in the developed countries.

4. Salient periods

If an examination is made of the main periods identifiable in broad terms since 1950, the concept concerning autonomy in industrialization and economic growth appears decidedly relative in character. Moreover, when it is realized that, although the volume of commercial relations with the centres has increased less than that within the region, and much less than the product, those relations are nevertheless seen to have retained their predominance and key influence in regional development. To that commercial interchange are added other elements contributing to the growing internationalization of the economy, such as financial and technological flows and the operations of transnational corporations emanating from the central countries.

As recently as 1981 more than 60% in value of the goods exported by the region were dispatched to the developed market economies, a similar proportion of the region's imports coming from those same sources. The key local influence referred to above is even more clearly evident when it is realized that in the year mentioned more than 80% of the manufactured goods imported by the region came from those same economies. Technological dependency should be borne in mind in this connection and the fact that innovations introduced by the centres are to a great extent transferred to the region and internalized through the medium of imports of manufactures, particularly in the intermediate and capital goods categories, precisely in the sectors where regional industry is most backward. Among other considerations, these same facts explain the difficulties of increasing intra-regional trade in manufactures. On the import side, trade within the region has not exceeded 10% although in the case of exports it has remained at an approximate level of 40%. In value, however, this obviously represents only a small fraction of total regional imports./ 8 /

Similarly, a noticeable diagnostic coincidence is apparent in attributing to the external sector the various trends that have characterized the different periods since 1950. The moderate economic expansion prior to the mid-1960s is to a large

extent explained by unfavourable conditions in the external sector after the Korean War. In that period exports and imports grew slowly, terms of trade deteriorated, and the availability of external financing was relatively modest. Subsequently, the rate of economic growth quickened, a fact attributed in large measure to expansion of the economy and of world trade and also to an improvement in terms of trade and greater fluidity in the field of external financing. Later, as from 1973-1974, when oil prices began to rise and crisis in the developed market economies became apparent, the speed of economic expansion diminished reverting almost to the same former modest level until, in the first years of the present decade, the trends became critical (see table 2).

There have been other marked differences between the periods in question, some of which deserve particular mention, especially when considering the role of industrialization. Prior to the early years of the 1970s the regional economy grew in harness with a relatively rapid pattern of industrial development, as evidenced by the greater velocity of manufacturing expansion compared with the overall growth rate (see table 2). The quotient of both annual rates, which tends to be referred to as "the process of industrialization", rose from 1.21 in 1.25 in 1965-1973, representing an acceleration of the process apart from an increase in the relative weight of industry from 19% of the gross domestic product in 1950 to 25% in 1973.

Industry thus fulfilled a conspicuously dynamic role, a fact that becomes the more evident on observing the coincidence between the greater velocity of economic expansion in 1965-1973 and simultaneous acceleration in the process of industrialization.

Events after 1973 were of a different character. The regional rate of economic growth fell noticeably but continued at a not unsatisfactory level until 1980 (see table 2), of the order of the average long-term trend (see table 1). Other factors were however influential in bringing about a situation of comparative "de-industrialization" (lower industrial variation than the overall rate). Prominent among these factors was the fluidity of external financing which to some extent compensated the depressive effects of the international economic crisis.

Nevertheless, that financing availability succeeded in creating a critical foreign debt and servicing problem while becoming less fluid and more restricted. In this manner the system sustained by indebtedness was interrupted and many countries adopted recessive policies in order to cope with balance-of-payments problems and inflationary trends.

5. Recession

a) Industrial retrogression

In this recessive panorama manufacturing industry was particularly affected. As from the international economic crisis which began in 1973-1974 its rate of growth became weaker and then experienced a significant setback in production levels which, with few exceptions, spread throughout the region.

Table 2

LATIN AMERICA (19 COUNTRIES): GROWTH OF PRODUCT, TOTAL AND INDUSTRIAL, 1950 TO 1983

(Average annual cumulative percentages)

Periods	Gross domestic product a/		
	Total	Industrial	Total per capita
1950-1965	5.2	6.3	2.3
1965-1973	6.5	8.1	3.8
1973-1980	5.5	5.1	2.9
1980-1981	1.5	-2.3	-1.0
1981-1982	-0.9	-2.3	-3.2
1982-1983	-3.3	-4.8	-5.6

Source: ECLA, based on official information from the countries concerned.

a/ On gross domestic product values at 1970 market prices (in US dollars at parity).

The severity of the industrial crisis becomes manifest on observing the deterioration of the sector in terms of volume of production and especially in the degree of industrialization in the countries concerned (see table 3).

All, with the exception of the Dominican Republic, underwent a phase of regression of greater or lesser degree in their overall levels of manufacturing activity. In nine of the 19 countries considered this level fell to that recorded five years earlier and in the case of five reverted to that of 10 years previously. In Chile this retrogression was equivalent to 16 years, in El Salvador to 14, 12 in Argentina and Uruguay, and 10 in Peru. For its part, deterioration in the degree of industrialization was even more severe: in 13 of the 19 countries it represented a regression of 10 or more years and of more than 20 years in the case of seven countries. Chile and Uruguay again figured in the last-mentioned category with levels of retrogression equivalent to 30 years. This compares with 23 years in Argentina and Peru, and 22 in El Salvador, Colombia and Panama.

In considering these developments of generalized impact throughout the region it should be borne in mind that the cause of the industrial regression differed in nature from one country to another. However, industry in general suffered the effects of various elements that combined perniciously as a result of the interruption of a scheme based on the fluidity of external financing and the recessive situation, as will be further examined in the following paragraphs.

Table 3

LATIN AMERICA (19 COUNTRIES): ECONOMIC AND INDUSTRIAL EXPANSION AND REGRESSION OF THE SECTOR

Countries	Growth of gross domestic product a/ (average annual cumulative percentages)				Industrial retrogression (year of attainment of the 1983 level)	
	Total		Industrial			
	1950-1980	1980-1983	1950-1980	1980-1983	Industrial product	Degree of industrialization
Large	6.0	-1.0	6.8	-3.2	1979	1966
Argentina	3.2	-3.2	3.8	-4.5	1971	1960
Brazil	7.1	-2.0	8.4	-4.5	1978	1968
Mexico	6.6	1.0	7.4	-1.0	1980	1970
Medium	4.7	-1.0	5.2	-3.5	1978	Before 1960
Colombia	5.1	1.2	6.0	-1.0	1980	1961
Chile	3.6	-3.4	3.1	-6.1	1967	Before 1950
Peru	4.6	-2.8	5.5	-6.1	1973	Before 1960
Uruguay	2.2	-4.8	2.8	-10.0	1971	1950
Venezuela	5.9	-0.4	7.2	-0.6	1981	1980
Small	5.1	-0.3	6.3	-0.6 b/	1980 c/	1976 c/
Costa Rica	6.5	-3.8	7.8	-7.1	1976	1973
El Salvador	4.5	-5.4	5.4	-8.7	1969	1961
Guatemala	5.0	-1.7	6.1	-3.7 d/	1979 c/	1968 c/
Honduras	4.4	-0.5	7.3	- d/	1980 c/	1981 c/
Nicaragua	4.4	3.0	6.8	0.3	1974	1977
(CACM)	(5.0)	(-2.3)	(6.5)	(-5.4) d/	(1977) c/	(1970) c/
Bolivia	3.4	-5.5	4.4	-6.2	1975	1978
Ecuador	6.2	0.8	6.9	1.3	1981	1982
Haiti	2.2	-	3.5	2.9	1981	1983
Panama	5.1	3.4	7.6	0.1	1980	1961
Paraguay	5.2	1.5	5.5	0.5	1980	1967
Dominican Republic	5.9	3.2	6.9	3.3	1983	1970
Latin America	5.6	-0.9	6.5	-3.1	1979	1966

Source: ECLA, based on official information from the countries concerned.

a/ Gross domestic product at 1970 market prices (in US dollars at parity). b/ Excluding Guatemala and Honduras. c/ Figure for 1982. d/ Corresponding to the period 1980-1982.

It should be reiterated that the scheme in question tended to debilitate industrial policy in many countries in such a manner that the regressive developments referred to began before the final critical years. Apart from this, substantial changes in the orientation of development policies towards neo-liberalism and indiscriminate freeing of trade had already been introduced in several countries, often with ruinous consequences for industry. Among these countries were some already mentioned where industrial recession was most severe.

It is furthermore necessary to bear in mind that in a few countries detention or regression of the process of industrialization (defined as more rapid growth of the manufacturing sector compared with that of the economy in general) preceded -or was independent from- the events that brought about the international economic crisis which started in 1973-1974 at the time of the increase in oil prices. Finally, notice should be taken of the fact that such a "detention" or "regression" often reflects an arithmetical conclusion deriving from greater progress in other sectors, as has tended to occur in the sphere of agriculture. It therefore does not necessarily denote a perversion of the development model, especially if the occurrence comes about in the short or medium term without detention of growth or reduction in the level of industrial activity.

Whatever the case may be, however, events linked with or deriving from the recent recessive trends have reinforced or combined with other elements, amplifying their impact on industry. For this reason, it would seem pertinent that examination should to some extent assign prominence to factors which, in more generalized or severe form, have affected the manufacturing sector in the framework of the recessionary situation, without, however, disregarding some prior circumstances or trends, sometimes of a structural character, that help to understand how it came about that industry has reached the position in which it finds itself today.

b) Main explanations

In reviewing this subject, it is necessary to consider that the industrialization process, measured globally by the more rapid growth of manufacturing activity than that of the economy in general, involves many aspects, including, therefore, the elements that determine its detention or retrogression. It is sufficient to remember that that greater rapidity represents the productive response arising from expansion of the internal market in accordance with income-elasticity in the demand for manufactures being greater than demand in general; to the installation of new activities tending to complete the industrial spectrum, horizontally and vertically, with a higher or lower degree of specialization according to market dimensions; and to the utilization or creation of comparative advantages favouring the export of manufactures! This process naturally requires investment, trained personnel and technological development, combined with action on the part of the State and support and promotion policies. Apart from this, to the extent that more advanced phases are sought, it becomes the more essential to have access to larger markets, either national, international or both.

In practice, all these considerations should be borne in mind in examining the above explanations, although most national diagnoses give emphatic prominence to effects attributable to depression in the demand for manufactures or the substitution of national by imported products, or to both of these causes. In any event, many (and of a varied nature) are the causes that combine -with asynchronous frequency- to explain the facts described.

In so far as internal demand is concerned, in the context of general recessive trends it may be concluded that income-elasticity in the demand for manufactures being greater than the whole becomes manifest both when the level of income rises or when it falls. It should be kept in mind that the major part of industrial production in Latin America is devoted to local markets and that growth of the sector has for many decades been mainly due to the expansion of internal demand. This may partly explain the fact that the general recessive process affects industry in amplified form.

Apart from this, anti-inflationary policies and those aiming to adjust external restrictions have tended to depress wages in real terms as well as employment and especially public expenditure and investments including direct government purchases from local industry. For their part, private investments -including those from abroad- have often diminished due to an uncertain economic outlook failing to hold out clear prospects of development, sometimes aggravating speculative propensities apart from having to cope with rising interest rates and the contraction of external financing. Thus, the demand for manufactures is restricted and supply has in more recent times been disrupted, in some cases due to difficulties in the importation of inputs and capital goods arising from insufficient means of payment or policies instituted with a view to solving external imbalances.

It should be borne in mind that increases in interest rates affect supply when they contribute to indebtedness, increase financial commitments and adversely affect profitability and the formation of capital, frequently inducing precipitate financial action on the part of entrepreneurs, to the detriment of fixed investment and favouring growing obsolescence, thereby affecting external competitivity. It should furthermore be considered that those increases in interest rates conspire against consumer demand for manufactures -direct or indirect- customarily resorting to credit. In this context the metal-mechanical industry producing durable consumer goods, generally less indispensable than others (and in which credit has an important effect on demand) has more acutely experienced the impact of recession. It is also necessary to bear in mind that the building industry, which needs large supplies of industrial inputs, is seen to have been even more severely affected than the manufacturing sector due to the contraction of investments caused to a certain extent by financial difficulties deriving from high interest rates. Owing partly to this circumstance, the intermediate industrial group has suffered a considerable setback, although less than that affecting the metal-mechanical sector (see table 4).

Table 4

LATIN AMERICA (14 COUNTRIES): a/ MANUFACTURING EXPANSION BY INDUSTRIAL GROUP

(Average annual cumulative percentages)

Periods	Total	Industries		
		Non-durable consumer goods b/	Intermediate goods c/	Metal-mechanical products d/
1965-1973	8.1	5.7	9.2	11.6
1973-1980	5.1	3,3	5.6	7.0
1980-1981	-2.3	1.2 e/	-2.3 e/	-6.3 e/
1981-1982	-2.3	...	...	...
1982-1983	-4.8	...	...	...

Source: ECLA, based on official information from the countries in question.

a/ The 14 countries considered are Argentina, Brazil, Colombia, Costa Rica, Chile, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Paraguay, Peru and Venezuela.

b/ Foodstuffs, beverages and tobacco (ISIC, Rev.2, Division 31); textiles, wearing apparel, leather goods and footwear (Div. 32); furniture and fixtures (group 332); printing, publishing and allied items (group 342); pottery (group 361); and others (Div. 39).

c/ Wood and cork products (group 331); paper (group 341); chemicals petroleum derivatives, rubber and plastic products (Div. 35); glass and other non-metallic mineral products (groups 362 and 369); basic iron and steel products (group 371).

d/ Fabricated metal products, machinery and equipment (Div. 38).

e/ Eleven countries (Guatemala, Honduras and Nicaragua excluded).

For its part external demand also showed a marked decrease, causing a lowering of prices of basic export products and consequent deterioration in terms of trade. Thus, the demand for manufactured goods on the part of exporters has been affected, together with disposal of their surplus stocks, to the same extent as the export of manufactures as a whole. To the growth of protectionism in the central markets has been added a certain slackening of intra-regional trade, apart from critical trends which have for some time characterized regional integration agreements. In some cases, considerable devaluations introduced in one country have constricted imports from another with decidedly unfavourable repercussions on the industries concerned. Intra-regional trade in manufactured goods has in general been impaired by the countries' external problems and corresponding adjustment policies. In relative terms, intra-regional trade has dropped more than that conducted extra-regionally, while the possibility of a trade "war" within the region appears latent and, if it were to develop, might well have extremely serious consequences in all the countries concerned.

It should be added that industrialization has received considerable backing from promotion and support policies in addition to the direct activity of the State, but these policies have been partially or totally discontinued in some countries and export-promotion measures have in many cases been curtailed. To these trends have been added the weakening of deliberate protection and deferment of exchange operations, usually instituted in compliance with anti-inflationary objectives but risking the exposure of exports to "artifical" external competition and reducing possibilities of competing in international markets. Under these circumstances government services and enterprises have themselves sometimes preferred to import rather than rely on local industrial capacity, a fact which in some countries of the region has been yet another element tending to reduce manufacturing growth or depress levels of activity. In many instances, moreover, external competition has contributed to the depression of industries in the "traditional" category (generally producing non-durable consumer manufactures), well developed in the region for many years, including the smaller countries where those industries have held a predominant position due to lower incidence of considerations of scale.

As a general rule, adjustment policies have tended to include large devaluations which have had some success in recovering competitivity and have at the same time restricted imports, other external expenditure and flights of capital. They have nevertheless given rise to some problems in the industrial sector. Higher imported input costs, for example, when transferred to the final product have had a negative effect on internal demand for manufactured goods due to their impact on price-elasticity. Another not infrequent example of these adverse effects has been the raising of foreign debt servicing costs which, together with high interest rates has sometimes led to cases of veritable financial collapse.

/Apart from

Apart from all the foregoing considerations it should be reiterated that critical trends already existed in certain countries, prominent among them being some where neo-liberal policies were attempted and succeeded in achieving viability thanks to the relative ease of incurring indebtedness, albeit with temporary and precarious results. Industrial recovery in these cases has tended to be associated with general economic reactivation, the renewed application by the State of direct or indirect incentives, recovery of the internal market by local manufacturing activities, and the putting to rights of the financial affairs of corporations which in many instances had incurred exaggerated levels of indebtedness due largely to high interest rates. However, it has frequently been observed that not only has the industrial sector diminished in size but it has also undergone some significant qualitative changes capable of impeding its eventual reinstatement. Prominent in this respect have been the loss of qualified labour, weakening of administrative efficiency, reduction or disappearance of engineering services (including teams engaged in pure and applied research), a lowering of the degree of process integration and the conversion of transformation and assembly activities into importers of finished products. Under these circumstances, recovery of the sector (within which it would be necessary to distinguish different types of industry or enterprise) would be more difficult and protracted. Moreover in some cases it would not only be a question of putting idle capacity to work but of replacing enterprises, plants (or departments) formerly shut down, or at least of facing obsolescence and technological retardation after many years of paralization or insufficient investment. Shortages of inputs attributable to reduction in the degree of integration or scarcity of foreign currency, due among other things to external debt servicing, would be a further adverse circumstance.

Shortages of this kind might, however, have favourable consequences in some industries which, because of import difficulties, could recover their position in the internal market. This seems to have been the case of the manufacturing sector in Argentina in 1983 which tended to recover partially, showing a preliminary estimated annual growth rate of 9%.

It is clear that disarticulation of the production processes in the countries affected appears to have been particularly severe. But, as mentioned earlier in this document, the problem is of a structural character and common to all the countries of the region although, broadly speaking, of relative significance inversely proportional to the size of the internal market. For this reason, the higher cost or scarcity of imported inputs has in general been connected with critical trends in industry experienced in the recent past. Similarly, it would be reasonable to expect that, in spite of the protectionism to which they may give rise, future shortages of foreign exchange will constitute a hazard for industry, considering in particular the investments that would have to be made in machinery and equipment, the manufacture of which is what has most fallen behind in the manufacturing activities of the region.

The matter becomes particularly relevant when it is realized that the regional and subregional integrationist processes and aims characteristic of the 1970s have been growing progressively weaker. It is as well to remember in this connection that one of the conceptual bases and propositions of integration agreements has

been precisely the intention to overcome the restrictions imposed by national markets with a view to strengthening the process of industrialization in the sense here defined, and to attenuating the palpable vulnerability of the present state of affairs.

Similarly (and at the risk of redundancy), it is necessary to bear in mind that compensation through the medium of extra-regional trade has only been forthcoming occasionally and in limited form, nor is it foreseen with much optimism in the future despite the fact that policies relating to exports clearly accord them a high degree of priority. Even if reactivation of the world economy were achieved it is likely that Latin American exports will continue to come up against protectionism in the central countries, with the added probability of reduction in the region's present comparative advantages as a result of technological innovations being developed in those countries and the likelihood that they themselves will increase their own such advantages in the more dynamic industrial areas.

Finally, it should be reiterated that the deep generalized crisis affecting industry in the region sometimes presents differences as between one country and another, and between various manufacturing activities and types of enterprise. In so far as the last mentioned are concerned, the problems here examined have tended to lead many into bankruptcy, others to the limit of survival, and almost all to operate with high percentages of idle production capacity and often with exaggeratedly high financial costs, apart from being induced to undertake other commercial or financial activities, or both, which have in many instances become more important than those of production. Some diagnoses however, identify the situation and possibilities of recovery of certain less-affected enterprises. The latter tend to include some large organizations capable of dominating the market and others in the medium and small categories, sometimes family-owned, which have progressed by applying conservative financial and indebtedness policies. In this same context, and although sufficient systematized information is not available, the heterogeneity of various specific types of industry is manifest. A prominent example is the maintenance, expansion or installation in some countries of heavy metal-mechanical industries linked with oil, hydroelectric or nuclear development. Nevertheless, the persistence of recent general economic trends, of the acute external problem, and of policies of a recessive character, carries with it a potential danger of a further deepening of the crisis and its amplified impact on industry.

6. Policies associated with industrial reactivation

Without detriment to relatively longer-term propositions wherein Latin American industry will have to evolve towards solutions ensuring a fresh contribution to the more important objectives of economic and social development, as referred to later in the present document, it appears essential to search for ways of dealing with the recent critical trends. In this endeavour many governments in the region have shown increasing determination to reactivate the economy and especially the depressed manufacturing sector. The point has even been reached where an

appreciable set of measures has been formulated and attempts made to mobilize a large number of instruments of support and promotion of the manufacturing sector in recognition of the need to apply a "policy of defense of productive plant and employment" and revive industrialization as a key factor in development.

The defense measures undertaken recognize that the weakening or abandonment of the policy of industrial development threatens, sometimes seriously, the very existence of manufacturing installations as well as industrial articulation and other technological attributes -in addition, of course, to direct and indirect employment in the sector.

The revival of industrialist strategy responds to generalized evidence of the consubstantiality of economic growth and industrialization as clearly demonstrated in the countries of Latin America, where conclusive evidence to the contrary has also been observed in the form of "de-industrialization" combined with slow or negative growth, particularly in the 1970s and early years of the present decade (see table 5).

Industrialist reasoning certainly goes far beyond this statistical observation and embraces reasons of an internal nature such as those associated with economic and social dynamics, and also of an external character including those relating to the characteristics of international trade, vulnerability, autonomy, and the internalization of worldwide technical progress.

It is not necessary on this occasion to go deeper into these matters which have been carefully examined on many occasions over the past several decades. It is nevertheless advisable to bear them in mind, above all because they have for some time been overlooked in certain intellectual and political postures placing reliance on the inward flow of external resources to uphold the illusion of possibilities of growth and development without industrialization and, worse still, without the necessary intra-regional collaboration to overcome restrictions deriving from the limitations of purely national dimensions in terms of power of negotiation and economies of scale necessary to achieve progress towards more advanced stages.

With regard to these considerations and to ideas on the subject of "defense" and "revival" it is necessary to issue a warning. It is not -at least necessarily- a question of reproducing former patterns of manufacturing development or of perpetuating the "model" of industrialization to which reference has been made in a previous paragraph. To the contrary -and also as postulated for some considerable time- it becomes indispensable in a new phase to opt in favour of deeper and more creative forms of industrialization consistent with the objectives of general development and with the need to solve the main economic and social problems which persist or are becoming more acute in the region. Prominent among these -as is already well known- are distributional injustice, social exclusion and external strangulation.

Table 5

LATIN AMERICA (19 COUNTRIES): ECONOMIC EXPANSION AND INDUSTRIALIZATION, 1950 TO 1983

Countries	Long-term industrialization a/					Recent de-industrialization b/			
	Period c/	Growth of product (average annual percentages) d/		Degree of industrialization (Percentages) e/		Period f/	Growth of product (average annual percentages)		Degree of industrialization (percentages)
		Total	Industrial	1950	Final year		Total	Industrial	1983
Large	1950-1973	6.0	7.2	20.0	27.1	1973-1983	3.8	-2.9	24.7
Argentina	1950-1974	3.6	4.9	23.1	31.2	1974-1983	0.0	-1.9	26.2
Brasil	1950-1973	7.2	8.8	19.7	27.6	1973-1983	4.3	3.4	25.3
Mexico	1950-1979	6.5	7.5	19.4	25.2	1979-1983	2.8	1.0	23.5
Medium	1950-1973	4.8	5.9	17.7	22.4	1973-1983	2.5	1.1	19.5
Colombia	1950-1973	5.2	6.9	16.1	23.6	1973-1983	3.8	1.8	19.4
Chile	1950-1972	4.1	5.2	21.5	27.5	1972-1983	0.7	-2.0	20.4
Peru	1950-1976	5.0	6.3	18.7	25.5	1976-1983	-0.2	-2.5	21.7
Uruguay	1950-1979	2.1	2.8	21.9	26.8	1979-1983	-2.3	-7.0	21.9
Venezuela	1950-1980	5.9	7.2	12.1	17.4	1980-1983	-0.4	-0.6	17.3
Small	1950-1979	5.2	6.5	12.6	18.0	1979-1983	1.0 g/	-0.3 g/	17.3 g/
Costa Rica	1950-1978	6.8	8.4	13.7	21.2	1978-1983	-1.2	-3.7	18.7
El Salvador	1950-1976	5.2	6.7	13.7	19.9	1976-1983	-2.2	-5.4	15.8
Guatemala	1950-1980	4.9	6.1	12.0	16.7	1980-1982	-1.3	-3.7	15.9 h/
Honduras	1950-1981	4.3	7.1	6.7	15.3	1981-1982	-1.0	-1.5	15.2 h/
Nicaragua	1950-1980	4.4	6.7	11.5	22.5	1980-1983	3.0	0.3	20.8
(CACM)	(1950-1978)	(5.3)	(7.0)	(11.8)	(18.4)	(1978-1982)	(-1.1)	(-3.0)	(17.1) h/
Bolivia	1950-1980	3.5	4.4	12.6	16.3	1980-1983	-5.5	-6.2	15.9
Ecuador	1950-1982	6.0	6.8	17.6	22.5	1982-1983	-3.5	-5.6	22.0
Haiti	1950-1983	2.0	3.5	7.9	12.5	-	-	-	12.5
Panama	1950-1969	6.4	10.0	6.7	12.7	1969-1983	5.0	2.9	9.6
Paraguay	1950-1973	3.9	4.6	14.7	17.0	1973-1983	7.1	6.1	15.4
Dominican Republic	1950-1971	5.6	7.2	13.9	18.9	1971-1983	5.7	5.4	18.3
Latin America	1950-1973	5.6	6.9	19.2	25.2	1973-1983	3.5 g/	2.6 g/	23.2 g/

Source: ECLA, based on official information from the countries concerned.

a/ Development of the manufacturing sector with greater growth rates than those of the total gross domestic product ("process of industrialization").
b/ Period of retrogression or slower advance of the manufacturing sector compared with the total product of the economy. The figures for 1983 are preliminary estimates.
c/ Shown here is the period elapsing between 1950 and the year in which each country reached its maximum degree of industrialization.
d/ Total and industrial gross domestic product at 1970 market prices (in US dollars at parity).
e/ Incidence of the industrial product in the total.
f/ Period elapsing between the year in which each country reached its maximum degree of industrialization and 1983.
g/ Excluding Guatemala and Honduras.
h/ 1982.

The following final section of this chapter contains a schematic summary of the principal elements of a renewed policy of industrialization. For the present, reference will be made to some of the more outstanding ideas in the spectrum of industrial reactivation policies.

Most of those ideas are of course the result of analysis and take into account the relationship between industry and general economic trends and policies such as those relating to internal demand, this being a variable increasingly linked with the recent industrial decline, especially when applying to locally-produced manufactures, due to general recessive processes or to substitution by imports. Industrial recovery and growth therefore depend to a considerable extent on general economic reactivation causing income levels to rise and stimulating investments.

Although the corresponding general policy is not the subject of these pages, it is thought relevant to put forward some comments concerning certain requisites for a better contribution by industry to the general dynamics of the countries in question.

Some of these requirements are linked with the selective reservation of the internal market in favour of existing local industries or others to be installed. This implies a certain degree of protectionism, but does not preclude the operation of integration agreements nor of regional or subregional trade preferences, these latter being instituted precisely as part of a strategy tending to invigorate the regional economy and confront problems in the external sector, trends offering scant encouragement in the international economy, and difficulties imposed by the more developed countries with regard to imports from peripheral sources. Nor does reservation of the internal market in this manner conspire against exports in general, which should be the subject of high-priority promotion policies. Protectionist policies may be conceived selectively, in accordance with specific objectives. The need has even been suggested of "protectionism favouring competition", allocating priority to measures tending to support and promote exports.

In this connection it is necessary to warn against the risk that the Latin American countries, lacking other options in the light of external circumstances, may be encouraged to adopt exaggeratedly protectionist methods. A selective approach to imports in such cases may become converted into generalized and ad hoc measures of contention which would be far from functionally efficient at the stage which should currently be fulfilled by industrialization.

On the other hand, as has occurred in the past, the industrial sector may again assume a dynamic role whereby its own deliberately promoted and guided development becomes a stimulating factor for other activities. For this reason, the adoption of specific policies is suggested since "in order that the sector may expand, it is necessary that the State intervene by creating a physical, institutional and financial infrastructure providing public and private enterprises with the time horizon required by the activity concerned". This concept is laid down in the framework of medium and long-term planning since "the experience

of most developed countries confirms the need under the circumstances that the State follow a long-range social and economic project imparting continuity and guidance to the efforts of accumulation required by all development processes". Similarly, the idea is stressed that "regional co-operation and economic integration should fulfil an important role tending to impart space and efficiency to the processes applied"./10/

In this context insistence is placed "on the need that the regional countries benefit their reciprocal trade by establishing import duty preferences of such magnitude that they may deviate and create currents of trade toward Latin America and the Caribbean with due regard to the diversity of levels of development in the countries of the region". At the same time the use of government purchasing capacity has been recommended in benefit of suppliers in the region, with particular reference to capital goods, as part of the objective of "strengthening Latin American industrialization"./11/

The same idea of taking advantage of the direct purchasing capacity of the State in order to reactivate industrialization is suggested at a national level in some countries, tending to re-orientate public expenditure toward the acquisition of national manufactures. Such a step constitutes an instrument of decidedly direct effect, especially when established on the basis of purchasing programmes or agreements between public sector agencies and enterprises on the one hand and suppliers on the other. In an even broader context, consideration has been given to the application of policies of accord between entrepreneurial groups and suppliers with the support and assistance of the State.

The considerable importance attached by industrial reactivation policies to the reconstitution and growth of internal demand and to preferences for national manufactures should necessarily be accompanied by measures aiming to ensure adequate response on the part of suppliers, and of others assisting investment, either to replace obsolete assets or install more production facilities, thereby further stimulating the process.

A review of the diagnosis thus outlined, combined with economic suggestions emanating from the various countries, stresses the importance assigned to financial variables. Among these, the rate of interest is of outstanding significance, its increase having contributed to the financial disarray of many enterprises as well as the depression of demand (as already explained), the collapse of activities, and retraction of investments. Attention is invariably drawn to the need for credit at reasonable cost to help in the financial recovery of enterprises (including where necessary the use of salvage operations) and the reinforcement recomposition or establishment of promotional credit systems.

In the financial sphere emphasis is placed on the export of manufactures in both production and marketing stages. In more than one instance the tendency is encountered of establishing credit mechanisms to enable enterprises -especially those producing capital goods- to take part in international bids involving offers of financial facilities.

A further point has also recently been emphasized at the regional level, namely the need to "strengthen and develop mechanisms for export financing ... within the area and in respect of shipments to other countries". In this same context the advisability is pointed out of establishing "a regional preference system in favour of Latin American and Caribbean suppliers and enterprises" for use when purchases are made by means of public tenders./11/

To a certain extent the financial topic involves fiscal considerations when the mechanisms employed are used for promotional or support purposes. In some countries where previous systems have been dismantled the advisability of re-establishing fiscal incentives for investment and employment in specific industrial activities is being proposed with some frequency as well as the establishment of privileges for certain areas with view to decentralization of the development of backward areas. Incentives linked with export promotion are particularly emphasized, including subsidies for payment of taxes relating to export activities or temporary entry systems applying to inputs and other items imported for incorporation in export products.

One of the points raised most insistently in connection with reactivation and external strangulation is of course the matter of foreign trade policy. In this, export promotion and import restrictions are assigned a high degree of priority, especially in the framework of adjustment policies tending to achieve positive commercial balances in order to cover debt servicing costs in view of the lack of international financing and consciousness of the limitations of economic growth based on indebtedness.

In this context, a tendency is noted to abandon exchange deferment as an anti-inflationary instrument, policies being formulated and adopted based on utilization of the exchange rate to improve external competitivity and curb imports. In this fashion exports of manufactures may be stimulated while so-called "artifical external competition" is eliminated.

Attention has been drawn elsewhere to problems caused by devaluation in the case of enterprises owing money abroad and to those caused by rising costs of imported inputs and capital goods. In this connection, consideration tends to be given to more elaborate exchange policies involving differentiated conversion rates and controls and other mechanisms to facilitate payments of amortization and interest as well as programmes of exchange risk coverage. In the case of essential imported inputs and capital goods, import duty rebates or other measures may also be resorted to, especially, if linked to export production, as already mentioned.

The points noted so far with reference to industrial reactivation policies provide evidence that it is not possible to conceive the great variety of measures called for other than in the context of general economic programmes providing them with space to operate but avoiding the risk of exaggerated pragmatism liable to give rise to imbalances difficult to control. It is necessary on the one hand to establish explicitly the industrial objectives sought and on the other to establish

relevant specific measures to achieve their materialization. These measures should be consistent with the economic programmes already referred to.

It is also necessary to strengthen or revive public entities with experience in the field of industrial promotion and the entrepreneurial operation of the State.

7. Immediate prospects and long-term propositions

As pointed out in a recent study /10/ medium-term economic prospects in the region offer little in the way of encouragement. According to that study, if present internal and external trends were to continue, it would be hard to believe that by the year 1990 a higher level of product on a per capita basis might be reached than that recorded in 1980. To maintain this level would imply a rate of economic expansion of the order of 4% per annum throughout the rest of the present decade. The study in question also examines another scenario according to which the per capita product in 1990 would reach a level slightly in excess of 20% above that of 1980 with a global annual economic growth rate of 6.6% based on 1983. This alternative would however call for essential transformations in both internal and external terms. In the internal sphere these would include a dynamic degree of economic activity, the selective rehabilitation of productive sectors (with emphasis on manufacturing industry), and institutional and structural modifications to promote greater equity in the social distribution of the fruits of economic growth. In the external field, the role of regional co-operation is emphasized, together with important changes in external financial and commercial conditions (with particular reference to the central countries) in order to make it possible to increase exports, improve terms of trade and alleviate debt servicing expenditure with a view to adapting import levels to the requirements of more rapid economic expansion.

As may be appreciated, neither of these two scenarios is particularly encouraging. The first shows extremely meagre results together with a tendency to aggravate some important social and economic problems. The second would lead to modest results of doubtful materialization over the next six years./10/

It would in any case be advisable to determine the level of industrial growth considered achievable in each of these scenarios, if only for illustrative purposes. In the first place, industry would undoubtedly have to fulfil a comparatively more effective role than that demonstrated since the early years of the 1970s. Thought might for instance be given to recovery of the maximum degree of industrialization reached (in 1973), namely 25.2% of the total Latin American gross domestic product. Based on the year 1983, this would imply an average annual industrial growth rate of 5.4% in the first of the above scenarios and 8.0% in the second.

In the case of the first scenario it would perhaps not be so difficult to attain the envisaged annual industrial rate of 5.4% since the major part of this increment would correspond to recovery of former levels of activity. In the second,

the rate of 8.0% would represent a greater challenge since the proportion equivalent to recovery would in this case be much lower. A growth rate of this order was only reached in the region in its greatest recent period of expansion between 1965 and 1973 when the total product reached a growth rate similar to that envisaged in this second scenario (see table 2). However, it would mean that by 1990, Latin America would have failed throughout a period of almost 20 years to raise the economic contribution of industry.

It should in any case be borne in mind that the industrial growth rates in question have been calculated based on the depressed level of manufacturing activity in 1983. It would consequently be reasonable to believe that, given the pre-existing industrial levels, even the rate of 8% would appear to be technically feasible.

These reflections are of course only valid for the region as a whole. A more detailed examination would have to consider that industrial deterioration in certain countries has been much more pronounced and protracted than in others. It is also necessary once again to bear in mind that in some countries an active industrial and sectoral investment policy continued to be applied, and appreciable industrial efforts were made, not only with a view to general economic and social development, but specifically to alleviate the effects of the international economic situation. Recovery in these countries could undoubtedly be more rapid and might be followed by a renewed and authentic process of industrialization.

Moreover, from a sectoral point of view, detailed studies should take into account the situation and prospects of the various manufacturing activities involved. It is in any case advisable that the industrial policy adopted be applicable over a long period of time in order that it may effectively contribute to the objectives tending to boost manufacturing development.

Those objectives have been the subject of various studies prepared in the past and submitted at several international meetings held at the regional level./ 1 /, / 5 / and / 6 / For this reason, and in view of the primary concern with reactivation, it is thought sufficient on this occasion to present a brief summary of the main features of the topic under review.

One of these refers to the long-standing and reiterated proposition -which is still fully valid- to direct industry towards a broader range of social strata. It has insistently been claimed that industry has the necessary capacity for this purpose and that the main problem lies in the sphere of more general decisions such as those tending to remove internal economic barriers and overcome extreme forms of social heterogeneity within the regional countries.

Similarly, the need has been stressed to correct -to the reciprocal benefit of the countries concerned- the industrial and economic heterogeneity existing between them. It may suffice in this connection to bear in mind the concern expressed in integration agreements with regard to the relatively less developed countries. This aspect encourages reaffirmation of the concepts of intra-regional co-operation and of the need for large markets in the interests of greater industrial development, with particular reference to manufacturing activities subject to economies of scale.

Inherent in these concepts is the need to perfect the structure of production in the manufacturing sector in the sense of promoting inter-industrial relationships and those between the sector and all other components of the economy. This would primarily imply correcting backwardness in the development of production of intermediate and capital goods to the benefit of economic and industrial activity in general, including the indirect generation of employment and the preservation of a degree of autonomy -without autarchic intentions or anything of the kind- in the context of large regional and subregional markets and particular lines of specialization.

The correction of this stubborn tendency, often referred to as "disparate growth" not only calls for extensive markets for a large number of industries but, very particularly, the definition of various aspects of technological policy. One of these involves the advisability of selectivity in the internalization of technical progress from the centres; another refers to the reduction of time periods between internalization and the materialization of local manufacture of the corresponding products; a third to the intensification of technological and scientific development in a manner consistent with priorities defined on the basis of specific and primary problems and objectives (in regard to which creativity is a decisive element) with a preference for specialization; and, finally, the need for mechanisms capable of curbing the exaggerated import tendencies of transnational corporations and which at the same time may favour national or multinational Latin American enterprises. This task will not be fully feasible in the context of national limitations and small markets, an aspect that again brings forcefully to mind the inspirational concepts of integration agreements which are all the more relevant the smaller the national economic sphere.

Another "strategic" objective involves the export of manufactures since in this case trade within the region contributes to the structural correction of industry and tends to modify the asymmetry of trade with the centres. Apart from the need to apply intense and stable promotion policies, this again emphasizes the urgency of technological development, since trade in manufactures implies a growing exchange of incorporated technology due to the need to generate comparative advantages.

Also linked with the foregoing is the advisability of raising the local processing content in exported raw materials. This matter may be viewed in a broader perspective in terms of the "industrial activation" of natural resources, this being especially relevant in the case of agriculture. In addition to increasing the benefits accruing from exports, this aspect could be a decisive element in the incorporation of large underprivileged or deprived social contingents in the process and fruits of development.

It should be noted that this is not a question of outlining an industrial model essentially directed to foreign markets. The export of manufactures is becoming increasingly necessary, especially because, mainly for technological

reasons, the region will continue to be a large importer of industrial products from the centres. Consequently, exports could not of themselves bring about a balanced foreign trade position in the region. Nevertheless, as already pointed out, there is also a need for structural improvements in trade through the medium of intra-regional interchange, this being the more decisive the smaller the scope of national economies. What is involved in this instance, therefore, is a form of industrial development strongly directed towards regional markets. Moreover, social priorities in terms of income distribution and the incorporation of excluded social strata would enhance the importance of internal markets, which would furthermore change qualitatively, since the proportion of demand for manufactures in the main markets -now excessively diversified and over-dimensioned in comparison with average income levels- would drop. In this manner, inter-industrial linkage would be encouraged, providing better possibilities of scale, not only in respect of consumer manufactures but also intermediate capital goods involved in final production, and in the structural correction already mentioned.

Chapter II

TECHNOLOGY POLICIES FOR INDUSTRIAL DEVELOPMENT

1. Introduction

Among its fundamental consequences, the industrialization model applied in Latin America and the Caribbean has had some very definite effects on the origin, nature and rate of technological innovation in the industrial sector.

Subject to the differences to be expected from the varied economic history of the countries of the region, the development of the industrial sector was associated in a first stage with the importation of capital and intermediate goods which made it possible, through the technology which they incorporated, to proceed with the production of technologically simple goods. The expansion of domestic markets -especially for products consumed by the high-income strata- and the production of goods of greater complexity within the framework of highly protected economies subsequently encouraged foreign investment which brought with it new technologies and the emergence of the practice of buying technology as another form of gaining access to the know-how developed in the central countries.

The effects of the industrialization patterns adopted are an unavoidable part of the present debate on the present situation and future prospects of industry in the region. With regard to the theme of the presen chapter, it is appropriate to make three main observations.

First of all, the countries of Latin America and the Caribbean have been important consumers of technology, but poor producers of it: in other words, there has been a marked imbalance between innovation of local origin and that coming from abroad, which has led to a generalized situation of technological dependence. Although some significant changes have been observed in recent years, which will be referred to further on, we are still a long way from reversing this tendency.

Secondly, the industrialization policies adopted did not include explicit components regarding technology policy, and up to the last decade -and even then only on a limited scale- they made no effort to promote local technological development. As noted in an ECLA document "all these concerns ... did not, however, constitute enough incentive for the creation of significant scientific and technological capacity to deal with the region's main development problems".1/ Thus, while industrialization policies (promotion of industry, encouragement of foreign investments, etc.) fostered the acceleration of technical change in the region, they paid no attention to the domestic generation of technology and thus in effect descriminated in favour of the introduction of foreign technology. The objective of securing the massive incorporation of technological inputs thus prevailed over that of promoting the development of technology.

Thirdly, against the background of an economic crisis which is the most severe registered in the entire period since the war,2/ there have been changes -and in some cases downright setbacks- in the industrial sector of various countries of the region which make it necessary to reformulate the objectives and instruments of industrial policy, not only with regard to the need to expand industrial exports, but also with regard to aspects connected with the modification of the structure of the sector itself and expansion of the production of capital goods. In such a reformulation it is inevitable to take account, among other factors, of the low growth rate which will probably persist for some time in the industrial economies, the possible impact of rapidly evolving technologies (microelectronics and biotechnology in particular) and the modification in the behaviour of transnational corporations and in the international division of labour that these tendencies imply.

In the following section, recent events and trends in the domestic technological development of the region and in the corresponding policies will be described and reviewed. The aim is to give a general picture of the present situation, especially as regards the relative weight of domestic and external technological innovations.

Later on in this document, an analysis will be made of some aspects of technology policy to which it is necessary to give critical consideration in order to face up both to the already familiar problems and to the new ones emerging from the present context and its probable evolution. This analysis is not designed, however, to propose a systematic programme of technology policy, in the preparation of which it would be necessary to take into account the big differences existing within the region and the need to integrate technology policies into the whole set of policies regarding industrial development and global development planning.

2. Main features of the present situation

In the course of the recent appraisal 3/ of the progress made in the region in the last few years as regards the application of science and technology to development it was stated, by way of a summary appraisal of the subject as a whole and with regard to the main subject areas.

"In the area of the development of scientific and technological infrastructure, the changes were relatively minor. As regards the transfer of technology, some countries have dismantled their machinery for the regulation of imported technology while others have enlarged and improved it. There has not been an appreciable change in the training of human resources, but many countries of the region have continued to expand post-graduate programmes and develop secondary and university education in science and technology.

The financing of scientific and technological development has shown some variation, and to varying degrees, all the countries of the region have felt the impact of the economic crisis and the austerity in public expenditure, as well as a reduction in real terms of transfers of resources for development, which resulted in a reduction of the resources available for science and technology. Some progress has been made in the creation of information systems, particularly in the setting up of subregional and regional networks. An effort was made to orient

research activity by linking it to the production sector, with different results in different countries of the region. Regional and international co-operation activities have increased, although some of the bilateral, subregional and regional schemes and arrangements for co-operation with countries outside the region are in their initial phases."

Following these general comments of an introductory nature, some topics particularly related with the problems of the industrialization of the region are dealt with below.

a) Purchase of foreign technology

The importation of technology through licensing contracts, the provision of engineering services, technical assistance, etc., is a very important source of entry into the region of "non-incorporated" technology, although its significance is considered to be less than that of the technology considered to be "incorporated" in capital goods.

In all the countries for which information is available, the industrial sector is the main importer of technology, as measured by the payments authorized or actually made: thus, it accounts for more than 90% of the total payments in Argentina, Mexico, Ecuador and Peru, and close to 70% in Venezuela.4/

The application since the past decade of systems of prior evaluation and approval of such contracts -as is currently the practice in Brazil, Mexico and the Andean Group- has brought about some important changes in the typical forms of purchase of technology compared with previous periods.

Thus, the growth rate of payments to the exterior in respect of the transfer of technology has gone down, mainly because of the limitation of excessive payments, the control of the duration of contracts, the suppression or restriction of payments between branch firms and their parent enterprises, and to a lesser extent the rejection of technology transfer contracts where the know-how could be obtained in the recipient country.

As regards the actual absorption of the technology transferred, various measures have been taken (especially in Brazil, Mexico and Venezuela) in order to ensure the assimilation of the know-how received. Special mention may be made, in this respect, of the recent Regulatory Act Nº 64/83 of the National Institute of Industrial Property of Brazil, which obliges enterprises requesting approval for a technology transfer contract to present at the same time a research and development project to be carried out by the enterprise itself or commissioned by it from another institution, whenever the above-named Institute considers this to be necessary in order to replace imports of technological know-how.

As conceived in the past, however, technology transfer regulation system have been aimed fundamentally at dealing with the question of how the technology is purchased (that is to say, the terms of the contract) and have dealt only partially with the aspects of what technology is to be acquired, when, from whom, and for what purpose.

The technological disaggregation of projects, which is an aim pursued in some regulations, does not seem to have had the generalized application expected in either the private or public sectors, although there are some encouraging examples in this respect (nuclear power stations in Argentina, the Brazilian iron and steel plan, the petrochemical programme of the Andean Group, and conceptual and practical exercises carried out on the initiative of the Andean Group).5/ With regard to the public sector, a legislative vacum is to be observed in administrative rules (and in the statutes of State enterprises or bodies). Generally speaking, these rules regulate in detail the procedure for purchasing physical goods, executing civil engineering and, in some cases, purchasing services, but there are no rules guiding the purchase of technology at any stage, from the original conception of a project, through the question of the search for technological alternatives and the final selection of the most advantageous ones, up to the negotiation of the respective contracts. In some cases, this lack of control has led to flagrant shortcomings, unsuitable negotiations and heavy loses.6/

b) Research and development efforts

During the 1970s, the efforts of the region in the area of science and technology were characterized by a substantial increase in the allocation of financial resources for research and development. Table 6 gives data (mostly regarding the later years of that decade) on the total and per capita expenditure on research and development and also on the proportion of the gross national product of the countries of the region represented by this expenditure.

Most of the countries spent between 0.20% and 0.40% of their GNP annually on research and development activities. These figures are far below the recommended level of 1% of the GDP proposed at various international conferences, exceptions being Brazil and Venezuela, which spent 0.61% and 0.56% on research, respectively.

The question that arises now is: what proportion of these financial resources goes to the industrial sector? Although there are serious statistical difficulties in determining this, it is estimated that this share is very modest. In Argentina and Brazil it is estimated to be between 10% and 11%; in Mexico it might amount to some 33% (including the mining sector); in Venezuela and Colombia it is estimated at around 10% and 8%, respectively, while in Costa Rica it is believed to amount to only about 2%. 7/

This relatively limited expenditure on research and development in the industrial sector contrasts with the great importance of this sector in the total payments made in respect of transfer of technology (see the preceding section). This suggests that the most realistic general hypothesis for this sector is that the expenditure on transfer of technology still exceeds -perhaps by a very considerable margin- the domestic expenditure on research and development.

Table 6

LATIN AMERICA: TOTAL EXPENDITURE ON RESEARCH AND DEVELOPMENT IN ABSOLUTE TERMS AND AS A PERCENTAGE OF THE GROSS NATIONAL PRODUCT (GNP)

	Years	Expenditure on research and development		Total expenditure as a percentage of GNP
		Total (thousand of dollars)	Per capita (dollars)	
Large countries				
Argentina	19781	245 386	9.8	0.39
Brazil	1978	1 150 028 b/	10.0	0.61
Mexico	1980	371 739	5.5	0.24 c/
Andean countries				
Colombia	1978	20 600	0.8	0.11
Chile	1979	65 652	6.0	0.33
Ecuador	1979	11 627	1.4	0.13
Peru	1976	48 111	3.0	0.36
Venezuela	1977	201 616	15.8	0.56
Other South American countries				
Paraguay	1971	1 328	0.6	0.20
Uruguay	1972	3 300	1.2	0.15
Central America				
Costa Rica	1981	5 186	2.3	0.17 a/
El Salvador	1974	4 760	1.2	0.31
Guatemala	1978	13 504 a/	2.0	0.22 a/
Honduras	1971	1 481	0.5	0.20
Nicaragua	1971	1 121 d/	0.6	0.14
Panama	1975	3 296	2.0	0.17
Caribbean				
Cuba	1978	112 270	11.5	n/d
Jamaica	1973	6 820	3.5	0.36
Dominican Republic	1972	1 561	0.4	0.08
Trinidad and Tobago	1970	2 586	2.5	0.32

Source: Latin American and the Vienna Programme of Action: Science and technology for development in the 1980s, E/CEPAL/CEGAN.9/L.2, table 3.

a / Estimated figures.
b/ Does not include private producer enterprises.
c/ This percentage is with respect to the GDP.
d/ The data refer to only two research centres.

This information referred to so far mostly does not include research and development expenditure by the production sector itself (public and private). There are isolated data which point out to the existence of efforts of this nature, although they are not sufficiently quantified, but it is most probable that their magnitude is not such as to alter substantially the conclusions of the preceding paragraph, although in Colombia, Mexico and Brazil a gradual increase in the support for research and development projects within the production sector is to be observed. 8/

The magnitude of the technological effort made in the region can also be illustrated with some examples of concrete achievements made either within the industrial sector proper or in areas related to it, which can largely be attributed to the conjunction of efforts in several areas. In this connection, mention may be made, in the case of Brazil, of the results of the PROALCOOL programme, the advances made in the computer and aeronautical industries, and the development of fibre optics and laser ray technology.

In Mexico, mention may be made, in addition to some achievements in the energy field, of the development of the HYLSA direct reduction process in steelmaking, which has won considerable acceptance at the international level. In Argentina, the most notworthy feature would appear to be the growing participation of local industry in the execution of the nuclear power plan. 9/ In the Andean Group, for its part, the Andean Technological Development Projects have led, inter alia, to the design of processes and equipment for the bacterial leaching of copper. 10/

The above bears out the persistence of an imbalance in the relation between the local generation and the importation of technology in the industrial sector, notwithstanding some isolated cases of progress and the existence of an extensive area of public action aimed at promoting the domestic generation of technology in industry and stregthening the still weak links between industry and the science and technology sector. 11/

With regard to legal protection for inventions, reforms of the patents systems have been carried out in various countries (Brazil, Mexico, Colombia, Ecuador and Peru) with a view to obviating the damage caused to technological and industrial development by the granting of legal monopolies which are of very broad scope or are ineffective in promoting the actual working of patents, most of which belong to enterprises based in industrialized countries. A feature shared by all these legislative changes is the strengthening of the obligation for the industrial-scale working of patents and the greater importance assigned to revocation as a punishment for the case of insufficient working.

c) Technological progress at the enterprise level

On a different level from that dealt with in the previous paragraphs -in this case that of "minor" innovations- it is to be noted that in a number of countries of the region, especially those of larger size, industrial firms carry out on quite a regular basis technological and industrial engineering activities aimed at the adaptation and improvement of imported or already known technologies. These activities are aimed at the incorporation of such innovations as changes in design, improvements in quality, the use of new materials, the introduction of more modern methods of engineering organization, etc. 12/

The scale of these efforts depends on the age of the enterprises and the phases of technological progress they have passed through. In some countries, industry has gone through a long process in this sense and this is reflected in the lines of products offered, the proportion of skilled and technically qualified labour employed, the improvement of production methods and the gradual creation of an autochthonous technological base. In others, only the initial stages of this process are to be observed, and even then only in more recently established industries.

The progress made by various Latin American countries in the manufacutre of capital goods is a good indicator of the technological capacity which is being created in the region, even though there are still considerable differences of level. As noted in the chapter dealing with the capital goods industry, it may be estimated that towards the end of the 1970s national production was capable of supplying approximately 60% of the region's needs in this area. Thus, in 1978-1981, this degree of self-sufficiency was 80% for Brazil and 70% for Argentina and Mexico; 40-45% for Colombia and Peru, 25% in Venezuela but only 10% in Chile. In Brazil and Argentina exports of capital goods have reached quite significant levels of value, and in both these countries, but above all in the first of them, the design and manufacture of technologically more complex capital goods has been initiated. The scope of government industrial promotion policies is also quite different in the various countries, the active State support given in Brazil, Mexico and Venezuela through various kinds of promotion and protection instruments being worthy of note.

Despite the technical advances achieved, however, and as noted in the chapter on capital goods, the local design capacity still suffers from serious limitations, to overcome which it is frequently necessary to purchase technology abroad in order to be able to manufacture more complex capital goods. 13/

Furthermore, there are already signs of the penetrations of automation techniques, especially the use of numerically controlled machine tools and, to a lesser degree, robots and computer-aided design and manufacturing techniques (CAD/CAM systems), whose possible impact on industrial productivity and employment have not yet been fully appraised.

Mention may also be made of the development of the minicomputer production industry in Brazil, on the basis of the policies of reserved markets and promotion of national manufacture begun with the installation of COBRA in 1974. In 1980, the overall share of local industry in the supply of computers had already reached 7% of the Brazilian market. 14/ As regards the production of software -a promising field for the semi-industrialized developing countries 15/- some progress has been registered in Argentina as regards application programmes.

Other indicators of this phenomenon of technological apprenticeship and progress are the flows of exports of technology and production plants from some countries of the region (which will be referred to later on) and the level of competitiveness reached by some industrial products in external markets, not only as regards traditional products (clothing, footwear, etc.) but other more complex manufactures such as capital goods. 16/

d) Development of consultancy and engineering capacity

The capacity to supply consultancy and engineering services has developed considerably in the region: the ALADI countries now have over 400 enterprises of this type. The predominant fields of specialization are energy, transport, drinking water and sanitation and, to a lesser extent, industrial development. The activities carried out include pre-investment studies and the formulation and supervision of projects, but are limited as regards basic engineering and design, where dependence on the exterior is still quite marked. 17/

The public sector is the main purchaser of consultancy services in the region, accounting for an average of over 80% of total demand, so that it has a decisive influence on the characteristics and rate of development of this activity.

Special mention may be made of the stengthening and expansion of "buy national" systems with the object of romoting the use and development of consultancy capacity in public contracts. Several countries (Argentina, Brazil, Paraguay, Peru and Venezuela) apply the principle of reserving the market for national firms, complemented by the compulsory association of foreign firms with local firms when the former are allowed to participate at all. This system of protection also applies in private sector contracts in Paraguay and Brazil. In the latter country, efforts have also been made to boost the role of local engineering services firms as liaison mechanisms between external suppliers of project engineering and the recipient enterprises, in order to ensure effective absorption of the technology transferred. 18/

e) The role of foreign investment

Investments of foreign capital have generally been considered as bringing new technology with them. Their role in this respect in Latin American industrialization cannot be overlooked nor minimized, and the transnational corporation still control extensive sectors in the region characterized by their dynamism and high technological requirements.

The technological contribution of foreign investments has been limited in various respects, however. First of all, they have frequently been concentrated on "mature" technologies which at the time of the investments were already somewhat obsolescent by international standards. Secondly, the technological effect of the investments has in many cases not been as widely disseminated as had been hoped. Thirdly, there is extensive evidence of the total lack or extremly low level of research and development work in the host countries by the investor enterprises involved, as well as the lesser propensity to innovation displayed by foreign subsidaries as compared with national enterprises in markets where this is a very important feature of their operations. 19/

Furthermore, there are indications that foreign investment has been losing relative importance as a vehicle for the transfer of technology compared with other channels such as the technology incorporated through the direct importation of capital goods or through licencing contracts, engineering services, etc. 20/

Although in most of the countries of the region (and at least in all those which are members of ALADI) there are rules regarding the entry of foreign capital, these rules do no impose the incorporation of technology as a condition, or even give this aspect primary importance in contrast with the models applied in some other developing countries, such as India, where emphasis is placed on the contribution which foreign industrial investment should make with regard to the introduction of advanced technology.

Furthermore, the prevailing regulations do not display any active policy as regards the weighing and selection of the various forms of incorporating technology, with or without the contribution of foreign capital. In other words, it would appear that they do not make proper use of the bargaining power of the State as regards the "untying" of the capital/technology package in order to further those forms of procurement of technology which lead to greater national control. Some intention to change this general attitude is to be observed, however, in the 1981-1985 National Plan of Venezuela, in which greater importance is to be assigned to contracts for the supply of technology than to foreign investment itself, which is considered rather as supplementary risk capital.

In short, in the present circumstances the role of foreign investment in the development of industrial technology is limited by the typical behaviour of the transnational corporation and by the scanty and inadequate attention given to this subject in the institutional framework.

f) State purchasing power and technological development

In Latin America, State purchases are of particularly great magnitude and importance: in 1980, the public purchases of goods and services of the ALADI member countries came to US$ 132 billion (an average of 18% of the gross domestic product), while public investment came to US$ 65 billion. 21/

Furthermore, the public sector is one of the biggest, if not the biggest, source of demand both for consultancy and engineering services and for capital goods, the national production of which plays a distinguish part in the creation of autochthonous technological capacity.

Most of the ALADI member countries and those of Central America, as already noted, apply "buy national" systems which give varying degrees of preference to products of local origin. Without prejudice to the positive effect which this policy may have, however, progress towards the production of technologically more complex goods and the encouragement of research efforts by suppliers calls for an active purchasing policy 22 / which, as well as giving quantitative preferences, also creates favourable conditions for projects with longer lead times involving larger amounts of investment. These conditions include the planning of purchases, co-ordination between the State and the production sector, the establishment of technical standards for the goods required and the disaggregation of projects in order to give maximum opportunities for national participation.

Some countries of the region have made plans for such action or are already carrying it out. In Argentina, the programming of purchases by public bodies is provided for in the legislation, although it is not as yet being effectively applied. In Brazil, emphasis has been placed on the co-ordination of the public and private sectors through the establishment of "industrial liaison nuclei", with the aim of channeling demand for equipment and engineering services to the domestic sector. A co-ordinating commission, of which FINEP acts as the Executive Secretariat, co-ordinates these nuclei, which already exist in more than 50 enterprises. 23/ In Mexico, rules have been established which lay down that purchases of types of machinery and equipment manufactured in the country must be made from national suppliers, and purchasing programmes have been prepared for the big State enterprises (PEMEX, SIDEMEX, Fertilizantes Mexicanos, Comisión Federal de Electricidad).

In other countries of the region, rules have been established or strengthened with a view to the disaggregation of projects, as in the case of Costa Rica (Decree Nº 14475-H, 1983), Colombia (Decree 222, 1983), Peru (Supreme Decree 017-81-TTI/IND, 1981) and Venezuela (Decree Nº 1234 of 1981 and Decree Nº 1980 of 1983).

Without prejudice to the partial progress made in some countries in the use of public purchasing power as an instrument of technological development, its great potential and the great importance which public action will continue to have in the economic field and the infrastructure suggests that priority attention should be given to this topic in the formulation of industrial development policies.

g) Intra-regional technological and industrial co-operation

The increase in intra-regional trade has been accompanied in recent years by growing capital investments, sales of complete plants and transfers of technology among Latin American countries.

Intra-Latin American foreign investment is somewhat more than US$ 650 million (i.e., barely 1.4% of the total accumulated foreign investment, which is estimated at some US$ 47 500 million). Although complete and reliable information is not available, it is estimated for the case of Argentina that half the investment made abroad in the period 1965-1981 corresponded to the industrial sector, and was mostly effected in other Latin American countries. 24/ These envestments generally take the form of joint ventures in which the external supplier provides technology and part of the capital. The sale of turnkey plants has also had some success in the region and has demonstrated that there are technological advantages deriving from adaptations and minor innovations and the greater suitability to the recipient country of technologies which have already been assimilated in countries with similar technical and economic conditions.

According to these data, between 1973 and 1980 Argentina exported 10 infrastructural projects amounting to some US$ 247 million, 61 industrial projects amounting to US$ 160 million, and consultancy services totalling US$ 10 million. The figures for Brazil and Mexico are, respectively, US$ 3 050 and US$ 778 million for 36 and 24 infrastructural projects; US$ 111 and US$ 43 million for 12 and 34 industrial projects, and US$ 8 and US$ 9 million for consultancy services, making an approximate total of over US$ 4 400 million for the period in question.

The industrial projects -turnkey plants and other industrial installations- included plants for the production of foodstuffs,antibiotics and pharmaceuticals (Argentina), alcohol from vegetable products, paper and pulp and household electrical appliances (Brazil), and chemical products, glass, bagasse, pulp, etc. (Mexico).

The destination of these exports of technology was predominantly the Latin American region and, in second place, Africa. 25/

3. The elements of technology policy for the industrial sector

What was stated in the preceding section confirms the persistance of the principal features of Latin American industrial and technological development which have been indicated more than once in the past: technological dependency, lack of links between production and research and development, inadequacy of the domestic effort to generate and adapt technology, and lack of an organic set of technological development policies and their explicit incorporation in more general public policies.

The new context in which industrial policy and its technological component must be defined calls for the reformulation of its objectives, the evaluation of the usefulness and suitability of the existing instruments, examination of the desirability of keeping them or, if appropiate, reviewing or improving them, and also design of the instruments needed to attain the new objectives, among which international co-operation must play a preponderant role.

The great heterogeneity existing in the structure and technological level of the industrial sector of the various countries of the region militates against the making of any generalizations which do not take into account the particular elements of the various existing situations. At least one objective and various instruments may be considered, however, as being valid for most of the countries of the region and for the region as a whole. This general objective is that of achieving independent capacity to handle technology, that is to say, the power to use technology -whether imported or of national origin- in a manner consistent with the objectives of each country and with the maximization of its contribution to the achievement of those objectives.

The scope and content of the possible instruments for the implementation of this policy will naturally vary according to the framework in which they are to operate. Two fundamental notions should prevail in the formulation and practical application of these instruments, which are briefly analysed in the following paragraphs. Firstly, it is essential to take into account the diversity of the situations usually found within the industry of a country, so that it is essential to disaggregate technology policies in order to specify actions and mechanisms in accordance with the particular sectoral or other features (for example, the size and the national or foreign-owened status of enterprises) which affect the viability and effectiveness of such policies. Thus it is impossible to overlook the different kinds of behaviour which are to be expected as regards the importation and generation of technology in the case of national, enterprises as compared with transnationals, or the considerable differences observed, for example, within the capital goods sector as a function of the type of goods produced and their technological complexity.

Secondly, the technology variable must permeate all those policy aspects which affect the technological conduct of the industrial sector: the most essential point here is that in the formulation of industrial policies their implications for the technological development of the sector should be identified and taken into account. This amounts, in the final analysis, to the integration into the analysis of a long-term perspective and judgement regarding the desirability and the possibilities of preserving, improving or creating suitable conditions for the autonomous management of technology in each of the areas involved. In this sense, it should be clearly understood that a particular economic policy (in its tariff, fiscal, or other aspects) may nip in the bud a whole potential area of technological development, while changes which are relatively simple and perhaps attract little attention (such as the incorporation of the technological variable into the management of credits for industry) may have a much more definite and intense effect than mechanisms which are more sophisticated but are not capable of establishing the necessary links with the actual industrial situation to which they are directed.

a) Equipment and the capital goods industry

A significant part of industrial technological development -as far as production engineering is concerned- depends on the rate of accumulation of capital and the incorporation of new equipment. The crisis being suffered by the Latin American economies seriously affects this rate of accumulation,

precisely at a time when the introduction of new techniques is accelerating the technological obsolescence of the equipment already installed and the methods of organizing production.

The limited resources available to the region, especially for the importation of machinery and equipment from abroad, give emphasis to the need to rationalize such imports, to promote the region's own production capacity, and to define concrete forms of Latin American complementation and co-operation in the trade and production of such goods.

Imports of machinery and equipment should supplement but not take the place of national production. The incentives granted so freely in the past in order to promote the capitalization of industry through tariff exemptions or generous rebates -should be made conditional upon the lack of local supply on comparable terms as regards prices, quality and delivery dates. Moreover, the principles of "buy national" policies -which are at present mostly restricted to the public sector- should inspire tariff policy in general in order to give sufficient markets to national producers. Adequate tariff protection should be provided, at least during the whole period needed to incorporate new technologies, and particularly in those areas where the technological lag is greatest.

The existence of idle industrial capacity as a result of the generalized recession, the difficulty in importing equipment, and the need to expand exports will also call for better use to be made of installed capacity by improving national production engineering and design capacity. The State could contribute to this effort by giving credit facilities, fiscal incentives, training of staff, technical assistance and export promotion.

The introduction of automation techniques in the production of capital goods calls for special attention. Numerically controlled machine tools incorporate technology which is already quite well established -it originated in the 1950s- and they are already being manufactured in some countries of the region. Their use involves a clear tendency towards economizing on the use of skilled labour,26/ and they are particularly suitable for automating metal-cutting operations and the production of parts. They can be particularly useful for overcoming the effects of diseconomies of scale in the production of capital goods in small lots.27/

Unlike numerically controlled machine tools, robot technology (whose application is less advanced than those tools) tends to displace unskilled labour. Robots are suitable for the production of standardized products (components, automobiles, machine tools). Since they have an impact on a resource which is abundant and generally of low cost in the region, it may be assumed that the use of robots will only be on a marginal scale, or at least will be much less significant than that of numerical control systems. The prospects for the use of computer-aided design systems are also uncertain, although they may have advantages for countries where important design tasks must be carried out yet there is a severe shortage of experienced design engineers.28/

The technological revolution which is being brought about by the rapid dissemination of microelectronics will have a decisive effect on the options regarding the production of capital goods. The State should be capable, in this stage, of promoting technical assistance and information services in order to permit the evaluation of the various alternatives and their implications for the structure and competitiveness of industries. 29/

It may be added that the introduction of automation techniques in the developped countries is changing the comparative advantages in North-South economic relations, since it reduces those based on the low cost of labour. This situation could affect some categories of exports in which some penetration into the developed countries has been achieved, as well as affecting the hoped-for benefits from the industrial redeployment. It is therefore evident that, depending on the speed and lucidity with which an answer is found to the problems raised by this issue, microelectronics could play an ambivalent role in the countries of the region: it could equally well strengthen some national development strategies or, alternatively, aggravate the present problems of the region. 30/

b) Integration of the importation and the development and adaptation of technologies

As observed earlier, the current systems of control over the importation of technology deal mainly with contractual aspects and not with those which concern the effective absorption and integration of imported technology into local technology and development. As well as stengthening the machinery for the absorption of technology, it is necessary to adopt policies regarding the basic decisions preceding the purchase of such technology, especially those regarding its selection.

Although the decision on what technology to use is linked with the investment process, it is also necessary to take into account its decisive influence on various economic, technical, social and even cultural variables. The selection of technology should therefore be in keeping with the major objectives and needs of national policies, taking account of environmental aspects, employment of labour, use of local resources, etc. Its is particularly necessary that this selection should be directed and decided in line with such policies when the investments receive subsidies or other government incentives, and above all when it is a question of the acquisition of technology by public enterprises or other bodies.

To this end, existing rules must be supplemented or new rules adopted both as regards the transfer of technology proper and as regards the question of industrial promotion systems, public sector purchases, granting of financing, etc. Thus, the State development banking system should apply criteria specifically related with the technology variable when appraising projects and should grant financing preferentially to projects which provide for the disaggregation of technology, 31/ the acquisition of technology from local institutes or other enterprises, or the importation of technology under an effective programme of assimilation and adaptation. 32/

Furthermore, it is necessary to incorporate the technology variable in foreign investment policies with a view to achieving two main objectives: i) affirming the complementary role of such investment vis-a-vis national investment by permitting it primarily in those sectors where, because of the novelty and complexity of the technology involved, such imports can make a contribution to the country on terms (participation of local associates, programmes of training and absorption of technology, etc.) which ensure that they assist technological development; and ii) establishing, with respect to the various forms of importation of technology, criteria which favour its transfer in a manner which is disassociated, whenever possible from the contribution of foreign capital -through licencing contracts, technical assistance, engineering services, etc.- in order to maximize national control of imports of technology, their assimilation to local conditions, and their subsequent development.

c) Strengthening of research and development

The countries of the region as a whole have still not managed to invest in research and development the minimum percentage of their GDP recommended as being necessary for establishing a viable development strategy. 33/ Furthermore, as we have already seen, the composition of the expenditure made reflects only limited participation by projects for industrial purposes, and there is still only a weak linkage between the research and development agents (State laboratories, universities, research institutes, etc.) and the potential users of the results.

Emphasis must be placed on the need to stengthen these links through concerted programmes, the participation of research institutes in the transfer of technology and the provision of services and technical assistance, the creation of linking nuclei between the institutes -including the universities- and public enterprises, and the need to make an effort to lay down priorities for research and development so as to cencentrate the frequently scanty resources available on particular areas or sectors.

The improvement or establishment of instruments for the promotion of technological development also requires priority attention. Such instruments could include tax measures (special rebates), finacial provisions (subsidies or loans on preferential conditions), "shared risk" mechanisms for the joint execution of projects, etc. 34/

There are various aspects which should be taken into account in the conception of these instruments. First of all, they should not only promote research and development in the strict sense (that is to say, leading to results involving innovations of high inventiveness) but should also cover the improvement, adaptation and copying of technologies which are already known and available. The private profitability of projects in these latter areas is of course much greater (because of their lower cost, less risk and shorter lead times) than in the case of more fundamental research and development activities, and these differences should be reflected in the content and scope of the means of promotion used. Secondly, support for research should not be limited strictly to production technologies (processes and products), but should also cover management techniques, whose

improvement -especially in small and medium-sized industrial enterprises- can bring about significant increases in overall productivity. Thirdly, the experience of some developed countries and even of some countries from the region itself 35/ would seem to indicate that instruments concerned with finance are more effective and easily controlled than tax instruments. Fourthly, promotional measures should extend -through the same or other instruments- from the research stage up to the commercial application of the process or product, via the experimental development, the preparation of prototypes, and the construction of pilot plants.

It may be considered that in some areas of great uncertainty, high costs and long lead times, the State should itself directly assume responsibility for certain types of research and development work which industry could hardly carry out alone. Such areas include those -such as microelectronics and biotechnology- where the international scientific and technological frontier is moving with enormous speed. Every endeavour should be made, however, to ensure that such activities are carried out with a view to their industrial utilization and are effected in close contact with the potential users of the results. For this purpose, it will be necessary to develop forms and techniques for the transfer of technology from the public to the private sector, in which regard there is as yet little experience in the region. These techniques should ensure on the one hand that the public interest in relation to the inventions is protected and that at least part of the cost is recovered, while on the other they should permit their effective use on reasonable conditions by the recipient enterprises.

It is necessary, in this connection, to review the prevailing legislation on intellectual property in order to determine the most appropriate legal framework for dealing with computer technology and genetic engineering and biotechnology. With regard to the first of these, one of the central issues is that of defining the treatement to be given to computer software with a view to catalyzing the potential for its domestic development. Genetic engineering and biotechnology, for their part, will probably influence a wide range of industrial activities (food, medicines, basic chemicals, etc.), so that it will be essential to adopt rules on the patentability of microorganisms and biotechnological processes and products with a view to stengthening and not discouraging or hindering the prospects of national control over these technologies and their industrial application.

Certain adapted technologies which make small improvements on the original techniques and are outside the scope of the patent system should nevertheless receive some kind of protection so as to stimulate creativity, especially in small and medium-sized industrial enterprises.

d) Training, technical assistance and standardization

The execution of technological development activities in industry and the achievement of technological progress at the enterprise level require not only financial resources but also, and in particular, the availability of skilled personnel. Human aptitude is a fundamental element in such development, both at the most highly qualified levels and in the case of middle-level

specialists and technicians. Public investment in education and training is therefore an indispensable component of any industrialization policy, just as much as the improvement of the infrastructure in the areas of energy, transport, communications and distribution systems. Just as incentives are provided for the installation of new equipment or for technological development projects, provision should also be made for subsidies or special financing for staff training porgrammes in the industrial plants themselves.

Likewise, as a purchaser of consultancy and engineering services from consortia of national and foreign firms, the public sector should be willing to cover part of the higher cost deriving from the execution of training programmes for the personnel of the local firms. Such training should also be an indispensable requisite in every contract for the purchase of technology from the exterior, where, by the very nature of the transaction, the absorption of the know-how transferred calls for the training of local staff.

Another aspect which should be given increasing attention is that of technical assistance, especially to small and medium-sized industrial firms. There is enormous scope for an increase in productivity through the use of better production techniques and the introduction of more efficient management practices. The technical assistance work should also include functions of technological information and evaluation and should as far as possible integrate private and official action in bodies of a sectoral nature. 36/

Likewise, considerable efforts remain to be carried out as regards the improvement of quality -a key aspect for the expansion of industrial exports- by organizing the stengthening efficient quality control systems at the enterprise level. This should go hand in hand with the stengthening and expansion of technical stadardization activities and the extension of the use of official seals of approval through contracts with government stadards bodies.

As experience shows, the work of standardization is by no means free from difficulties resulting from inter-enterprises problems and conflicts of interests. Such activities can have significant effects, however, especially in the development of subcontracting firms capable of providing parts and components, the achievement of economies of scale through specialization, and overcoming, in the case of the capital goods industries, of the disadvantages of insufficient vertical integration.

e) Regional integration and co-operation

The heterogeneity of the region can serve to foster technological exchange, especially between countries of different degrees of relative development.

The recent Quito Declaration and Plan of Action (Latin American Economic Conference, Quito, 9-13 January 1984) include tariff preferences among the instruments which can be used to stengthen co-operation and development in the region.

In the area of interest to us here, such measures could be particularly important in three main fields: capital goods, consultancy and engineering services, and the supply of technology. They could be either of a general nature, applying to both private and public sector purchases, or else could be concentrated -at least in a first stage- on public sector purchases.

As regards capital goods, it would be necessary to: i) adopt integral systems for the evaluation of offers, in order to enable Latin American firms -which generally have less background than those from outside the region- to compete with some possibilities of success; ii) improve the systems for providing information on tender competititions, and iii) recommend maximum possible participation by local consultants in preparing the specifications for the projects.

As regards consultancy and engineering services, the Latin American Federation of Consultants' Associations (FELAC) advocates the establishment, through ALADI, of rules providing that preference should be given in public purchases to national consultancy and engineering service enterprises as compared with firms from outside the region, unless the firms from outside the region operate in association with local enterprises of the country awarding the contract.

The expansion of the exchange of technology within the region would make it possible to gain access to more suitable technologies, offered by enterprises which have already passed through a process of learning and adaptation and which can transfer both the necessary technical know-how and the methodologies for its assimilation. While it appears desirable that fiscal incentives, financial aid, assistance in the identification of demand, etc., should be given to promote the export of technology to other countries of the region, it is also necessary to take care that access to such incentives is made dependent on the observance by the supplier of the technology of certain minimum practices which ensure an advantageous transaction for both parties, that the contracts should not include any of the unfair provisions present in some cases in North-South transactions, and that the recipient can disaggregate the projects and improve his own capacity for handling the technology.

In order to bring about greater co-operation in the three areas mentioned (capital goods, consultancy and engineering services and technology), rapid access to complete and up-to-date information on the present and potential supply and demand is a paramount necessity. The activities of the recently established Latin American Technological Information System (RITLA), the Andean Technological Information System (SAIT) and the support that can be obtained from UNIDO's Industrial and Technological Information Bank (INTIB) are obviously essential elements in satisfying this need. In this respect, mention should also be made the initiation of studies with a view to the establishment of the Central American Technological Information System (RECIT). In the same connection, action should be taken to promote the establishment of special rules on foreign investment effected by enterprises of other countries of the region

which have national capital and are under national control, 37/ especially in the case of those promoting joint industrial ventures.

Regional co-operation has a vast and fertile field of opprotunities for the joint execution of professional training and research and development projects. In addition to the Andean Technological Development Programmes (PADT) within the Andean Group, the creation of an Andean Scientific and Technological Development Fund has been proposed, and Decisions 179 and 183 (August 1983) approved the establishment of an Andean Council on Science and Technology and the implementation of the Caracas Programme for Co-operation by Member Countries in Scientific and Technological Research and Training, respectively. The aims of the latter project include that of strengthening co-operation between the scientific and technological systems of the member countries, promoting the harmonization of incentive policies, and establishing joint research programmes. The 1980 Treaty of Montevideo which set up ALADI provided, for its part, for the adoption of rules governing special forms of partial-scope agreements on scientific and technical co-operation, among other matters. In Central America, the Permanent Secretariat of the General Treaty on Economic Integration (SIECA) has continued to promote co-operation activities, especially in the institutional sphere. The Commission for the Scientific and Technological Development of Central America and Panama, set up in 1976, seeks to identify lines of action of subregional interest, particularly as regards policy instruments and mechanisms and scientific and technological planning. The Caribbean Community (CARICOM), for its part, has initiated activities in the fields of agriculture and training, specifically in energy and livestock research.

Because of their growing importance and probable impact, it would be desirable to analyse the possibilities of different kinds of co-operation -from the simple exchange of information and evaluation of technological alternatives to the execution of research and development projects- in connection with the spearhead technologies (microelectronics, biotechnology, new materials). Among these, the basic technology as regards biotechnology is relatively simple and inexpensive. 38/ It uses natural resources which are abundant in the countries of the region and it is of strategic importance for solving some of their basic problems. It therefore represents an extremely promising field for regional action. 39/ By way of example, mention may be made of the extraction of alcohol from sugar cane, which has been undertaken by various countries of the region, especially Brazil. The Central American Research Institute on Industrial Technology (ICAITI) is carrying out research in connection with this subject, which is also of interest to other countries of the region, such as Argentina.

Finally, the regional-level treatment of the issue of technical standardization could favour trade, joint industrial investments, and other integration mechanisms. It is advisable that the efforts made at the national level should also be projected on to the regional level. 40/

4. Conclusions

Over the last 20 years, Latin America and the Caribbean have made significant progress in science and technology. The advances made in the technological capacity of the industrial sector have been uneven and more often than not incomplete, however, mainly as a consequence of industrial policies which frequently did not give adequate attention to the technological aspects.

The present international crisis thus finds the region with an industrial sector which is technologically vulnerable, although it has potential for overcoming the limitations imposed by this, provided that suitable technology policies are introduced or strengthened and full use is made of the possibilities for regional and even interregional complementation.

This crisis which is affecting the region, together with the rapid changes taking place in the spearhead technologies (especially microelectronics and biotechnology) and their probable effects on the industrial structure and the international division of labour, make it more urgent than ever today to define technology policies which are integrated in the more general policies on industrial development.

The basic objective of such policies should be to achieve autonomy of decision-making in the handling of technology and to take care of industrial development needs increasingly through the use of domestic sources of innovations; i.e., to strengthen scientific and technological capacity, which is one of the central objectives -if not the most important aim- of the Vienna Programme of Action. In view of the present situation of the region, it would be better -rather than concentrating on the creation of norms or institutions- to act on a variety of fronts so that the technology variable is incorporated into all those aspects of public policy which influence technological innovations in industry.

A wide variety of instruments which can be used to promote technological development in industry have already been identified. In some cases, however, the potential usefulness of such instruments has been wasted in formal schemes which have had no operational effectivemess, while in other cases only partial aspects have been dealt with and they have not been integrated in an organic technology policy. It is therefore necessary to review the scope and content of the instruments and public policy measures in question, which have considerable unused potential for promoting autonomous technological development.

Among the aspects which call for reconsideration or new treatment are the following: i) the promotion of technological development in the capital goods industry; ii) the regulation of imports of technology, especially as regards public sector purchases; iii) the definition of technological criteria for the admission of foreign investments and the appraisal of this channel of technology transfer in relation to other contractual forms which do not necessarily involve external control over the application of the technology in question; iv) the application of active State purchasing policies; v) mechanisms for the strengthening of research and development in the area

of innovations of varying scope and magnitude and for the creation of greater links between the scientific and technical sector and the production sector; vi) State suppport for training and technical assistance to industry, and vii) expansion of standardization and quality control activities.

Regional and even interregional integration and co-operation call for special mention. Although they have long been considered as ways of accelerating global economic development, their potential as a tool for promoting technological development has received only secondary attention. The critical situation through which the region is passing, and the evidence of the possibilities of technological and industrial complementation observed within this, make it essential to give regional action top priority and to define concrete measures for putting it into effect.

The specific content of the technology policy will depend on the circumstances and aspirations of each country. Whatever that content may be, the profound consequences which the current technological revolution is bound to have on industrial development will make the appraisal of new projects more difficult, call for continual work of analysis and prospection, and possible also require the reformulation of industrialization programmes and strategies. Because of the nature of this challenge and the unfavourable situation in which it has to be faced, it is perhaps the most important task that the region has had to tackle since its industrial development first began half a century ago, and the way in which it is solved will have a decisive influence on the industrial future of the region and on the way it fits into the international economy.

Chapter III

THE CAPITAL GOODS INDUSTRY: AN ANALYSIS OF ITS SITUATION AND THE POSSIBILITIES OF CO-OPERATION

1. Introduction

The manufacture of capital goods has certain features which justify special concern for it.*/ Above all, the capacity to make their own machinery and equipment gives the countries which possess it a concomitant capacity to choose between options regarding economic structure. It is a question of having more or less autonomy with regard to a basic component of investment. If this capacity is not possessed, the demands which arise in this connection will exert pressure on the balance of payments, with the risk that difficulties in this field will affect the size and structure of investment itself and hence the rate of economic growth.

Among industrial activities, the manufacture of machinery and equipment is one of those which call for most technical know-how, so that on the one hand it demands, while on the other hand it serves as a support for, a continual advance in engineering and design capacity. The existence and progress of this sector will help society to fit itself to assimilate, adapt, and even create such technical know-how: it is precisely these capacities which, in the final analysis, determine a society's level of competence and well-being.

Although the universe of capital goods of metalworking origin is very broad, and the physical characteristics of the products which make it up are very varied, most of them share the common feature that their production is labour-intensive: a feature which is of great importance for the Latin American countries. This sector generates employment of increasing volume and increasingly high levels of skills in proportion as mastery of the process and its basic conception advance.

These and other considerations, which become more and more numerous as one goes more deeply into the topic, have led ECLA, in collaboration with UNIDO and with the sponsorship of UNDP, to organize a joint project aimed at giving an overview of the regional situation of the sector which can serve as the basis for common action and for helping to ensure that national policies are formulated in a context of mutual knowledge, thus helping to avoid their application in a dispersed and even possibly contradictory manner.

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*/ In this chapter the expression "capital goods" is limited to those coming from the metal manufactures and machinery sector and is equivalent to the term "machinery and equipment".

It is because the information obtained in the course of the studies forming part of this project -which is still in course- provides most of the basis for the comments made in this chapter that the project is specifically mentioned here.

The studies carried out up to the end of 1982 have made it possible to progress in knowledge of the regional market for capital goods, its size, historical evolution and possible future projections. In this task, analyses were made of the requirements of several of the main demand sectors, including projections of future needs. It has also been possible to evaluate regional production capacity, concentrating -for reasons which will be explained below- on the medium-sized and small countries.

It should be noted that up to mid-1982 the analyses made indicated that Latin American demand was of very appreciable magnitude (even compared with world demand) in such sectors as electric power generation, iron and steel, cement production, etc. In recent times, however, the economic situation of the region has deteriorated sharply to such a point that some of the estimates and projections which were carried out at the time -using criteria which could then be described as conservative- now seem excessively optimistic. Investment programmes have been reduced, and in at least one case -that of steel production- they have even fallen to levels which are only a small fraction of what was originally planned.

The machinery and equipment industry, whose rate of activity is obviously linked to investment, is more deeply affected by the recession than other branches of the economy. The unfavourable current situation may even endanger the very existence of some enterprises, especially those specializing in a limited range of products. The decline in rates of investment is not the same for all countries or all sectors, however. Consideration of the situation of Latin America as a whole could make it possible to undertake collective efforts which would tend, on the one hand, to make it easier to withstand the present conditions through better use of local opportunities and, on the other, to open possibilities for external negotiations aimed at keeping the level of investment as high as possible in certain sectors where the region offers favourable conditions.

An example of such a sector is the programme of hydroelectric works, which will be dealt with in greater detail further on.

2. The capital goods industry in Latin America

In quantitative terms, the degree of development of a branch of industry can be appreciated from its share in the manufacturing product. Capital goods, however, do not form a definite category within the universally adopted classifications of industrial activity and international trade, and it is therefore only possible to make international comparisons in an indirect manner. For this purpose, it is possible to use as an indicator of the development of the capital goods sector -or the machinery and equipment sector, as it is also often called- the product of the metal manufactures and machinery sector, which, in accordance with international

practice, ranges from the manufacture of metal structures and hardware to transport equipment and optical goods. It may be roughly estimated that the share of capital goods in total metal manufactures and machinery production varies from 30% to 60%, depending on the country, the year in question, and the range of products included under the heading of capital goods; their share in imports and exports of metal manufactures and machinery is probably closer to the upper than the lower limit of the percentages indicated.

Appraisals of the degree of development of a sector are frequently based on observation of the structures of production or industry in the country in question, taking as a pattern of reference the structure of countries with a high level of income, which are considered to be "balanced" or "integrated". From the point of view of international trade, the degree of maturity is measured according to the sector's contribution to total exports of goods or the surplus registered by it in the trade balance. Analysis of industrial statistics indicates that, in the case of the developed countries, the share of the metal manufactures and machinery sector in the manufacturing product is generally between 25% and 45%. In the same group of countries, metal manufactures and machinery account for between 15% and 58% of total exports of goods, except in the case of Australia and New Zealand, where this share is very much lower since these countries are primarily commodity exporters (see table 7).

Among the Latin American countries, the metal manufactures and machinery industries of Argentina and Brazil account for a proportion of the manufacturing product comparable to that registered in high-income countries, while the Mexican metal products and machinery industry has reached a level of development fairly close to the lower limit of the participation of this sector in the advanced countries. In the other Latin American countries, the development of the metal manufactures and machinery industry is significantly smaller. If we analyse the external trade data of the Latin American countries, we see that only Brazil is in a position comparable to that of the developed countries. The contribution of the Brazilian metal manufactures and machinery industry to total exports is above the lower limit characterizing the situation of some developed countries, while Brazil's trade balance as regards metal manufactures and machinery tends towards a state of equilibrium.

The other Latin American countries register considerably smaller volumes of exports of metal products and machinery. With regard to the interpretation of these international comparisons, it should be noted that the price of consumer durables, especially automobiles, is usually considerably higher in the Latin American countries than in the developed countries, thus leading to overestimation of the degree of development reached by the metal products and machinery industries in the former.

The metal products and machinery industry -and, by deduction, the production of capital goods in most of the Latin American countries- seems to display a lag compared with the situation to be observed in high-income countries, because of its smaller share in overall manufacturing production.

Table 7

INDICATORS OF DEVELOPMENT OF THE METAL MANUFACTURES AND MACHINERY INDUSTRY

(Percentages)

Countries	A Value added by metal products and machinery sector (Division 38 of ISIC, Rev.2) as a proportion of total manufacturing	B Metal products and machinery imports as a proportion of total imports of goods	C Metal products and machinery exports as a proportion of total exports of goods	D Metal products and machinery exports: Coefficient with respect to corresponding imports
Latin America				
Argentina	28.5	25.1	7.5	0.3457
Brazil	34.8	23.3	18.2	0.5780
Mexico	22.8	36.5	4.5	0.1008
Colombia	14.1	39.4	3.5	0.0443
Chile	15.0	28.1	1.3	0.0381
Peru	14.6	30.3	1.8	0.0586
Venezuela	15.4	29.7	0.3	0.0053
Bolivia	4.9	42.8	0.0	0.0000
Ecuador	12.2	53.3	1.2	0.0187
Paraguay	16.6	67.6	0.0	0.0000
Uruguay	16.7	48.2	5.0	0.1189
Costa Rica	9.9	30.7	3.6	0.0766
El Salvador	7.4	24.2	2.0	0.0849
Dominican Republic	7.1	22.2	0.7	0.0145
Developed market economy countries				
Federal Republic of Germany	43.9	18.7	44.9	2.4721
Australia	31.0	36.1	7.1	0.2163
Austria	32.9	28.9	27.1	0.6717
Belgium	33.1	22.5	21.6	0.8632
Canada	32.1	46.0	26.1	0.6213
Denmark	34.0	20.6	24.0	0.9932
Spain	29.3	17.9	26.3	0.9023
United States	43.9	25.0	40.2	1.3944
Finland	26.6	26.6	17.7	0.6033
France	38.6	21.3	33.7	1.3046
Holland	32.6	19.7	16.2	0.8148
Ireland	22.9	27.2	18.5	0.5171
Israel	40.8	25.7	12.1	0.2882
Italy	36.4	20.2	32.5	1.2601
Japan	41.2	6.0	58.4	9.0432
Norway	35.1	28.5	12.2	0.4654
New Zeland	25.0	27.7	4.3	0.1428

cont.

Table 7 (cont.)

Countries	A	B	C	D
Portugal	22.6	25.1	13.4	0.2649
United Kingdom	40.4	25.8	34.7	1.3064
Sweden	42.8	26.8	39.7	1.3694
Switzerland		23.8	31.9	1.0918
Yugoslavia	32.5	28.0	28.4	0.5978
Socialist countries				
Czechoslovakia	40.0	36.1	46.7	1.2949
Hungary	36.0	29.2	32.1	1.0312
Poland	38.7	26.4	37.0	1.2935
Union of Soviet Socialist Republics		36.0	17.8	0.5537
Developing Asian countries				
Korea	24.2	22.5	20.3	0.7110
Philippines	14.1	27.4	1.8	0.0460
Hong Kong	28.0	18.5	7.5	0.3302
Indonesia	15.1	33.5	0.5	0.0300
Singapore	51.6	29.4	26.4	0.7239
Turkey	20.7	28.1	1.9	0.0314

Source: ECLA, Division of Statistics; United Nations, Yearbook of Industrial Statistics 1980, Vol. I., Statistical Yearbook 1979/1980, Yearbook of International Trade Statistics 1980, Vol. I.

Furthermore, the high degree to which requirements for machinery and equipment are obtained from external sources contrasts with the only partially used production capacity existing in the larger countries and even in some of the medium-sized and small ones.

This margin of unused capacity needs to be analysed with great attention, especially since in the present circumstances it is difficult to finance external purchases and the search for regional complementation mechanisms could therefore prove more feasible than at times of greater economic prosperity.

3. The regional market

The size of the Latin American machinery and equipment market is considerable, and in certain sectors is so even at the world level. For example, Latin America accounts for approximately 30% of world demand (excluding that of the socialist countries) for hydroelectric generating equipment. Latin American requirements in respect of equipment for the cement industry and other basic sectors are on an equally large scale.

If the various countries' investment in machinery and equipment is taken in the aggregate, the regional market represented an approximate value of 70 billion dollars in 1981. This big market, however, does not make itself so sufficiently felt as a dynamic factor of production of capital goods, especially in the small and medium-sized countries, because of its being broken up into separate national demands. Trade among Latin American producer countries is of little significance and the lack of reciprocity between those of different size is very marked.

Moreover, as shown in table 8, which presents the geographical structure of investment and imports, the small and medium-sized countries' investment in machinery and equipment, taken as a whole, represents 27% of the total for the 19 countries considered.

In addition, the small and medium-sized countries together absorb rather more than half Latin America's imports of capital goods, or nearly three times as much as Brazil imports under this head. Although both these observations must be regarded as purely illustrative, in as much as they are based on punctual information in each case, the size of the small and medium-sized countries' market is favourable to mutually beneficial collective activities, different from those that can be proposed to one another by the three largest countries.

The regional project to which reference has already been made has primarily analysed the requirements of what might be termed the basic or heavy industry sectors (mining, petroleum and natural gas, electric energy, pulp and paper, steel-making, rail and maritime transport), besides agricultural equipment, although this last still at a primary level.

Among These sectors, it is that of generation and distribution of electric energy whose demand is on the largest scale. In the 1970s, this sector accounted for approximately 9% of Latin America's investment in machinery and equipment.

The investment of the sectors analysed mainly takes the form of a not very considerable number of major projects. Equipment is supplied, essentially, by consortia of large-scale manufacturers of machinery and boilermakers.

In many instances, the requirements of the investment project encompass a wide range of products, varying in their degrees of complexity and technical exigence. This fact makes it possible for enterprises of different size and at different stages of progress in metalworking to participate in the supply. Accordingly, such projects afford important opportunities for increasing the capacity of 'infant' industries, since the operation through a consortium with which works of this kind are normally tackled involves an intensive interchange of technological information and experience among the participating enterprises.

The aforesaid operation in association, however, does not usually come about spontaneously, and to move towards it the countries, especially those of small and medium size, must have clear and explicit policies that operate in its favour.

a) The requirements of the electricity sector as exemplifying the size of the Latin American market

In this concise presentation there is no room for detailed consideration of the requirements of every sector analysed. Nevertheless, both on the account of its importance in absolute terms and because in connection with it the governments of the region have decided to go ahead with joint activities,*/ express mention is made of some of the conclusions reached with respect to the electricity sector.

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*/ Latin American Economic Conference, Quito, January 1984, Plan of Action.

Table 8

LATIN AMERICA: a/ GEOGRAPHICAL STRUCTURE OF INVESTMENT IN MACHINERY AND EQUIPMENT AND OF IMPORTS OF CAPITAL GOODS

(Percentages)

Countries	Average for investment in machinery and equipment b/ 1978-1981	Average for imports of capital goods c/ 1978-1981
Argentina	8.9	9.8
Bolivia	0.4	1.6
Brazil	38.1	17.5
Colombia	3.9	6.1
Costa Rica	0.7	1.3
Chile	2.5	5.5
Ecuador	1.4	4.3
El Salvador	0.5	0.8
Guatemala	1.0	1.4
Haití	0.2	0.2
Honduras	0.5	1.0
Mexico	26.2	20.2
Nicaragua	0.3	0.5
Panama	0.5	1.0
Paraguay	0.6	0.7
Peru	2.4	5.0
Dominican Republic	1.0	1.0
Uruguay	0.8	1.2
Venezuela	10.1	20.9
Total	100.0	100.0

Source: Prepared by the ECLA/UNIDO/UNDP Project on Capital Goods on the basis of data furnished by the ECLA Division of Statistics and Quantitative Analysis

a/ 19 countries.
b/ At 1982 prices, the import exchange rate being for conversion and the United States capital goods price index for adjustments of the value of the dollar.
c/ On the basis of classification by economic use or destiny (Clasificación para Uso o Destino Económico - CUODE).

For the sake of simplicity, reference will be made only to hydroelectricity programmes. Research carried out by the ECLA/UNIDO/UNDP project in conjunction with CIER */ for the countries which the latter covers, plus Mexico and Central America, shows that taking the period extending up to the year 2000, and primarily considering plants of 100 MW or more, the execution of the works envisaged implies a demand for equipment amounting to 953 hydrogenerating groups with an average power of 142 MW. (This global requirement is very large even by comparison with world demand for such equipment.)

But the projects hitherto identified show an increase in installed power in the decade 1991-2000 smaller than that predicted for the period 1980-1990. This anomaly is presumably explained by the fact that for the last decade of the century programmes are defined only in part and in relation to some countries.

It is thus reasonable to assume that the growth of installed capacity during the last decade of the century will evolve at a pace similar to the historical rate, at least as far as hydraulic equipment is concerned. On this assumption, and supposing average power per unit to be maintained, the requirements of the known projects and of those not yet identified would amount to approximately 1 913 hydro-turbines (average power 142 MW).

Demand for hydroelectric equipment is of special interest for the Latin American region. The water resource exists in such abundance that the share of hydroelectricity generation in the region's total generation of electricity is already very high today; the works projected make it probable that this situation will be accentuated.

The region is gaining in importance as a market for hydroelectrical equipment. In 1961-1970, Latin America brought into operation hydroelectricity plants whose aggregate power was equivalent to 17% of the total installed in the world (excluding the socialist countries). In 1970-1979 this share rose to 23%. Estimates for the period 1981-1990 carry the proportion to 30% and for 1981-2000 to 42%. The significance of these figures is enhanced if it is considered that by the year 2000 the region is likely to maintain substantial reserves of water resources, while those of the OECD countries will presumably be in process of depletion.

With regard to hydroelectricity generation programmes, two additional considerations may be put forward. In the first place, it should be stressed that the distribution of the project is geographically very well balanced. Of the predicted power in identified new works, 41% corresponds to countries of the region other than Brazil, Argentina and Mexico. This special situation opens up interesting prospects for efforts in the direction of complementarity, in which countries of different size may participate.

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*/ Comisión de Integración Eléctrica Regional. Its membership comprises the main electricity enterprises in Argentina, Brazil, Bolivia, Colombia, Chile, Ecuador, Paraguay, Peru, Uruguay and Venezuela.

The physical structure of the equipment required by hydroelectricity plants has also been analysed (using reference prototypes) and the conclusion has been reached that in addition to the possibilities for joint efforts afforded by balanced geographical distribution, the existing industry in the small and medium-sized countries is in a position to provide a significant proportion (measured by weight) of the requirements indicated. In a 300-MW power station */ the part susceptible of execution by intermediate-type machine shops was estimated at 6 140 tons.

If average direct use of manpower in manufacturing what might be termed "easy parts" is estimated at 100 man-hours per ton processed, the execution of the above mentioned simple equipment for the power station in question would represent about 614 000 man-hours. In other words, it would be equivalent to approximately 320 men per year, a number which, added to the indirect personnel of the machine shop itself, would make it reasonable to estimate that the plant under consideration would have given an enterprise full-time work for 400 persons throughout one year, merely to execute the less complex parts.

Although it is hardly legitimate to make extrapolations on reference bases of a punctual character, the parallelism discovered in the structure of similar power stations suggests that the part of the hydroelectricity programme for the present decade corresponding to the small and medium-sized countries represents about 120 times the capacity of the power station considered.

b) Demand in other sectors

Very brief comments on a few other sectors of demand will follow. This information, combined with that presented above in relation to the electricity sector, may give some idea of the size of the aggregate market, or, where appropriate, may point to conjunctural situations that deserve special attention.

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*/ In a 300-MW power station with a 180-metre head, the following parts of relatively low complexity have been found:

- 4 000 tons of pressure pipes. (It is possible that in this specific case the normal requirements of power stations of this size may be exceeded);
- 1 070 tons of valves;
- 71 tons of grids;
- 265 tons of structures for the gantry cranes and the travelling cranes;
- 740 tons of miscellaneous structures.

All these elements, amounting to 6 146 tons, can be executed by machine shops of the types existing in countries at a medium stage of progress. The remainder, more complex and of course of much higher value, add up to about another 3 000 tons.

Pulp and paper. This sector of production is of particular interest for the region, which possesses one-fifth of the world's forest area but produces only 2.5% of its pulp. To judge from the predictions made, as has been pointed out, before the recession revealed itself at its worst, by 1991 regional production could be expected to increase by 5.5 million tons of chemical pulp and one million tons of mechanical pulp, which in turn would represent a demand for equipment in the neighbourhood of 320 000 tons.

Cement. With the same reservation as above, it may be stated that in relation to the decade 1981-1990 demand for 139 furnace lines, with an average annual output of 750 000 tons, was predicted: a set of equipment which in terms of weight would amount to about one million tons.

Maritime transport. On somewhat conservative hypotheses, it was estimated that in 1981-1990 demand for shipping on the part of the region's merchant navies would represent 6 700 000 GRT.

Rail transport. For the same period, and taking only rolling-stock into account, global requirements were estimated at 4 000 locomotives and 80 000 goods wagons.

Steelmaking. The evolution of this sector, which was very dynamic, raised its aggregate production capacity from 4 million tons of steel in 1960 to 36 million in 1980. The analyses prepared at the beginning of the present decade showed a set of projects which on materialization would signify an additional capacity easily exceeding 50 million tons of steel per annum. The critical world situation and the circumstances attendant on each project made it advisable to reduce this forecast to a more probable hypothesis of 39 million tons, which by mid-1982 had already been reduced to 33 million, a figure which at the time of writing these lines (early 1984) should be brought down still further.

Nevertheless, the steady previous growth, as well as the excess of unsatisfied needs in the Latin American economies as a whole, makes so widespread a suspension of projects a matter of serious concern. An economic recovery tending towards a growth rate similar to that recorded in the past might be held back by a possible shortage of steel supplies. Everything points to the advisability of keeping a careful watch on the evolution of a sector which is of an especially critical character, apart from the fact that its reactivation would give rise to a large-scale demand for equipment that could be met by the region's own industry.

Agricultural machinery. In the mid-1970s the Latin American countries were importing about 700 million dollars' worth of agricultural machinery every year. Of this quantity, almost three-quarters corresponded to tractors, and about 14% to harvesters and threshing-machines.

On the other hand, by 1974 regional output amounted to about US$1 000 million at that year's prices, and exports to a value of about US$ 70 million were even effected, primarily from Brazil and Argentina and almost entirely

to the region itself. (Magnitude included in the import figure given in the preceding paragraph.)

Mining. An analysis was made of equipment requirements for mining activities, of which the part relating to metal ores in Argentina, Brazil, Chile, Peru and Venezuela was completed. The demand for equipment predicted for the period 1983-1992, including the requirements of new exploitations and replacement material, reached a figure of about US$ 6 billion at 1983 prices.

4. Regional production capacity

As mentioned earlier, the development of production of capital goods has varied greatly from one country to another, depending both on the domestic market and upon the policies pursued by each country and the efficacy with which, where the case has arisen, specific development measures have been applied. Thus, in the years 1978 to 1981, Brazil attained a level of self-sufficiency approximating to 80%. As remarked at the outset, for the region as a whole the corresponding figure is very much lower. The small and medium-sized countries import virtually all their equipment, even those parts which their own industry would be in a position to make. Recently, moreover, even the larger countries have had to reduce the proportion of local manufacture for financial reasons (which, in addition, have necessitated the suspension of complete projects).

It is difficult to make a realistic evaluation of the physical production capacity of the region as a whole. The unfavourable economic conjuncture has forced down the percentage of utilization of this capacity even in the countries with larger markets, just as in the small and medium-sized countries.

In some Latin American countries, production of capital goods increased rapidly in the period preceding the economic recession through which the region is now passing. This speeding-up of production was partly induced by a vigorous expansion of demand in consequence of the procurement and investment of abundant financial resources. The expansion of installed capacity was also promoted by governments as part of their development strategies. When the crisis supervened, investment abruptly decreased, even in economic sectors which were important by reason of their demand for domestically-produced equipment. Given the depth of the depression, the recovery of former investment levels may possibly be slow, and it would seem that the countries' economic reactivation implies changes in the sectoral orientation of investment, which would therefore be reflected in a change in the structure of demand for capital goods. These trends and circumstances would appear to suggest that the capital goods industry in some Latin American countries may be oversized or ill-adapted to the new requirements. Exporting capital goods as an expedient for short-term utilization of this industry's installed capacity is only partly viable.

In the field of capital goods, the three large countries of the region possess a quite well diversified and quantitatively significant production capacity. These countries' industry is capable of largely meeting the

requirements of their own markets, while in the other Latin American countries supply is much more restricted. By virtue of surveys recently made within the framework of the above-mentioned regional project and as part of national efforts, it has been possible partly to identify this supply in a certain number of the small and medium-sized countries. In essence, an idea has been obtained of production capacity in terms of finished products and manufacturing plant in the Central American countries as a group, Chile, Colombia, Ecuador, Paraguay, Peru, Uruguay, Venezuela and, recently, the Dominican Republic. Supply varies in magnitude, of course, from one country to another, but it presents certain common features.

Tables 9 and 10 provide summarized information on indicators of production capacity in the boilermaking industry in the countries mentioned. (Serialized products do not appear, neither do the data for the Dominican Republic, which the project now has at its disposal and which are being processed.)

This partial reference material is given to illustrate the manufacturing capacity already existing in a group of small and medium-sized countries, using to that end those metal-working processes which, although simpler, are also the most flexible and are required for the construction of a wide variety of final products.

Albeit in subsequent sections of the present chapter more careful consideration will be given to the barriers preventing the expansion of Latin American production of machinery and equipment, as well as to some ways of overcoming them, a few observations on the limits of physical production capacity may appropriately be made here. Attention has already been drawn to the intercountry differences existing in this respect and stress has been laid on the fact that there is no joint market, but only the sum of disperse national requirements. The large proportion of the region's supplies that is obtained from third countries and the conjunctural situation of serious underutilization of installed capacity combine to reveal an interesting opportunity to switch to the region itself a higher proportion of its own demand.

But an effort in this direction will be efficacious only if the benefits obtained reach all the various countries and also contribute to the progress of those whose activity in this sector is still incipient. It should be pointed out at once that fulfilment of this condition is difficult, but possible with firm political backing.

Table 9

LATIN AMERICA (SELECTED COUNTRIES): INDICATORS OF CAPACITY IN THE BOILERMAKING INDUSTRY

Countries	Cold rolling Maximum thickness of sheet a/	End plates and headstocks Maximum sizes Diameter and thickness	Hoisting capacity b/	Annealing furnace
Bolivia	19 mm (3/4")	2.5 m x 5/8"	10 t	n/d
Colombia	60 mm (2.3/8")	4.5 m x 1.1/2"	120 t	5.6 x 5.6 x 23.0
Chile	50 mm (2")	4.0 m x 7/8"	55 t	4.0 x 5.0 x 20.0 (750ºC)
Ecuador	45 mm (1.3/4")	3.0 m x 1.1/2"	30 t	n/d
Paraguay	75 mm (3")	n/d	60 t	6.0 x 4.0 x 10.0 (950ºC)
Peru	50 mm (2")	4.0 m 1.1/2"	60 t	6.0 x 5.0 x 8.5
Uruguay	19 mm (3/4")	n/d	20 t	2.5 x 2.5 x 10.5
Venezuela	75 mm (3")	5.0 m x 1.1/2"	200 t	6.5 x 6.5 x 18.0 (959 C)
Central America (Guatemala)	19 mm (3/4")	2.5 m x 5/8"	10 t	n/d

Source: ECLA estimates.

a/ Sheets 3 metres wide, except in the case of Paraguay and Venezuela, where the figures correspond to sheets 4 metres wide.

b/ Including use of supplementary media.

n/d No data.

Table 10

LATIN AMERICA (SELECTED COUNTRIES): ESTIMATE OF PRODUCTION CAPACITY IN RESPECT OF BOILERMAKING ELEMENTS AND STRUCTURES

(Tons per year)

Country	Metal structures	Storage tanks and chutes	Preasure-feed containers, columns	Heat exchangers	Total
Bolivia	2 000	1 000	500	-	3 500
Colombia	15 000	15 000	8 000	3 000	41 000
Central America	4 000	2 000	500	-	6 500
Chile	18 000	15 000 a/	3 000	1 000	44 000
Ecuador	6 000	8 000	2 500	500	17 000
Paraguay	n/d	n/d	n/d	n/d	n/d
Peru	12 000	10 000	4 000	2 000	28 000
Uruguay	n/d	n/d	n/d	n/d	n/d
Venezuela	65 000	35 000	20 000	10 000	130 000

Source: ECLA estimates.

a/ Including capacity existing in the steelmaking plant of the Compañía de Acero del Pacífico (5 000 tons per year).

n/d No data.

Previously, in the context of the requirements of hydroelectricity equipment, mention was made of the proportion in which, in view of a specific case, the industries existing in many small and medium-sized countries might come to play a significant part. Still with reference to the sectors already analysed (which in the aggregate represent a very large share -about 40%- of regional demand for capital goods), figures relating to other cases can be given, which show that combined activities jointly undertaken by enterprises and countries at different stages of progress can help to raise the level of activity in all of them. In other words, the effects of a well-structured collective effort to place the region's demand at the service of the advance of its own industry would not be confined to the more advanced enterprises in the larger countries.

But an effort in this direction will be efficacious only if the benefits obtained reach all the various countries and also contribute to the progress of those whose activity in this sector is still incipient. It should be pointed out at once that fulfilment of this condition is difficult, but possible with firm political backing.

Previously, in the context of the requirements of hydroelectricity equipment, mention was made of the proportion in which, in view of a specific case, the industries existing in many small and medium-sized countries might come to play a significant part. Still with reference to the sectors already analysed (which in the aggregate represent a very large share -about 40%- of regional demand for capital goods), figures relating to other cases can be given, which show that combined activities jointly undertaken by enterprises and countries at different stages of progress can help to raise the level of activity in all of them. In other words, the effects of a well-structured collective effort to place the region's demand at the service of the advance of its own industry would not be confined to the more advanced enterprises in the larger countries.

With the sole aim of justifying this assertion, it may be pointed out that 30% (in terms of weight) of the equipment required for the programmes on expansion or construction of pulp mills in the countries of the Andean Group and the Central American Isthmus could be supplied by the industry existing in those countries themselves. Given close collaboration with more advanced enterprises in the region itself, this share might exceed 40%. In turn, up to 60% (in terms of weight) of equipment requirements for cement production could be met by the medium-sized countries industry. A significant proportion of steel equipment needs, too, could be supplied by medium-scale industries, although in this case the diversity of processes makes it difficult to propound a global percentage.

5. Measures for the development of the machinery and equipment sector

The present section will comprise a very brief discussion of some policy measures which, in the light of the available background material and the experience of certain countries in and outside the region, appear likely to stimulate the progress of this key sector. Mention is also made of some critical obstacles and procedures for overcoming them are considered.

a) Maintenance of an active and stable policy

The need to possess a capital goods industry and to enjoy official support for its development is a controversial subject. In some countries the question has lapsed into oblivion or is not raised as one of the problems of today. Some national and even State sectors of demand have not gone along with government efforts directed towards the development of a capital goods industry. On other occasions, discrepancies of opinion between various protagonists or the indifference of some of them have resulted in the shelving of promising efforts which had already produced positive effects.

Nevertheless, some Latin American countries have done fruitful work in this field. Some longstanding efforts, such as those undertaken by Brazil and, in their time, by Argentina have been based on various active policies apart from the vigorous drive towards industrial development induced by the two World Wars. In recent years endeavours to encourage these branches of manufacture have been renewed in various countries. Cases in point -to list them in chronological order- are a specific project of Nacional Financiera S.A. in Mexico, the activities of the Comisión Ecuatoriana de Bienes de Capital (CEBCA), the work of the Consejo Nacional de Desarrollo de la Industria de Bienes de Capital (CONDIBIECA) in Venezuela, the programme of the Instituto Colombiano de Comercio Exterior in this field, and the recent reactivation of the Corporación (Privada) para el Desarrollo de Bienes de Capital in Chile.

Some of the work of analysis and promotion carried out by these entities is beginning to bear fruit. In December 1983 UNIDO and the Regional Project co-sponsored a meeting of experts on the subject, the participants in which included those chiefly responsible for the national activities in question. It is worth while to stress the firm consensus which was reached with respect to the desirability of activating in each country specific focal points of stimulus to the machinery and equipment sector, and to keep them permanently and organically interrelated at the regional level, in order to take advantage of experience, combine capacities, and, in consequence, enhance the efficacy of the action taken.

b) Formulation and application of policies

The establishment in a country of some branch of production of capital goods normally implies a parallel effort in respect of domestic technology. Both proceedings entail prolonged and sustained action, since on the one hand a maturation period is required and, on the other, the recovery of investment

is a long-term process. This fact, inter alia, means that the existence, efficacy and permanence of State support may be a determining factor in the progress of this industry, especially in small and medium-sized countries, for which market constraints are of critical importance. Moreover, given the complexity of these lines of production, the degree of specificity of the measures that their promotion and establishment require is decidedly high.

The region can draw up on valuable experience in this field. In Brazil, promotion and support of the capital goods industry has been characterized by its coherence. For example, co-ordination among the various government departments involved in the development of certain branches of the capital goods industry has been secured by means of what are called "Executive Groups", formed by institutions and officials with an adequate degree of operational competence. Another feature of Brazil's promotion system has been the part played by the industry's trade-union organizations in such matters as attesting the existence or non-existence of products of domestic origin similar to those proposed in the investment projects. In various other countries of the region, too, experience in this field exists which would merit being better known and turned to account by those responsible for the determination of national policies.

c) Exercise of State purchasing power

The maintenance of a certain level of activity in the capital goods industry should be a major part of the permanent and still more of the conjunctural policies of the Latin American countries. Measures must urgently be adopted to stop the deterioration of the portfolio of orders and of the financial situation of enterprises producing capital goods, which, in some cases, are being seriously endangered. It will even be necessary to support the re-opening of plants or to facilitate the re-organization of the industry. Unless corrective measures are adopted in the short term, the countries are running the risk of losing an industrial and technological heritage which has been built up with great sacrifice over many years. Its recovery will be slow and difficult. Light is shed on this question by the action of the developed countries which, by means of various instruments (mainly financial), are sparing no effort to keep up the activity of their capital goods industries in the present circumstances.

It is in this context that special relevance is acquired by the decision and efficacy with which those enterprises act that besides being important purchasers of machinery and equipment are owned or directed by the State. The responsibility of these enterprises, deriving from the source of their capital itself and from the origin of their directives, must not be confined to efficient production of the goods and services specifically corresponding to them; they can and must act, in addition, as factors of stimulus to production and to the country's technological progress.

The significance of State enterprises is considerable in the Latin American economies. Their concerted readiness to act as agents of stimulus to local industry would have very positive effects, as has been demonstrated, moreover, on those occasions when in one country or another an impulse has been given to such policies. Of course a regional agreement in this respect,

which could give unitary expression to the State demand of a group of countries in relation to a given sector, would substantially magnify the results obtainable. This desirable collective attitude, however, has not become a reality despite the moves in that direction attempted in the past. It is to be hoped that, by virtue of their high political level, greater headway will be made as a result of the recent decisions of the Latin American Economic Conference, held at Quito in January 1984.

It must be pointed out that the exercise of State purchasing power for the benefit of the country's own industry, and even the many examples of 'buy national' legislation which are not restricted to guiding the action of public enterprises but are aimed at spurring private firms in the same direction, encounter numerous obstacles which must be taken into account in proposing the activation of this desirable policy. Apart from the financial problem to be mentioned later, other difficulties stand in the way of putting it into practice: some of them derive from the general legal framework, which at times imposes restrictions that prevent public enterprises from exercising to the benefit of domestic industry the purchasing power which they actually possess; others are related to the above-mentioned inadequacy of the engineering available in the national environment or, at a more general level, to lack of experience in the management of major projects, which is often reflected in subcontracting of this management or of the basic technical studies and therefore in a loss of independence as regards deciding on the origin of equipment.

In the Latin American environment there is an ingrained preference for products imported from outside the region, a tendency from which purchases of capital goods are far from exempt. The difficulties of encouraging purchases in the local environment are increased in the case of transactions linked to major works or investment projects. In these cases the purchaser has to assume additional risks and responsibilities if he resorts to local suppliers who, in most instances, do not enjoy the prestige and the experience of the traditional enterprises with which they have to compete.

The sole purpose of the foregoing observations is to put the subject on a realistic footing and underline the fact that while State purchasing power as an instrument of development is very important (and in many cases irreplaceable), it would be a mistake to lose sight of the objective difficulties which it encounters.

d) Financing mechanisms

Capital goods are normally sold on credit. Almost all the industrialized countries have established medium- and long-term credit systems for their exports of capital goods. Many Latin American countries, among them several of the small and medium-sized, also have credit systems for this purpose. In contrast, in most of the countries of the region mechanisms for the financing of sales of capital goods on the domestic market are non-non-existent or insufficient. Latin American producers of machinery thus find themselves at a great disadvantage in their own markets in competition

with the credit periods and terms that can be offered by foreign suppliers. In normal circumstances, and to an even greater extent in the present world economic conjuncture, financing is a determining factor in decisions on where to purchase supplies, as much as or more so than technical quality or supply prices.

In Latin America the national bank systems were originally structured to meet the credit requirements of economies geared to producing pre-eminently primary commodities and consumer goods. Accordingly, the role of the State has been of fundamental importance in those cases where credit systems appropriate for the sale of machinery and equipment have been established. This role has not been confined to accommodating the legislation to these specific needs and to regulating the operation of financial institutions. In addition, governments have actively intervened in the creation of special funds and the channelling of resources. Furthermore, the keen competition faced on the world market by countries exporting machinery and equipment has driven them to adopt financial practices which in many instances may be described as extreme. Although these countries have agreed to subject their competence in this field to certain rules, a number of cases have come to light which suggest that in practice these rules are often infringed. Even if this were not so, the existence of flexible credit mechanisms at the service of external suppliers, combined with the lack of them at the national level, limits or eliminates the participation of local suppliers, even if the quality and prices of their products are definitely competitive.

The insufficiency or non-existence of financial mechanisms for domestic sale transactions in a large part of the region also restricts industrial co-operation among producers in the different Latin American countries. The formation of supply consortia to tackle the execution of major investment projects, combining the productive and technical resources of local manufacturers with those of firms in other Latin American countries, would be a valuable form of industrial co-operation. But it necessitates both the existence of financial mechanisms for the domestic sale of equipment in the country where the work is carried out and the operation of external credit systems in the countries of the associate producers.

Financing procedures vary substantially according to the type of capital good marketed. The so-called catalogue products are sold to a numerous clientèle and individual transactions are usually on a small scale: cases in point are agricultural machinery and motorized transport vehicles. In these cases payment periods are short and guarantees are of a collateral or similar type. For operations of this kind it is easier to find financing in the countries of the region. The above-mentioned insufficiency of financial machinery for the domestic sale of capital goods is more striking in the case of the supply of complex installations or of large-scale equipment made to order. Contracts of this kind often stem from the basic or heavy-industry sectors, such as petroleum extraction, mining, generation of electric energy, steelmaking, the cement industry and rail and maritime transport. The transactions generallly represent amounts a good deal higher than in the preceding case and amortization periods are longer. The type of guarantees demanded is also different, emphasis being placed on the

expected rates of return on projects and their capacity for generating a cash flow sufficient for debt servicing (over and above the real guarantees that may be provided by the promoters). In this case, the technical and economic evaluation of projects gains importance and it is in this field that the bank system and industrial development institutions in the Latin American countries must make a major effort.

The creation or, where appropriate, the improvement of financing mechanisms for domestic sales of capital goods is one of the basic challenges facing the countries of the region. Indubitably this is a complex problem which is all the more difficult to resolve in the present world and regional economic conjuncture. However, its consideration in the context of possible joint activities affords, because of the very magnitude of the programmes involved, negotiation prospects that are not open to isolated efforts.

e) Utilization and strengthening of Latin American engineering

As has already been remarked, it is project engineering that largely determines the final origin of equipment. This well-known fact explains why the industrial countries sell their engineering, especially that relating to initial phases, on much more favourable terms than those applied for the sale of the equipment itself. In large-scale projects a very wide field of options exists, with respect both to the construction of the capital goods and to their design and that of the works as a whole. Some items of equipment or their parts are relatively simple to manufacture and allow enterprises differing in size and technological capacity to take part in their execution. This possibility, however, depends not only upon the intrinsic complexity of the equipment, but also, and essentially, upon whether the participation of smaller or local suppliers has been taken into consideration right from the start. Thus, for example, the variety of products available in an industrial country may lead to specification in the technical blueprint for the project of some items which are not manufactured in the country where the work is located, while others are in fact made that could have replaced them without negative effects on either price or service conditions. Acquaintance with the possibilities of local production, as well as the effective will to use it, determine the participation of national producers, facilitating it or making it impossible. Consequently, industrial complementarity in major projects will be more or less feasible in so far as their design has or has not been oriented towards securing it.

In a large number of Latin American countries there is enough engineering capacity for the project to take advantage, in the search for an optimum combination of resources, of local manufacturing potential. Consequently, efforts in the direction of manufacturing complementarity could be based on these skills. Engineering and the manufacture of equipment are, in reality, the two inseparable facets of a single economic fact.

Regional engineering, deliberately turned to account, could help to ensure that Latin American purchases were switched towards the area's own industry. Apart from the above-mentioned lack of explicit and stable policies, such an effort is faced with two main difficulties: first, the great shortage of reciprocal information, since the countries are ignorant of one another's capacities, and often even of their own, both as regards engineering and in respect of physical production; secondly -and this is an ill much more difficult to cure- in most cases regional engineering has not yet mastered the designing of complex electromechanical equipment. This widespread state of affairs (although there are exceptions here and there) leaves the branch of regional industry producing such capital goods in a position of dependence unlikely to be remediable over the short term.

Of all the obstacles to the development of the capital goods industry that we have mentioned hitherto, this is perhaps the hardest to surmount. To this end time is needed and sustained long-term effort, including the creation of a generally costly infrastructure. This difficult question, too, opens up a broad field for co-operation, to which we shall revert later.

6. Regional and international co-operation

a) Preliminary remarks

Technical know-how and scientific knowledge are the basis of the industrial leadership of the advanced countries and, in the last analysis, the determinants of their level of living. This point is raised here for two reasons. The first of these is that the vast extent of the economic environment of Latin America as a whole would make it possible not only to develop spearhead industries, but also to maintain the technological infrastructure by which they need to be supported.

It should be recalled, however, that as has so often been pointed out in the present article a group of separate markets is not equivalent to a single one, and the action possible for a group of different political entities has neither the broad range of options nor the flexibility that a single government can command. Attempts at integration, in their turn, have not hitherto met the expectations entertained.

Nevertheless (and this is the second consideration that justifies the initial observation), an immense gradation of intermediate situations is conceivable between the present unconnected conduct of many separate operations and the establishment of a solidary regional structure.

There are many aspects of industrial as well as of overall development that are cramped by the size of the national economies. Some have been indicated in the relevant sections. A few, however, may usefully be taken up again in the context of co-operation possibilities.

In most of the Latin American countries, and of course in all those of small and medium size, a vertical enchainment of productive activities is wanting. Only in exceptional cases (for example, that of fish meal production in Peru during its boom period), is there continuity in manufacturing lines from the primary process to the manufacture of machinery and equipment. This lack of industrial integration is not attributable to the narrowness of the economic ambit alone; it is also influenced by the want of a medium-term overview of what the country requires.*/

In this quest for broader points of view, providing firm bases for complex activities, outstanding opportunities for inter-Latin American co-operation are offered by those sectors whose investment projects are far apart in time in each of the national ambits considered in isolation, but in the region as a whole constitute a virtually continuous demand.

b) Co-operation in policy formulation and in the quest for joint activities

In an increasing number of Latin American countries impulse has been given to national projects aiming at the definition and establishment of stable policies in relation to the capital goods industry.

These projects or programmes are making headway in basic analyses for the purpose of ascertaining the status of this industry and identifying the obstacles that hamper its development, as well as formulating recommendations for the adoption of support measures. In some of the countries promoting these activities specific agencies have been created and in others the projects are executed by entities already established.

The action required in this field also includes the strengthening of the supplementary institutions concerned with the development of the capital goods industry in such areas as technical standardization, tests of materials and quality controls, metrology and régimes for patenting inventions. Efforts in this direction, which should be increased, have had the benefit both of the technical assistance of regional and international institutions and also of that obtained under bilateral agreements, whether inter-Latin American or with developed countries. As the region has ever-increasing experience of its own in these respects, there will be interesting possibilities of promoting technical co-operation between Latin America and other developing regions.

Contact between the national entities specifically responsible for the sector makes it possible, firstly through the exchange of information and experience, and secondly by virtue of the breadth of vision acquired through that same contact and the work of regional bodies, to adapt and perfect partial approaches and to move forward in the search for coherent attitudes which will help to place the region on a more advantageous footing in its relations with the rest of the world.

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*/ One of the participants in the meeting of Latin American experts organized in December 1983 said that in the case of Argentina, between the mid-1950s and the early 1980s a generating capacity of over 9 million KW was installed. This enormous demand was not adequately reflected in the country's industrial capacity, because attention was always focused on isolated works and not equipment programmes.

The above-mentioned decisions of the Latin American Economic Conference provide for the establishment of a regional margin of tariff preference and are in agreement on the need to take advantage of aggregate demand in order to pursue the region's industrial development in greater depth and step up the participation of local enterprises in the provision of the equipment required. In these measures the Conference gave priority to the electricity sector.

These decisions and mandates, adopted at the highest political level, usher in an urgent phase of construction and establishment of operational mechanisms whose principles, not confined to the capital goods sector, were also enunciated at the Conference: utilization of State purchasing power, preference mechanisms other than the tariff margins stated, countertrade systems, and so forth.

The decisions of the Conference constitute a timely political framework for the joint activities necessary to enable the regional capital goods industry to weather its present crisis and resume its role as a basic instrument of economic development.

c) Co-operation in industrial production and in the solution of the problems directly affecting it

As has been remarked, there is a substantial capacity for production of machinery and equipment in the region that is not used in due proportion. The reasons for this underutilization have already been noted in several previous sections. Among them, mention has been made of the lack of contact and knowledge of one another among the enterprises engaged in this activity in Latin America. Generally speaking, these enterprises maintain good and stable relations with others in the developed world, but know nothing of what is happening in their own region.

Given the size of the Latin American market and the high proportion of its requirements that is met from outside the region, there is abundant room for local manufacturers of capital goods to develop, perfect and expand their productive activity. In some countries, particularly Brazil, development policies have made it possible to establish plants of an advanced technical level which could combine their capacities with others in the region, in some cases in quest of a level of specialization that will make them more competitive, and in others with a view to cutting unnecessary transport costs through the manufacture of certain parts in the neighbourhood of the work in which they are to be incorporated. To that end, use will be made of local capacity, developed or encouraged to forge ahead by the demands of the project itself.

Looking at regional requirements as a whole that ought to be operationally related, and considering their evolution over reasonably long intervals, the area opened up for industrial co-operation is, in absolute terms, of great magnitude and importance. Mention has already been made of the advantages that would derive from interrelationship and exchange of experience among national development centres in the sector. The aim of

the present section is to make brief reference to some of the benefits that would result if more dynamic and stable relations were maintained among the producer enterprises themselves.

Launching a manufacturing activity which entails some measure of technical responsibility, as is the case with machinery and equipment, presupposes not only possessing the objective capacity fo fulfil specific requirements but also the capacity to confront the potential purchaser with evidence of specific experience. In both respects, systematic collaboration among enterprises at different levels of progress in the region might help to reduce or do away with the barriers that are raised in the path of industries entering new fields.

The benefits of mutual support are obviously not confined to facilitating the first steps taken by an enterprise in a given area, but may also include the furtherance, through the addition of experience and operational capacity, of joint and more dynamic progress at later stages of development.

This was the view held by the entrepreneurs of the sector who were invited, in April 1982, to participate in a consultative meeting to orient the studies carried out by the ECLA/UNIDO/UNDP project on the status and prospects of the capital goods industry in Latin America. Meeting for the first time, they considered mutual information and contact to be of such importance that they decided to form a Permanent Group which, of an informal character in an initial phase, could be set up as the nucleus of a stable organ of promotion and liaison. In October 1983 this Group obtained approval for its Statutes, and its aim is to bring together all enterprises in the region manufacturing boilermaking and heavy metalworking products and electrical equipment with the same characteristic.

On the occasion of the Meeting of High Executives of the Regional Electricity Integration Commission (CIER) (Viña del Mar, 8 November 1983), in view of the great importance attaching to the electricity sector from the standpoint of its demand for equipment, a meeting was held with representatives of the Industrial Group, whose President summed up its spirit and intentions in the words: "we, the industrialists of the region, are not confining ourselves in these hard circumstances (he was referring to the recession affecting Latin America) to the adoption of a passive attitude, withdrawn into the shell of our own countries and our own enterprises. Our aim in forming this Group is to increase our joint capacities. On coming before you to ask you to consider the advantages of relying on the industry of your own country and that of the region as a supplier, if not in preference to others, at least on equal terms, we for our part offer you an attitude of solidarity: the Group has pledged itself to place the experience of those who have made most progress at the service of those who are just beginning. Thus, local supplier enterprises can count on the active backing of all the rest".

This textual quotation exemplifies the potential scope of co-operation among entrepreneurs in the Latin American machinery and equipment sector in many spheres, as regards both strengthening their own manufacturing capacity and relating their activity, to the benefit of all, with the decision-making centres that orient purchases or determine policies. Such co-operation should be encouraged both by national authorities and by regional entities and international institutions. If it is successfully matured and stabilized it will be bound to help in eliminating or reducing many of the obstacles hampering the progress of the sector.

d) *Final considerations*

Although in several of the foregoing sections attention has already been drawn to it in connection with one or other facet of the subject, stress should be laid on the vital importance attaching to the mastery of engineering and the construction of machinery and equipment as a determining (and, when it is lacking, absolutely limiting) factor in the level of income and consequently the level of living of the countries.

The propositions put forward in the present chapter, necessarily summarized and therefore undoubtedly inadequate, have indicated some paths along which the Latin American countries might advance. In every case the conclusion is reached that it is by joint efforts that more and better results could be achieved and also that most could be done to diminish or do away with the obstacles obstructing a process that is proving an imperative necessity.

The guidelines for action emanating from the present notes are based on the consideration of what might be defined as "classic sectors" of demand, since others which, like information techniques and telecommunications, raise entirely new problems have not yet been analysed. Much the same thing happens in the case of machine-tools, whose conception and modes of operation are passing through a period of very rapid and radical technological change.

To the considerations that were mentioned at the beginning of the chapter as determining the choice of priority sectors, it should be added that preference was given to those which, within the bounds of prediction in this field, show relative technological stability. This choice did not stem from an attempt to shirk the realities of today, but, on the contrary, from the search for know-how and production structures that can be regarded as attainable and whose construction may serve to support the likewise necessary efforts to master those techniques in which the flow of change is very swift, as pointed out in the specifically relevant chapter of the present paper.

Another point that must be noted is that the structuring of coherent action in this field is not only necessary in the ambit of the Latin American region, but up to a point can be seen as a worldwide trend. The developed countries maintain an intensive interchange of machinery and equipment

with one another and are advancing toward increasing global integration of this industry, both through the operation of transnational corporations and through the proliferation of co-operation agreements among enterprises in different countries.

This is the backcloth against which should be viewed the direction and intensity that ought to characterize the forms of Latin American action so far sketched out in part.

Notes

1/ Latin America and the Vienna Programme of Action: Science and technology for development in the 1980s, E/CEPAL/CEGAN.9/L.2, paragraph 14.

2/ See the Quito Declaration and Plan of Action (Latin American Economic Conference, Quito, 9-13 January 1984).

3/ Report of the ninth session of the Committee of High-Level Government Experts: Science and technology for development (Montevideo, Uruguay, 23-24 January, 1984).

4/ Sources and years of information: Argentina: INTI, 1981; Mexico: Dirección General de Inversiones Extranjeras y Transferencia de Tecnología, 1975-1981; Ecuador: Central Bank, 1978; Peru: CONITE, 1981; Venezuela: SIEX, 1982.

5/ See Jorge Sábato, "Desarrollo tecnológico en América Latina y el Caribe", Revista del Derecho Industrial, No. 11, May-August 1982, p. 324. In the second Argentine nuclear power plant, local participation in the total cost of the plant was around 50% (in the provision of components, the proportion is estimated to be around 34%, compared with 12% in the case of Atucha I). See Juan A. Valeiras, "The negotiation and enforcement of guarantee clauses: a case study on the construction of the first Argentine atomic plant", ICPE, 1982. With regard to the Andean Group initiatives, see Decision 84 of the Commission of the Cartagena Agreement and the "Manual de desagregación tecnológica para proyectos industriales de transformación física y química" prepared by the Board of the Cartagena Agreement in 1982.

6/ See Guillermo Monge G., Modalidades de compra de productos tecnológicos en el Estado costarricense (Estudio de casos), Project COS/81, San José, 1983.

7/ Un decenio de transición: ciencia y tecnología en América Latina y el Caribe durante los setenta, by F. Sagasti, F. Chaparro, C. Paredes and H. Jaramillo, GRADES, March, 1983.

8/ See Latin America and the Vienna Programme of Action: Science and technology for development in the 1980s, op. cit., p. 27.

9/ Of course, in another connection, and because of its great importance, mention should also be made of the recently announced development by the National Atomic Energy Commission of Argentina of a technique for enriching uranium.

10/ See JUNAC, Principales actividades desarrolladas por la Junta del Acuerdo de Cartagena en el área de tecnología durante 1982, J/GT/118, May 1983.

11/ The PADT referred to earlier have tried to stimulate such links. Mention may also be made of Decree 222 (February 1983) of Colombia, which promotes the participation of local universities in public sector competitions for the purchase of consultancy services. In Brazil, the Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq) has promoted the establishment of nearly 20 technological innovation nuclei linked with the universities and technological research institutes (see the article on new alternatives in technology in Brasil Comercio e Industria, August/September 1983, p. 10).

12/ See Jorge Katz, Cambio tecnológico en la industria metalmecánica latinoamericana. Resultado de un Programa de Estudio de Casos, Buenos Aires, July 1982.

13/ See J. Katz, op. cit., p. 61 and Problems and issues concerning the transfer, application and development of technology in the capital goods and industrial machinery sector. The capital goods and machinery sector in developing countries: issues in the transfer and development of technology, UNCTAD, TD/B/C.6/AC.7/2, May 1982.

14/ See CTC, Transborder data flows and Brazil, New York, 1983, p. 79.

15/ See La microelectrónica y el desarrollo de América Latina: problemas y probabilidades de acción (E/CEPAL/R.317) and the Report of the UNIDO/ECLA Expert Meeting on the Consequences for Latin America of Progress in Microelectronics (ID/WG.372/17) (Mexico City, 7-11 June 1982).

16/ In 1980, for example, 34% of Brazil's exports of machinery and transport equipment went to developed market economy countries. See UNCTAD, TD/B/C.6/AC.7/2, op. cit., p. 9.

17/ For a more detailed analysis of the possibilities of co-operation on this subject among the countries of the region, see Ingeniería y Consultoría en Brasil y el Grupo Andino, E/CEPAL/G.1215, August 1982.

18/ See Acto Normativo 060/82 of the Instituto Nacional de Propiedad Industrial.

19/ See J. Katz, op. cit., p. 55, in relation to the metal products and machinery industry and, with regard to the pharmaceutical industry, Daniel Chudnovsky, "The challenge by domestic enterprises to the transnational corporations' domination: a case study of the Argentine pharmaceutical industry", World Development Vol. 7, 1979, pp. 45-58.

20/ See F. Sagasti, et al., op. cit., p. 98.

21/ See Guillermo Ondarts and Carlos M. Correa, Compras estatales e integración económica, INTAL, 1983, tables 3 and 4.

22/ See Alberto Aráoz, "Políticas de compras del Estado y desarrollo tecnológico", Integración Latinoamericana, March 1983, p. 16.

23/ The objectives of these nuclei only seem to have been partly fulfilled, partly because of the lack of a policy of preferences in favour of domestic enterprises. See Fabio Erber, "Desenvolvimento tecnológico e intervenção do Estado: un confronto entre a experiencia brasileira e a dos países capitalistas centrais", Revista de Administração Pública, FGV, Rio de Janeiro, 1980.

24/ See Jorge Katz and Bernardo Kosacoff, "Direct foreign investment of Argentine industrial enterprises", 1982 (unpublished).

25/ Progreso Económico y Social de América Latina: el sector externo, Inter-American Development Bank, Report 1982.

26/ In one case, the use of numerically controlled lathes instead of the regular type of lathe led to a reduction of 33% in labour costs. See UNCTAD, Problems and issues concerning the transfer, application and development of technology in the capital goods and industrial machinery sector. The impact of electronics technology on the capital goods and industrial machinery sector: implications for developing countries, TD/B/C.6/AC.7/3, May 1982, p. 12.

27/ See J. Katz, op. cit., p. 15.

28/ See UNCTAD, Problems and issues... The impact of electronics technology..., op. cit., TD/B/C.6/AC.7/3, p. v.

29/ In Brazil, a special commission on the automation of manufacturing has begun to consider the technological, industrial and social aspects of automation in that country. See Data News, 14 June 1983, p. 2.

30/ See ECLA, La microelectrónica y el desarrollo de América Latina: problemas y posibilidades de acción, E/CEPAL/R.317, May 1982, p. 10.

31/ The Venezuelan National Plan for 1981-1985, for example, provides that the purchase of turnkey plants is to be discouraged by not granting public credits or any kind of incentive to projects of this type.

32/ See in this respect, C. Buarque and S. Buarque, "La promoción de tecnologías apropiadas: hacia una política de tecnología de la banca de desarrollo de América Latina", ALIDE, October 1982.

33/ The United Nations Advisory Committee on the Application of Science and Technology to Development recommended in 1970 that expenditure on science and technology should be equivalent to 1% of the GDP; the Regional Programme of Action for Latin America in the 1980s (1981), for its part, recommended that by the end of that decade the proportion of financial resources devoted to scientific and technological research should be double the figure for that year.

34/ An interesting model is that providing for the creation of State enterprises to identify viable industrial applications for the results of the research and development carried out by institutes, universities, etc., and to take part in the establishment of enterprises for exploiting them. See in this respect the experience of the Korea Technology Advancement Corporation (K-TAC) in Young-Ok Ahn, "Interaction of government policy and transnational companies in the development of pharmaceutical industry in Korea", presentation made at the Regional Workshop on Regulating and Negotiating with Transnational Corporations in the Pharmaceutical Industry, Bangkok, December 1983.

35/ See Carlos M. Correa, "Promoción del desarrollo tecnológico en América Latina. Instrumentos tributarios y financieros", Revista del Derecho Comercial y de las Obligaciones, No. 63, Buenos Aires, 1978.

36/ One example of this possibility is the Argentine Commission for the Development of Agricultural Machinery (CODEMA).

37/ In this respect, Decision 103 of the Commission of the Cartagena Agreement provides for special treatment for subregional capital and the possibility of agreeing on differential treatment for other Latin American countries which are not members of the Andean Group.

38/ See UNIDO, International Forum on Technological Progress and Development, Tbilisi, USSR, 10-15 April 1983, Technological progress and development: study of dimensions, problems and possible solutions, ID/WG.389/3, February 1983, p. 5.

39/ In 1982 UNIDO carried out a preliminary study for the establishment of a subregional centre for research and development on biotechnology and genetic engineering aimed mainly at the production of antibiotics. See UNIDO, "Report of the Group of Experts on the appraisal mission" (undated). The arrangements also promoted by UNIDO for the establishment of an international centre for co-operation in genetic engineering and biotechnology are likewise very well advanced.

40/ In August 1983 the Commission of the Cartagena Agreement also adopted Decision 180 by which it decided to set up the Andean Subregional System for the Co-ordination of Technical Standardization, Quality Certification and Metrology Activities.

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