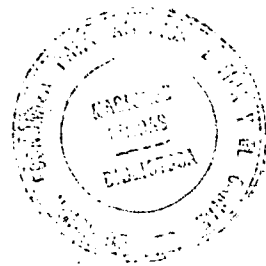


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TECHNICAL CHANGE AND ECONOMIC DEVELOPMENT:
ISSUES FOR A RESEARCH AGENDA

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INTRODUCTION

Past experience seems to indicate that one of the most notable features of economic development is the combination of the know-how of the more advanced societies with economic and social innovations allowing for its adaptation to the specific shortcomings and potentials of the less developed countries. This accounts for the generally accepted fact that the changes which are taking place involve a variety of different essential components, directions and institutions as a reflection of this combination of know-how and innovation. A different view of this phenomenon which leads to the same conclusion is the following: "The variety of experiences of theories of growth attests to the absence of a simple assured route to success. The variety of experiences of growth offers a potentially fertile field for empirical generalizations and suggests the need for growth strategies that adjust to the structures of individual economies".^{1/}

In the mid-1970s, when the rate of increase in the industrialized countries' productivity started to decline, the subject of the incorporation of technical progress and its impact on productivity and growth ^{2/} once again began to come to the fore in both political and academic circles. The way in which the classical and neo-classical schools of thought were dealing with this subject began to be viewed with dissatisfaction in various quarters. These criticisms, which were chiefly based on the ideas of Schumpeter, underscored the complexity of this phenomenon, its dynamic and unbalanced nature, and its connection with the social-institutional environment.^{3/}

Emphasis was placed on the fact that the stepped-up efforts and increased investments that were devoted to promoting the incorporation of technological progress (a higher ratio of R and D Expenditure to GNP and FC Investment in the 1980s in the OECD countries) had had little impact on productivity. This is the "productivity paradox" which professor R. Solow summed up in the following terms: "We see computers everywhere except in the economic statistics".^{4/}

Finally, a systematic analysis was undertaken of the new types of relationships and institutional modalities linking science and technology in the 1980s, and government and business made a greater effort both to support and to base their actions on the trends which had been identified.^{5/} In short, the importance of this subject was recognized, but some degree of uncertainty was still felt as to how to bring about technological changes in a way that would be in keeping with economic policy objectives.

In the 1980s, the achievement of a competitive position at the international level became a prime objective, chiefly in response to the growing presence on international markets of Japan and its South-East Asian disciples and of an ever-wider range of goods and services. The reorganization of production and the incorporation of technological progress came to be regarded as a more and more pressing issue in both the developed and the developing countries, regardless of whether they had market or centrally-planned economies.

The way in which this subject has been addressed in the developed countries and in Latin America is, however, different. In the developed countries, the main motivation has been to maintain a competitive position in the international market. In the Latin America of the 1980s, on the other hand, the need to service the debt has resulted in a shift in the orientation of the production structure towards the generation of a trade surplus, which does not necessarily entail an increase in the region's competitiveness.

When viewed from a medium- and long-term perspective, at the national level being competitive entails the ability to maintain and expand a country's share in international markets, together with a corresponding rise in the population's living standard. This, in turn, calls for an increase in productivity and, hence, the incorporation of technological progress. Past experience at the international level suggests that there is no other reliable means of improving a country's international competitiveness. While it is true that, on the short term, a currency devaluation will improve the relative position of the business enterprises in a country, an attempt to promote competitiveness by making a series of devaluations rather than increasing productivity and stepping up the incorporation of technological progress will eventually erode social cohesiveness, thereby, ultimately jeopardizing the effort to improve the country's international market position.

For an individual business enterprise, it is legitimate to compete in the international market by taking advantage of the availability of low-cost labour and artificially subsidized financial resources, to offset small or even negative profit margins in the external market by making large profits in the protected domestic market, to take advantage of special tax exemptions, etc. In the aggregate, however, if all business enterprises behave in this manner in a situation where the level of domestic demand is low, the country will not be in a good competitive position, even though its trade balance may improve and its export coefficient may rise in the short run. In terms of this narrow concept of competitiveness, however, Latin America could be said to have improved its international competitive position significantly during the 1980s.

On the other hand, in terms of the concept of competitiveness discussed earlier, what has occurred in Latin America during the 1980s (a decrease in per capita income, in investment coefficients, in expenditures on technological research and development and in spending on education and the erosion of real wages) would not warrant such a description of recent trends in the region as corresponding to an improvement in its competitive position.

The international market is not only an arena in which various business enterprises compete with one another; it is also a setting for encounters between different production systems, institutional schemes and social organizations in which business enterprises figure prominently but are nonetheless only one component of a network that links them with the educational system, the technological infrastructure, management/labour relations, the relationships between the public and private sectors and the financial system. It is important to underscore the fact that the debate on competitiveness in the developed countries is taking place within a framework formed by institutions which have established a legitimate position for themselves through the achievement of a relatively high degree of social

cohesiveness, by consumption patterns and a pool of technological know-how which have become widespread and fairly uniform, and by an international market position in which the manufacturing sector plays a pivotal role.

In the first section of this paper, a comparative analysis is undertaken of Latin America and semi-industrialized countries in other areas of the world. Attention is drawn to the specific features of Latin America as regards its lack of a strong predisposition towards the incorporation of technological progress and its dubious achievements in relation to growth, equity and competitiveness. In the second section, a similar type of comparative analysis is applied to the leading countries. Finally, in the third section, a number of questions are raised which call for additional study and which are viewed as relevant to the design of policies aimed at augmenting the technological capabilities of Latin American enterprise.

I. CHARACTERISTICS SPECIFIC TO LATIN AMERICA: FROM THE
"EMPTY BOX" TO THE "BLACK BOX"

1. The "empty box" in Latin America

Under an exceptionally wide range of circumstances, the governments of Latin America, like those in the rest of the world, regard growth and equity as being among their chief development objectives. To what extent have the countries of the region achieved either or both of these objectives in the course of their development?

For the purposes of this discussion, the growth rate of the advanced countries during the past two decades (2.4% annually of per capita GDP between 1965 and 1985) will be taken as a standard of growth, and equity will be defined in terms of the ratio between the incomes of the bottom 40% and the top 10% of the population on the income scale (in the advanced countries during the late 1970s and early 1980s this ratio has averaged 0.8, i.e., the bottom 40% of the population in this respect have an income equivalent to 80% of that of the top 10%).

Again, for our purposes here, the dividing line between the most equitable and least equitable countries in Latin America will be drawn on the basis of this ratio, but at a level of 0.4; this is tantamount to setting an "equity" target equivalent to half of that existing, on average, in the industrialized countries. If we cross-reference these two variables --growth and equity-- and use the average growth rate of the advanced countries in the period 1965-1985 as the dividing line for the growth variable and use the above-mentioned ratio between the bottom 40% and the top 10% of the population in terms of income as the dividing line for the equity variable, we then see (table 1) that the resulting matrix contains an empty box, which would correspond to countries having both a faster growth rate than that of the advanced countries and a higher level of equity (in terms of the reduced scale of one-half the average level of the developed countries). This empty box represents a key question in terms of the subjects under discussion here.

Approximately 66% of the regional gross domestic product is generated by countries which could be described as having fast growth rates but which also suffer from disarticulation (Brazil, Colombia, Dominican Republic, Ecuador, Mexico, Panama and Paraguay); 13% of the regional GDP is accounted for by countries at the other extreme, i.e., countries which could be characterized as being integrated or articulated but whose economies are stagnant (Argentina and Uruguay); and the remaining 21% of this product corresponds to countries exhibiting both disarticulation and stagnation.

The placement of the countries in the various boxes is, of course, determined by what level we define as being the "watershed". For example, if the cut-off point for the equity variable were to be shifted slightly downward, then countries such as Costa Rica, Chile and Venezuela would be included in the upper right-hand box; and if the growth-rate dividing line were to be moved upward, then the number of countries categorized as being fast-growing would

decline, with only such countries as Brazil, Mexico, Ecuador and Colombia remaining in that category. As regards the blank box, it is to be supposed that it could only be filled by countries whose development process had moved forward.

Another sort of interpretation which might, perhaps, be more reassuring would be to assume that there is a trade-off between growth and equity and that, accordingly, in order for a country to move up into this empty box, what it would have to do is to raise its level of development. Under this assumption, the "problem of the empty box" would eventually be resolved with the passage of time. Nevertheless, there are quite a few developing and semi-industrialized countries in other parts of the world which exhibit a combination of the levels of growth and equity that represent the "empty box" in the case of Latin America (China, Sri Lanka, Indonesia, Egypt, Thailand, Hungary, Portugal, Yugoslavia, South Korea, Israel, Hong Kong and Spain) (see table 2). Indeed, these countries account for a total of 73% of the GDP and 58% of the population of the developing countries that were taken into consideration.^{6/}

This group of countries ranges over the entire spectrum in terms of inward- and outward-oriented nations.^{7/} The same degree of diversity is to be observed in respect of the relative significance of the public sector as well.^{8/} The share of GDP accounted for by agriculture is comparable in the two groups of countries, as is the level of the per capita product. Some of these countries are similar to Latin America in that their position in international markets is based on their natural resources (Indonesia, Thailand, China and Egypt); the rest, because they do not have a large amount of natural resources upon which to draw, have had no alternative but to attempt to secure a place for themselves in the international market by means of industrialization (South Korea, Spain, Hungary, Israel, Portugal and Yugoslavia).

2. Latin America versus "growth-with-equity industrializing countries (GEICs)

As a first step in arriving at an understanding of the process of incorporating technological progress which goes along with changes in agricultural activity, industrialization and the establishment of a position in the international market, the comparative analysis which follows will not include those countries in other parts of the world in the GEIC category which have a low level of industrialization, this being defined as under 20% (Egypt, Indonesia and Sri Lanka), which lack a significant agricultural sector (Hong Kong) or whose geopolitical position is highly unusual (Israel). The remaining group of countries will be referred to as "growth-with-equity industrializing countries" (GEICs).

The unsatisfactory nature of the economic performance of Latin America and the sharp contrast between it and that of "latecomers" in other regions of the world provide the basis for this concept of GEICs. The idea of NICs, on the other hand, arose in the 1970s as a reflection of the growing concern with

which the OECD countries viewed the erosion of their competitive position in the international market. The comparisons made below will focus on the contrast between Latin America and the GEICs and will include some specific references to the three largest countries of the region (Argentina, Brazil and Mexico, or ABMEX).

Both groups of countries (Latin America and the GEICs) include a wide range of different situations. It nonetheless appears to be possible to identify various types of significant contrasts in addition to those relating to growth and equity which were mentioned earlier (i.e., a growth rate of 1.3% of per capita GDP for the period 1965-1986 and a ratio of 0.3 between the bottom 40% and top 10% of the population in terms of income for Latin America versus a growth rate of 4.0% and an equity index of 0.62 for the GEICs) (see tables 3 and 4).

The major differences from both a theoretical and an empirical standpoint⁹ between the two are the following:

a) Latin America exhibits a markedly lower domestic saving effort (gross domestic saving/GNP of 16% versus 28%), along with higher levels of external borrowing and direct foreign investment (debt/GDP of 79% versus 38%, and direct investment over GDP of 10.9% versus 3.0%);

b) The growth rate of the population is higher in Latin America (2.5% versus 1.4%);

c) The share of the GDP accounted for by the manufacturing sector is lower in Latin America (19.4% versus 33.1%), even though the share accounted for by the agricultural sector is similar in the two groups;

d) The relative significance of the industrial sectors which typically play an important role in technological progress (the chemical and the metalmanufactures and machinery industries) is considerably less in Latin America than in the GEICs (16.9 versus 31.4%, respectively);

e) The performance of the industrial sector during the 1980s has been much poorer in Latin America (if 1980 = 100, then the gross value of industrial output yielded a coefficient of 98.6 in 1986 for Latin America and of 127 for the GEICs). This is particularly significant in view of the fact that this was a period during which the technological modernization of industry proceeded at a very rapid pace at the international level;

f) Latin America's coefficient of exports of manufactures was lower (10% versus 18%), as was its overall coefficient for total goods and services (21% versus 28%);

g) The level of international competitiveness, as measured by the quotient between exports and imports of manufactures was lower in Latin America (0.3 versus 0.8).

3. Differences in development patterns

In sum, as compared to the GEICs, Latin America's economy is organized in such a way that it is less equitable, shows less financial restraint, and has a lower level of domestic savings and which, despite the greater contribution by external savings, is therefore less dynamic; this, in turn, inhibits the incorporation of technological progress (which is influenced by all the differences identified above) and international competitiveness. A graphic illustration of these four dimensions (equity, austerity, growth and competitiveness) is given in figure 1.

If, rather than considering Latin America as a whole, attention is focused on the three largest countries --Argentina, Brazil and Mexico (ABMEX)-- it may be seen that the difference between these two groups of countries as regards equity remains the same, while the contrasts between the two in relation to domestic savings, growth and competitiveness are less sharp. It will be observed that the GEICs exhibit greater equity, financial restraint, growth and competitiveness than the countries of Latin America as a whole. In order to provide a clear illustration of this contrast, one of the GEICs, South Korea, was compared to the three largest countries in Latin America (see figure 2). The outcome of this comparison was that, regardless of the specific features of the individual Latin American countries, all of them had lower levels of equity, financial restraint, growth and competitiveness than South Korea.

4. Preliminary hypotheses concerning the specific characteristics of Latin America

In the following discussion, a number of hypotheses are outlined in a simplified form; additional theoretical and empirical research will clearly have to be carried out with respect to these hypotheses. The main thrust of this analysis is to demonstrate the need to link the subject of technological change with the complex process of economic and social change in which these sources, institutions and policies are closely interrelated.

A total of 89% of the economic activity (GDP) of Latin America is accounted for by countries whose level of equity is less than half that prevailing in the advanced countries. Various studies conducted at the international level,^{10/} as well as the experience of Latin America,^{11/} support the hypothesis that there is a clear cause-and-effect relationship between the structural transformation of agriculture and an improvement in income distribution. As will be indicated later on in this discussion, income distribution plays an important role in shaping the system of production and, consequently, in determining an economy's ability to absorb and generate technological progress and its position in the international market.

As is also the case with mean income levels, equity (along with what it represents in terms of social articulation) tends to give rise to a relatively more restrained consumption pattern than that which is usually found in situations where the concentration of income is high, inasmuch as it hinders

the higher-income sectors from engaging in an exaggerated imitation of the consumption patterns associated with the more advanced societies.

In addition to the fact that a more restrained consumption pattern makes more resources available for investment, the hypothesis could be advanced (although it would be very difficult to corroborate empirically) that a relationship may exist between the lavishness of a given consumption pattern and the capital/product ratio; on the basis of this hypothesis it might be supposed that the productivity of investment would be higher in societies whose consumption pattern is relatively more restrained in the sense that it involves a lower proportion of consumer durables and less use of energy and foreign exchange.

In such countries, the capital/product ratio would tend to be lower than in those where an attempt is made to maintain a consumption pattern characterized by a high proportion of consumer durables, heavy consumption of energy and a physical communications and transport infrastructure capable of supporting such a pattern in a large and sparsely populated country having an abundant supply of capital.

Growth makes it possible to incorporate new generations of equipment and products, thereby raising productivity and thus reinforcing a country's international competitive position. An initial broadening of the domestic market through the introduction of a growing variety of goods and services, which is associated with growth and promoted by equity and financial restraint, is the only feasible basis for the industrial/technological learning process that is necessary in order to expand a country's share in the international market. This "virtuous circle" between growth and competitiveness (in which the need for equity, financial restraint and the accumulation of technological know-how are often overlooked) is one of the pivotal elements in successful cases of "industrialization".

In Latin America --precisely because of its shortcomings in respect of equity and financial restraint and because of the "frivolous" nature of protectionism-- growth and competitiveness have increased by fits and starts which do not correspond to the cyclical growth trends of the industrialized societies. In the latter case, these variations follow a generally upward trend in the incorporation of technological progress, whereas in Latin America these fluctuations reflect the consequences of the weakness of some of the links in this chain which have already been mentioned, links that are necessary in order for this type of "virtuous circle" to function.

An internationally competitive industrial system, given a social context in which a certain minimum threshold of equity (agrarian transformation) has been passed, may tend to promote equity in the country concerned by means of, at the least, the following phenomena: a relatively broader distribution of ownership, which is associated with the creation of small and medium-scale enterprises; a wide range of manpower skills; a more rapid increase in employment, associated with the dynamism of the international markets; a rise in productivity and wages; the operation of the educational system on a broader and more integrated social basis as a precondition for the maintenance of a competitive position in the international markets; and, finally, the

dissemination of an industrial logic, through both formal and informal channels, to society as a whole, which will make it more receptive to technological progress. This factor, will, in its turn, contribute to an increase in productivity and, by the same token, to the sharing-out of the benefits of technical progress on a more equitable basis in the society as a whole.

However, these things do not necessarily occur in cases where competitiveness is achieved at the expense of the wages paid to labour and where the resources that have initially been generated are used for consumption or are sent out of the country rather than being channeled, via investment, towards the incorporation of technological progress. This is a spurious and ephemeral type of competitiveness which should not be confused at either a theoretical or historical level with the type of competitiveness described earlier.

Equity, then, appears to be conducive to growth both directly, by leading to a consumption pattern in keeping with a higher rate and more efficient form of investment, and indirectly, by creating a social environment that is compatible with an effort to "build the future", inasmuch as such an effort requires that both elite groups and the system have a rightful claim to legitimacy so that society as a whole will be willing to take the types of actions and decisions that will lead to growth.

Growth, in its turn, tends to help the society function more flexibly, and, by the same token, to make any lags in distribution more bearable in situations of economic stagnation. This does not mean that growth per se results in equity (something which has been disproved time and again in both Latin America and other regions); what it does mean, however, is that if the growth process is proceeding on the basis of a competitive industrial pattern, then delays in achieving an increase in equity will not necessarily result in social conflicts in so far as there is a general feeling that the situation will be better in the future than it is at the time in question.

A competitive industrial sector which is confronted with a faster growing demand than that of the rest of the sectors of production makes a positive contribution to growth. Experience shows that international trade in manufactures is expanding at a faster pace than world trade as a whole, and this difference is even greater in the case of the product lines representing a greater degree of technological innovation (during the past four decades, most of these product lines have corresponded to the metalmanufactures and machinery and the chemical industries).

At a more disaggregated level, the leading product lines in terms of international trade and technological progress are continually changing. Consequently, the ability of the countries to gain a solid foothold in international markets is heavily influenced by their ability to keep up with international technological trends and their opportunities for doing so.

As this aptitude is developed, a greater feedback effect on growth is produced via modifications in relative prices, a rise in productivity and the expansion of the domestic market. While it is true that competitiveness

reinforces growth, its contribution is much greater when productivity is high in product lines having a greater technological content and, as will be discussed later on, when business enterprises and their technological support infrastructure make a part of the pool of resources available to the country in question.

This does not mean that a contribution may not be made by product lines having little technological content or by those developed by foreign enterprises; what it does do, however, is to stress the importance of the relationship between production sectors, business enterprises and types of markets; a more in-depth analysis of this relationship is essential if we are to gain a better understanding of the progress of technological innovation. The fact that the conventional macroeconomy sidesteps this linkage (sectors, enterprises, markets) makes it less able to "grasp" the core elements of the dynamics of technological progress.

5. The "black box" of technological progress

As a first step in exploring the reasons why this "empty box" exists, it may be interesting to compare the relative position of Latin America in the international economy in various different spheres of economic activity. Such a comparison (see table 5) clearly brings out a fact which may provide an initial and basic research "clue" and which will be interpreted in these terms throughout the rest of this paper: the region makes a greater contribution in terms of population than in terms of any other indicator of economic activity. More precisely, there appears to be a clear tendency for the region's share to decline as one moves up the list of indicators relating to activities with an increasing level of intellectual value added: the region's share is 8% in terms of population, 7% in terms of gross domestic product, 6% in respect of manufacturing output; its share plunges to 3% when one focuses on the capital goods subsector within industry and is only 2.4% as regards the regional share of engineers and scientists. If we then look at manufactured exports or at the resources available to these engineers and scientists as they go about their work, the region's share drops to 1.8% while, finally, in relation to the presence of scientific writers (making full allowance for the unreliability of this type of indicator), Latin America accounts for just slightly more than 1%. A comparison of Brazil, which is the technological leader in the region, with some of the GEICs provides further evidence of the existence of the "black box" syndrome.

6. Intersectoral relationships and the "black box"

It is important to emphasize, first of all, that innovation and technological development are not phenomena that are represented to a similar extent by all the various components of production activity. Innovative efforts are mainly to be noted within the manufacturing sector. Despite the fact that this sector accounts for between one-fourth and one-third of the gross domestic product, in most industrialized countries it frequently absorbs more than 90% of the

resources devoted to research and development; in other words, the presence of innovative technical efforts and technology in the manufacturing sector is three or four times greater than that exhibited by economic activity on average.

Within the manufacturing sector, technological effort is concentrated within certain industries. It has been found that the chemical industry together with the industrial branch which, in generic terms, is known as "engineering products" (metal manufactures and machinery, which include capital goods and transport equipment, plus household appliances, primarily) are the object of 80% of research and development efforts, even though they account for less than 40% of total manufacturing activity.

Consequently, the "technological density" of the engineering products and chemical industries is twice that of the manufacturing sector as a whole and is a full six times greater than that of production activity overall. The industrial branches which are particularly intensive in terms of technological progress also have at least three other important characteristics. Firstly, these industries have grown the most rapidly during the postwar period in various types of countries having differing levels of development. Secondly, they are the most dynamic industries in international trade, i.e., these "technological progress-intensive" industries account for a growing proportion of industrial output and international trade. Thirdly, the process known as the internationalization of production has also been the most dynamic in these industries. The Latin American countries have trade deficits in all of these industries. This fact provides a graphic illustration of just exactly what the "black box" of technological progress really means (65% or more of the region's manufacturing deficit is attributable to these industries).

This combination of the "empty box" and the "black box" is manifested in an array of traits which are shared by the various countries of the region: a) a position in the international market based almost entirely on the trade surplus generated by natural-resource sectors --agriculture, energy and mining-- together with a consistent trade deficit in the manufacturing sector (with the exception of Brazil from 1982 onward and of Mexico from 1986 onward; in both cases, this was accompanied by a contraction of the domestic market); b) an industrial structure whose makeup and forward progress are chiefly oriented towards the respective domestic markets; c) a low social value is placed on entrepreneurship and the national public and private business leadership is weak in those sectors whose growth and technology shape the industrial profile of each of the countries; d) a desire to imitate the lifestyle of the advanced countries, both in terms of consumption and, to varying extents, as regards domestic production, without due consideration for the need to make sure that some groups are not excluded from society, much less that of safeguarding the country's international competitive position.

These four shared traits are linked to and reinforce one another. That is why it is difficult to picture the presence of "showcase modernity" and a systematic orientation towards the domestic market unaccompanied by a weak national business leadership and vice versa. The combination of these three factors explains why, after a number of decades of industrialization, the region's position in the international market continues to be based on natural

resources. The availability of these natural resources, in its turn, influences the type of industrialization which is pursued.

In those societies having an abundant natural resource base, which generally gives rise to a heavy concentration of property in either the private or public sector, the business leadership tends to rely on the use of profits from these natural resources, and there may be a tendency for class-based societies and wealth-oriented States to form.

Given the existence of a certain tendency towards mimicry within society, i.e., a tendency for the values expressed by the leaders to spread and be imitated throughout society, in societies where the above-mentioned type of leadership prevails, this rent seeking world view may tend to penetrate into and spread through various spheres of the public sector, the private sector and a wide range of institutions that help them to function (political parties, the armed forces, trade and labour unions, professional associations, the bureaucracy). The specific manifestations of this dissemination of rent-seeking values (parochialism, an emphasis on the short term, an aversion to risk and to technological innovation, stress on the usefulness to the individual of given activities rather than on institutional roles) seen at various levels and in various types of behaviour falls outside the scope of this paper; nonetheless, this is a subject which warrants further investigation, particularly in respect to Latin America, where this type of situation would appear to be of greater significance than had previously been thought. The process of urbanization, industrialization and institutional modernization may have caused the significance of what might be referred to as a latent rent-seeking mentality to be underestimated.

The presence of a national entrepreneurial base is undoubtedly a highly important factor in determining the possibilities of building up an internationally competitive industrial system. This is not a prime requirement for supplying the domestic market; indeed, the leadership of the most dynamic sectors may shift to transnational corporations which can easily adapt their behaviour to suit these market conditions. However, in order to win a foothold in international markets (which requires the incorporation of technological progress and innovation in order for a country to maintain a solid position by the only reliable means of doing so (i.e., adding intellectual value to natural resources or to available unskilled manpower), the existence of a national entrepreneurial base, together with various possibilities and ways of linking this up with foreign investment, will be a crucial factor.

It is futile to ignore the existence of a certain type of consumption pattern which has captured the "collective imagination" of the populations of the countries in the region, including the inhabitants of rural zones (a wide variety of examples corroborating this may be found at the national and even the continental level). Acknowledging this reality does not, however, free us from the obligation to try to make the absorption of this "modernity" as expressed in access to goods and services compatible with the domestic needs for growth and economic and social integration.

The differences to be noted from one country to another are not due to the fact that some choose this consumption pattern while others opt for a different

and apparently non-existent one, but rather to differences in the speed and means by which this consumption pattern (which would appear to be a single and dominant consumption style) is internalized in each given instance in each one of these societies. In the case of Latin America, the imitation and absorption of this seemingly universal "modern" consumption pattern would appear to have taken place without even a basic minimum of consideration being given to internal needs for economic and social integration and for the creation of the conditions necessary for the maintenance of a solid position in the international market; moreover, the pattern seems to have been adopted at a time when the corresponding countries' mean income levels were far lower than those prevailing at the time of their adoption in the societies where these models originated.

7. The pathology and "les trente glorieuses"

It is quite clear to historians that in order to understand a region like Latin America it is absolutely essential to know about more than just Latin America. However, while this may seem to be a fairly obvious fact, it has sometimes been ignored by the methodological approaches taken to the subject of development in the region.

The acknowledgement of this shortcoming, which is associated with what we have called the "empty box", is entirely compatible with a recognition of the sweeping changes that have taken place in the Latin American economy and society during the past 30 years. This period is what A. Hirschman has referred to as "les trente glorieuses" of Latin America.^{12/} During this period (1950-1981) the product grew fivefold, the population grew from 155 million to nearly 400 million, and a very rapid urbanization process took place. As a result of this process, a number of the countries in the region which had more than half of their population in agriculture in 1950 saw this proportion drop to between one-fourth and one-third; in these countries, education and health services improved significantly, and institutions were created which helped to promote the economic, social, political and cultural integration of the region. Furthermore, the foundations were laid for technological development in major areas linked to agriculture, public works and energy, and the life expectancy in these areas rose significantly in all the countries of the region.

The world has grown and changed in economic, social, political and cultural terms since the end of the Second World War at a pace without precedent in human history. Many of these changes have taken place in Latin America as well. An awareness of the positive changes which have occurred in the region should not, however, be seen as a cause for the complacency often displayed by countries which have played a leadership role at the international level for a number of decades, as will be discussed in the following chapter.

II. THE LEADING COUNTRIES: INSTITUTIONAL PLURALISM AND THE "BLACK BOX"

1. Why look at the situation of the industrialized countries?

We must, if only for the following reasons: firstly, the leading countries (USA, Japan and FRG) determine the economic and technological environment in which Latin America and the GEIC'S operate; secondly, having resolved the syndrome of the "black box" and the "empty box" through various institutional and political instruments, their experience constitutes a necessary, though in itself insufficient, source of inspiration for regional analysis; thirdly, each one of them embodies a certain model of development which exercises a "cultural" influence on neighbouring countries: Japan in Asia, the FRG in Europe and the United States in the rest of the world, but particularly in Latin America. The GEICs are to be found in Asia and Europe; and, fourthly, it would be useful to verify whether the relationships identified in the preceding section exist in the industrialized countries.

2. Different approaches to the "black box" syndrome?

Taken together the population of these three countries represents approximately 9% of the world total and is equal to that of Latin America. However, these three countries account for almost half of the resources allocated to research and development worldwide and almost three-quarters of the resources which the OECD countries earmark for this purpose. In other words, the per capita availability of resources for research and development in these countries is approximately five times the world average.

Roughly 40% of the world's economic and industrial activity takes place in these countries. The main reason for comparing and contrasting the situation of these countries and evaluating them together, is that, for the reasons mentioned before, the performance of these countries shapes the profile and determines the main features of the world industrial system.

Independently of current strains in their trading relations, to a large extent these three countries define the type of product, process, manufacturing techniques, institutional arrangements and accessibility, to which other countries could aspire as they develop their expertise in the various industrial sectors.

A number of significant differences exist between the United States, on the one hand, and Japan and West Germany, on the other (table 6). It is well known, for example, that the United States has a very high density of scientific production in relation to its population and in comparison with that of the other two countries. However, in strong contrast with this solid base of scientific production, the relative strength of Japan and West Germany in the industrial sector is much greater than that of the United States. Taken together, the manufacturing output of Japan and West Germany is already almost

20% greater than that of the United States even though the combined population of these two countries is 20% less than that of the United States.

While Japan and West Germany demonstrate a notable aptitude for transforming knowledge into highly competitive industrial production, the United States exhibits a relative disproportion between its available knowledge base and its relatively weak industrial performance. This is due, in some measure, to the asymmetry in defence expenditure, an issue to which reference will be made further more. These same figures illustrate a particular characteristic of Japan, i.e., its high density of engineers and scientists (if we were to examine the relative positions in terms of density of lawyers, the United States would lead the table: 13/ 279 per 100 000 inhabitants as against 77 in the FRG and 11 in Japan).

3. The possession of natural resources - a key factor

Some of the main differences in the insertion of the various countries in international trade are as follows (table 7): first of all, there is sharp contrast between Japan and West Germany, on the one hand, whose deficit in all sectors of natural resources is a structural characteristic indicative of a fragile base in this area and, on the other hand, the situation of the United States, which, at least in the agricultural sector, posts a large and, up to the early 1980s, growing surplus; for Japan and West Germany there is no alternative source of generation of the resources needed to acquire the natural resources which they lack other than achieving a solid insertion in world manufacturing trade. In contrast, the generous endowment of resources and the continental scale of the United States leads it to conceive of international trade as a strictly complementary and marginal element. Moreover, in the case of a continental economy such as that of the United States, the concern for establishing priorities among the sectors is largely irrelevant, and a neutral non-selective approach is adopted towards the various sectors. There is a perception in that country --accentuated by the preeminent position it has enjoyed over the past forty years-- that its principal market is the domestic one and that while the performance of the various sectors may vary over time, at least up to the late 1970s, its overall situation appeared, to be one of almost absolute invulnerability. Various indications exist in the economic, political and academic fields, which confirm the perception of an approach that is centred mainly on the domestic situation.^{14/}

4. The test of competitiveness

Seven alternative indicators of the international competitiveness of these three countries have been defined (table 8). Perhaps the most interesting conclusion is that for all these indicators the relative positions of the countries remain unchanged: in first place Japan, with the Federal Republic of Germany second and the United States third.



As regards the first indicator, one notes that research and development activity for non-military purposes is significantly higher in Japan and in the Federal Republic of Germany than in the United States; this has been mentioned in various studies as a possible factor to explain the different rate of increase in the competitiveness of the three countries. The next indicator relates to growth in industrial exports in the three countries over the last two decades. The third is related to the share of high technology products in total exports. The fourth indicator measures the evolution, for engineering products, of the relative importance of the exports of each one of the countries in world exports in the period 1963-1986. The fifth measures the ratio between exports and imports of these goods for the same period.

As regards the increase in productivity in the manufacturing sector, a key factor in the long-term evolution of the competitiveness of the various countries, it may be observed that in the three countries under consideration there has been a quite significant decline during the period 1965-1973 and during the remaining years of the decade of the 70s up to 1981; however, the sharpest decline occurred in the country which had the slowest growth rate in the previous period: the United States; the decline has been somewhat less in the Federal Republic of Germany and significantly less in the case of Japan. In the 1980s, however, the United States has been experiencing a substantial increase in productivity in the manufacturing sector, surpassing the rate of increase of the FRG.

The final indicator, which is the one used in the comparison graph, is the ratio between exports and imports of manufactures for the year 1986.

5. Are there consumption-oriented countries?

It is useful to compare and contrast the role of consumption and investment in each one of these three countries. A set of indicators have been defined which permit an assessment to be made at the macro and micro levels of the relative weights of consumption and investment, which would reflect the implicit relative importance of the "present" as opposed to the "future", in each of these countries. This set of indicators clearly shows that in the United States consumption would have greater relative weight, with Japan at the other extreme and the Federal Republic of Germany in between. This order remains true, without exception, for the entire series of indicators selected (table 9).

6. The emergence of different national models

It would be useful to compare the relationships that exist between, on the one hand, the objectives of growth and equity and, on the other, two of the factors which have been given special attention: the degree of international competitiveness of the industrial sector and the pattern of consumption (figure 3).

If one accepts the idea that the shared objectives of the various countries in question are growth and equity, it will be seen that the Japanese model "will be superior" to the models of the Federal Republic of Germany and the United States respectively, and that the model of the Federal Republic of Germany would be "superior" to that of the United States (the meaning of "superiority" would correspond to greater success in the achievement of both objectives).

This suggests that there is no trade-off between the two objectives, which runs counter to one of the basic premises of conventional wisdom on these matters. This convergence is associated, however, with the presence of certain patterns of behaviour and international competitiveness: the "superiority" of Japan over the other two countries as regards growth and equity is accompanied by greater austerity and international competitiveness, which suggests that --in keeping with the reasoning put forward in the previous section-- austerity and competitiveness actually promote the convergence of the two objectives. With regard to competitiveness, one notes that the absence of natural resources has a positive impact on the greater competitiveness of the industrial sector, which in turn helps to promote both growth and equity.

While sporadic growth may occur in a context of inequity and over-consumption, solid growth would seem to simultaneously require --this is the message of this model-- competitiveness and austerity, which is closely related to equity. Growth would need to be conceived of as the main objective and equity as a by-product of growth (an idea rooted in Latin American thinking for decades, which to date has had no empirical confirmation). This means ignoring the impact which inequity has on consumption patterns and, consequently, overlooking the possibility of social tensions, and of a scarcity of investment resources, as a consequence of over-consumption. Even when the level of competitiveness is high, such growth as is achieved is fragile and sporadic.

The case of the Federal Republic of Germany represents a balance between, on the one hand, a high degree of opening up to international trade, higher than that of Japan and the United States, and at the same time, a high level of domestic social concertation, accompanied, moreover, by a role of the State in economic matters that is markedly greater than in the other two cases.

If one compares the relative weight of public expenditure in Japan and the United States and the role which public enterprises play in the industrial production of the two countries, one may conclude that the two roles are similar. In both cases it may be said that participation is low and significantly lower than in the industrialized countries of Europe as a whole and in the Federal Republic of Germany in particular.

However, attention should be drawn to the fact that this apparent institutional similarity conceals fundamental differences of approach to the use of public sector instruments. Moreover, it would be possible to say that the industrialization pattern in Japan shares many common elements with that of the Federal Republic of Germany; nevertheless, in the latter country, the relative weight of the public sector is markedly greater.

It is clear from the above that, if one seeks a greater understanding of the role of the State in the process of industrialization, it would be totally inadequate to limit oneself to aggregate magnitudes. The special and almost symbiotic relationship that exists between the State and large entrepreneurial groups in Japan makes it quite unnecessary for the State to participate directly in production. This does not mean that the State's quantitatively low profile is comparable to that which exists, for example, in the United States, where the lack of co-ordination between the public and private sectors accompanies the low profile of the State.^{15/} Inversely, in the case of West Germany, the relationship between the public sector, financial intermediation and the industrial sector, is substantially the same as in Japan, notwithstanding the fact that in the former case the scope of the public presence in the productive sector is quantitatively greater.^{16/}

An additional quantitative indication of the above is the relative size of the public deficit. In both the United States and Japan over the last few years the relative weight of the deficit has been approximately 5% of the national product. The fundamental difference lies, however, in that while in the United States this deficit is practically equivalent to the total amount of net private savings, in the case of Japan this ratio is only 35%. In other words, the weight of the public sector is similar, the public sector deficit is similar, but the significance of this deficit is notably different in the two cases, in so far as in the case of Japan it represents only one-third of net private savings, while in the case of the United States it absorbs almost the entire amount.^{17/}

These elements mark the basic difference not between different currents of macroeconomic thought, but rather between a prosperous country which looks down on the world from its position of pre-eminence and a powerful challenger, with a history not exempt from trauma and with the will to realize its perceived destiny. The difference between a continental economy, whose language, currency and lifestyle have since the second world war become worldwide references and a small island territory of which the principal asset is its population governed by a leadership whose domestic legitimacy is linked to the recovery of national dignity, one of whose manifestations has been the conquest of the international markets.

7. The precarious position of the major powers in world trade in manufactures

If we examine closely the relationship between defence expenditure (as a percentage of gross domestic product) and international competitiveness in the industrial sector (surplus or deficit in the manufacturing sector in relation to manufacturing output), it would be seen (figure 4) that there is an inverse relationship with the USSR, China, the United States and England, at one extreme, and the Federal Republic of Germany and Japan, on the other, with France, Sweden and Italy occupying the intermediate positions. Contrary to conventional wisdom, the multiplier effect of defence spending on international industrial competitiveness would be negative.

This fact --which is part of an unresolved controversy about the impact of research and technological development on the military sector, as a collateral effect for the industrial sector-- would be a further argument in support of the idea that these are spheres in which, at least for given periods, low levels of international competitiveness in tradeable goods may coexist with extremely high levels of competitiveness in the military sphere. The fact that these are activities whose challenges, procedures, periods and forms of organization differ radically may have some influence on this.

In the military sphere, where it is necessary to define objectives and goals rather than to determine time-frames, economic restrictions play a considerably less important role. The possibility of long-term programming in this sphere does not exist in the area of industrial trade, in which the most important element is flexibility and the capacity to rapidly adapt to changing trends in international trade. Moreover, the intensification of competition in the field of industrial trade is not occurring at the same rate and over the same periods as in the military sphere. The replacement of successive generations of "products" and the "differentiation" within each generation is, fortunately, not determined by the test of its performance. The military sphere is able to attract the most noted talents in science and technology, by offering them conditions of tranquility, resources and the absence of demands for immediate results over short periods of time, quite apart from the fact that remuneration in this sphere is not subject to the implacable dynamic of the market.

All of these factors combine to create a situation in which a group of countries, which have channelled substantial resources into the military sphere, exhibit great precariousness in their international industrial competitiveness in conventional products, while another group which channels virtually no resources into military spending, are the leaders in industrial competitiveness in these products.

In the case of some Latin American countries, high defence expenditures are accompanied by low international competitiveness in the industrial sector, but the difference lies in that there is no local expenditure on research and technological development in related areas. There, the hypothetical positive long-term multiplier effect which defence expenditure would generate on the industrial sector does not materialize.

III. ELEMENTS OF A RESEARCH PROGRAMME

A consensus exists that technological change plays a key role in economic development. The complexity of the relationship between these two factors is, however, acknowledged. The lack of an adequate understanding of this link is reflected in the perplexity which is frequently encountered when attempts are made to bring about technological change in a direction that is consonant with the objectives of economic policy. In the case of the industrialized countries:18/

"An increased emphasis on the contribution of technology to industrial performance has been the counterpart to the generalization and deregulation of industrial policies. OECD governments are becoming more aggressive in the field of high technology as evidenced by greater funding to research and development, support for high-technology ventures and schemes for encouraging technology diffusion. Funding for basic and applied research, the encouragement of collaborative research activities and technology transfer schemes are part of new government attempts at longer-range industrial policy approaches. Government interest in high technology sectors stems from their specific contributions to restructuring, job creation and improved balance of payments as well as the key role these industries play in the modernization of other sectors. There is some fear that government aid to high technology sectors such as electronics, telecommunications and aerospace will conflict with the adoption of more industry-neutral policy measures, replacing aid to additional sectors and entailing the same risks of economic distortions".

In Latin America, faced with the considerable burden of "pending matters" described in the previous chapter, a broad consensus seems to have emerged on the high priority that should be attached to the strengthening of the capacity for technological innovation in the entrepreneurial sphere and the consequent enhancing of its international competitiveness. When an attempt is made, however, to translate this favourable disposition into concrete policies, numerous questions arise on the impact of macroeconomic policies, the effectiveness of specific policies designed to support technological innovation, obstacles of a structural nature, the institutional/cultural context and the influence of the international environment.

The literature on development plans and programmes generally points to the fragility of the entrepreneurial sector, thereafter adopting the implicit hypothesis that this situation must be overcome and that the objectives set could be achieved. In other studies, attention is focused on analysing the virtues and defects of the public and private enterprise, but fail to adequately cover the crucial question of the forms of linkages between the two types of enterprises and their impact on technological innovation.

In the literature on short-term macroeconomic adjustment, the technological dimension is overlooked, although policy recommendations are made which certainly affect the technological performance of enterprises (relative prices and the functioning of the various markets). The microeconomic studies on technological innovation deal mainly with a few branches of the

manufacturing industry and some internal aspects of enterprises, particularly in the economic evaluation of decisions in the sphere of product engineering, processing and manufacture. Finally, a considerable effort has been made to evaluate the functioning of national science and technology systems and of the explicit instruments that promote technological development.

As a contribution to the preparation of a research programme, a number of questions are raised about which tentative hypotheses exist, including those advanced in preceding chapters, but for which systematic empirical evidence is inadequate.

Let us examine some of the questions relating to modality and sequence:

a) Impact of macroeconomic policies. What effect does the degree, modality and sequence of the process of opening up the economy in the areas of trade and finance have on entrepreneurial technological innovation and on international competitiveness? How does one reconcile the need to maintain macroeconomic balances with the financial requirements imposed by the necessity of introducing technological innovations into existing plant and into the expansion of capacity in given sectors? What is the impact of the composition of public expenditure and of the tax system on entrepreneurial technological innovation and on international competitiveness?

b) Direct support for technological innovation. What is the most appropriate combination between the dissemination of mature technologies, an area in which the region lags considerably behind, and the incorporation of the leading-edge technologies of the emerging technological pattern? What is the role of the State in the development of entrepreneurial technological capacity? What are the most effective financial mechanisms for promoting technological innovation? To what extent does the reduction of the minimum scales of plants, in the various sectors and the increase in flexibility really permit rapid growth accompanied by a strengthening of small and medium-sized enterprises in Latin America? What contribution could the subregional and regional integration formulas make to the strengthening of entrepreneurial technological capacity? In the current Latin American situation and bearing in mind international experience, how does one promote flexible, mixed and decentralized modalities of linkages between educational and technological research bodies and the productive sector?

c) Structural aspects. What influence has been exercised on the willingness of entrepreneurs to engage in technological innovation by the combination of protected domestic markets and diverse and abundant natural resources available? What influence has the relative disarticulation between agriculture and manufacturing had on the innovation of entrepreneurs? How does one reconcile the contribution of technological innovation to enhancing international competitiveness, with the achievement of the objective of protecting the deteriorating social cohesiveness in many countries of the region? In the specific conditions of the small countries of the region, how does one reconcile the absence of a critical mass of resources for research and development with the requirements of a systematic programme of technological innovation?

d) Institutional/cultural context. What are the characteristics of the basic and higher educational system that are compatible with the objectives of enhanced efficiency and greater social cohesiveness? What effect on innovative entrepreneurial performance do the various modalities of the internal organization of enterprises have? What role is played by enterprise/labour relations at the national level and by political stability, in determining the technological performances at the level of enterprises? What effect does the value of innovative activity projected explicitly and implicitly by the educational system and the mass media have on entrepreneurial and government performance in the area of technology?

e) International context. Having regard to the evolution of the economic environment and of the international technological pattern, in which sectors that produce goods and services should medium and long term attention be focused, particularly in the case of the relatively smaller countries?

TABLE 1

LATIN AMERICA: a/ GROWTH - EQUITY
(in percentage)

e: equity = $\frac{40\% \text{ lowest income}}{10\% \text{ highest income}}$ (since 1970)

	0.4 <u>c/</u>	0.4
	Bolivia	Argentina
	Chile	Uruguay
	Peru	
	Venezuela	
2.4 <u>b/</u>	Costa Rica	
	El Salvador	
	Guatemala	
	Honduras GDP: 21.0 <u>d/</u>	GDP: 13.0
	Nicaragua Pop: 22.1 <u>d/</u>	Pop: 8.7
	Haití	
:GNP per capita average annual growth rate (1965-1986)	Brazil	
	Mexico	
	Colombia	
	Ecuador	
	Paraguay	
	Dominican Republic	
2.4	Panama	GDP: 66.0 Pop: 69.2

Source: Joint ECLAC/UNIDO Industry and Technology Division
based on World Bank, World Development Report, 1987 and 1988,
New York, Oxford University Press.

- a/ Includes 19 countries. LAIA, CACM, Dominican Republic, Haiti
and Panama.
b/ Industrialized countries GNP per capita average annual growth
rate (1965-1985).
c/ Industrialized countries half comparable relation.
d/ Percentage of GDP and population of Latin America.

TABLE 2

OTHER DEVELOPING COUNTRIES: a/ GROWTH - EQUITY
(in percentage)e: equity = $\frac{40\% \text{ lowest income}}{10\% \text{ highest income}}$ (since 1970)

	0.4 <u>c/</u>		0.4
	Kenya		Bangladesh
	Zambia		India
2.4 <u>b/</u>	Philippines		
	Cote d'Ivoire		
		GDP: 3.5 <u>d/</u>	GDP: 17.1
		Pop: 3.8 <u>d/</u>	Pop: 35.1
<u>:GNP per capita</u>	Turkey		China
<u>average annual</u>	Mauritius		Sri Lanka
<u>growth rate</u>	Malaysia		Indonesia
<u>(1965-1986)</u>			Egypt, Arab Rep.
			Thailand
			Hungary
			Portugal
			Yugoslavia
2.4		GDP: 6.4	Korea, Rep. of
		Pop: 2.7	Israel GDP: 73.0
			Hong Kong Pop: 58.4
			Spain

Source: Joint ECLAC/UNIDO Industry and Technology Division based on World Bank, World Development Report, 1987 and 1988, New York, Oxford University Press.

a/ These countries represent 80,2% of the population and 79,5% of the Gross Domestic Product (GDP) of the total developing countries excluded Latin America.

b/ Industrialized countries GNP per capita average annual growth rate (1965-1985).

c/ Industrialized countries half comparable relation.

d/ Percentage of GDP and population of these selected countries.

TABLE 3

LATIN AMERICA AND GEIC'S : STRATEGIC PROFILES
(in percentages)

	LATIN AMERICA a/ STANDARD DEVIATION		ABRAMEX b/ STANDARD DEVIATION		GEIC'S c/ STANDARD DEVIATION	
	AVERAGE	STANDARD DEVIATION	AVERAGE	STANDARD DEVIATION	AVERAGE	STANDARD DEVIATION
1. GNP Per Capita Average Annual Growth Rate	1965-1986	1.3	1.6	2.4	1.7	1.2
2. Equity 40% Lowest Income/10% Highest Income	Since 1970	0.3	0.2	0.3	0.1	0.2
3. Gross Domestic Savings as Percentage of GDP	1984-1986	15.7	6.7	21.8	5.2	5.7
4. Manufactured Exports/Manufactured Imports d/	1986	0.3	0.4	0.8	0.4	0.4

Source: Joint ECLAC/UNIDO Industry and Technology Division based on World Bank, World Development Report, 1988, New York, Oxford University Press, June 1988.

a/ Latin America (19 countries) includes LAIA, CACM and Dominican Republic, Haiti and Panama.

b/ Argentina, Brazil and Mexico.

c/ Growth with equity industrializing countries (GEIC's) includes: China, Korea Rep., Hungary, Portugal, Spain, Thailand and Yugoslavia.

d/ UNITED NATIONS, International Trade Statistics Yearbook, 1986, (ST/ESA/STAT/SER.G/35) New York, 1988; UN Publication Sales No. E/F.88.XVII.2.Vol. 1, manufactured exports and imports are defined as SITC Sections 5 to 8 less Division 68 (non-ferrous metals).

TABLE 4

LATIN AMERICA AND GEIC'S: GENERAL COMPARISON

		LATIN AMERICA ^{a/}		ABRAMEX ^{b/}		GEIC'S ^{c/}	
		AVERAGE	STANDARD DEVIATION	AVERAGE	STANDARD DEVIATION	AVERAGE	STANDARD DEVIATION
1. Total External Debt/GDP	% 1986	79.0	41.3	71.0	11.0	38.0	24.0
2. External Direct Investment/GDP ^{d/}	% 1986	10.9	2.8	10.6	0.2	3.0	1.2
3. Share of Manufacturing in GDP	% 1986	19.4	5.6	28.3	2.1	33.1	7.1
4. Share of Agriculture in GDP	% 1986	16.7	8.4	11.0	1.6	15.0	7.4
5. Share of Machinery, Transport Equipment and Chemicals in Value Added ^{e/}	% 1985	16.9	9.0	29.3	2.9	31.4	8.0
6. Gross Output Per Employee (1980=100)	1985	98.6	45.9	94.7	14.7	127.0	20.3
7. Export Coefficient (X/Gross Output) ^{e/}	% 1985	10.0	8.5	8.5	1.6	18.2	9.5
8. Share of Exports of Goods and Services in GDP	% 1986	20.8	7.4	12.0	2.9	28.1	10.1
9. Education - Secondary ^{f/}	% 1985	45.6	16.4	53.3	14.3	65.0	24.1
Higher Education ^{f/}	% 1985	17.8	9.4	21.0	10.8	18.4	9.1

Source: Joint ECLAC/UNIDO Industry and Technology Division based on World Bank, World Development Report, 1988, New York Oxford University Press, June 1988.

^{a/} Latin America (19 countries) includes: LAIA, CACM and Dominican Republic, Haiti and Panama.

^{b/} Argentina, Brazil and Mexico.

^{c/} Growth with equity industrializing countries includes: China, Korea Rep., Hungary, Portugal, Spain, Thailand and Yugoslavia.

^{d/} OCDE, Les principales économies en développement et l'OCDE (SE/M DE/2), Paris, May 1988.

^{e/} UNIDO Database.

^{f/} Number enrolled in school as percentage of age groups.

TABLE 5

INTERNATIONAL INSERTION
(in percentages)

Participation in World Total (early 1980's)	Latin America		Other Countries		Brazil	Korea Rep.	Spain	Hungary	Israel	Portugal	Yugoslavia
	Total	Other	Total	Other							
1. Population	8.0	2.7	2.8	0.9	0.9	0.8	0.2	0.2	0.1	0.2	0.5
2. Gross Domestic Product	7.0	3.0	2.2	0.6	0.6	1.3	0.2	0.2	0.2	0.2	0.4
3. Manufacturing Product	6.0	3.1	1.9	0.7	0.7	1.2	0.3	0.2	0.2	0.2	0.6
4. Capital Goods	3.0	1.7	1.2	0.4	0.4	0.6	0.2	0.1	0.1	0.1	0.3
5. Engineers and Scientists	2.4	3.0	0.9	0.9	0.9	0.4	0.6	0.4	0.4	0.1	0.7
6. Research and technological development resources	1.8	1.4	0.6	0.4	0.4	0.3	0.2	0.2	0.2	0.4	0.3
7. Manufactured exports a/	1.8	6.0	0.9	2.3	2.3	1.4	0.7	0.4	0.4	0.4	0.7
8. Scientific authorship	1.3	...	0.45

Source: Joint ECLAC/UNIDO Industry and Technology Division, based on data from UNESCO, Statistical Yearbook, various years; UNIDO, DATABASE; and United Nations, Demographic Yearbook, 1986; (ST/ESA/STA/SER.R:/16) New York, 1988, United Nations Publication Sales No. E/F 87.XIII.1.

a/ Manufactured exports defined as SITC, Section 5 to 8 less division 68, (non-ferrous metals).

TABLE 6

INTERNATIONAL INSERTION

(Participation in world total, early 1980's)

(Percentages)

	Latin America	United States	Japan	Federal Republic of Germany
1. Population	8.0	5.0	2.5	1.3
2. Gross domestic product	7.0	27.0	9.4	5.8
3. Manufacturing product	6.0	18.0	11.7	9.4
4. Capital goods	3.0	14.7	11.1	9.6
5. Engineers and scientists in R&D	2.4	17.4	12.8	3.4
6. R&D resources	1.8	30.1	10.2	6.7
7. Manufactured exports <u>a/</u>	1.8	12.1	14.2	13.3
8. Scientific authorship	1.3	42.6	4.9	5.4

Source: Joint ECLAC/UNIDO Industry and Technology Division, based on data from UNESCO, Statistical Yearbook, various years; UNIDO, DATABASE; United Nations, Demographic Yearbook 1986, (ST/ESA/SER/R/16) New York, 1988, United Nations Publication Sales No. E/F 87.XIII.1.; National Science Foundation, International Science and Technology Data, UPDATE 1986, Washington, 1986.

a/ Manufactured Exports defined as SITC Sections 5 to 8 less Division 68 (non-ferrous metals).

TABLE 7

UNITED STATES, GERMANY FED.REP., JAPAN: TRADE BALANCE BY
SECTORS OF ECONOMIC ACTIVITY, 1970-1985
(Millions of dollars)

	1970	1975	1981	1982	1983	1984	1985	1986	1987
Agriculture:									
United States	631	12 069	25 344	19 728	16 518	13 307	3 659	-320	...
Japan	-5 292	-13 931	-24 929	-23 508	-23 301	-25 776	-24 214	-27 892	...
Germany F.R.	-5 774	-10 145	-13 441	-12 852	-12 868	-15 568	-12 644	-15 266	...
Manufacturing									
Industry: a/									
United States	4 154	21 196	13 369	-3 942	-28 925	-82 377	-107 566	-138 626	-126.100 b/
Japan	13 180	42 393	119 152	107 197	113 403	131 689	137 550	162 311	164 000 b/
Germany F.R.	14 424	39 338	62 317	68 174	59 013	60 235	68 131	89 902	106 600 b/
Energy:									
United States	-1 480	-21 922	-73 974	-54 665	-50 349	-53 814	-45 759	-31 652	...
Japan	-3 858	-25 432	-72 091	-65 306	-58 636	-59 989	-55 319	-36 565	...
Germany F.R.	-1 616	-10 286	-32 723	-29 694	-26 694	-25 545	-26 212	-17 971	...
Mining:									
United States	-863	-1 295	-5 183	-3 426	-5 298	-6 424	1 302	-6 087	...
Japan	-3 698	-5 734	-11 223	-10 388	-10 055	-10 554	-9 663	-8 657	...
Germany F.R.	-2 343	-2 662	-3 835	-3 651	-3 571	-3 319	-3 319	-3 331	...
Other									
United States	196	640	758	-280	-1 268	188	-245	-3 961	...
Japan	105	594	-2 168	-1 095	-877	-1 758	-1 992	-6 454	...
Germany F.R.	-318	-431	-176	-712	375	171	-484	775	...
TOTAL:									
United States	2 638	10 688	-39 686	-42 585	-69 322	-129 120	-148 609	-180 646	...
Japan	437	-2 110	8 741	6 900	20 534	33 611	46 362	82 743	...
Germany F.R.	4 375	15 814	12 142	21 092	16 595	18 722	25 472	52 559	...

Source: Joint ECLAC/UNIDO Industry and Technology Division based on data from United Nations, International Trade Statistics Yearbook, various years, 1986 and United Nations Commodity Trade Statistics, OECD various years

a/ Manufacturing includes SITC Section 5 to 8 less Division 68.

b/ Manufacturing includes SITC section 5 to 9; OECD, Evolution Recente des politiques industrielles (DSTI/IND.88.14) Paris, June 1988, Annexe 1.

TABLE 8

UNITED STATES, GERMANY, FEDERAL REPUBLIC, JAPAN:
INTERNATIONAL COMPETITIVENESS: DIFFERENT INDICATORS
(in percentage)

	United States	Japan	Federal Republic of Germany
Civilian RD/GNP <u>a/</u> 1985	1.9 (3)	2.6 (1)	2.5 (2)
Growth Manufactured Exports <u>b/</u> 1965-1986	11.1 (3)	16.9 (1)	13.3 (2)
Engineering Exports/Total Exports 1986 <u>c/</u>	48 (2)	64 (1)	48 (2)
Engineering Exports/World Engineering exports 1986/1963 <u>c/</u>	61 (3)	515 (1)	90 (2)
Engineering Exports/Engineering Imports 1986 <u>c/</u> 1963	64 408 (3)	1317 266 (1)	246 399 (2)
Productivity growth in manufacturing <u>d/</u>			
1965-1973	2.8	11.0	4.2
1975-1981	1.7	8.7	3.2
1980-1986	3.7 (3)	5.4 (1)	3.3 (2)
Manufactured exports/ manufactured imports <u>b/</u> 1986	0.5 (3)	5.1 (1)	1.7 (2)

Source: Joint ECLAC/UNIDO Industry and Technology Division based on data from:

a/ National Science Foundation, International Science and Technology Data Update 1986, (NSF 86-307) Washington D.C., 1986, p. 6.

b/ World Bank, World Development Report 1988, Paris, 1986.

c/ United Nations, Bulletin of Statistics on World Trade in Engineering Products, 1986 (GE 88-30950) Geneva, April 1988, UN Publication Sales No. E/F/R.88.II.E.14.

d/ OECD, Productivity in Industry, Paris, 1986; OECD, Evolution Recente des politiques industrielles (DSTI/IND/88.14) Paris, June 1988, Annexe 1.

TABLE 9

UNITED STATES, FEDERAL REPUBLIC OF GERMANY, JAPAN:
PATTERN OF CONSUMPTION, DIFFERENT INDICATORS
(in percentage)

	United States	Japan	Federal Republic of Germany
Savings/GDP (1984-85-86) <u>a/</u>	16% (1)	31% (3)	24% (2)
Saving/disposable income (1984)	5.2 (1)	22.5 (3)	12.8 (2)
Gross Fixed Capital Formation/ GDP (1985) <u>d/</u>	19% (1)	28% (3)	20% (2)
Automobiles/1000 persons (1985) <u>b/</u>	552 (1)	270 (3)	428 (2)
Person/room dwelling space (1980) <u>c/</u>	0.5 (1)	1.0 (3)	0.7 (2)
Dwellings with fix bath/shower <u>c/</u> % (1979)	95.2 (1)	65.6 (3)	81.8 (2)
Energy consumption per capita (1986) (Kg of oil equivalent) <u>a/</u>	7.193 (1)	3.186 (3)	4.464 (2)
Daily calories/needs (1983)	137 (1)	113 (3)	130 (2)
Animal proteins: grams inhabi- tant day (1984) <u>d/</u>	73 (1)	46 (3)	69 (2)
Telephones: number/1000 inhabitants (1985) <u>b/</u>	760 (1)	555 (3)	621 (2)

Source: Joint ECLAC/UNIDO Industry and Technology Division, based on data from:

a/ World Bank, World Development Report 1988, New York, Oxford University Press, June 1988.

b/ U.S. Bureau of the Census, Statistical Abstract of the United States: 1988, (198th. Edition), Washington D.c., 1987.

c/ President's Commission on Industrial Competitiveness, Global Competition: The New Reality, Vol. I and II, Washington D.C., US Government Printing Office, January 1985.

d/ OECD, The OECD Observer No. 145, Paris, April/May 1987.

TABLE 10

UNITED STATES, FEDERAL REPUBLIC OF GERMANY AND JAPAN:
STRATEGIC PROFILES
(in percentage)

	United States	Federal Republic of Germany	Japan
1. GROWTH: GNP per capita average annual growth rate (1965-1986)	1.6	2.5	4.3
2. EQUITY: 40% Lowest income/10% highest income (1978-1980)	0.74	0.85	0.98
3. AUSTERITY: Gross Domestic savings as percentage of GDP (1984-1986)	16.0	24.0	32.0
4. COMPETITIVENESS: Manufactured exports/manufactured imports <u>a/</u> (1986)	0.57	1.73	5.10

Source: Joint ECLAC/UNIDO Industry and Technology Division based on World Bank, World Development Report, 1988, New York, Oxford University Press, June 1988; United Nations, International Trade Statistics Yearbook 1986, (ST/ESA/STAT/SER G./35) New York, 1988, United Nations Publication Sales No. E/F 88.XVII.2 Vol. 1.

a/ Manufactured Exports and Imports are defined as SITC Sections 5 to 8 less Division 68 (non-ferrous metals).

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5. C. Freeman, The Future of Information and Communication Technologies: Implications for Decision-Makers, Science Policy Research Unit, University of Sussex, February 1987, LGCFAM; F. Chesnay, "Technical co-operation agreements between independent firms: Novel issues for economic analysis and the formulation of national technological policies" to be published in DSTI Review No.4, OECD, 1988; See, National Programmes to promote Industrial Diffusion of New Technologies, Synthesis Report, OECD, Paris, 1987.
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7. See World Bank, World Development Report, 1987, p.83.

8. See World Bank, World Development Report, 1988, p.51; R. Hemming and Ali M. Mansoor, "Is Privatization the Answer?" in Finance and Development, September 1988.
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