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UNITED NATIONS
ECONOMIC COMMISSION FOR LATIN AMERICA AND THE CARIBBEAN

SANTIAGO, CHILE, APRIL 1990

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LC/G.1613-P

April 1990

Notes and explanation of symbols

The following symbols are used in tables in the *Review*:

Three dots (...) indicate that data are not available or are not separately reported.

A dash (—) indicates that the amount is nil or negligible.

A blank space in a table means that the item in question is not applicable.

A minus sign (-) indicates a deficit or decrease, unless otherwise specified.

A point (.) is used to indicate decimals.

A slash (/) indicates a crop year or fiscal year, e.g., 1970/1971.

Use of a hyphen (-) between years, e.g., 1971-1973, indicates reference to the complete number of calendar years involved, including the beginning and end years.

Reference to "tons" mean metric tons, and to "dollars", United States dollars, unless otherwise stated.

Unless otherwise stated, references to annual rates of growth or variation signify compound annual rates.

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UNITED NATIONS PUBLICATION

ISSN 0251-2920

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CEPAL

Review

Santiago, Chile

Number 40

CONTENTS

Development, crisis and equity. <i>Oscar Altimir.</i>	7
Macroeconomic policies: in search of a synthesis. <i>Daniel Schydłowski.</i>	29
An industrial and technological strategy for Brazil. <i>Joao Paulo dos Reis Velloso.</i>	37
Social structures and democracy in the 1990s. <i>Marshall Wolfe.</i>	53
The growing presence of women in development. <i>Miriam Krawczyk.</i>	69
Unequal participation by women in the working world. <i>Irma Arriagada.</i>	83
From agrarian reform to associative enterprises. <i>Emiliano Ortega.</i>	99
The capital goods industry: situation and challenges. <i>Jorge Beckel.</i>	117
Population and development in the Central American isthmus. <i>Andras Uthoff.</i>	133
Development and social change in Sweden. <i>Villy Bergstrom.</i>	153
Guidelines for contributors to <i>CEPAL Review.</i>	161
Some recent ECLAC publications.	163

An industrial and technological strategy for Brazil

*João Paulo dos Reis Velloso**

This article begins by briefly analysing the situation in Brazil which followed the crisis of the 1980s, contrasting it with the recent modifications which have taken place in the pattern of industrialization on the world level. The article goes on to discuss the new trends and their consequences for the world economy in general and the developing countries in particular.

The competitiveness and efficiency of Brazilian industry are examined. For this purpose, national exports are classified according to their competitiveness, with due regard for their technological and productive heterogeneity.

The basic ideas of the strategy proposed are to renew the modernization process, achieving growth with redistribution and reforms; to begin a new stage of industrialization; to obtain a national consensus on a model of development; and to seek a better involvement in the world economy.

The proposed strategy includes three main lines of action: to explore the dynamic comparative advantages of the country; to strengthen domestic and external competitiveness; and to bring the logic of industrialization to other sectors, such as agriculture, functional services and mining. Different public-policy instruments are spelled out in order to explain the strategy.

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The definition of a new industrial and technological strategy for Brazil is especially significant at this time. There are two main reasons for this.

The first is that the crisis of the 1980s has left a trail of infrastructural damage in electric energy, communications and transportation (mostly roads and ports), and of technological backwardness in several industrial sectors, including those oriented to exports. Throughout the decade no new industrial strategy has been defined to replace the strategy of 1974, which was worked out in reaction to the oil crisis. By failing to do so, Brazil has not only lost the chance of participating in the new cycle of world expansion begun in 1984, but also has fallen behind the recently industrialized countries of Asia, like the Republic of Korea and the Chinese province of Taiwan, which have moved on to a new stage of industrialization by adopting new technologies.

The second reason is the authentic industrial revolution taking place in the world, especially in the second half of the decade just ended. The basic pattern of industrialization has been modified by the tremendous impact of high technologies. The effects of this new industrialization must be carefully considered, both from the positive viewpoint of new opportunities and from the negative viewpoint of the limits they place on Brazil's competitiveness.

I

The new world trends and their consequences

International competition today is undergoing profound changes, which include the following:

a) The pattern of industrialization is rapidly being modified. Up to the 1970s, it followed the path of metalworking and chemical complexes. The new pattern of development, as is well-known, is highly conditioned by the new technologies: microelectronics, informatics, telecommunications, automation, new materials, laser, biotechnology, and renewable sources of energy.

The heart of these technologies is information technology, mainly symbolic information, of numbers or words, and also images, but which can even decipher and reprogramme information about living matter through genetic engineering, which serves as the basis of biotechnology. Recent applications of information technology are based on discoveries about new materials, on the transformation of energy by the laser, and where applicable, on new forms of renewable energy.

In the developed countries, the new technologies have produced two main currents of renovation: the development of more advanced sectors, creating a new technological and industrial pattern; and the renovation of modern sectors—and even some older ones—which recover their dynamism and competitiveness (among them, for example, the textile sector of countries like Switzerland and the United Kingdom).

b) Even though they did not invent these new technologies—frequently developed by the United States—countries with an active industrial policy, headed by Japan, knew how to make them the basis of a whole, progressively more complex, international offensive. The dominant note, however, was the attempt to conquer principally the United States and European markets, either through exports in areas like electronics or automotive vehicles, or by investing in those very markets in order to ensure a better penetration. Trade and investment thus became complementary instruments in that offensive, which displayed a great capacity to adapt to specific local demands by differentiating products, as happened in the classic case of Nissan automobiles in the United States, described by David Halberstam (1987).

At the same time, Japan multiplied its links with the so-called "four tigers" (Republic of Korea, the Chinese province of Taiwan, Singapore and Hong Kong), especially with the Republic of Korea; with China, which is becoming the new global competitor in world markets; and, more recently, with the countries of the Association of South-East Asian Nations (ASEAN).

c) The United States and Europe became more protectionist in reaction to this offensive. The concept of managed trade and the principle

of reciprocity overrode the traditional principles of non-discrimination and transparency established by the General Agreement on Trade and Tariffs (GATT). At the same time, huge common markets began to develop, characteristic of the multipolar world which is perhaps replacing United States hegemony. One need only mention the free-trade agreement between the United States and Canada, with repercussions in Mexico; it could in fact lead to a special integration scheme with the common market of Oceania (Australia and New Zealand). Therefore, the United States strategy has clearly not been limited to defensive reactions.

Along the same lines, the unification strategy of the European Economic Community in 1992 is being careful to avoid having the enlargement of its market benefit principally United States and Japanese transnational corporations. It seems clear that a new dynamism is dominating Europe, reaching even the peripheral zones such as Portugal and Greece, and certainly with strong centres such as the Federal Republic of Germany, the United Kingdom, Italy and perhaps France.

In any case, in forming these large regional blocs (in which Brazil does not participate), there is an element of trade diversion, and, consequently of inversion, which is detrimental to the countries outside of these common markets and certainly favourable to those within them.

Eastern Europe, with a mediocre economic performance up till recently, could recover its strength with the help of Gorbachev's *perestroika*. The new attitude of the Soviet leadership has already helped to minimize or resolve local conflicts in different parts of the world. International tensions have been relaxed, which could contribute to the new cycle of expansion on a world scale.

d) In the light of the trend to strengthen the regional blocs, which favours the industrialized countries through trade diversion and investment, consideration should be given to the international effects of macroeconomic imbalances.

The main imbalance is the United States tendency to maintain huge trade deficits, and therefore new devaluations of the dollar. This would lead to a greater loss of competitiveness by the European countries and Japan in relation to the countries of the dollar zone, generally

including the newly industrialized countries. At the same time, European and Japanese investment in medium- and even high-tech product lines, and/or intensive use of capital, generally long-cycle products (naval construction, capital goods and their components, durable consumer goods and certain electronic products), could be moved to the recently industrialized countries.

e) To the extent that competition among the large blocs increases, markets will become more international, with financial and capital markets operating apart from currents of trade and direct investment, through credit operations, in the first case, and portfolio decisions (and not direct industrial investment) in the second.

In this much more internationalized—and therefore interdependent—context, national policies have to take into account the actions of large transnational corporations. These tend to adopt strategies designed for world-wide competition and serve as active agents of the new changes, both with respect to the industrial pattern and the formation of new common markets.

It is difficult to single out the trends in a situation of conflicting and increasingly world-wide movement. Nevertheless, although the different blocs compete among themselves, it cannot be denied that there is greater integration within the Organization for Economic Cooperation and Development (OECD) i.e., between the countries of the developed world. This can be seen in trade currents, direct investments, technological alliances, financial investments and capital markets.

On the one hand, since 1984 the United States has experienced a period of sustained prosperity, which has attracted large external investments, currents of financial capital and portfolio investments. On the other hand, European unification is awakening considerable interest among the Japanese and United States transnational corporations, which are afraid of losing their position in exporting to this market. Finally, the debt crisis has cut off the flow of foreign capital, both risk and financial, from the countries of Latin America.

This trend has not prevented the recently industrialized countries of Asia from continuing

to develop dynamic industrial policies, which always reveal new possibilities of external competitiveness. Their gross domestic product and especially their exports continue to increase rapidly, which would indicate that they are taking advantage of the new cycle of world expansion. Even the external debt of the Republic of Korea has already ceased to be a problem, since it is being reduced even in absolute value.

A new star is coming on to the stage of world competition: the People's Republic of China. On the one hand, its yearly exports, of the order of US\$130 billion to 140 billion, and its reserves, close to US\$90 billion, already make it one of the major participants. On the other hand, its opening to a market economy and to advanced technologies has accelerated the process of economic integration with Hong Kong and the Chinese province of Taiwan. Whatever the outcome of its political integration, the Chinese world is a new, natural, common market.

These facts basically mean that the increasingly world-wide character of markets and the strengthening of large regional blocs have undoubtedly intensified competition and placed the developing countries somewhat on the margin.

Nevertheless, as the recently industrialized countries of Asia, the People's Republic of China and the Soviet Union itself (and with it, the East European bloc) have understood, these effects imply important disadvantages only when developing economies lack specific weight and accept a static situation with respect to comparative advantages and competitiveness; in other words, when they accept being on the margin, which is certainly not inevitable. These economies suffer damage when they do not develop, on their own or through transnational enterprises, new factors of competitiveness from the new pattern of industrialization; if they do not form new alliances, in order to avoid remaining outside world markets; if they do not take advantage of opportunities to relocate investments or new export lines linked with the deactivation of certain sectors in Europe and Japan, owing to the new devaluation of the dollar; and if they do not find new ways to involve themselves in world competition.

II

The competitiveness and productivity of Brazilian industry

Having made these observations, we turn now to the question of the competitiveness and efficiency of Brazilian industry.

The first point to explore is the competitiveness of Brazilian exports. It is mainly a question of knowing whether this competitiveness depends excessively on macroeconomic instruments, such as the exchange policy, or if it is more closely linked to factors of industrial productivity. A first answer is found in a study done by the IEI, of the Federal University of Rio de Janeiro. The study concludes that Brazilian exports of manufactures are divided into three groups on the basis of factors of competitiveness:

Group I consists of non-durable consumer goods, such as footwear and clothing. Their competitiveness is derived from the domestic use of abundant natural inputs (for example, textile fibres and leather) and relatively cheap labour. They combine advantages derived from being relatively well endowed with factors which have other advantages such as the domination of production techniques, adequate scales and quality control. The possibilities of modifying such advantages are increasing, owing to the use of electronic equipment.

Group II consists mainly of intermediate goods (for example, steel, pulp, aluminium and chemical products). The main element of their competitiveness is the degree of technological advancement of their productive capacity. There are advantages derived from recently installed scales of economic production, associated with the low cost of abundant inputs in the country (iron ore, wood, bauxite). Modifications of the comparative advantages can be based on substitute materials (plastics, ceramics). In any case, it is indispensable to remain up to date with respect to absorbing the logic of informatics.

Group III consists especially of capital goods, weapons and durable consumer goods, all with multiple attributes and considerable diversification. At times they are presented in "packages" (systems of goods and complementary services). Competitiveness is

derived especially from technological training and attention to the specific needs of certain markets. Exports are encouraged by long-term financing, generally from abroad. Economies associated with increasing skills are important. The State usually plays an important role in sales.

To a large extent, this group involves exports to countries less technologically developed than Brazil. In some cases, such as aircraft, Brazil can compete with developed countries. Having its own technological training and staying up to date technologically are vital for maintaining the competitiveness of these products.

To these three groups of manufactured goods should be added the agroindustrial complexes in which Brazil was able to consolidate its activity, such as soya and orange juice, as well as the sectors linked with mineral processing. This would give a complete picture of the country with respect to its industrial exports, in a broad sense.

It can be concluded that Brazilian competitiveness is linked largely to specific sectoral factors, which can range from being relatively well endowed with labour and natural resources to the modern character of large-scale installations (with standardized technology and reasonable competition with respect to the technology of the product and process). This does not mean that the exchange policy was unimportant. The need to generate tremendous surpluses led to the constant adjustment of the real exchange rate. The huge devaluation of 1983 was part of an effort to face an emergency situation. Nevertheless, specific factors of competitiveness are more related to an evaluation of the levels of efficiency of Brazilian industry in comparison to external competition.

Any analysis of the question is difficult at this time because, as is known, in recent years the non-tariff system of barriers only allowed products to be imported that did not compete with national products. For this reason, we preferred to use the World Bank study based on a survey taken in 1980-1981, a period in which the level of non-tariff restrictions was much lower.

The study begins by referring back to the situation in 1967, after protective tariffs were reduced by the government of President Castelo Branco. In that year, the level of nominal protection was 48%, with the real level at an average of 66% for the processing industry. The highest level (101% effective protection) was achieved by consumer goods. Intermediate goods were close to the average and capital goods below it. The situation reflected the industrial policy of the time: strong protection for consumer goods, which constituted import substitution, and less protection for equipment, the importation of which was subsidized.

The analysis made of the 1980-1981 period gives very different results. The implicit effective protection was 23% on the average for the processing industry. This was measured directly (not by the tariff) by the difference between domestic and external prices according to the equilibrium exchange rate — "shadow" — and the current subsidies. (It should be noted in passing that the figure for agriculture was -21%.) Considering the different categories, the figure was 16% for consumer goods, 22% for intermediate products and 37% for capital goods. This means that the overall level of protection was reduced, the protection of consumer goods (imports of which had long since been substituted) was considerably lowered, and the protection for equipment, which has recently been substituted, greatly increased. It was a reasonably predictable result.

However, once the distortions of the price system have been corrected, it can be observed that the average protection, not very high, conceals effective protectionist levels, rather high in some branches of industry: 52% in machinery, 82% in electrical equipment, 60% in chemicals, 85% in pharmaceutical products and 64% in perfumes.

On the product level, cases of much higher protection can no doubt be found. The reason for this is well-known: the import substitution process, especially in the heroic stage of the 1950s and during the time of scarce foreign exchange in the 1980s, showed little selectivity or flexibility. This was particularly true of flexibility, in the sense that the usual procedure consisted of fixing certain indexes of nationalization for the main products, which had to be reached rapidly. (Little

attention was paid to the much more than proportionate increases in costs arising from small increments of those indexes, after a certain level.)

Consequently, the correct interpretation of the question of the level of tariff protection demands great care. The use of averages by sectors (whether according to the criterion of effective tariff or implicit protection) generally underestimates the protectionist character of the system, in so far as there are a considerable number of branches, and particularly products, with negative protection. What is basically of interest, then, is to consider on the product level what is over and above the average.

Another distortion mentioned in the study is the large dispersion of the levels of protection between the different branches. It runs from -18% for non-metallic minerals to +97% for pharmaceutical products. The final liquid level of protection in other branches is not the result of a deliberate policy, but often only of the accumulation of the effects of multiple instruments with different objectives. In itself, the excessive dispersion can indicate a real level of protection higher than what is apparent, in so far as it implies a large number of branches with below average protection, and therefore also a large number with above average protection (which is, as stated above, the usual case).

What can be said, then, about Brazilian industry? It is, above all, enormously heterogeneous in technology and management. Because of these and other factors, it is also enormously heterogeneous with respect to levels of productivity. This fact, moreover, was explicitly recognized in the proposed industrial policy of the National Confederation of Industry (CNI), presented in May 1988. The heterogeneity can be seen between branches of industry, within the same branch, and at times within the same firm (between different plants). The conclusions about whether or not this fact has economic importance will be presented below, when the question of strengthening the competitiveness of the country is analysed. Nevertheless, some factors responsible for this heterogeneity are worth mentioning.

The first and most obvious factor is that import substitution moved from non-durable consumer goods in the 1930s to durable consu-

mer goods in the 1950s, with some substitution in other categories. From 1974 to the present, import substitution has especially affected intermediate and capital goods. The different ages of the diverse industrial establishments are due to this substitution.

Thus, some modern sectors, developed on the basis of the 1974 strategy, such as basic inputs and capital goods, have new plants, with an economical scale and a state-of-the-art electromechanical technology. There are, however, even in this group, branches, such as paper and pulp, in which large integrated enterprises coexist with smaller, less modern, enterprises. These have their own internal heterogeneity, since they maintain machines in old plants (on the limits of economic and technical survival).

In the older sectors, of both durable and non-durable consumer goods, there were very different degrees of modernization throughout the boom of the 1970s, depending largely on the extent to which their export drive faced competition from the rest of the world.

The situation became complicated with the stagnation of recent years and the lack of investment already mentioned. The base was already very differentiated, and became even more so because of the disparity of efforts made by the different sectors to adopt the logic of informatics during the present decade. This disparity was caused by the enterprises' own policies, as well as, during a certain stage, by the obstacles arising from the restriction on imports and the policy on informatics. Consequently, evidence is accumulating that in several sectors, including the export-oriented industries (like textiles, footwear and automotive vehicles), technological backwardness is beginning to have a real effect on the competitiveness of the country.

A recent study of technological innovation in the Brazilian processing industry was conducted by the Brazilian Institute of Economics (of the Getulio Vargas Foundation). Although only preliminary, it gives an idea of the results of this evolution. The criterion consisted of having each sector evaluate subjectively its degree of modernization. The results vary. The indexes are 98% for the aeronautics industry, 95% for steel, 92% for chemical elements and products, 90% for non-ferrous minerals, 79% for pulp and paper, 66% for sound and television apparatus, 65%

for machine-tools, 46% for automotive vehicles, 37% for tractors and earth-moving equipment and 14% for milk and milk products.

A second factor of heterogeneity is the system of industrial protection, the characteristics of which have already been mentioned. In the most recent stage, direct administrative action was the rule, case by case. Then a level of ensured protection came into existence, an element of protection unsolicited by those to be protected, but rather arising simply from the country's need to avoid spending foreign exchange.

According to the analysis of Honorio Kume (no date), the Brazilian system of protection was characterized by the generalized presence of tariffs that exceeded in almost all sectors the protection needed, and by the broad use of non-tariff barriers (list of suspended products, previous authorizations, minimum terms for financing) which recently affected almost 60% of the processing industry. There was also the Law of the Local Similar Product (often interpreted in a simplistic way, only in terms of the existence of a similar product in the country, without taking into account the other requisites of the same law) and the approval of the annual budget for the imports of each enterprise. In recent years, there has also been the effect of the restrictions from the Informatics Law.

At the same time, additional taxes on imports were collected, such as the IOF, the TMP (to improve the ports) and the AFRMM (additional tax for the renovation of the merchant marine).

To sum up, the system could be described as irrational, out of touch with the current industrial structure of the country and the objectives of the industrial policy, complicated, extremely haphazard, redundant in innumerable sectors and inadequate in others (which was determined by a direct, non-tariff control). Only the competence of the agencies that had to apply it, mainly the external trade agency (CACEX), avoided worse problems, even though it was unable to overcome all the drawbacks of irrationality and haphazardness. The operation of the system virtually meant importing only goods which complemented the country's industrial structure.

Given the almost prohibitive character of the system (in the sense of prohibitive tariffs), and its aim of saving foreign exchange, it is no surprise that special systems multiplied, at times

affecting almost 80% of imports. Recently, there were 42 special systems, which awarded exemptions and reductions to 70% of foreign purchases, without counting crude oil.

It is also no surprise, given the high and irrational level of protection, that many sectors ignored demands to keep costs down and increase productivity.

Finally, we should also mention as a factor of heterogeneity the preponderant presence in

Brazilian industry of a contingent of small and medium enterprises, the vast majority of which are operated by individuals or families. According to the 1980 census, in the 19 branches of industry, microenterprises and small and medium enterprises as a group were responsible for 56% of value added and 96% of the number of employees.¹ We will have to return to the problem of small and medium industry when we try to define the strategy.

III

The basic ideas of the new strategy

After these reflections on the present state of Brazilian industry, we should consider what signals Brazil wants to send, both to itself and to the rest of the world, regarding its plans for future development.

It seems to us that these signals consist mainly of the following:

a) The country wants to return to the path of modernization. This had its already-known limitations, and even gave rise to a good deal of structural heterogeneity between the economic, social and political fields. Nevertheless, it showed Brazil's desire to develop economically according to modern patterns. The country's roots, with their known limitations (related to exacerbated individualism and the dualism of the State, which has one modern face and another paternalistic face) do not impede the process of industrialization and urbanization, with a growing autonomy of civil society *vis-a-vis* the tutelage of the State.

b) The new strategy will be applied from the perspective of *growth with redistribution and reforms*. Growth is considered indispensable for modernization, including social and political modernization, but it is combined with a social strategy, capable of leading to the gradual creation of a mass-consumption market and, the gradual reversal of the factors that lead to a concentration of income and the rapid reduction of absolute poverty.

c) The new industrial strategy means essentially that Brazil must reaffirm its commitment

to industrialization and enter a new stage of that process. Brazil must begin a new phase of advanced industrialization, selectively and gradually incorporating high technology with a view to generating dynamic comparative advantages. This new phase is also characterized by the general development of Brazil's industrial competitiveness so that it can supply the domestic market more efficiently and expand exports.

d) Brazil's crisis is mostly of internal origin. It stems from the country's political and economic situation (although it also has an external cause linked to the public sector's limited capacity to invest). For this reason, the solutions should be sought essentially on the domestic front. Brazil should try to create a national consensus aimed at defining a development model; at paying attention to the more obvious political conditions of growth; and at considering in an interrelated way the serious short-term crisis (to avoid hyperinflation and gradually reduce inflation), the medium-term perspectives and the major national questions. Only such an integrated vision will make it possible to return to sustained growth. This does not prevent, but rather implies, that external economic problems

¹The Institute of Developing Economies in Japan pointed out: in 1983, nearly two million Brazilian enterprises declared that they had *no employee* (67% of the total of all establishments). The study suggests an idea of the size of the informal market, estimating that such enterprises have around six million employees; i.e., something less than 20% of the total number of employees in the urban zone.

should be faced at the same time, especially the problem of the debt and the linkage with the world economy.

e) The country is attentive to the new industrialization trends in the world and to the new realities of the increasingly global nature of the international economy and expansion of common markets on several continents. In view of this new world movement, it tries to become involved more efficiently and more rationally, directed by an affirmation of its interests, but within the modern, not isolationist, vision, perceiving the opportunities and the risks of this involvement.

Some of the implications of the new strategy are worth examining more closely.

First, the sources of dynamism. Brazil already learned how, mostly in the 1970s, to develop a growth dynamic centred on investments to meet the expansion of the domestic market (which corresponded to close to 85% or 90% of industrial growth up to the end of the 1970s), but which at the same time invested to substitute for imports and increase exports. Preferably, both goals were sought simultaneously, as happened in the case of basic inputs and capital goods.

Attempts are now being made to recover this dynamism, adapting it to the new circumstances. Naturally, the role of import substitution in the traditional sense, which implied large blocs of new sectors, is more limited, since the country just finished a long cycle of substitutions (the 1974 strategy). However, since Brazil is not in the vanguard of industrialization or technological progress, import substitution is always needed. It is a permanent process, although with different phases, depending on how far behind the country has fallen. It is evident, then, that once the basic-input sectors are installed —petrochemicals, steel, paper and pulp, non-ferrous minerals, fertilizers— progress can be made in the domestic production of more elaborated products in these areas (third and fourth generation products) and their ramifications in several directions. The same can be said, selectively, about some new kinds of equipment, mainly related to informatics.

However, the most important point is that import substitution will be linked with the new phenomenon of world-wide industrialization:

high technologies, like informatics and electronics, biotechnology and the new materials. For example, import substitution and the incorporation of new technologies are interrelated, since they bring to the country production of new electronic controls for capital goods and for local electronic products, or of digital components for electronic data-processing equipment, communications, laser, etc. Specious discussions aside, we will consider both import substitution and the incorporation of new technologies in general, recognizing the importance of the role which they have to play in the strategy. Let us consider why.

It is no doubt important to incorporate the new technologies, selectively and with a definite strategy for each one. First, because in themselves they offer a dynamism which will contribute to growth. It is a question of the well-known process of Schumpeter's analysis, in which innovations and new products give rise to new investment cycles, whether large or small.

Moreover, by simply observing the tremendous technological and managerial heterogeneity in the Brazilian industrial complex, as well as the diversity of factors upon which the competitiveness of the country in the three main categories of export manufactures depends, we can see that these new technologies assume another very important function during the present stage: to make possible the technological updating or modernization of a great number of industrial branches. The process should certainly be carefully conducted, attending to the situation of each sector, with criteria of macroeconomic logic that take into account overall employment in the economy; it is not a question of modernizing simply to modernize.

This brings us to the problem of industrial competitiveness. We repeat *industrial* in order to emphasize the important concept of competitiveness, analysed in the well-known study of Fernando Fajnzylber (1988). It is impossible to try to base the competitive capacity of exports on large real devaluations of the exchange rate and on stable wages, except in emergency situations. This procedure destroys the social structure of a country in the long run.

The exchange rate must certainly be realistic (the exchange can even be a little above parity with purchasing power, without considering the

effect of external inflation) and real wages should be governed by productivity increases. However, competitiveness has its own essential dimension, related to industrial productivity. In that dimension, competitiveness is partially connected with technological advancement and can include the new technologies, but it is also connected with all the other factors that condition operating costs and investment, including the correction of the distortions in the current industrial structure. At the same time, the question of employment and the well-being of the population must be taken into account. Competitiveness cannot be economically and socially destructive as a result of a recession or lower real wages.

After all, why do we need more competitiveness?

Basically because we want an economy with rising real wages, without detriment to highly dynamic employment; and in order to avoid inflationary pressures, this has to be obtained through productivity increases. Also, it seems to be the time to begin to consider the perspective of the domestic consumer, since the economy is integrated and diversified, and its initial stages of industrialization, in spite of its emergent character, are apparently over. The domestic consumer, as far as possible, must obtain good quality and a good price. And finally, because we want to base the conquest of external markets on concrete economic factors, like those referred to, and not on the artificial use of the ratio between the exchange rate and wages.

Competitiveness, then, has a domestic objective—to serve the consumer—and an external objective—to improve exports. In both cases, it should provide ever larger real wages and be consistent with the growth of overall employment.

Another aspect that deserves comment is the following: the strategy was already defined in accordance with a dynamic based on the expansion of the domestic market designed to attain simultaneously import substitution and the incorporation of new sectors, as well as an increase of exports. In this process, it could be to the country's advantage to have a progressive rise during a determined period of time in the coefficients of exports and imports, in so far as the former have been low (except in an atypical year like 1988), and the latter even lower (5%).

The idea would be to increase exports and imports to rates somewhat above those of the gross domestic product (with a higher differential in the case of imports) but to maintain at the same time a commercial trade balance of the order of US\$12 billion, or somewhat more, to pay between 50% and 60% of the interest on the debt.

Emphasis should be given to the importance of first defining the objectives, in order to give meaning, for example, to the discussion of matters such as the trade surplus and the export and import coefficients. It is a question of making a new development strategy viable, from a perspective of growth with redistribution and reforms. The surplus and both coefficients are instruments of this strategy, and should be considered as such in order to judge whether or not the proposed definitions should be maintained. The element which makes it possible to evaluate them is, above all, their functionality within this strategy.

For example: why increase imports? Essentially in order to grow more, to modernize certain industrial sectors and to increase the competitiveness of exports. Far from hurting domestic industry, the goal is to make it more solid, since it will be more efficient when it is up to date. In other words, more production goods should be selectively imported, and not more consumer goods (except marginally). There would emerge an industrial structure located on a higher level of competitiveness; i.e., a higher level of resistance to the incursions from the exterior and a greater dynamism in the search for external markets.

And why increase exports? Also in order to grow, through a greater use of domestic factors of production (manpower, natural resources, intermediate products, machines); and, in the following stage, to increase the domestic market, to the extent that these additional factors lead to the purchase of more goods and services within the country. At the same time, exports serve two other ends: they finance the larger amount of imports desired, without increasing the external debt; and they pay the interest on the external debt, as was already said. Edmar Bacha once pointed out, correctly, that it made no sense to think that Brazil could become an export platform. However, it does make sense to raise the

coefficient of exports during the next few years, in the gradual way that has been proposed.

Having already dealt with the aspects of the strategy that are related to the external sector (exports and imports), we now examine more closely its incorporation into the international economy.

Keesing (1967) stated very accurately the idea of an "outward-looking" strategy. For him,

"outward-looking" means essentially a strategy that gives constant and deliberate attention to trends in commerce and industrialization beyond the borders of the country itself, as does Japan and the supercompetitors of Asia. This constant study of what is happening in the world puts them in a position to take advantage of future opportunities and to anticipate eventual risks.

IV

The strategy: perception of the new comparative advantages and the ways to obtain them

After having examined the trends in industrialization throughout the world and the trends in competition on a global scale, we are better equipped to analyse the implications of the industrial and technological strategy suggested.

As pointed out, this strategy, within a selective and flexible focus which differentiates it from the policies adopted in the initial phases of our industrialization, comprises two major lines of action:

a) To explore the new dynamic comparative advantages of the country, which are still not completely known, acquired through technological advances already under way: electronics, informatics, the linkage of these with mechanics, advanced industrial chemicals, the use of new materials and biotechnology. This technological and industrial development is urgent, especially because of the lack of initiative in the last few years and the backwardness of certain more modern sectors of Brazilian industry.

b) To fortify national competitiveness, domestic and external, by developing technology and management where it is justified from a macroeconomic viewpoint, and by correcting the distortions linked to excessively widespread import substitution or to a comfortable domestic climate, the result of an excessive or irrational protection. In the overall effort to increase competitiveness, the social consequences of the strategy will certainly always have to be taken into account, especially those related to employment.

A third line of action can be added to these two basic lines, in the following terms:

c) To complete the effort to carry the logic of industrialization and modernization to the sectors which form a necessary part of a diversified and integrated economy, such as agriculture, functional services (industrial services of public utility, transportation, communications, storage, modern commerce, finances) and mining.

Unlike what happens in economies like those of Japan and Korea that lack natural resources, the exploitation of Brazil's comparative advantages can never lose sight of the tremendous opportunities available in sectors such as agriculture and mining.

If we consider the development of the first line of action, we should ask what are the consequences of the new world-wide technological pattern for the comparative advantages of the country. This new pattern raises two major questions. The first concerns changes in the very concept of the factory, in manufacturing processes and in the organization of production. The other has to do with the effects of the new materials and new productive methods on the use of traditional raw materials (given that these new methods and materials save on inputs), and with the consequences of biotechnology on agricultural productivity.

With respect to the first question, it must be remembered that the traditional technological pattern —which goes back to the beginning of

the century and the revolution initiated by Henry Ford in the automobile industry when he set up assembly lines— was designed to produce a standardized product on a large scale (mass production methods). Up till a short time ago, automation did not affect that logic, and only meant a greater use of machinery and reduced use of labour, a factor which was scarce in the industrial economies.

The new technological pattern, whose characteristics are *flexibility* and *integration*, is capable of *being applied in a general way to all industrial activities*, and not only to mass production, like automation in the previous pattern. According to a special study of the Economic Commission for Europe (ECE) of the United Nations (1986), there are two new important advances:

i) In mass production processes, the control of the machines with computers makes it possible to increase the flexibility of the productive system, in so far as it can be used to manufacture innumerable variants of the product, with minimum transition times. At the same time, the need to maintain stocks is considerably reduced, and it is easier to adapt to market preferences. Even the automotive industry (birthplace of the concepts of the assembly line and automation) is moving away from mass, standardized production, and moving towards the production of differentiated lots in large volumes.

ii) Nevertheless, the technology of controlling manufacturing with computers has even greater potential *in traditional activities of production in small and medium-sized lots* (a very important development, considering that even in the United States 75% of manufactured articles are produced in lots of between 50 and 100 units).

While the previous model of automation is essentially oriented towards diminishing the cost of labour per unit produced, the new technological pattern is aimed at a better use of all the items that enter into the total cost (even time); at reducing stocks of products, either in process or finished; at completely integrating the stages; and at obtaining superior quality and more guaranteed products.

The second type of advance can be of particular interest for developing countries, in so far as it means improving productivity without neces-

sarily using automation. It is a question of obtaining continuous productivity increases, through successive improvements in the organization of production (new technologies of social organization of production —TSOP—, as opposed to technologies of flexible automation —TFA—, in the terminology of Tauile). This eliminates losses of time and materials, and high quality products are obtained, with no defects.

These improvements can accompany or not a greater automation. The use of the new technologies of social organization of production change the productivity of automated systems (which before was almost a datum, once the learning stage was over) or of those that use few machines. For example, a recent study of Japan's Institute of Developing Economies recommends the use of techniques of this kind in Brazil's small and medium-sized industry: total quality control, "kanban" or *just in time, zero waste*, etc. Added to these are design and manufacturing methods that computers use (*computer-aided design* —CAD— and *computer-aided manufacturing* —CAM). We thus have different forms of *software*, to give them a name, which do not imply automation, and which, according to Henrique Rattner (1988), are already being used successfully in small and medium-sized industry in places like France, Italy, the Netherlands and the Federal Republic of Germany, through programmes that count on government support.

With respect to the second type of question raised by the new world-wide pattern of technology, much has been said—including the well-known article of Peter Drucker in *Foreign Affairs* (1986)— about the trend towards less demand for traditional raw materials (steel products, copper, aluminium). This is because the new methods of production need less materials per unit of product, and also because the incorporation of new materials (ceramics and plastics for the automobile industry, semiconductors for the microelectronic and informatics industries, optic fibres for the photoelectronic industry, superconductors for the transmission and storage of energy, etc.).

Having analysed all the practical consequences, we may observe that the principal effect in the medium term could be the use of new materials, especially for new uses, and not so much the substitution of old materials. The effect of

substitution is certainly irreversible; but perhaps its repercussions will not be dramatic in five to 10 years (except in Japan). This is not to deny the importance of the problem, but only to say that we shall need time to prepare for it.

With respect to biotechnology, and without trying to underestimate the change that it will produce in the conditions of agricultural productivity when advantages from the climate and abundance of land are reduced, its effects tend to be rather gradual. Nevertheless, it is certainly necessary to be alert.

There is one basic idea that should be stressed: according to the new technological pattern, the intensive use of technology in a great number of industrial sectors will mean in practice that *many of the comparative advantages will be created* by the basic aptitudes the country manages to develop. Relative endowments of natural factors (work, land, natural raw materials) will become less and less important. However, it is evident that the best results will be obtained by taking advantage—using the new technologies—of the factors that are abundant in the country, whether semi-skilled manpower or natural resources, or more highly specialized manpower (less abundant, but, even so, much less expensive than in the developed countries). This last factor, for example, can create competitiveness even in technologically very advanced sectors, such as international engineering services and computer programming (*software*).

In short, we have to use our radar to obtain new comparative advantages, within the specificity of the conditions the country offers.

Having examined the implications of the new technological pattern, we can have some idea of the possible new areas of Brazilian competitiveness. In doing so, we must strive to be specific. As an initial approximation and taking as a reference the classification of Brazil's factors of competitiveness presented in the IEL study (Federal University of Rio de Janeiro), we can point to the following trends in Brazil's dynamic comparative advantages:

a) The establishment of a new group of sectors, related to the generation of a minimum of critical mass in the high technologies, through selected production lines and specific strategies for each new technology: informatics (physical components and logical components), electron-

ics, and the linkage of both of these with mechanics to form a mechatronic industry; new materials and biotechnology.

With respect to new materials, their highest development is expected in Japan, where, by the year 2000, 40% of the manufacture of automotive vehicles will employ new materials. Brazil could have some opportunities (new metallic alloys, ceramics, quartz, since 90% of the world reserves are found in the country). With respect to biotechnology, the more simple techniques are relatively easy to dominate.

High technology, particularly informatics and electronics, generally includes short-cycle products (subject to rapid obsolescence), and these brief cycles tend progressively to become even shorter.

For this reason, Brazil could possibly develop along those lines, with a policy that includes a rapid absorption of technology and a certain technological capacity of its own, but in association (with the large world producers, through the purchase of technology and the establishment of corporations), and only exceptionally in the vanguard. Likewise, as suggested below, Brazil will have to create a special and efficient system of incentives.

The computer industry, with a reasonable structure already in place, will have to move on to a stage in which it will become more competitive and more solid technologically, economically and financially. Its costs are still very high, especially because of the excessive number of enterprises, which prevents the industry from taking advantage of economies of scale. An effort should be made, then, to restructure the industry in such a way as to augment the scale of a certain number of adequately capitalized enterprises; to induce them to make a greater effort to adapt and improve (by reducing technological passivity); and perhaps also to seek some markets abroad.

In general, the new technology sectors could be expanded with a view to looking for good opportunities to incorporate themselves into external markets. Such opportunities certainly exist for computer programmes (*software*), owing to the critical mass already in place and to the greater competitiveness that it has shown. Moreover, this can be accomplished with a small investment. Some of our own vanguard technol-

ogies —such as the exploitation of petroleum in deep water and the transmission of electric energy in continuous current over long distances— can also be adapted for a development of this kind.

It is useful to recall that this first group of activities will play an important role in the modernization of almost all the other groups, through a case-by-case analysis which will consider the aspect of the economic feasibility of the change and the desirability of adopting it, according to macroeconomic criteria, for example, employment.

Given current synergies, Brazil's development should be conducted through an integrated policy for informatics, telecommunications and consumer electronics, which is important even for the feasibility of the production of microelectronic components in the country.

b) Development of a line of strategic investments, with a high priority for the group of sectors whose technology could be mastered and whose products have a long cycle. These are mainly capital goods, high-quality steel, components for durable consumer goods and capital goods, and the aeronautical industry (which is approximately equivalent to Group III in the IEI study of the Federal University of Rio de Janeiro). Naval construction could also be included in this group. The automotive vehicle industry is a special case. In order to reach more demanding markets, it will have to develop new models (by introducing automation in the productive process, as well as by using electronic components and new materials).

Since they are long-cycle products, whose technology is advanced but does not change very rapidly, Brazil could choose the appropriate sectors and use them to become a world-level leader (in the case of the aeronautical industry, only in a certain line of small planes; in the others, without that kind of limitation).

Brazil is already exporting high-quality steel products to some 50 countries, and dominates the technology; it can ensure, then, its place in the world-level vanguard. The international trend consists in a small number of leading firms coming together, while the other producers begin to function as associates.

Brazil's competitiveness can also extend to different kinds of special metal alloys, where it has advantages because of its natural resources.

The situation of capital goods is more complex. Nevertheless, it makes sense that the country try to obtain a place in the international vanguard. This sector also tends to be concentrated in a small number of countries and producers. The reason is that the developed nations, with a few exceptions, are losing their competitiveness because of the high cost of specialized labour (which the sector uses intensively) or because of the rising revaluation of the European and Japanese currencies in relation to the dollar. The adjustment process of the capital goods sector is especially felt in the United States, but is also growing in Japan. The Republic of Korea and the People's Republic of China are emerging as large producers (the Soviet Union's technology is out of date).

Brazil has a great opportunity, because it can employ specialized labour at reduced costs, which ensures products of recognized quality in competitive conditions. However, in order to exploit this advantage, two conditions must be met: Brazil must ensure access to and dominate the technology, and count on considerable support from the domestic market. This second condition is difficult at the present time, since orders from the State are paralysed and the private sector is hesitant to invest.

Consequently, in order to reaffirm the international competitiveness of the country and aspire to a growing participation in the vanguard, the sector must apply a programme that is consistent in:

Technological modernization. The machine-tool segment needs to be modernized through a greater use of numerically controlled machine tools (NCMT) and machining centres. There is an even greater need for modernization in the made-on-demand capital goods sector, which entails numerically controlled machine-tools, machining centres and computer-aided design systems in project activities.

The security of being able to dominate the technology. This is only possible with a prosperous domestic market, which confers a better position for negotiating with suppliers of technology during the stage in which the national enterprise develops its capacity to absorb, adapt and then generate that knowledge. Also, such domination is only obtained on the basis of an incentive system for the firms in the technological sphere.

The gradual introduction of new kinds of equipment, incorporating the new technological pattern (informatics) to the extent allowed by domestic demand and export alternatives.

The application of a broad programme to gain external markets, which will only acquire the necessary dimension if it is associated with the effort to modernize and dominate the technology.

*Consolidation of the country's capacity for competition in the basic-input group (Group II in the IEI study of the Federal University of Rio de Janeiro). The priorities are the following: i) paper and pulp, whose industrial establishment is modern, but out of date with respect to the application of informatics for the automatic control of processes; ii) steel, which also has a new situation with respect to technology, especially in heavy flat and rolled steel, but needs some investments to modernize and link up with the capital goods industry in order to develop the country's basic technological project, and iii) chemicals and petrochemicals, whose processing installations should modernize through automation and the application of informatics to process controls. In this latter sector, more complex segments of petrochemicals (plastics of advanced engineering *et al.*), and more elaborated chemicals should be incorporated.*

The revitalization of more traditional spheres of industrial activity, such as textiles, footwear, pharmaceutical products, certain food products (especially milk and meat products) and the whole range of construction materials. These correspond to Group I of the above-mentioned IEI study.

The conservation of the competitive capacity of agroindustrial complexes, like soya and orange juice. It would be expedient to review the situation of the agroindustries of sugar, alcohol, now very dependent on subsidies.

With respect to the development of Groups I and II, two questions should be considered which are certainly of interest for the future of industry in the country. The development of the North-east and Amazonia (with a selective character for the latter) should be priorities for the national strategy. However, the policy applied in both regions should not be allowed to create insuperable distortions.

The first point refers to a re-examination of the Foreign Trade Zone of Manaus. This should be maintained as, moreover, is provided for by the Constitution. However, the original project must not be distorted. It was conceived as a mechanism to provide the area of influence of Manaus with the dynamic effects of a pole of integrated growth, both industrial and agricultural. That means, in this case, ensuring that the integrated character be maintained, even with respect to feeding the population of the zone with the agricultural production. Given the high level of current subsidies, the Foreign Trade Zone should also be prevented from assuming dimensions that are disproportionate with its purpose.

An observation can be made regarding this last point. The incorporation of high technologies benefits a great deal from the interconnection between informatics and electronics (physical components, peripheral elements and logical components) and consumer electronics. It is reasonable to keep part of consumer electronics in the Foreign Trade Zone; but the future of the country's consumer electronics cannot be centralized there, and even less so the future of the new technology industries. The whole modernization of Brazilian industry and the exploitation of the new comparative advantages depend on these industries. For this reason, such sectors have to be developed essentially at competitive costs, wherever their location is the most efficient.

A second issue which needs to be re-examined is the decision regarding the programme of export processing zones.

The industrial development of the North-east should be pursued through: integrated industrial complexes, especially those that use the region's natural resources, like the petrochemical pole of Bahia, the chemical complex of Alagoas and the alcohol plant in Pernambuco; the agroindustrial projects in which the region has competitive conditions, such as vegetable oils, fruit juices, tinned fruits, etc.; the export projects of manufactured products or their production for the regional market, made feasible by regional fiscal incentives; the exclusivity of the special import arrangement (or tax reduction or exemption) in certain sectors such as textiles;

the preference in locating projects of State enterprises, without detriment to their economic and financial feasibility.

With a creative approach, a whole system of differentiation can be used to favour the North-east in the framework of credit and fiscal policies of the Union, particularly when it is a question of ensuring the capacity to export.

However, it is not expedient to use mechanisms like those of the export processing zones, which Brazil stopped applying at the beginning of the 1970s, a time when they may have been more justifiable. These zones, which are real enclaves, were created by the so-called "tigers" of Asia when they were beginning to industrialize, as a means of offering attractive minimums to foreign capital, which knew practically nothing of those countries. Brazil at that time already was receiving a large flow of direct foreign investment, and did not need such a measure. On the contrary, instruments were used such as the concession of fiscal benefits to special export programmes (BEFIEEX), which are integrated into the industrial structure of the country as temporary mechanisms for promoting determined export lines.

Having presented the idea of the new national comparative advantages, mention should be made of some conditions for these to become effective in practice. These are mainly linked to two kinds of relations which need to be created in a society oriented towards a progressive affirmation of the new technological pattern: a relation of co-operation and not antagonism between the governmental and private sectors; and also a relation of co-operation and not conflict in the system of labour relations (mainly between engineering teams and specialized workers on the one hand, and the management of enterprises on the other).

The first point was emphasized recently in the United States in an important book of Simon Ramo (1988), one of the two geniuses that hold up Hughes Aircraft, and now the president of TRW, Inc., the giant of the aerospace sector. According to Ramo, one of the factors responsible for his country's loss of competitiveness with respect to Japan consists in the fact that Washington and Wall Street (that is, the government and the capital market) have not given enough importance to the role of science and technology, and have allowed the public sector and the enterprises to relate to one another as adversaries. In his judgement, the concept of federal government action being limited only to regulate economic activity is clearly out of date; it should be replaced by another, one of close co-operation and mutual support, without confusing interests.

For the second point, it has become evident that one of the secrets of the success of the Japanese enterprise management teams consists of the relationship of co-operation between the personnel of the enterprises and its administration, with a view to constant improvement of productivity and quality. The price for this is that the different categories of employees share in the better results obtained because of productivity increases.

These are the rules of the new technological pattern, which is characterized by the predominance of research, technology and the better organization of industrial production; by the constant modification of the factors of competitiveness; and by the trend to a competitiveness of global reach, which not only includes the activities of the enterprise, but also important aspects of the type of society in which that enterprise is situated. Those who fail to perceive this reality will not meet the challenges of our times.

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