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IDRC-133e

Science and technology for development: planning in the STPI countries. Ottawa, IDRC, 1979. 178p. :ill.

/IDRC publication/. Compilation on the integration of /science/ and /technology/ into the /development planning/ process of several /developing country/s — examines issues in science and technology planning, and its /economic implication/s; presents /case study/s of science and technology planning experiences. /Bibliography/s.

UDC: 600.001.1

ISBN: 0-88936-182-7

Microfiche edition available

Science and Technology for Development:

Planning in the STPI Countries

32402

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no. 26

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3. Analysis of the Technological Content of the Argentine 3-Year Development Plan (1974–77)

Eduardo Amadeo

Theoretical Framework

All policy instruments, and planning instruments in particular, contain a series of postulates that refer specifically to the goals of S&T activities, because the product of these activities is considered to be of primary importance in the achievement of a country's overall aims.

There are, on the other hand, S&T needs that can be inferred from a reading of the general and sectorial objectives, as well as the descriptions of the projects and programs planned to achieve these aims. The needs are implicit in the very existence of proposals for changes in a country's development. Observation of the normal development of knowledge and the incorporation of new knowledge into the elements of production has shown that new technological structures are a necessary part of any attempt to enhance development. Technological factors can affect an S&T plan in two ways: by influencing the attainment of immediate goals; or by influencing the attainment of all quantitative goals (immediate and long-term).

For example, the failure to incorporate modern technology may simply limit the possibility of achieving a desired rate of growth in productivity or it may simultaneously hinder the goal of growth and a goal of full employment at high salaries.

Another example, often found in dependent countries, of the importance of technology in S&T plans is the attempt to modify the structure of production by modernizing it, with a proportionate increase in "autonomy," when the capacity to generate knowledge is lacking. Generally this results in an increased dependence on foreign technological and financial assistance. The problem of the different time frames of economic development and of S&T development shows even more clearly the importance of studying the S&T content of a development plan.

The need to achieve rapid growth primarily in response to political restrictions is one of the principal influences that must be dealt with by all those who wish to effect structural changes in developing countries. Moreover, there are often lingering problems of scarcity of supply in vital sectors, financial strangulation, chronic lack of external balance, and so forth that are considered primarily as short-term problems whose solution demands an all-out effort. And it is here that the stereotyped prescriptions are used again and again, recommending accelerated accumulation of capital, supplemented by foreign contributions, and counting on imported

technology for investment in sectors presumed to have the potential for tremendous growth and contribution to the economy. As a result of the attempts to achieve rapid growth, structural reform becomes deferred and undesirable structures are ratified.

The situation is even more serious if attempts are made to end technological dependence, relying on the local scientific community to create new technologies and the local production sector to absorb them. The process of establishing a scientific creative capacity that is durable and of high quality is long and costly.

It is essential that knowledge generated by the S&T system not only is of good quality but also meets the demand. Thus, there is a need for policy instruments that foster the relation between the scientific and the production systems, ensuring that the results obtained by the former are used by the latter.

Doubtless all these objectives exceed the aims of a short-term development plan, especially one of 3 or 4 years. However, this discussion has shown the need to analyze the relations between the proposals for structural reform, the need for growth, and the technological factors expressed in concrete plans, instruments, and programs for institutional reform either in the S&T plan or in other documents from the scientific area of the state.

Political Framework

The Argentine 3-year development plan is a document that expresses the political proposals of action of the "national bourgeoisie," a group with economic and political force that took power together with the Peronist movement early in 1973. In contrast, earlier plans, those created during the 1960s and early 1970s were the result of either purely political groups, such as the radical government of 1963, or technocrats affiliated to a transitory structure of power, such as that in 1966–73.

Thus, the importance of technological factors in the 3-year plan is clear. Technology is one of the elements that determines whether small and medium-sized firms survive on their own or must depend on other sources of capital, mainly foreign.

To understand the importance that the plan gives the state in the implementation of the proposed policies, one must be aware of another political factor: that in its struggle for dominance, the national bourgeoisie can make use of only one possible ally, the economic power of the state, and can do so only when it has control of the pertinent apparatus.

Principal Features of the 3-Year Plan

The primary objectives of the 3-year plan are to attain substantial general and sectorial growth and to modify some features of the social structure of Argentina. It does not propose modification of production relations but, rather, improvement in specific aspects of the elaboration and distribution of the product within a capitalistic system.

The principal objective of the plan is "to establish the bases of a long-term process that, while reaffirming the authority of the State's

decision over economic activity, will facilitate increasing production of goods and services and the full employment of productive factors within the framework of an equal distribution of income and wealth, and a balanced regional development."

The plan is defined as a plan of change, in contrast to a continuity plan, which would be concerned only with the growth of measurable variables. This is expressed to some extent in the plan's general objectives, which include:

- Marked expansion of economic activity (doubling of the rate of growth of the previous decade) and increasing independence on all fronts.
- A high quality of life, with idiosyncratic patterns of consumption and without ecological problems.
- National unity and full regional economic independence.
- A marginal role for foreign capital, and renationalization of industry.

These general objectives become transformed into the following postulates:

- The restructuring of demand, which implies, among other things, that "in the choice of providing individual equipment for the higher income groups, or collective equipment for the community, the latter option will obviously prevail";
- The need to transfer the dynamism of economy from foreign monopolies to national enterprises and especially to foster the activity of a large group of small and medium-sized firms;
- Opportunities provided for productive employment in the whole country; and
- The restructuring of the government, so that it may carry out efficiently its role as promoter and regulator.

The 3-year plan attempts, through these objectives, to transcend the purely evolutionary designs, in which changes of structure would be the long-term outcome of economic growth. The quantitative variations are significant, in that they aid in the attainment of the desired objectives.

Bases of the Growth Model

Three elements constitute the bases for achieving the goals of the plan: a high rate of growth of investments (average of 12% per annum), increased productivity of the installed capital, and doubling of the volume of exports.

The important increase in public and private investment should generate the desired rate of growth (7.5% per annum, cumulative), doubling the rate during the previous decade, because a high percentage of investments should be intended for installation and expansion projects in sectors producing intermediate and capital goods, as well as for the economic infrastructure.

Therefore, to ensure that the increase in investment would terminate in a more than proportional increase in production, it is necessary to have a

substantial decrease in the marginal relation of capital to product, which, together with increased labour productivity, would double traditional volumes. This would depend not only on more complete and effective use of existing productive installations, but also on the nature of the capital stock incorporated from the time the plan entered into effect.

Export goals constitute a principal element in the growth dynamics provided for in the plan, because the plan needs to ensure that "the import capacity will not hamper the attainment of the aims of growth programmed by the plan for different sectors, nor the level of foreign debt jeopardize the country's capacity to take autonomous decisions."

For the general aims of the plan to be achieved, these growth designs must be consistent with a sustained process of redistribution of income, in which the average real wage increases (by an average of 7%) and the participation of wage earners in the total income of the country rises through higher salaries and the elimination of unemployment. The planners considered that a substantial expansion of economic activity, particularly in the traditionally vegetating sectors that have a high employment capacity, would lead to the achievement of full employment, this being one of the primary general objectives of the plan.

A study of what the plan refers to as the "principal actors" in the proposed model — the state and the local enterprises — is of special importance. With regard to the state, the plan affirms that "the action of the State aims to fulfill the aspirations of the majority. . . . The State's function as regulator of the behaviour of economic agents and of the community as a whole, is considered essential to the needs of a development policy." Moreover, "the direct production of goods and services by the State holds an important place in Government Policy. Apart from the traditional activities which are increased to fulfill the needs of the population, and the formation of an economic infrastructure compatible with global and sectorial development objectives, the function of the State is to carry out large scale projects which constitute together with certain basic measures of economic policy, *the supporting pillars of Argentine development*." For this purpose, "a high administrative efficiency is needed, as well as a concentration of resources and a reform of the administrative structure, leading to the creation of optimal conditions for the coordination of effort."

As for local firms, "it is necessary to foster the activity of a vast sector of small and medium size firms which act as agents of change and promotion in many sectors and in specific areas," and to promote "the development and reconversion of some industries manufacturing durable and non-durable consumer products, which employ a large number of manpower. This would be the case . . . [for] . . . the textile industry, ready-made ware, leather, furniture, branches of the food and beverages sector, home appliances and 'printing and publications'."

In this respect, the plan proposes a change in one of the main features of the Argentine economy since the beginning of the 1960s: the marginal role of sectors producing goods for massive consumption, the "vegetative industries," which consist mostly of local firms.

Technological Implications of the General Objectives of the 3-Year Plan

The Role of Technology in Development Models

The 3-year plan proposes a qualitative and quantitative change in the socioeconomic structure of Argentina. Perhaps the most relevant components of the proposed qualitative change are: (a) the modification of the way in which basic needs are to be fulfilled; (b) the revitalization of small and medium-sized local enterprises; (c) the replacement of foreign capital with local capital in the economic structure; and (d) the establishment of the state as controller of economic activity.

To understand the technological implications of items a, b, and c, one needs an understanding of the reasons for a specific structure of production in a dependent country, such as Argentina.

The predominance of foreign capital, the marginal role of local firms (small and medium-sized firms in particular), and the existence of an unsuitable structure of consumption are part of the process initiated with the incorporation of Argentina into the development designs of world capitalism.

The structure of demand is founded on the cultural, economic, and political dependence that became a symptom of life in Argentina during the last decades of the 19th century and the first half of the 20th. Substitution of locally produced goods for imports is merely an attempt to satisfy a demand that previously necessitated importation. Successive development projects implemented by the government have, by different means, opened the door to foreign capital and continued dependence. The government's concentration on improving income and social conditions constitutes fertile ground for substantial foreign investment that, with the help of the mass media, consolidated a structure of demand to fulfill the accumulation needs. Demand and supply cannot be considered independent from one another (though theory has always maintained the contrary); they are two aspects of the same process, determined by the evolution of world capitalism.

What role does technology play in this process? First, it largely determines the capacity to generate profits, whether through lower costs, diversification of products, use of raw materials, or other factors. These are the elements that, depending on the structure of the market, every business must confront and decide upon. Exclusive access to "modern" technologies generates monopolistic advantages, which at present belong to the industrialized nations and which largely account for the dependence of developing countries such as Argentina.¹²

Although modern technology is controlled primarily by the industrialized nations, it trickles out on a world scale due to the demand arising from specific expansion needs of capital. The means of fulfilling demands, the average size of the market, the degree of concentration of enterprises, and the general nature of competition provide specific guidelines for technological evolution with respect to the type of goods being produced, the nature of the capital goods used (their sophistication, degree of

¹² See: Merhav, M. 1972. *Dependencia tecnológica, monopolio y crecimiento*. Buenos Aires, Periferia; Sylos Labini, 1966. *Oligopolio y progreso técnico*. Madrid, Oikos.

automation, etc.), the nature and scale of the production, and the type of raw materials and intermediate products involved.

All these considerations restrict rather than expand the range of effective technologies (those that minimize the relation of capital to product, of fundamental importance in developing countries). If we admit that these observations are true, then we must admit that all policies that attempt only to modernize the production system must lead to the use of such technologies.

Implications of the Qualitative Proposals

I will now attempt to apply the foregoing discussion to the proposals for structural changes contained in the 3-year plan, particularly proposals to restructure consumption patterns (demand), to give preferential treatment to local enterprises, and to revitalize small and medium-sized firms.

Obviously, unless these proposals are supported by plans or research programs aimed at finding solutions that will make them technically feasible, they will remain as mere suggestions.

The restructuring of consumption patterns requires a review of needs, with particular attention to those that have been ignored mainly because of the policy to redistribute income, and a search for new methods to satisfy the needs. The first question to be asked is: Are there any technological alternatives that allow the fulfillment of existing needs to the greater benefit of society? On the basis of experience the immediate answer appears to be No, and even if such technologies do exist they probably are obsolete. Food, clothing, transportation, communications, and leisure time are basic needs, the fulfillment of which in Argentina has traced, more or less precisely, the pattern of the United States. In this respect the most significant proposal concerning the reform of consumption patterns in the 3-year plan is: "In the choice of providing individual equipment for the higher income groups, or collective equipment for the community, the latter option will obviously prevail." If this proposal were to be implemented, it would require total modification of the structure of public services and discouragement of the production and consumption of durable goods and services that are oriented toward the fulfillment of individual needs. The first to be affected would be the transportation and communication, health, education, and housing systems, but such complex variables as the whole design of urban structures would also be directly affected. The two greatest stumbling blocks are creating the knowledge necessary to determine pertinent technologies and convincing production managers to adopt them (maintaining the rules of the game of free enterprise).

The structure of production is not based on chance, but is the result of a process in which the distribution of income, the expectations for social improvement, and the types of goods consumed are determined by accumulation needs. A change in one of the elements of this equation requires appropriate changes in the other elements to maintain the balance. The balance is due to the benefit derived by the units producing the goods consumed; included in the calculation of this benefit are, among other factors, the cost and nature of the technologies involved, and the relations that such technologies may establish abroad. Therefore, the

new technologies must be economically acceptable to the production sector if they are to be adopted without the use of coercion and without change in the accumulation process.

Technological development is of the greatest importance in fostering the activity of small and medium-sized firms. Although many of these firms' problems are financial, all have in addition technological characteristics that limit the possibility of an increase in productivity to allow them to compete effectively with large firms; thus they are condemned to perpetual marginality. The problem transcends national frontiers and becomes a question of technological development on a world scale. That is, technologies that lead to high productivity or to the production of goods that are able to generate monopolistic benefits on local or international markets are developed for large-scale activity far beyond the market possibilities of the small and medium-sized firms that need help.

Hence, research programs should be planned that are aimed at developing advanced technologies locally for small-scale production, and technologies generated elsewhere that are considered to be desirable for a market that the production of small and medium-sized local firms may satisfy should be adapted to a local scale.

Implications of the Quantitative Proposals

The goals that constitute the basis of the dynamics of the 3-year plan for the Argentine economy in the coming years are a high rate of investment growth, increased productivity of the installed capital, and doubling of the volume of exports.

A large percentage of the proposed investment will be applied to important projects in the industrial sector and to projects related to the economic infrastructure that would complete the vertical integration of industry and put an end to some of the bottlenecks restricting general expansion and regional integration.

Investment in important industrial projects will be in the areas of iron and steel (U.S. \$1 140 million), petrochemicals (U.S. \$581 million), and cellulose, paper, and wood (U.S. \$500 million), and \$ U.S. 3 764 million will be invested in building power plants.

These investments will be made taking into account two elements: the need to balance investment in growth with that in vertical integration of the industrial sector; and the fact that these investments will be the principal factors in the improvement of the structure of production to attain the desired rate of growth.

Although from the technological point of view, the plan specifically establishes that the largest possible portion of investment purchases should be made within the country, it also specifies that the core technology of the projects, whether incorporated or not, will have to be imported, owing to the nature of the projects, the limitations of existing installations, or the current creative ability in priority areas.

It appears, then, that the large investments will increase the degree of dependence on foreign technology in the sectors that are basic to the plan.

Political limitations make it necessary to place technological development on a secondary plane initially, although it would be unrealistic to expect a short-term alternative — more so in view of the chosen pattern of growth.

An additional comment should be made regarding the nature of the basic sectors chosen and the proposals in the plan for a change in the structure of demand. If a definite new structure of demand were created that would "find expression in a new national model, freed from consumption patterns imitating foreign models," it would be necessary to provide for the resultant structural changes in the production of intermediate (or "basic") products. If we failed to make such provisions, we would be proposing a different structure of final demand while extrapolating the existing structure to determine its downward requirements.

The plan has failed to make these provisions, and therefore leaves a situation in which the future characteristics of the society depend on the immediate needs of growth.

Similar comments on the relation between long- and short-term goals can be made about the need, explained in the plan, of achieving a substantial increase in employment together with a decrease in the growth of the capital/product relation. Careful evaluation is required of the technologies that would make the objectives feasible.

In view of these considerations and the experience of Argentina during its period of rapid capitalization (1958–62), it is likely that a significant increase in employment capacity and a decrease in technological dependence of industry are possible only through proper control of the technology incorporated in the new investments. This is especially true for the traditionally employing industries, which, in the sectorial strategy of the plan are given great responsibility to generate employment for the plan's duration.

As for the proposals made in the plan to double the volume of exports, the goals pursued are diverse: to obtain in the short term an influx of foreign currency such that the import capacity will not hamper the plan of general expansion; and to make a significant change in the industrial structure, enabling it to generate at least as much foreign currency as may be necessary for its own expansion.

The first aim may be achieved by strong financial or credit incentives (reimbursements, drawback, credit promotion, preferential exchange rates, etc.). These incentives do not, in principle, modify the structure of the benefiting industries to such an extent that they are forced to abandon the foreign market as soon as the government ceases to give such incentives. They only provide the means for greater efficiency through greater production. On the other hand, provision of these incentives necessitates redistribution of the resources of the whole economic system toward the export sectors, and this may involve considerable sums.

It is obvious that Argentina needs a consolidated and dynamic structure for the export of manufactured products, one that will make it possible to overcome the cyclic limitations of supply of primary products. This can only be achieved through the production of goods able to hold their position on the international market, either by lower cost or diversification. Therefore, policy instruments should selectively support these products and attempt to change the structure of their production through intense technological activity, the granting of loans, and the action of specialized state agencies, such as the Corporation of State Enterprises and the National Industrial Technology Institute.

Explicit Technological Policy of the 3-Year Plan

At this point, two aspects must be considered: the explicit statement in the plan regarding technology in general, and the concrete measures proposed for the achievement of the plan's objectives in this area.

Perhaps the most complete statement in the plan is the following:

Scientific and Technological development shall constitute one of the pillars of the efforts toward reconstruction and liberation It is fundamentally a question of placing the talent and creative ability of the Argentine people in the service of the highest objectives of the plan. In particular, the end of technological dependence This involves the development of a capacity to solve our technological problems, resorting to foreign cooperation only when it is indispensable. This, of course, does not mean that we must reject new international advances in the scientific and technical fields; only to strengthen our ability to choose from these advances what is most useful to our future progress. It is essentially a question of relating functionally technical development and the nature of the destinaries of production

This means that preference should be given to some lines of technological development more than to others, and in particular:

- The creation or adaptation of technologies leading to the full employment of the labour force, growing productivity and remuneration; decreasing costs and improved quality of goods and services, which will strengthen the economic integration of the industry through the development of the production of capital goods.
- Improving the ability to adapt technological advances to Argentina's structure of consumption and production.

Briefly, this is the position with regard to the nature of the desirable technological structure, according to the general objectives of the plan.

The policies proposed in the plan to achieve these objectives include:

- Intensifying basic and applied research, using selective standards that will direct it to serve national aims and not to supplement the S&T progress of great international industrial centres.
- Establishing a solid S&T infrastructure.
- Strengthening the role of the state, through its agencies and firms, as the promoter of technological development and as the inductor for the absorption of new developments into the country's production and distribution machinery.

These policy guidelines will be supplemented by the action of the institutions created by the plan, particularly the Corporation of State Enterprises and the Corporation of Small and Medium-Sized Firms.

Clearly the plan establishes the characteristics of an optimal S&T system acting in perfect harmony with the global objectives of the proposed model of development. In other words, the global objectives appear to have been "interpreted" so as to arrive at the S&T structure that should be useful to these objectives.

With regard to the technological policy as it appears in the plan, instruments are lacking that would clearly define the lines of action that, in

general, would lead to the attainment of the objectives established for the area. Just as the plan details the nature of the instruments that will implement sectorial policies, it should set out the most important aspects of the S&T policy, especially the forms of financing, the necessary reforms of institutions for the planning and performance of science, and the mechanisms and instruments to ensure national development and absorption, by the production sectors, of technology.

The failure of the plan to provide such definitions suggests that it contains only a series of pronouncements impossible to implement or that implementation has not been planned.

It is interesting that there has been no intervention of the Secretariat for Science and Technology during the design and implementation of the plan. The main implication of this is that the technological policy was to be carried out mainly through the institutions and instruments controlled by the Ministry of Economics. Apart from the internal political problems that led to the division between the economic and technological areas, this suggests that the technological proposals of the plan do not take into account the technological alternatives available in the country and the existence of "idle capacity," or lack of it, in the scientific system to fulfill the intermediate demands stemming from the final technological requirements.

Conclusions

If a general conclusion can be reached concerning the technological content of the 3-year plan, it would be that the technology policy implicit in the desired aims, and even more in the objectives, is richer and more complete than specific technological policies and measures proposed.

The proposal to obtain a high rate of growth and to modify patterns of consumption without changing the basic features of the capitalistic system implies creative effort of hitherto unknown proportions to modify technology — a central element of the economic system — in such a manner as to maintain a balance in the system.

Achievement of the task is considered doubtful because it is not reconciled with other goals, such as redistribution of income, full employment, regional balance, the fostering of national capital, and investment in small and medium-sized firms.

Experience shows that efforts to achieve speedy capitalization as a means of attaining a high rate of growth in a short period are apt to condition the structure of production for many years. But if economic growth is a short-term economic necessity for structural changes, it is necessary to provide the mechanisms for progressive change at the same time that speedy capitalization is attempted. One of the basic mechanisms for this is S&T creative ability (and therefore the ability to decide), which, while allowing progressive reduction in the greater dependence arising from the process of capitalization, ensures that future capital "stocks" will progressively include national technology.

Paradoxically, processes such as are proposed in the plan may provide the financial and institutional bases for the attainment of this ability, because the large flow of investments allows the inclusion of provisions

concerning S&T creation without greatly affecting the total conduct of investment. Furthermore, political will to attain this goal does exist.

The concrete proposals in the plan concerning the implementation of an S&T policy leading to the attainment of the global objectives are clearly insufficient. The most notable lack is precise sectorial definitions concerning the S&T needs to be fulfilled in the course of the plan, both the existing ones and those that may arise from the investment process. The plan also fails to propose specific changes in the generation of scientific knowledge: guidelines for the organization of institutions, standards for the allocation of resources, and relations with potential users, etc. These will, apparently, not be taken into account in view of the lack of a specific S&T plan.

Perhaps one of the principal reasons for the marginal role of S&T in the development model of the plan lies in the planning process. In the 3-year plan, technology is introduced from outside to inside and from above to below, almost as if it were a patch inserted in the process.

In practice this means that the technological implications of global aims are ignored because the necessary basic studies have not been carried out. Briefly, planning consists in defining the way to balanced growth on the basis of the existing balance of input and output and general political restrictions (desirable external debt, level of employment, distribution of income, etc.), not including the technological needs that may be implicit in global and sectorial alternatives.

The Argentine 3-year plan does not escape this general rule, although ambitious proposals are included concerning S&T.

Finally, the plan gives the state a role as one of the main elements for the attainment of the proposed changes. This implies that the state has the technical capacity to search for technological alternatives, to interact with its "environment," and even to develop original technological answers to the problems posed by accelerated growth. This is not the case in Argentina, where, with very few exceptions, the state has proven its very limited possibilities, despite huge resources. The most crucial point, however, is that the national bourgeoisie believes that the state can reorient its activities and use its power effectively for their political needs. The Corporation of State Enterprises was created as one of the main instruments for this purpose.

Once the national bourgeoisie lost its political power in early 1975, the corporation practically disappeared, and all the measures taken concerning the technological behaviour of state enterprises vanished and the enterprises returned to their traditional passive and dependent behaviour.