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FRENCH ACADEMIC AND PRIVATE RESEARCH ON ECONOMIC DEVELOPMENT PROBLEMS

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This paper has benefitted from comments received from Messrs. Michael Hoffman, Bela Balassa, Hugh Latimer, Herman van der Tak and staff members from the European Office of the IBRD.

Industrialization Division
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**ANNEXES**

A. List of Organizations Active in the Field of Development

B. List of Persons Active in the Field of Development
"My fourth rule was to make enumerations so complete, and reviews so general, that I should be certain to have omitted nothing."
Descartes, Discourse on Method

I. INTRODUCTION

1. This paper has been written primarily for the benefit of the Bank's economists, to acquaint them with what we may call a French economic development school. It does not attempt to be a complete survey of current French economic thought. It does not cover the ideas and methods that are commonly used in analyzing economic problems of France, or other developed countries, but have found little acceptance in economic analysis of developing countries. There is considerable skepticism in France about the usefulness of rigid macro-economic models and quantitative analysis, which are widely used in France itself, for the problems of developing countries, particularly in Africa where French economists have been most active. To cope with the special behavioral, social and political problems in this area, considerable emphasis has been placed on sociology, anthropology, and political science in the analysis of economic problems.

2. This survey concentrates on academic and semi-academic research institutes and consulting firms. The growing research activity of government developing service has not been reviewed. This is a serious limitation, but it was thought that the activities of government institutions were relatively well-known in the Bank. Until recently these government services were mainly involved in operational activities and relied for analytical work largely on academic and semi-public consulting organizations. This has now changed and the public services are expected more and more to carry out their own analysis. A brief survey of this research may be of interest in the near future.
3. This is not a critical survey of French economic development thinking. This would hardly have been possible in the short time devoted to the paper. Its aim is a much more modest one of simply reporting - as objectively as possible - on the major aspects and features of French thinking and research on economic development problems and the major institutions active in this field. I should add one warning here. There is not one school of economics even in a small country, let alone in France, and I have tried to introduce different, and often conflicting, points of view. It should be well understood that such expressions as "French economists think" do not mean that a significant or influential number of economists more or less adhere to a particular point of view. It does not mean that they are unanimous or even that it is a majority view.

4. To the best of our knowledge, neither French modern economic thought nor its application in the field of economic development has ever been reviewed. This has set a formidable task to the present reviewer. The coverage of this survey is rather uneven. Its coverage is reasonably comprehensive on general ideas of economic development, foreign aid, growth models and on industrial problems and transportation. Only a few comments are made on work going on in such fields as agriculture, education, quantitative analysis, etc.

5. The survey is divided into several parts:

(a) **Organizations Active in Research on Economic Development**

This gives a brief summary of the principal organizations doing research on economic development problems. I have tried to indicate their main fields of interest, staff resources, general outlook, etc. Annex A lists the organizations reviewed.

(ii) **General Ideas on Economic Development Problems**

I have tried here to extract whatever is new and specific in French economic thought, for a number of reasons. First, as one of my British friends, an economist living in France, has aptly put it, French economists often ask questions which have never been asked before and focus on development problems which, alas, no one has ever bothered about before. Secondly, France being a highly intellectual country, it is not surprising to find that methods of applied research and of practical economic analysis are firmly set within the broader frame of economic thought. A circular movement of economic thought, economic analysis, and economic policy can be very clearly seen. Thirdly, in line with the purpose of this study it was necessary to eliminate from the discussion everything which had been intercepted from economic theories originating outside France, or which did not apply to underdevelopment. This general part of the survey is based on numerous talks with university professors and on a reading of a vast, but highly dispersed economic literature devoted to development. For the sake of clarity, it has been divided into a number of basic topics.
Here again our survey focuses on analysis of developing countries. In order to derive the main lines of research, I have chosen from the major development research centers a number of papers and project analyses which were outstanding and representative examples of work in the major fields of development economics. Subject coverage of these research papers is uneven. Some fields, such as industry or transportation are widely covered here, while such subjects as agriculture or education are only lightly touched upon. This disproportion does not only reflect the abundance of research papers in some specific fields of development economics as opposed to others, but results also from a certain difficulty to synthesise papers in which the economic approach is not always evident or possible.

6. While surveying research papers, I have also tried to build up an image of the economic philosophy underlying the work of each research center. This seemed to be important for two reasons. First, the broad lines of thinking of the research centers reflect, usually, the ideas of a particular professional fraction of the intellectual community which influences the center of decision and, consequently, economic policy. Thus, if we want to learn more about the economic development of various African countries, one way is to know which research center contributed the most in laying down the foundations for its long-term economic plan. Secondly, in any future allocation of research contracts the Bank may wish to take account of the particular research interests and capabilities of the centers surveyed here.
7. **Historical influences.** What may be called a French approach to problems of economic development is fundamentally different from economic thinking and research methods practiced elsewhere. These differences have practical importance since all public servants in North and West French-speaking Africa, and also a sizeable fraction of the economic elite in the Middle Eastern countries, have been either educated in France or molded by French patterns of thinking.

The historical origins of differences between French and English scientific methods go back to René Descartes and Sir Francis Bacon. But while the nature of the exact sciences itself imposes a unique approach, given especially the possibility of verification through experiments, a variety of analytical approaches are still possible in the social sciences.

8. Two main factors played a determining role in the orientation of French economic thought. First, since the time of Napoleon Bonaparte, if not before, France has been a country with well-defined, powerful, and more or less unchanging public institutions. Market fluctuations were fewer and less severe because of the strong influence of public institutions and the almost closed character of the French economy with only slight interference from external flows. This, among other reasons, explains why Keynesian ideas found a largely delayed response in France and has shaped the content of economic thought in France as a mixture of law, economics and sociology.\(^1\) Secondly, the more specialized field of economic development,

\(^1\) With a few notable exceptions, such as Léon Walras.
heavily influenced from above by the weight of the institutional approach in overall economic thinking, was also determined from below by the fact that the immediate source of inspiration was almost exclusively French-speaking Africa.

9. **Geographical influence.** The economic analysis of French-speaking Africa has to tackle some very specific features:

(i) The role of institutions in shaping economic life in French-speaking Africa is as strong, if not stronger, as in France.

(ii) There is mainly a scarcity of manpower, rather than of capital. In France the scarcity of manpower was a result of slow demographic growth, and the relative abundance of investible capital, until very recently, of high profit rates and a high propensity to save. In Africa the first is a result of low population density, and the second, of the free flow of private capital and sizeable public aid from France. Thus, the main interest of economics is focussed on the human rather than material (fixed) elements of growth.

(iii) Sociological factors are important. Given the conservative force of human habits, French economists realized early that sociology should play a considerable, if not a predominant role in the economic theory of development. Social and religious motivations, archaic mentalities, and other factors are intricately woven into the economic pattern.

10. **Organization and extent of research.** It should be stressed here that the academic and research circles are very fractionalized and compartmentalized. There is very little university research in the field of development economics. Thus, the broad economic ideas born at universities are not always the result of an accumulated knowledge of facts
(which might have been supplied by researchers) but are rather often the result of intuition or, occasionally, of brilliant intellectual speculation and deduction. On the other hand, the research centers not connected with universities have little or no time for generalization of their practical experience. Moreover, the secrecy imposed on the circulation of mimeographed materials is rather strict. Estimates and analyses of projects, programs, and countries, are carried out on the basis of contracts, concluded between these centers and various ministries or other public organizations in France and abroad. The results of this research remain the exclusive property of the contractor.

II. One is inclined to believe that the amount of thinking and research on underdevelopment is slowly shrinking. This can be explained by the following reasons:

(i) As mentioned above, France operated over a long period, within the confines of an almost closed economic model with more or less institutional market regulation and very slow changes in production and consumption patterns. This model was destroyed with the creation of the Common Market. Through massive action the government has been trying to prepare the country to meet the new conditions. This has brought to the forefront the necessity to conduct all kinds of economic research on problems rarely studied before, such as competitive power of France, public works, urbanization, technical progress, industrial structure, and incomes and prices. Research on economic underdevelopment has necessarily been set aside in recent years.
(ii) Even those institutions set up to deal exclusively with the developing countries seem to be preoccupied with other work seemingly more immediate and practical than a thorough economic analysis of the problems of development.

(iii) The cost of research is increasing considerably, making some lines of economic investigation too expensive for the developing nations. It is now considered in France that while a researcher is engaged and sent abroad to cope with problems of economic development, much more than a mere salary is involved, since he becomes a part of an organization having growing opportunities in other more remunerative fields of research. This new situation differs greatly from the past, when a number of freelance researchers were still available on the market and when a choice of other research opportunities (such as those mentioned above) did not yet exist.

(iv) There is also a realization that the present economic knowledge of underdevelopment is more advanced than that of the sociological, educational, and organizational (i.e., public administration and management) problems of underdevelopment. In the developed countries of Europe the development of knowledge was an inverse one. Precise economic knowledge emerged there from sociology and other branches of the social sciences. However, there has been very little sociological research in the developing countries. French economists and econometricians often said that economic solutions in these countries depend on a precise knowledge of motivations along with some idea of local perception of measures, value systems, and time horizons.
II. Organizations Active in Development Research

12. **SEDES** (Société d'Etudes pour le Développement Économique et Social) - Research Center for Studies of Economic and Social Development.

This joint stock company was created ten years ago by the Caisse Centrale de Coopération Économique, and the Banque Française pour le Commerce Extérieur, to perform the economic and sociological analyses claimed by public organizations to be necessary for their decision-making processes. The activity of this center is distributed among the following departments:


(ii) Rural and social development. Studies on manpower and employment.

(iii) Industrial and commercial studies. Market analysis.

(iv) Econometric research. Studies on transportation.

(v) Agricultural research.

(vi) Financial analyses.

(vii) Urbanization.

The center includes approximately 110 professionals, mostly engineers and economists of different specializations. After ten years of existence approximately 600 reports have been completed. Most of these deal with French-speaking Africa, although recently there has been an increase in the share of research centered on France and Western Europe, especially in the fields of agriculture, regionalization, and urbanization. The center had no opportunity to publish anything.
mostly because of financial and time constraints). This has deprived outsiders of a useful synthesis and evaluation of the center's extensive practical knowledge of economic development. The methods applied by its researchers will be treated elsewhere. Its basic philosophy is eminently practical. Most of the members whom I had the pleasure to meet, seemed to know Africa inside out, and therefore, were inclined to reject any preconceived theory (or model) of development. However, three basic characteristics can be drawn from theSES reports consulted by the author of this survey.

a. The center often sends teams of researchers into the field for a long time. There is usually a considerable amount of legwork, which is in general rather an uncommon quality in Europe.

b. Although many of the researchers, especially those with a scientific or an engineering background, possess extensive knowledge of mathematical statistics, the analysts usually employ rather simple statistical methods. It is generally felt that unreliable data are often highly sensitive to intricate tools of analysis and, therefore, more rudimentary methods, on the whole, yield better results and also save time.

c. Although only a few pages of sociology are included in the reports, it is felt (and was explicitly conveyed to me) that the economic reasoning of the researchers in

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1/ Not too rudimentary, of course.
each particular case is based on a more or less thorough knowledge of African customs and motivations. This knowledge results not only from long sojourns and frequent fields visits, but also, from having the former colonial officials on the staff.

Most of the studies are of purely practical interest, however, a few internal publications are of abstract scientific interest. Since their relevance to under-development is considerable, they will be summarized further on in this survey. The head of SEDES is a mathematician with a theoretical bent. His deputy is an engineer with immense practical experience (see the list of researchers in the Annex). Its annual budget (or, the total value of its contracts) amounts to about $3 million.

13. SEMA (Société d'Economie et de Mathématiques Appliquées) - Center for Economics and Applied Mathematics. This company can boast a particularly rapid growth. Throughout its relatively brief history it has never ceased to create affiliated centers abroad and new professional divisions at home. Its fields of activity include economic and social development, management organization, communications and control, marketing, national and urban planning, systems analysis and design, corporate and product planning, among many others. The whole organization has a professional staff of over 400 members, who have training in a wide range of disciplines, including economics, mathematics, statistics, physics, chemistry, the social sciences, psychology, business administration, data processing, and various branches of engineering. Its supporting technical staff of 250 com-
prises computer programmers, tabulators, research assistants. It has also over 1,500 field investigators. The bulk of SEMA's work is carried on outside the field of underdevelopment, although some of its methods (I have tried to review some of these further on in the survey) also appear to be applicable in part to the developing countries. The department dealing solely with economic development (SEMA - Développement) has 23 professionals (20 of whom are engineers). Its annual budget barely reaches $1 million (while the annual budget of the whole organization attains $19 million). The initial idea was to run this department on a non-profit basis. However, public credits became less ample and costs of research increased, causing financial losses. A company principle of financial independence for all departments made it impossible to tolerate the existence of such a non-profit section. Thus, the department, caught between these two trends, is now being forced to arrest and even contract its future growth. SEMA has a separate scientific Directorate which concentrates exclusively on methods. These are passed on to the different departments for application. There is also a quarterly review Métra which publishes the results and general conclusions of various finished projects and introduces new ideas and methods. Every four years or so the Director General of SEMA publishes a book on the existing theoretical and practical problems of economic calculus. SEMA's studies all rely strongly on mathematics and are programmed for its computer (a Control Data 6600, the biggest of its kind now in existence). The economic philosophy of SEMA, as applied in its work on underdevelopment, consists of the following principles:

(i) There are two separate economic rationales: public and private. An optimal way of combining these two point
of view must be found for each case. The economic optimum can only be derived from a comparison of the different variants (possibilities). It cannot be envisaged as an abstract situation.

(ii) Special consideration is given to the time horizon of projects. Researchers not only use a wide scale of different discount rates, but also often view the future from a probabilistic angle.

(iii) A marginal approach was taken in almost all the works consulted. SEMA's economic philosophy and approach are distinct from those of other development centers. The thinking of present managers was first shaped by the teachings of Professor Maurice Allais (Ecole des Mines), who strongly advocated and developed the use of interest rates, discount rates, and the marginal approach. Their careers, began in large public enterprises, which produced mostly homogeneous products (coal, electricity, gas, etc.).

This, in its turn, gave them a strong sense of the public (collective) benefit along with the private one (which did not conform with Allais' teaching). Moreover, their early beliefs in marginal theory were confirmed because of the homogeneity of the product in those enterprises where they were employed. SEMA enjoys considerable prestige in the "technocrat" circles of the planning commission (in France and elsewhere), in the large industrial enterprises, and in the industrial ministries, because its staff members speak the same language of precise facts and algebraic equations.

IRFED (Institut International de Recherche et de Formation en vue du Développement Harmonisé) - International Institute for Research
and Education Towards Harmonious Development. This is a non-profit institute. Its activities vary from publishing (It publishes one monthly review "Economie et Humanisme" and one quarterly review "Développement et Civilisations" which concentrate on the problems of economic development), to teaching (It runs an extensive regular teaching program for all those intending to work in the field of economic development, and organizes discussions and seminars on the main topics of economic development), to remunerated advisory services which are provided by the following subsidiaries:

(i) CINAM (Compagnie d'Etudes Industrielles et d'Aménagement), Center of Industrial Studies and Regional Development, and

(ii) IRIM (Institut de Recherche et d'Application des Méthodes de Développement), Institute for Research and Application of Development Methods.

The whole organization (IRFED and its semi-commercial branches) employs about 55 professionals. It was founded in 1958 by an ecclesiastic, Pere Lebret (who died recently). Its objective is to promote economic development, including if not emphasizing human development. Hence, the idea of a "harmonious" development, which implies a search for the compatibility of three basic threads: economic, political, and social, in order to arrive at a global strategy of development. The Institute's philosophy is based on the premise that development depends primarily on men, and in order to ensure development one must influence those who are active in the process of growth. One of the main techniques of the Institute is, therefore, the formation of human elites in
the developing countries. Its system of field research is also rather unique. This consists of all-embracing interviews, conducted at the basic level of country economic life (family, small village, city quarter) in order to obtain a complete image of human activity so as to see what hides beneath the general macro-economic surface of the country. These interviews (a more detailed description can be found in paras. 114-116 of this paper) are conducted by local residents, co-opted as Mission members. IRFED enjoys considerable influence both in France and in the developing countries. This influence results from the thoroughly democratic nature of its activity, and its religious background (it is connected with the Dominican order). There is a feeling in many of the developing countries, where its teams operate, that no vested interest whatsoever lurks behind its findings and recommendations. Its present Director General is Robert Buron, former President of the Development Center of the OECD. Outside of its work in the French-speaking African countries, IRFED has done some work in the Middle East (Lebanon) and Latin America (Venezuela).

15. **ISEA (Institut de Science Economique Appliquée)** - Institute of Applied Economic Science. This is the oldest economic institute in France, founded in 1944. Its activity consists mostly of research, publication, and the organization of international scientific discussions. Its prestige is coupled with the personality of its founder, Professor Francois Perroux, a towering figure in the field of economic thought in Continental Europe. His perception and original discussion of new problems of economic development have earned him a remarkably large audience in the developing countries. Also, most of the senior economists
now in a position of power in France or in French-speaking Africa, at one time or another, passed through the Institute, either as researchers or contributors to its economic publications. The Institute itself now employs only 25 professionals, but many others are connected with it indirectly. Its activity has passed through three stages of concentration. During the first stage new economic ideas and methods from England and the United States were absorbed and applied to the post-war conditions in France. This was instrumental in the creation of National Accounts and in the introduction of new elements into the macro-economic analysis of investment. The next stage consisted of investigations of underdevelopment. The third and current stage concentrates on planning for education and innovation. The first, post-Keynesian, and the last, neo-Schumpeterian, stages are outside the immediate interest of this report, hence only the second stage of the analysis of underdevelopment will be discussed here. The Institute's philosophy consists of stimulating economic development through the installation of growth poles and "motor", growth-propelling, industries. There is an implicit assumption that the creation of "poles" will lead to the activation of backward regions, by attracting skilled labor and capital and generating new incomes, while the activity of "motor" industries will tend to induce the creation of ancillary branches, and so quicken and widen the spread of industrialization. Using modern terminology one would describe the Institute's economic creed as one of production-led models with induced consumption. Presumably, this is its main attraction to many developing countries, for whom the outside intrusion of growth and its quasi-automatic trigger action are by all means a welcome proposition. The Institute's contact with the developing world is achieved mostly
through the exchange of persons (seminars, etc.) and information (publications). Its annual budget is about US$0.4 million and is derived mostly from public subsidies and contracts. There are a few, small branch offices in Africa (Tunis, Alger, Dakar) and Latin America (Mexico, Lima). The ISEA enjoys further prestige because it constitutes the economic "laboratory" of the Collège de France, the highest academic institution in France.

16. **IEDES (Institut du Développement Économique et Social)** - Institute for Studies of Economic and Social Development. This Institute was founded in 1957 by the former Deputy Secretary General of the U.N., Professor Henri Laugier, who left his place to Professor Perroux after a few years (the latter at present manages both IEDES and ISEA - see above). It is one of the few economic institutes directly attached to the universities. Its main activity is teaching. This teaching is divided into three basic cycles and confined exclusively to the problems of underdevelopment. This educational activity of the IEDES involves about 100 professors and more than 300 students. The students come predominantly from Africa, though in the last few years some have come from Latin America. The Institute publishes a quarterly review, "Tiers

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1/ In the last few years, the large universities in France have created their own Management Institutes. Up until now, these have been almost the only form of economic institutes attached to universities. Very little research is carried on by these Management Institutes (Instituts d'Administration des Entreprises). Mostly they provide specialized teaching for students and for the local business community.
"Monde", which focuses exclusively on development problems. Its research activity is narrower than would be expected for an institution of its size. Although more than 20 professionals are employed, their activity is limited to problems of education. A considerable reputation has been established in this field. The Institute has researched such various aspects of education in the developing world as: (i) the stocktaking (estimation of the level) of education, (ii) the cost and efficacy of education, and (iii) the planning of education. Less thoroughly explored by the IEDES are the areas of technical assistance and public administration in the developing countries. The Institute's working philosophy is very similar to that of the ISEA, given their joint management. One small distinction is that the ISEA has concentrated on the factors necessary for stimulating development, while the IEDES has given more thought to those factors capable of impeding development, such as a lack of the proper education, administrative facilities, etc. The Institute enjoys considerable influence in French-speaking Africa because a large number of its graduates return to their countries to occupy responsible positions.

17. **Institut d'Etudes Sociales** (Institute of Social Research) - University of Grenoble. This is another of the few university institutes dealing with problems of underdevelopment. It was founded only five years ago by a young and dynamic professor of Economics, Gerard Destanne de Bernis. It employs 8 professional researchers and, in addition, has the opportunity of using doctorate candidates and post-graduates. Contrary to the IEDES, researchers from the IES travel widely and undertake contracts with the public authorities of developing countries for
research projects. In part its general philosophy is akin to that propagated by the ISEA, namely the implantation of industrial growth centers in the developing countries. However, the ideas of the IES are supported by more factual, quantitative research. It is also the only institute which has studied the practicality of integration for the developing countries in Africa. However, analysis in this latter field is, fatally shrinking with time. Possibilities for the integration of 14 African countries were analyzed in two successive reports furnished to the conferences in Niamey (July 1962 and January 1963), a report for the conference in Lagos (November 1963), and finally, a report at Bamako (October 1964). A fifth report dealing with the integration of only four countries in the Senegal River Region, for conferences at Nouakchott (November 1965) and Dakar (August 1966), was necessarily more modest, although it contained proposals for more than just industrial integration which was treated in the preceding four reports. The most recent research concentrates only on two countries (Mali and Senegal), but even here, the prospects are not very optimistic. The Institute is especially interested in two of the main aspects of industrialization:

(i) The miniaturization of industrial plants. While its economists do not deny the importance of economies of scale, they consider the break-even point to be entirely dependent on the prices used in estimating the production costs and the returns. And, since, the price system of the developed countries is used as a yardstick for the underdeveloped countries, it is felt that any effort to implant industries capable of generating further industr-
rialization may be condemned at birth. Another bias of the industrialization projects, is that against a superfluous (according to the Institute) degree of modernization. The construction of industrial giants can not be avoided if modern technologies are applied, but by making a few steps backwards in technology, the construction of medium-sized plants becomes possible.

(ii) The necessity of a link between industry and agriculture.
Here the Institute considers that each newly-implanted industry has to have a preconceived firm link with agriculture, whether it is at the first stage of development (production of fertilizers) or at a higher level (metallurgy linked to the production of agricultural machines).

The Institute focuses on industrialization because it believes industrialization is a global process which leads to a new social and economic structure of society. To achieve this, it is felt that the classical views concerning the distribution of the national income must be changed. For instance, the prevalent opinion in the Institute is, that two types of consumption exist in a developing country, the incompressible (basic) consumption, and what they call a "development consumption" (the improvement of sanitary conditions and the raising of the educational level), and that the sum of the development consumption and investment should be used to measure the development effort. The

\[1/\] These have been named "industries industrialisantes" or otherwise, industries which industrialize.
Institute seems to maintain excellent relations with countries such as Tunisia and Algeria, and also, some of the West African Coast countries, where its philosophy is met with a ready ear and an enthusiastic response.

18. **Institut Economique et Juridique de l'Energie** (Economic and Legal Institute of Energy, University of Grenoble). This Institute was created in 1956 to study the economic aspects of electrical energy. Considering that Professor de Bernis has assumed the joint management of both the Institute of Social Research and the Institute of Energy, it is not surprising that a part of the activity of the latter has been deflected to research on the underdeveloped countries. The Institute employs only seven full-time researchers, but a number of postgraduates, predominantly engineers (ten at present), come from the developing countries (mostly Latin America) to carry on research for the Institute. The following are the essential lines of the Institute's thinking:

(i) The production of electrical energy as a sector of the economy should be analyzed and projected (planned) as an integral part of economic development strategy. It has its own induction effects (linkages), depending on the kind of energy tapped. The Institute's researchers try to discover the effects of new energy projects upon such various aspects of a country's economic life as monetary fluctuations (Alucam's activity in Cameroon) or regional development (Asswan Dam).

(ii) The production of electrical energy is, possibly, one of
the easiest and most valid ways to start regional
(multinational) integration of the developing countries.
Some research in this field has been carried out by the
Institute in Latin America.

On the whole, there is a conceptual link between the two In-
stitutes in Grenoble. Economic Development is viewed not as a projection
of the present into the future, but as an installation of a new economic
structure, if possible independent of the present. This French economic
philosophy has its precursor in the Prospective School. This school,
founded by the philosopher Gaston Berger about ten years ago, attracted
a number of the top technicians in all fields of industry, public ser-
vice, and banking. This group planned to develop a new economic and
technological structure which might be introduced in ten or twenty years.
Links with the present were to be then traced back. This could lead to
a system of planning based on more than mere extrapolation.

19. ORSTOM - Office de la Recherche Scientifique et Technique d'Outre-
Mer (Bureau of Scientific and Technical Research Overseas). This is a
public research institution, which depends on the Ministry of Cooperation
and the Ministry of Education. Its main activity is concentrated in the
natural sciences. It has institutes in practically all the French-
speaking countries of Africa, researching in the field of pedology,
hydrology, oceanography, and the like. Its Division of Economics and
Demography was created only in 1963. At present, almost forty full-time
researchers and a small number of research assistants are employed. Its
staff upholds the view, not uncommon among French researchers in the
field of development, that the classical methods of economic analysis are hardly applicable to the largely archaic societies of Africa. Now new methods are beginning to be substituted for the old ones.

Unlike other institutions which are compelled by the provisions of their research contracts to yield quick results, ORSTOM can conduct time-consuming field research to determine group attitudes to development. For instance it has begun to study the differences in the mental perception of time and space by the various ethnic entities in Africa. The main lines of research conducted by ORSTOM are:

(i) Regional development, and
(ii) Social structures and economic development.

ORSTOM tries to determine the danger of regional disequilibria stifling growth, after a certain level of development has been attained in a given country, and appropriate remedies to this threat, which should be included in the long-term plans. ORSTOM intends to set up a system of regional economic indicators, capable of reflecting the specific character of the regions in French-speaking Africa, including all their sociological and tribal peculiarities. The proper combination of urban and rural development is being sought for the countries where industrialization is considered inevitable. ORSTOM's intellectual advantage lies in its large network of local centers which deal with the purely scientific and physical aspects of the terrain and climate in the developing world. The widely-travelled research workers of these centers constitute a useful and stimulating pipeline of sociological information which can be exploited, or at least, considered by their colleagues in the Division of Economics. This knowledge has, so far, undermined their belief in
the existence of homo oecononacus in Africa and may orient the research
toward a more folkloristic aspects of economic and social development.
We must try to refrain from any value judgments, but it is evident that,
if pursued too far, this advantage could easily transform itself into
a disadvantage. The reader will easily notice that SEMA and ORSTOM for
example, are worlds apart in their views on economic development. As
always, truth lies somewhere in between.

20. BCEOM - (Bureau Central d'Études pour les Équipements d'Outre-
Mer) Central Bureau for Public Works Projects destined for Overseas
Countries. This publicly-owned company depends on the Ministry of Equip-
ment and the Ministry of Cooperation and its shares are publicly owned.
It functions on a private budget, financed by its service fees. BCEOM
employs about 90 professionals in France and about 70 overseas. Prac-
tically no purely economic studies are carried on by this Institution.
Its projects are in the fields of transportation (ports, railways,
roads), urbanization, and water. Nonetheless, the company is anxious
to keep economic considerations in the background of its engineering
work. Periodically it organizes conferences on infrastructure and eco-
nomic development (to which delegates of the European Office of the
Bank are invited). Its Director General teaches the economics of trans-
portation and the economics of industry at the IEDES (see above).

This Institution tries to insert its projects into the tra-
jectory of economic development, i.e. to see what may happen to the
economy if a certain program of public works is fulfilled, considering
that all economic factors will tend to adjust to the new situation. Some
of these projects (i.e. a railway project in the Republic of Chad) are
planned several decades in advance and therefore, involve considerable
effort in economic projection.
This type of economic reasoning is necessary for establishing a break-even point between the costs of transportation by air, roads, and railways, as functions of the future bulk of goods to be transported. BCEOM has diagrammed possible choices between these means of transportation.

21. **CREDOC** (Centre de Recherches et de Documentation sur la Consommation) - Center for Research and Documentation on Consumption. This is a private association which depends on the French Planning Commissariat for the orientation of its work. It employs 50 professionals and its annual budget amounts to US$0.7 million. It is the only research institution which specializes in savings and consumption in France. Other than a few trips outside France (notably to Israel), this institution has not yet shown an interest in studying savings and consumption in the developing world. Nonetheless, its activity contains two points of interest for our survey:

(i) **Methods.** While researching the possibility of changes in the consumption pattern in France, CREDOC has developed some new methods for consumption studies. Some of these are worth testing in the developing countries. These include the application of Engel and logistic curves to consumption and the establishment of links between the planning process and consumption and savings.

(ii) **Data.** The Center has tried to establish a consumption function for France and with it to predict a further consumption pattern. I inquired about the possibility of applying a derivation of this consumption function to imported products, in order to project France's demand.
for imports from the developing countries. Until now this has received little thought, but for products such as tropical fruits one could assume the entire bulk would be imported from the developing countries. Such data could be made easily available, and in conjunction with FAO predictions, for example, would furnish ample material for projections of exports from African countries to Europe.

22. **CEPREL** (Centre d'Etude de la Prospection Economique a Moyen et Long Terme) - Center for Medium and Long-Term Economic Programming - This Center depends on the School for Practical High Studies of the University of Paris through the Section of Economic and Social Sciences. Its budget amounts to US$0.15 million, and it employs 12 researchers, most of them trained econometricians. Here, again, the activity of CEPREL lies exclusively in the field of the developed economies. Nonetheless, I delved a little into CEPREL's activities, because some of its methods appeared as if they might be useful in future analyses of under-development.

   (i) The "gravitational" method is used to predict foreign trade. This method is described in para. 77 below. Briefly, it entails the prediction of future foreign trade flows as a function of the domestic production of the exporter and the consumption of the importer.

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1/ Ecole Pratique des Hautes Etudes de l'Université de Paris, which is a para-academic extension of the university.
This introduces the dimension of the trading countries into the equation. This seems to offer a prudent solution to the developing countries, since rapid quantum jumps in foreign trade are hardly conceivable.

(ii) Their method for the optimum allocation of resources to services satisfying collective demand, such as education, is also of interest.

23. Direction de la Prévision, Ministère de l'Economie et des Finances (Department of Forecasting, Ministry of Economy and Finance). Here, again, we have an organization which is not directly concerned with economic development. However, some of its lines of thinking are at least of interest if not fundamental, to those seeking new approaches and methods applicable to the developing countries. Moreover, this Department already possesses varied numerical studies which would be useful to the Bank. The research activity of three of its divisions deserves mentioning:

(i) Groupe d'Etudes Prospectives sur les Echanges Internationaux (Group for Forecasting and Studies of Foreign Trade Flows). For the last few years, this group, which includes 20 professionals, has been working on a model of the world trade. Included vertically in this model are eighteen large geographical zones (the developing countries are grouped in six zones) and horizontally, thirteen main branches (industrial products and raw materials). The method utilized is described in Chapter IV of this survey, paras. 71-76. What deserves signalling here
is that the statistical calculation of the group, quantifying all production, foreign flows, and exogenous variables in the model, could be used to predict world trade for the medium-term future.

(ii) Bureau de l'Exterieur (Bureau for Foreign Trade). Aside from its statistical analyses of customs data, the Bureau prepares an interesting model, aimed to show the possible repercussions of the suppression of one or more of the industrial sectors of a given country on its foreign trade. While this model was developed in expectation of close relations and increased specialization among the Common Market countries, with certain modifications, it could be applied to any bloc of developing countries, where integration might lead to a changed allocation of resources and specialization in industrial location. 1/

1/ I think that we deal here with an entirely new line of reasoning which is very much worth exploring further. Most models of developing countries are based on "incremental increases". That this approach is open to question is proven by the whole commodity prices issue. A transfer of technology can also bring abrupt structural changes in both developing and developed countries. Some methods proposed nowadays in Europe show that economists are giving increasing thought to economic growth accompanied by structural breaks. Another example of this approach is a study on the possible effects of a violent cost decrease on an oligopolistic production structure (the French Automotive industry is an example) prepared by a research group, headed by Professor Alain Cotta at the University of Caen.
(iii) Bureau des Economies Étrangères (Bureau of Economics of Foreign Countries). In addition to its usual studies of the economies of foreign countries, generally limited to France's main trading partners and therefore, exclusive of the developing countries, this Bureau also conducts some useful studies on commodity markets. Two reports, one on copper and another on wheat have so far been completed. Although they analyze the world commodity market in terms of its relation to French production and consumption, they serve as useful additions to this type of study and possibly revisions to some FAO anticipation about wheat.

24. INSEE (Institut National de la Statistique et des Études Economiques, Service de la Coopération) National Institute of Statistics and Economic Research, Division of Economic Cooperation. The INSEE is the only public statistical office. Its annual budget is over US$10 million. It has a professional staff of 400. At present, only a small fraction of the Institute, namely the Division of Economic Cooperation, works on the problems of the developing countries. It has completed a considerable and complex demographic analysis of the countries of Black Africa, Madagascar, and the Comoro Islands, including present and forecasted age structures, temporary population movements and migrations, fecundity and mortality figures, and analysis of the urban population. This first step is important for the next stages, which include the analysis of family budgets, agricultural product flows and consumption patterns.
These statistical surveys of Africa are based exclusively on sampling methods. The sample data have been multiplied by demographic indexes in order to arrive at macro-economic indicators. The purpose of this study was to improve the demographic "multiplier". Although some data relating to family budgets have already been collected by the field services of the INSEE, the computing work has not yet been started. At present a lack of funds impedes further work. After the synthesis of family budgets is accomplished, some further conclusions will be attempted on the degree of integration of the commodity flows in the monetary circuits of each country. Studies of family budgets comprise between 1,000 and 3,000 families in each country. They will enable a tracing of larger areas of consumption, overlapping national boundaries in the Sub-Saharan region. Hopefully, future studies will include North Africa, the Near and Far-East, and English-speaking Africa.

25. Institut d'Etudes Internationales et des Pays en Voie de Développement (Institute of International Studies and Underdeveloped Countries, University of Toulouse). This Institute concentrates predominantly on the education of French and foreign students. However, some research is done, mostly by the doctorate candidates. This Institute studies primarily the legal organization of international markets. Eight theses have been written on the international markets of different commodities (coffee, olives, sugar, rubber, cotton, rice, copra, wine) plus a major work on the international market of all agricultural commodities by the Director of the Institute. Another line of research deals with the socio-economic development of backward regions. Regional development studies have been limited to Corsica and
Spain. The Institute favors "community development" with pilot regions leading the overall growth process. Since its establishment in 1959, the Institute has strived to keep in touch with its more than 200 alumni.

26. Centre d'Etudes Nord-Africaines (Center of North-African Studies, University of Aix-en-Provence). This is a relatively small university center which works exclusively on the political, social, and (to a lesser degree) economic aspects of North Africa, including Libya. Notwithstanding its size, it manages to issue a yearly almanac of North Africa with more than a thousand pages of scrupulously collected data and information (The last one was published in July 1967.).

27. SOFRED (Societe Francaise d'Etudes de Developpement) - French Company for Studies of Development. This private company, through its subsidiaries, has more than 200 technicians, engineers, and economists at its disposal for studies of development. While its activity is mostly limited to the micro-economics of development, its accumulated experiences have a general value. Its economic philosophy can be synthetized as follows:

(i) Some disequilibria in the process of economic development are unavoidable. In order to maintain its growth rate, a country must concentrate on its most exploitable natural resources, some efficient, local enterprises, and, last but not the least, a productive or creative elite. These are the "germs" or "rudiments" of economic development, according to SOFRED. SOFRED regards itself as a development company which must create conditions sufficiently favorable to assure the self-sustenance and growth of
these germs of development. Thus, this company supports a concentration of efforts on some elements inside the country, contrary to IRFRED which supports harmonious development, but "... line with ISEA, IEDS, etc. (see above).

(ii) SOFRED believes that main gap in Africa is the one of people and not of capital. Here, again, its reasoning corresponds with the majority of French development economists with African experience. Those judged to be intelligent, capable, and industrious should be torn from their archaic environment, transferred to factories and plantations, and paid well. In return, these people should put in a large effort of work. SOFRED feels marginal wage increases in the developing countries of Africa would not have any significant response.

(iii) Markets in these countries seem to be developing rapidly as a corollary to the increase of monetary incomes, which is almost entirely absorbed by purchases of spectacular and imported consumption goods. According to SOFRED, the African's image of economic development is wrong, because it is based on the consumption pattern and way of life of the colonial officials. SOFRED has carried out some comprehensive studies (like that on the world market for tropical timber, on a country-by-country basis), and a few macro-economic projects (like that on Congo-Brazzaville).
28. **Secretary of State for Foreign Affairs, Chargé de la Coopération, Sous-DIRECTION des Études Générales** - Under-Secretaria of Foreign Affairs for Cooperation, Division of General Studies.

29. **Caisse Centrale de Coopération économique** - Central Fund for Economic Cooperation. The bulk of the work of both these institutions (paras. 28 and 29) consists of practical analyses of economic development. On the advice of the Bank's European Office management, I decided not to investigate the above institutions, as our Paris Office maintains daily contact with them and is well aware of all the topics of their studies.

30. **École Pratique des Hautes Études, Section des Sciences Économiques et Sociales** - School for Higher Studies, Section for Economic and Social Sciences, University of Paris. As explained earlier, this is a very atypical institution. It concentrates mostly on teaching small groups and tutoring students. Formal academic rules are scarce if not non-existent. It would be of little interest for this paper if it were not for the fact that some research on economic development is also conducted there. A number of the school's activities certainly deserve mentioning here.

(i) **The Centre d'Étude du Développement Économique** (Center for Studying of Economic Development) is directed by Professor André Piatier. This Center is a good sounding board for the visiting high officials of the developing countries. Here, they can expose their economic ideas to both the students (mostly postgraduate) and various competent people invited from outside. Some theses and
a few books concerning economic development have been published by the Center, though the bulk of preparatory work was carried on outside the Center.

(ii) The Centre d'Etudes Africaines (Center for African Studies) is directed mainly by Professor Georges Balandier (in joint management with other Professors). The main activities of this group are teaching and editing the review "Cahiers d'Etudes Africaines". Its main concerns are not economics, but sociology of development, such as that carried out by Margaret Mead and her associates in the United States, and public administration in Africa. The analysis of public administration is more philosophical (power structures and the like) than quantitative. The Center is particularly interested in the conflicts between the old and new hierarchical statutes in African society (such as between the ethnical and archaic and the professional and power hierarchies).

31. Institut des Hautes Etudes de l'Amerique Latine - Institute for Higher Studies of Latin America, University of Paris. The educational and research programs of this Institute do not deal directly with economic problems although some studies (in climatology, pedology, geology, and the like) relate indirectly to economics, for instance, through their importance to agriculture. However, the basic role of this Institute is the dissemination of cultural and literary knowledge.

32. Discussion groups

The research centers surveyed above also periodically organize discussion seminars on development problems (such as the ISEA
seminars on Latin America, the IRFED seminars on the organization of the world market, and the BCEOM seminars on infrastructure). There are also a number of associations, in France, which convene from time to time merely to discuss a specific topic related to development economics. The most influential of these are:

(i) **Semaines Sociales.** Annually, in one of the cities in France thousands of professors, researchers, clerics, and public officials participate for one week in a public debate on problems of economic development. These problems are treated against a sweeping social and intellectual background. The President of this congress is Professor Alain Barrere, Chairman of the Faculty of Law and Economics of the University of Paris. The debates of the "Semaines" are covered daily by the entire press. They serve as a seedbed for new ideas and express the current thinking of a powerful group of catholic intellectuals in France.

(ii) **Technique et Democratie.** This group of engineers and "technocrats" is headed by Jean Barets, a management consultant who is one of the managers of SOFRED (see above). Its periodical conferences, concentrate on different subjects. It is worth mentioning that its April 1967 meeting was devoted to the problems of underdevelopment and economic aid and to aid prospects for the next 45 years or so. The thorough coverage of this Congress can be judged from its list of participants.
Everybody dealing with the problems of underdevelopment in France was present. From what I have been told, the debate was on a good technical level and was thought-provoking too. The minutes of these conferences will be published. As they reflect the present thought of the technical and creative intelligentsia in France, their circulation is apt to exert additional influence.
III. General Ideas on Economic Development

In this chapter we try to outline some of the basic features of the French economic thought applied to general problems of economic development. It contains, therefore, a review of conceptual approaches to macro-economic problems, while in the following chapter we grouped analytical approaches adopted in tackling the micro-economy of less developed countries.

1. Structures

Two Schools and Two Approaches. The idea of "structures", which appears in practically all lectures, interviews, books, articles and research papers by French economists dealing with underdevelopment, represents one of the foundations stones of thinking in this field. It also represents one of the main differences between French and British and American economics. If an imaginative comparison may be permitted here, it could be said that French economic thought reposes on "structures", the British and American on "flows".

Thus, one school uses deductive processes of reasoning and predicts future flows from its present knowledge of structure, while another school uses inductive processes, supposing existence of certain structures from its knowledge of flows. Further repercussion of this cleavage may be felt in the decision-making process where the first school implies that flows can be adjusted through changes in structures, while the second presumes that structures will be adjusted by changes in flows. While these considerations may seem esoteric, one can find some proof in facts. The creation of new administrative functions (or changes in structure) is thought to improve internal market equilibrium (or flows).
in many French-speaking developing countries. On the other hand, largely unchanged institutions in many English-speaking developing countries accompanied by watching and influencing the market is illustrative of the second school. All further differences can be derived from this basic one; for instance, in the pursuit of gains, the existence of immutable structures implies rents, while the assumption of elastic flows of supply and demand leads to profits. The difference is thus between a Ricardian and a Schumpeterian world.

One system has no abrupt changes, because of an established order (structures), the other has complete mobility of factors with almost unlimited combinations. While the influence of these two approaches is disappearing in the developed countries because of the quickening pace of events which relate both to structures and flows, in the developing countries this distinction may still be important.

3l. Importance of Mental Structures. Structures also refer to the specific mental, political and social characteristics of a given society for a given period of time. One of the ideas is that "primitiv thought" or mentality (Levi-Strauss) is not basically different from "scientific thought" but represents its natural and free state. 1/ Economists and sociologists consider nonetheless the mental structures in the developing societies to be a serious hindrance to their economic development.

Primitive thought operates not through concepts, but through signs and symbols. This makes diffusion of the idea of development particularly difficult. Some economists speak of a necessity to create and propagate a "mysticism" of economic development, in order to bypass the barrier of mental structures.

Proof of the lack of a mental response to development can be seen, for instance, in the deflection by traditional civilizations of a sizeable portion of their savings for feasts of a mystical or ontological character. Other important wastes of savings are expenditures on worship. Thus... "the only investment (viewed by some underdeveloped societies) capable of changing their fate and improving their living standards is the expenditure of money, time, and food for some supernatural power." 1/

This was found to be even truer for archaic societies in Africa, 2/ where the importance of mental structures has been reconfirmed by quantitative studies. 3/ According to these, about $80-90 per family is spent annually on baptism, circumcision, marriage, and burial ceremonies, which is enormous when compared to the income per capita in these countries. The importance of mental structures is also made evident

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3/ See De Garine, "Budgets familiaux dans la région de Khombole (Sénégal)".

4/ The family in some countries usually a much bigger unit than in the developed countries of Europe.
through the study of African attitudes toward the marketing of agricultural products. 1/ On the whole, the existence of pre-logical, archaic (as opposed to Promethean) 2/ mental structures may occasion a resignation of the peasants in the developing world. There is a belief that the traditional societies can only move at a slow pace, primarily because their concern for order and conformity prevails over that for progress. 3/

35. **Elements of Structures.** In France, it is customary to distinguish between the following structures.

(i) **Men's structure** (described above). In other words they can be described as pre-technical (or pre-logical) structures, where a belief in and respect for the powerful and sacral forces of nature predominates. The vision of the world, induced by these structures, is that of a stable world where everything re-occurs according to some pre-established regularity.

(ii) **Social structures.** These are based on family and blood relations and the authority of seniors. They impose almost complete social immobility, which impedes economic development. According to some observers of African life, the quasi-identity of tribal and family relationship is no longer true, rather the family has become the center of African life.

1/ Henri de Farcy, "Attitudes africaines en face des problèmes de Commercialisation des produits agricoles" by CERAS (Centre de Recherches et d'Action sociales), Action populaire.

2/ See works by Levy-Bruhl or Georges Gurvitch, both French Professors of Sociology.

3/ See works by Georges Balandier, one of the most prominent authorities on Africa in France.
(iii) Political structures. In most of the developing countries of Africa, political structures are apt to impede further growth, according to French economists. This is due to the traditional weakness of central authority in these countries and to the lack of feeling for public property, public welfare, and public good, typical in a predominantly archaic society.

36. French economists studying African structures consider the influence of the following attitudes on the behavior of men in developing societies.

(i) Attitudes toward the external world. The will to transform the environment presupposes an aggressive attitude toward nature. Howør, in African societies men consider themselves part of nature and therefore, do not and cannot confront it. 1/

(ii) Religion. For instance, in the Islamic religion the role of heredity is an obstacle to the development of individualistic personality. 2/ Also, the Islamic religion forbids lending with interest, corporations, etc. Finally, the idea of value rests on purely subjective premises.

(iii) Attitudes toward labor.

- From a quantitative point of view one often has to deal with what is called "gambler's philosophy". 3/ Gradual

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1/ P. Bordieu, "Le sous-développement en Algerie", p. 43.
increases do not enter into thinking and planning. Economic decisions are made on an all-or-nothing basis, as opposed to marginalistic considerations, where only increments (of gain and effort) are weighted.

- From the qualitative point of view, both manual and technical labor are often disparaged.

(iv) **Attitudes toward the concept of time.** In using such concepts as investment, money, and credit, one should admit a certain concept of time, which includes the immediate future. The idea of time is entirely different in Africa.

37. Considerable importance is attached to the passage from old to new structure. The passage from subsistence economy of barter to a market economy necessitates certain changes. Two types of effects are produced.

(i) **Sociological and psychological effects.** Usually a destruction of previous structures, even if achieved, is not followed by a creation of new ones, based on individual values and some profit motive, for example. The old structure is disrupted without any concern for leaving a substitute.

(ii) **Economic effects.** These lead to exports of one or a few commodities and involve what the French economists call a "business cycle domination effect." 1/

38. This understanding of structures is typical of all the economists with knowledge of and experience in Africa. Much less numerous are those

1/ In the original "domination conjoncturelle" where conjoncturelle includes more than business cycles, as it implies all kinds of economic fluctuations.
with experience in other continents (mostly Latin America). These economists try to combine the traditional concept of structures with a more modern, Keynesian concept of flows and current market equilibria. For instance, Professor Barrere, the Chairman of the Economics Faculty in Paris, is currently developing a concept, where the structural foundation of an underdeveloped economy is supplemented by its functional (as reflected in flows) aspects.

39. **Keynesian Economics and Underdevelopment.** On the whole, French economists consider Keynesian economics to be inapplicable to the economically underdeveloped countries. Mostly, because they feel Keynesian concepts apply to short-term periods and assume that structures and conditions of production remain unchanged, while the theory of underdevelopment assumes a long-term period since it involves evolution, and also accepts implicitly the idea of the mutation of structures, in order to quicken and smoothen the pace of development. Also, the theory of monetary flows, lying at the foundation of Keynesian economics (aggregate demand and supply, income, etc.) cannot reflect the reality of underdevelopment for the following reasons.

(i) The underdeveloped economy is largely "amoney" (the monetary circuit often represents a mere fraction of the exchange flows).

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additional effort on his part will reward him with a higher level of consumption. If the additional effort required seems too large to him, which is often the case, his initiative is entirely stifled.

(ii) Economic techniques cannot be diffused as quickly as medical techniques. It takes infinitely longer to teach the illiterate peasants Danish methods of cattle-breeding, than to teach a few nurses or medics how to inject a vaccine, which is usually imported from abroad.

42. **Old and New Institutions.** Institutions are regarded as powerful instruments which might help transform the structures impeding economic development. Here the logic is indeed very subtle. In Europe a period of economic development was eventually followed by new institutions and new mentalities. Such a purely endogeneous process resulted in slow maturation free from outside intervention. 1/ On the contrary, exogeneous mutation, seemingly unavoidable nowadays in the developing countries, inhibits a complete restructurialization. Responses to external efforts are always incomplete. Partial changes result in a breach of harmony in indigenous life 2/ and upset the whole, composed of intertwined components. Some of the French economists (with a sociological bent and long-time experience in Africa) feel that the social and psychological residuals of a former equilibrium are principal obstacles to economic development and

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1/ M. Nicolai, "Approche structurelle et effet de domination" Revue economique, Septembre 1956.

thus, if a progress is to be attained, changes must be all-embracing. This, evidently, does not conform with the views of other economists (see Chapter II) who uphold that rapid economic progress can only be achieved by a concentration of efforts on a few points.

43. At least three fundamental obstacles must be removed if the new institutions necessary to perpetuate economic development are to arise.

(i) In the legal institutions, métayage (payment of rents in kind), latifundia (great landed estates with primitive agriculture and servile labor), and the absence of land ownership titles prevent agricultural advancement.

(ii) In the political institutions, the impossibility of rising in the hierarchy discourages economic initiative.

(iii) On the whole, decision by decree 1/ is thought to be the determinant factor whether it be to establish agrarian ownership, or to create essential infrastructure, or to supply an idea capable of stimulating the population, or to educate technicians, or to create a climate in which enterprise might thrive. 2/

2. Growth and Development - Dual Economy

In France the concept of economic development is inherently connected with the concept of structures. Growth is understood to imply a growth of flows (or of the GDP over time) while economic development depends on a mutation of the structures 3/ (or mental and social changes

1/ "Le fait du prince".
2/ J. Austruy, "Existe-t-il un mode obligé de la croissance économique", Revue d'économie politique, 1961, p. 82.
of a population) instrumental for permanent and cumulative growth of the real product. 1/

45. The introduction of structures in the concept of economic development introduces the problem of dual economy. This is necessarily so, since the existence of a modern sector implies at least a partial modification of structures.

46. It is considered that in a dual economy

(i) A modern sector represents more than a small fraction of the economy i.e. it cannot be completely overshadowed by the traditional sector.

(ii) There are no economic ties between the two sectors. Also, a certain social division exists, so there is no population movement between the two sectors.

47. The rapid increase in the importance of a modern sector in an underdeveloped economy is thought to cost infinitely more economically and socially now, than it did in Europe during 19th Century. 2/ The exceptional conditions of the 19th century contributed to a quick expansion of modern sector and disappearance of dualism. This period witnessed the crowning of a long pre-capitalist transition and moderate monetary stability, which induced savings and entrepreneurial spirit. Innovation in its broader sense was then as profitable as speculation. This is not true for the developing countries now. Also more favorable trends in foreign trade,

1/ F. Perroux, "Qu'est-ce que le developpement?". Etudes, January 1961.

a greater relative abundance of foreign currencies, and freer capital flows facilitated rapid growth in Europe during the 19th Century. While there are some separate French studies on the economies of Japan and Brazil, countries where quick growth of the modern sector in recent history contributed to erosion of a dual economy (I was unable to find anything on Mexico, which also belongs to this group of countries), they do not contain, however any analysis showing whether the cost of the emerging from dualism was really larger than that borne by Europe a century ago.

Other French economists see in dualism not only a lack of ties between the two sectors, but what is called the "domination effect". Here, again, one distinguishes between:

(i) Internal domination (such as imposed by the existing agrarian structures), 1/ and

(ii) External domination, which results from: 2/

- The inflow of private capital and creation of foreign enclaves,
- A dependence on foreign experts, and
- The fluctuation of commodity prices in the world market.

In a way, the concept of the "domination effect" is traditional in French economic thought. It is not so much an introduction of politics into the economy, as it is a belief that economic relations are neither symmetrical nor molded by principles of comparative advantage and/or the rational (optimal) allocation of resources. Thus, French economists concluded that the lack of symmetry and equilibrium is due to the "domination effects" of larger and more powerful countries, groups of producers


2/ G. Turin, "Le sous-développement".
and power elites. One often wonders, whether growth poles can coexist with the 'omination effect. Sometimes it is simply a choice between the two of them, considering that it is rarely possible to have a growth pole without private foreign capital and experts and that either its inputs (if imported from abroad) or its outputs (if exported) are subject to international price fluctuations.

3. Poles of Growth - Large International Firms

Another typical concept of French economists is the "growth pole". It implies a concentration of investment and production efforts within a given geographical point or region. This is liable to magnify the effects of a dual economy, but also leads to immediate growth (as opposed to cumulative growth) without the painstaking necessity of changing entire structures overnight. Poles of growth are also expected to show a maximum marginal social productivity.

This school of thought maintains growth cannot appear everywhere at the same time, but rather erupts in points or poles with a varying intensity from which it is propelled through various channels to make different end-effects on the whole economy.

Numerous endeavors have been made to apply this approach not only as a tool of analysis, but also as a practical lever of development.

3/ J. Boudeville, "Contribution à l'étude des poles de croissance bresilienne", Cahiers de l'ISEA, No. 10.
4/ I came across a Mission sent by the European Investment Bank to Greece in order to investigate possibilities of creating such a growth pole in the region of Volos (Greece). Also the juncture Bari-Taranto in Southern Italy is considered as a "growth axis". See also TIRD report on Spain, Vol. II, Annex I (December 1966) paras. 18-25 on "polos".
51. Loosely related to the concept of growth poles is the connection between a large multinational firm and economic development. Some growth poles are inevitably based on large multinational firms. A large multinational firm has been defined as a chain of producing units dispersed over various territories, but united by a single decision center. 1/ The influence of a large international firm on economic development has been analyzed from various viewpoints in France. Even for the national economy of France herself various policy changes have been enacted during the last few years, offering both a re-inducement to foreign investment and fiscal benefits to foster mergers of national enterprises.

A principal report on aid and development (Rapport Jeanneney of July 18, 1963) mentions 2/ that the role of a large foreign firm in a developing country may differ from case to case. This report notes that the positive effects of such implantation are not always appreciated. This is especially true in the case of enclaves where the economic effects are limited to taxes paid and foreign currency sold to the local administration. Particular treatment has been given this case by Professor Raymond Barre (Vice-President of the European Economic Community) who found, for example, in relation to the creation of the Aluminum Company in Cameroon, that "it was not Pechiney who solved a problem for Cameroon, but on the contrary, Cameroon, who solved a problem for Pechiney." 3/

2/ See "La Politique de Coopération avec les pays en voie de developpement" - Ministère d'État chargé de la Réforme Administrative, p. 23.
Other particular cases studied show a wide deployment by foreign firms of local manpower and the sale by foreign firms of their products in local markets. Obviously, these three cases overlap. Various solutions are being offered to magnify the economic effects of large international firms. One of the most noteworthy is that suggested by Professor André Piatier. 1/ He proposes "world status" for large international firms investing in developing countries. This would involve a legal association between the country of the parent company and that of its subsidiary.

Another solution proposes 2/ the establishment of an institution of multinational development funds, partly administered by the underdeveloped countries.

4. Demography and Belief in Human Development

52. Given the humanistic bent of growth economics in France, it is not surprising that attention is given to demographic problems. On the whole, the fertility rate of the underdeveloped countries corresponds to that of Europe in the 18th Century, at the beginning of her period of economic development. However, thanks to medical and biological progress, their mortality rate corresponds to that in Europe in the early 20th Century. 3/

This fundamental cleavage serves as the foundation for various economic proposals. Most of these propose to improve the quality of the men in the developing world, to catch up with quantitative (demographic) processes.

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This tendency has been observed, curiously enough, in the ideas of two engineers (such as Roland Pré) and economic mathematicians (such as Professor Alain Cotta) in France. The basis of thinking of quantitative economists is two-fold:

(i) Even Nature itself cannot be considered given datum, rather it can only be viewed as a function of its relations with Man. The character of the upper soil is shaped by men, and while the same does not apply to the sub-soil, its value depends exclusively on whatever knowledge we have of it (geological exploration); and, again, its utility for economic development results solely from the actions undertaken by men. 1/ (level of practical technological knowledge)

(ii) Unemployment cannot be explained by the scarcity of capital, but by the scarcity of skilled or easily trainable labor. This should be considered as an absolute constraint in a growth equation. 2/

For the reasons stated in the introduction to this paper, this applies more to Africa than other continents. As such it tends to orient research on underdevelopment in France.

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5. Monetary Transfers and the Role of Treasury

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particular role in France and, consequently, in the French-speaking African nations.

55. On the one hand, the Treasury plays a principal role in the creation and circulation of money, and on the other hand, in the collective and utilization of savings. Thus, as outstanding managers of money and savings in France 1/ so aptly put it, the Treasury is not the banker of the State but the State as a banker. As a State (or as a public administrator) the Treasury manages the funds and uses its power of trusteeship to launch public works and the like, while as a banker it receives deposits, engages in borrowing, grants loans, gives guarantees, and participates in investment.

56. Equilibrating role of the Treasury. The opinions of French economists on the importance of the monetary area (Franc Zone) to economic development are far from uniform. Some of them 2/ believe the monetary area generally favors a return of private funds and public funds (which often become private) to the parent state. A number of analyses 3/ show that an automatic mechanism exists for restoring equilibrium in the monetary relations between France and other members of the Zone. Investment made by France returns as various transfers made by African countries to cover different items of their external expenditures.

On the whole, the balance of payments (foreign currency) of the African countries cannot be considered separately from their franc

3/ L. Maldant "Flux monétaires et flux réels dans les relations de la France avec les pays d'Outre-Mer, November 1959, p. 7."
balance 1/ (as it is simply one of its elements). But, as the French economists maintain, a mere financial approach is inadequate, because financial flows must be considered in conjunction with real flows. For instance the trade deficit of the French-speaking African countries vis-a-vis the world amounted to 103 billion (old) francs in 1949. Within the Franc Zone, this deficit was offset by equilibrating operations. This equilibrating operation increases the real commercial deficit of African territories vis-a-vis France, but offers the advantage of merging two separate elements of the deficit of these countries (with countries outside the Franc Zone and with France) into one real flow. Therefore, in this case, there is a grant made by France to the African countries, reflected in the real deficit for which payment in the form of goods is not claimed. 57. However, another element obscures this type of aid (the restoration of monetary equilibrium). This is the special price system operating within the monetary area. Pierre Moussa was the first to draw attention 2/ to the difference between the fixed prices inside a monetary zone and the world market prices. The difference was estimated to be 80 billion (old) francs to the disadvantage of the African countries and 60 billion (old) francs to the disadvantage of France. Thus the grant (or otherwise, deliveries-supplies without any material counterpart) was smaller than 103 billion francs.

1/ This became even more true since introduction of the convertibility of the franc, a few months ago, but the experience in this field is too short to be spoken about.

A more recent estimate \(^1\), calculated in percentages, indicates overpriced (surprix) of 18% for countries of Black Africa and 23.5% for Algeria (French quotations over world market prices). Algeria export prices for France exceed the world prices by over 29%, Moroccan 14%, and other overseas territories as much as 64%.

These estimates are, of course, outdated. A very particular system of pricing used in exchanges between French-speaking countries and France must have been largely changed through association of these countries with the Common Market. I found no information as to how this system functions nowadays. It is certainly a problem which deserves a thorough study. It would be particularly interesting to know whether subsidizing of prices for imported raw materials from African countries involves higher pricing of manufactures, exported by European countries. Secondly, it is worth exploring whether some apparently advantageous forms of suppliers credits do not imply higher prices of supply.

As in all other cases, where prices are involved, the matter is particularly difficult to check, but not impossible as the above data from French sources tend to prove.

\(^58\). Thus the equilibrating role of the monetary area on the balance of payments of the French-speaking African countries eliminates, from the line of thought of French economists, most of the usual considerations of deficits on the external accounts. Because of the particular role of the Treasury the search for investment funds is less difficult than elsewhere, while the system of special prices which existed until recently

\(^1\) Report by the Direction Generale des Prix in France, dated March 1956, cited by Professor Raymond Barre.
dims the calculation of comparative advantage. It not only makes African economic development different from that of other continents but, given that these differences are due to existing institutions, it increases the importance of a "structural" or institutional approach.

6. Solutions

This Chapter would be incomplete without a review of some of the solutions suggested by various French economists to relieve economic underdevelopment. These can be grouped accordingly:

(i) Solutions to create mental structures 1/ more propitious to economic development
- separation of the temporal from the spiritual
- establishment of the supremacy of man over the forces of nature
- implantation of the belief that the future is a result of a joint effort
- diffusion of a mystique (new myth) of economic development.

(ii) Solutions employing the expertise of development 2/
- the creation of an international association (guild) of development experts

(iii) Marketing solutions 3/
- the creation of an elite of men capable of solving difficult problems, and organizing and interpreting data and market signals

1/ Mostly by René Gendarme.
2/ Independently originated by Messrs. Ferrandi (Director of the European Development Fund of the EEC), André Philip (President of the Development Center of the OECD) and the late J.L. Lebret, President of the IRFED.
3/ Henri de Farcy, from CERAS (Centre de Recherches et d'Action Sociale).
international solution 1/ to equilibrate the sale of commodities
an understanding of the commercial and marketing problems of the developing countries

(iv) General solutions 2/
The causes of most of the failures of development are considered to be the isolated treatment of underdevelopment and the original separation of its victims from the rapid economic progress in the developed countries 2/, and the view held by both the developed and underdeveloped countries that economic development could result from foreign aid alone without any great strenuous internal effort.

1/ This is treated more in detail in the Chapter IV of the present report.

2/ Mostly by Professor A. Barrère, Chairman of the Faculty of Economics, University of Paris, and Chairman of the Semaines Sociales de France, (in Tiers Monde et Développement - Recherche Sociale No. 7, September-October 1966), and by Professor R. Barre, Vice-President of the EEC in "Le Développement Economique, Analyse et Politique", Cahiers de l'ISEA Serie F, No. 2, p. 82.

3/ Some further-reaching solutions should be signalled here. The first, originated by André Philip at the Semaines Sociales in Nantes, in July, 1967, proposes the changes necessary to prepare the developed countries so they will be better able to help the developing countries (text to be published soon). The second by Jacques Dumontier, Director of the National Institute of Statistics and Economic Studies, starting from the premise that military progress is the quickest of all progresses in the developing world, concludes that developed countries might one day be militarily attacked by the developing ones, if a new, global redistribution of incomes is not introduced by the developed countries. This redistribution could apply only to productivity increases obtained in developed countries, and be allocated to the economic development of developing countries.
Thus, a broad solution is sought through internationalization of the problem of economic development, by:

a. the establishment of a "world" economic optimum of development

b. an international distribution of innovations and modern methods, and

c. an international allocation of resources, based on a combined method of free market allocation and proposed optimum allocation aiming to tie the world and local demand with fully utilized local capacities

(v) Other solutions

a. the necessity to extend the monetary circuits. This is predominantly an African problem and French experts maintain that a future market for industrial products cannot be created before barter and self-consumption are eliminated. Unfortunately, a new wave of African nationalism has contributed to the expulsion of Indian, Syrian, and Lebanese nationals, who had been granting small credits and collecting saleable products, without introducing any new system of trade to replace them. Thus the monetary circuits are deteriorating instead of improving.

b. the creation of half-public, half-private development centers, and a revaluation of the profit motive, which is still considered to be shameful (by the public administration) and a fruit of short-term activities (by the private sector).
IV. ECONOMIC RESEARCH ON SPECIFIC PROBLEM AREAS

59. In this chapter I have tried to bring together significant and representative ideas, appraisals, and analyses applied in each of the main areas of development. Those which follow the usual lines of Bank research have been omitted.

1. **Foreign Trade and Aid**

   **International Commodity Market Organization**

60. No official contacts were made with public authorities for reasons mentioned above. I concentrated on contacts with some university professors and senior researchers active in this field. It is noteworthy that opinions of such groups do often contribute, much more than one would expect, to the underpinning of more specific administrative decisions.

61. **Classification of Commodities.** In general, the French subdivide the commodities supplied by underdeveloped countries into the following groups:

   (i) commodities for which there is no serious competition in the industrialized countries (such as tea, coffee, cocoa, bananas, etc.);

   (ii) commodities for which there is competition from synthetics; and

   (iii) commodities, primarily agricultural products and raw materials, which are produced by both the developing and the developed countries. These are further subdivided into:

   a) commodities exported primarily by developing countries,

   and b) commodities exported equally by developed countries and developing countries.
This system of grouping is helpful in adjusting a particular price stabilization solution to each group.

62. **Stabilization Depending on Group of Commodities.** The following solutions have been proposed (the order of classification used in the paragraph above has been maintained):

(i) In the short-term: stabilization of commodity prices.
   In the long-term: a linking of the stabilization policy with a policy for allocation for rational use of new surpluses of income obtained from commodity price increases.

(ii) In the short-term: price stabilization.
   In the long-term: reduction of production costs and improvements in productivity. Synthetics have gained the market largely as a result of research and development expenditure. If the same are applied to the production of raw materials, they might recuperate part of the market.

(iii) a) Same solution as in case (i), but more cautiously applied.
   b) Eliminate impediments to market entry in the developed countries (which should simultaneously encourage some improvements in productivity of agriculture).

63. **Techniques of Stabilization.** After proposing these solutions, French economists delved deeper into the various techniques needed to realize them.

(i) In all cases agreements on market organizations should be concluded between principal importers and exporters in order to stabilize prices at a certain moving average level
related to the general long-term trend. A principal
instrument in these agreements would be export control
through a system of quotas. Hence, if considered desirable
control of production might be possible.

(ii) Another technique would consist of import quotas for
purchasing countries and a transfer system. Levies equal
to the difference between market prices and some guaranteed
minimum prices would be returned to the exporting countries
proportionate to their exports.

(iii) Buffer stocks of commodities should be created. The stocks
would grow in times of falling prices and, when they become
excessive, the surplus would be destroyed or used for
secondary transformations. For the financing of these
stocks a small surcharge over the usual customs duties
might be enacted. Some prefinancing will be necessary
before the mechanism starts operating, and could be ensured
by private banks and warranted by governments, which will
also be expected to reimburse a part of the interest rate
charged to prefinancing loans. Some tie-ups in the
movements of various commodity stocks are foreseen so that
a surplus of certain ones could be used to prefinance others.

(iv) Production should be diversified. Participating countries
should avoid returning additional incomes or transfers from
price stabilization entirely to the producers of the
commodity marketed, as this would encourage the existing
crop pattern, rather than induce the necessary changes.
Compensatory financing has been criticized sometimes as opposing organized commodity markets. Compensatory financing is regarded as a transitory auxiliary to free market access while organizational problems are being settled.

A number of French economists support a consumption tax, levied by the developed countries on products such as tea, coffee, and cocoa imported from developing countries as a means for increasing their (LDC's) budgetary receipts. Given the inelasticity of demand for these products, no reasonable increase in imports could be expected from an abolition of consumption taxes. A better solution would be to reimburse the exporting countries for a part of consumption taxes, gradually increasing the coefficient of reimbursement.

Considerable importance is attributed to clearing systems based on differentiated prices. For instance, a system of double prices for cereals with higher cereal prices for developed countries is being discussed currently. On the other hand, an organized market cannot detach itself from the economic situation in each particular country, otherwise local cultivation of rice might be depressed by cheap deliveries of wheat, for example, against the best interests of the country concerned.

In some French university circles solution of the commodity markets problem, while it is considered extremely important in view of current liquidity difficulties, is not considered really as the most fundamental for long-term development of backward areas. The following thought recurs:

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1/ It is noteworthy, that Mr. Jean Durieux, Department Director in the General Directorate for Overseas Development of the Common Market Commission considers also that "while the system of international trade should be re-organized, it cannot be considered as the fundamental element of the solution to problems of economic growth. I am a little perplexed when I realize that, at UNCTAD most pleas formulated by developing countries focus on commercial questions; this may lead to a neglect of some more essential problems." Cf. Developpement et Civilisations, No. 24, December 1965, p. 68.
Given that the overall growth rate of the developing countries exceeds their export growth rates, the development of local industries rather than foreign trade would seem to be the predominant factor in economic development.

68. **Stability or Change.** Another question of French economists is whether economic aid should have a stabilizing or de-stabilizing effect. This is primarily a problem of how a system of price stabilization can avoid a fixed pattern for crops and raw material production. If commodity prices are stabilized, it would be on the basis of past scarcities, instead of present scarcities or, better yet, expected future scarcities.

69. **Additional Financing.** Financial aid, both before and after market organization is attained, is thought to be indispensable:

- (i) to finance external exchanges between developing countries;
- (ii) to finance food and agricultural supplies;
- (iii) to prefinance stocks of commodities;
- (iv) to finance transportation of products (during the early stages of industrialization);
- (v) to assure supplementary or complementary financing; and
- (vi) to raise the low loan ceiling of developing countries in one way or another (the Horowitz Proposal has been favorably mentioned at this juncture).

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1/ Here, e.g., some French economists propose an index of commodity prices tied to imported equipment goods prices.
Forecasting Models of Foreign Trade

70. After Paul Clark's seminar on import function, organized by the Bank in 1967, I thought methods of forecasting imports might be of interest. I looked for research activity in this field.

71. The most interesting is, certainly, a model of the CEPEI\(^1\). A description of this model has never been published. Its predictive capacity is now being tested and there is no way to establish its usefulness before the results are analyzed. The matrix of exchanges used by the group divides the world geographically into 18 large trading zones\(^2\) and, productwise into 13 main branches\(^3\) of economic activity, corresponding to aggregated national input-output tables and to a revised SITC nomenclature, adjusted by the group to fit into the model.

72. I was unable to copy the statistical data in the matrix, but I noted the main mathematical equations upon which the model is founded. I refrain from reproducing them here, as it may prove burdensome and will dim the simplicity of exposition.

73. Characteristics of the Model. The model is:

(i) based on volume, i.e., price variations have been eliminated;

(ii) four-dimensional, i.e., possesses the following facets:

---

1/ "Groupe d'Etudes Prospectives sur les Exchanges Internationaux", see paragraph 22(i) above.

2/ U.S.A., Canada, Belgium and Luxembourg, France, Germany, Italy, The Netherlands, United Kingdom, the rest of Western Europe, U.S.S.R., Eastern Europe, Japan, Australia and New Zealand, and South Africa, Latin America, Arab Countries, South-East Asia, Mainland China, Sub-Saharan Africa. The order corresponds to that of the exchange matrix and is dictated by statistical considerations. The lower the zone the less reliable its statistical information.

3/ Agriculture, husbandry and fishing, energy, construction materials, minerals, metallurgy and metal products, food, textiles, timber and paper, mechanical and electrical industries, chemical products, construction, and services.
a) exporting zones
b) importing zones
c) production groups
d) consumer groups;

(iii) differential, i.e., includes two types of flow matrices:
   a) inter-industry exchanges by zones
   b) inter-zonal exchanges by products

Flow matrices are adjusted, in the forecast, according to the predicted changes in the explanatory variables, which are based on exogeneous data and on long-term plans. Other factors, more difficult to separate, such as the influence of transport distances, price levels, are implicitly included in the basic structure of the model.

(iv) Dynamic, i.e., allows successive projections, period after period. In a way it is a mobile projection system, where exogeneous variables are not only adjusted to the immediately foreseeable future, but are also corrected by current observations.

(v) Iterative in its solution, given the non-linearity of certain equations. Production in each zone can be derived from the final (internal) demand, which is considered exogeneous, and from hypotheses of exports and imports for the final year. The model can also be used (with other exogeneous variables) to determine the variation in foreign trade flows between zones. From these, according to the principle of iteration, one can derive exports and imports by zones and by products,
which in turn are liable to modify the final demand.

After a number of iterations, the model yields, by the convergence principles, a forecast for the terminal year.

Explanatory Effects. Four main effects have been considered in this foreign trade growth model:

a) Mechanical effect of growth. Here a growth in imports is tied by a simple function to a growth in (final and intermediate) demand.

b) Effects of implantation. More-than-proportionate growth in trade is explained by an extension of the sales network (by the exporter in an importing country).

c) Effects of competition. Profit rates are compared to determine the choice of supplier and sales markets for both exporters and importers.

d) Effects of specialization. Certain branches, because of their specialization have an exceptionally high rate of growth and better export chances.

Formulas for these effects have been derived from observations of past trends (where a certain unexplained residual appeared). Their future magnitudes are established through group discussions and outside consultations with various experts.

Still another set of effects is being worked on for branches with either institutional\textsuperscript{1} or out-of-the-ordinary sources of future exchange\textsuperscript{2}.

\textsuperscript{1} Like some minerals and foods.

\textsuperscript{2} Like services.
The complexity of the model will be expanded in the future to include at least three additional elements important in shaping foreign trade, namely:

a) the balance of payments position;

b) long-term decisions taken by large firms, and

c) international capital movements.

A verification of the predictive power of the model is in process. The model is being applied to the 1960-64 period and the results compared with the actual observations for 1964 (completion was expected by the end of October 1967). The next step will involve predictions for 1964-67, 1967-70, and 1970-75. The introduction of additional variables (balance of payments constraints, decisions by large firms, and international capital investments) will follow later. Given the complexity of this task, it will be at least a few years before reliable information can be collected.

Gravitational Model. Another forecasting model for foreign trade has been set up by CEPLAN (see paragraph 22 above). It is a "gravitational model" based on the Newtonian law of proportionality between a mass and its force of attraction. It examines the liaison between foreign trade flows and the internal economic structures of countries. The model is centered upon coefficients of proportionality, established at a certain level of disaggregation and representing ratios between the global production of exporters and the global uses of importers. These coefficients of proportionality supposedly reflect the state of trade relations between exporters and importers, reflected in particular trade agreements, customs duties, physical distance, etc. The main difference between this model,
the preceding model (or rather its "mechanical effect") and many models built in the United States and the United Kingdom is that total imports and exports are here the results of the aggregation of elementary flows, each of them calculated independently.

Foreign Aid

78. Research on the effects of foreign aid was carried out by different research groups under the auspices of the Ministry of Cooperation. It has yielded two noteworthy unpublished reports, separated by a number of years.

79. The first report of SEDES analyzed statistics on France and African countries in order to establish the impact of aid on the donor and on the beneficiary country. To do this, a first step consisted in calculating the relation between private and public flows:

Let \( x \) be the surplus of foreign public transfers, basically public investment from France plus military expenditures; and \( y \) the surplus of foreign private transfers, mostly the trade deficit of African countries with occasional transfer.

Compensatory effect of flows. The linear correlation between the two variables yields the following results:

For 1952-57 : \( y = 0.95x \)

For 1959-63 : \( y = 1.06x \)

which shows a high compensatory effect of public and private flows.

---


The foreign purchases of African countries were highly selective\textsuperscript{1/}.

Sectors with a low supply elasticity (such as agriculture and food products) accounted for only 2.3-3 percent of the final demand, while other sectors, such as the chemical industry accounted\textsuperscript{2/} for 10-17 percent, and transport even 18 percent.

In more concise form the basic analytical aid model, which has been tested statistically, can be expressed as follows:

\begin{equation}
1/ \text{B. Maldant (SEDES) Flux monétaires et flux réels dans les relations de la France avec les pays d'Outre-Mer, November 1959, p.5.}

2/ There are no recent data. One might presume that with the increasing cohesion inside the Common Market and a long upswing in industrial production and consumption in France, the share of consumption of the African countries in the final demand of French industry may have considerably diminished.
<table>
<thead>
<tr>
<th>Balance of Trade</th>
<th>Exports $X$</th>
<th>Imports $M$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public Capital Movements and Transfers</td>
<td>$T^p_x$</td>
<td>$T^a_x$</td>
</tr>
<tr>
<td>Private Capital Movements and Transfers</td>
<td>$T^x_p$</td>
<td>$T^p_x$</td>
</tr>
</tbody>
</table>

with the usual inequalities:

\[
\begin{align*}
T^x_a - T^a_x &> 0 \\
T^p_x - T^x_p &> 0 \\
M - X &> 0
\end{align*}
\]

from which

\[
\frac{(T^x_a - T^a_x) - (T^p_x - T^x_p)}{(T^x_a - T^a_x)} \cdot \frac{(T^x_p - T^x_p)}{(T^x_a)} > 0
\]

Statistical analysis has yielded the following results:

1. \[
\frac{M + T^a_x + T^p_x}{M} = 1.62
\]

2. \[
\frac{(T^x_a - T^a_x) - (T^p_x - T^x_p)}{(M + T^a_x + T^p_x) - (M + T^a_x + T^p_x)} = \frac{M - X}{M + T^a_x + T^p_x} = 1.6 \text{ percent}
\]

3. \[
\frac{T^p_x - T^x_p}{T^x_a - T^a_x} = 0.95
\]
80. **Importance of Price Elasticity of Demand.** Further analysis of the effects of aid is conducted by comparing two equations to determine its possible impact on prices in the donor country.

(i) French domestic producers sell goods Va and Vb at prices Pa and Pb without any surplus or deficit in supplies;

(ii) 315 billion (old) francs of additional deliveries, destined for French Africa are now included. Through an expansion effect, domestic consumption and prices in France change:

\[
\begin{align*}
\text{Product} & : \quad Va + \Delta Va & \quad Vb + \Delta Vb \\
\text{Prices} & : \quad Pa + \Delta Pa & \quad Pb + \Delta Pb
\end{align*}
\]

where \(\Delta\) can be positive or negative, depending on the case. In principle, production costs should diminish (consequently prices are expected to fall) as the market grows.

The final conclusion is not definite. It tries to show that in a new equilibrium (equation (ii) as compared with equation (i) above) which includes additional deliveries (non-reimbursable, i.e., grants) to the developing countries, the disposable income in the donor country can decrease or increase depending on the price elasticity of domestic consumption. To make the case clearer, a group of products (including agriculture, construction, and services) with a low mechanization of production was chosen for statistical analysis. The impact of increased exports on wages and price would be greater for these products.
Another aid model of interest considers more relationships and offers the possibility of interchangeable variants. While the results yielded by the model depend on figures used in assumptions, these figures reflect the effects of size (donor country as compared with beneficiary) and show how little effect a decrease of aid produces in a donor country and how much it will affect the beneficiary.

The model is based on the following assumptions:

a) only two countries exist (non-competitive environment): Job (the poor country) and Cresus (the rich country);
b) only the short-term is considered, i.e., the passage from an initial equilibrium to a final equilibrium;
c) prices are constant, and
d) only one central bank, owned by Cresus, exists.

The model contains 10 basic economic factors and seven basic flows.


2/ Industrial enterprises, commercial enterprises, indigenous households, households of metropolitan experts, administration, and foreign accounts.

3/ Marketable production, imports, distributed incomes, indirect taxes, direct taxes, transfers (incoming and outgoing), and savings (net).
There are 106 unknowns, connected by 99 basic relations. The degree of freedom of the system is determined by seven principal unknowns. Five of these unknowns are determined by political hypotheses, three are internal grants by Cresus, two are external grants by Cresus to Job.

- **De** - subsidies granted to enterprises
- **Dm** - subsidies granted to households
- **Da** - subsidies granted to the administration
- **S** - financial aid
- **W^t** - technical assistance

The sum of these five unknowns (A) is transferred out of the Resources of the Public Administration. The two remaining unknowns are prices.

- **F** - production prices in Cresus country
- **P** - production prices in Job country

### 82. Increase or Redistribution of Resources
The model is tested for two principal cases.

**Case I.** The administration of Cresus obtains new financial resources (A) from new credits granted by the central bank, and it can either distribute this credit inside the Cresus country, in the form of subsidies, or allocate it to Job, as economic aid. Here A = M (where M is newly created money).

**Case II.** The administration cannot appeal to the central bank. If it wishes, therefore, to obtain resources for subsidies and loans, one or more of the terms of the equation:

\[ D_e + D_m + D_a + S + W^t = A \]  

(for notations see above)
should receive a negative sign. This could be achieved either through additional taxation or by withdrawing some credits.

Case I is a general case, Case II is a degenerated case.

83. The results of the model depend on the values attributed to five basic variables:

a) credits granted to the industrial enterprises of Cresus
b) credits exhausted by subsidies granted to Cresus' households
c) credits granted to the administration
d) credits granted to Job's administration, used entirely for investment
e) credits granted to a Ministry of Overseas Development for sending technical assistance experts to Job.

Maxima and minima for the general case are calculated as a function of the assumptions used. Different hypotheses result in considerable amplitudes in domestic production, GDP, households' incomes, volume of investment, and taxes.

**Economic Impact on the Rich and on the Poor Country.** What is striking, however, is that under the degenerated case (II) the magnitudes of Cresus change very little. The volume of production changes by only 0.06, as new investment is fed by cuts in exports. Households' income does not change at all while that of commercial enterprises decreases.

On the whole, initial variation of (A) of one (+1) does not induce, in most cases, a response of more than 0.1 in the basic variables in the Cresus country. The situation is different in Job country, where the initial variation of one-half (+0.5) induces strong multiplier effects:

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1/ One of the reasons for the large multiplier is the purely monetary character of the initial variations.
Moreover, in order to invest 0.9 in Cresus, without any notable secondary effect, one has to disinvest by 2.4 in Job, with disastrous secondary effects for Job's economy.

2. Models of Growth

Although model-building is not a favorite game of development economists in France, a few cases deserve mentioning for their operational qualities.

Transformed Bruno-Chenery Model

An applied and modified Bruno-Chenery model was prepared in 1966/67 by Professor Alain Cotta and his associates. It differs from the original because of two additional variables: a demographic variable and an educational variable. Thus, while Chenery considers four basic economic possibilities, each defined by the relationship between the objective \( V \) and instrumental variables \( (s, r, l, F) \), Cotta studies eight economic policy possibilities, each defined by the relationship between \( (V) \) and \( (s, l, u, F) \) with one of the variables remaining fixed, thus acting as a constraint.  

\[ \text{Where: } u : \text{rate of unemployment} \\
\text{r : rate of increase of labor productivity} \\
s : \text{savings rate} \\
F : \text{foreign aid} \\
V : \text{national product} \\
r : \text{growth rate} \]
This kind of solution tends to approach reality, because a constraint (especially that of $s$ and of $F$) is sometimes unavoidably imposed on a growth policy.

This model has been applied to the economy of Senegal. The introduction of the demographic variable into the model is particularly valuable in the case of Africa, given the belief (underlined elsewhere) that the availability of manpower represents a real constraint in the growth equation. Thus, in the case of Senegal, growth of the National Product would stop at $169.5$ (billion CFA francs) even if aid ($F$) were to exceed $5$ billion francs and the savings rate ($s$) were over $0.14$.

Global Models of Growth

A similar orientation was taken by SEDES researchers in trying to strip down 20 or more complex growth models to a simple, but applicable, model. They attempted to grasp the transformation in the economic structure induced by industrialization.

Structural changes expressed by changes in the sectoral pattern of the economy were basic to the model. However, in models of capital accumulation this pattern boils down to a mere distinction between consumer goods and capital goods production. The distribution of investment among sectors is determined here by a savings decision. Therefore, either one accepts here first a certain rule regarding the creation of savings, from which a principle of distribution of investment is derived, or, on the contrary, there exists, at the inception, a given policy of allocation of investment, and savings will have to be compatible with such policy.

1/ A. Cotta and J.P. Debrix, Tentative d'élaboration d'un modèle de choix propre à la croissance de l'économie Senegalaise,mimeo.
Another new element is the treatment of foreign currency as a factor of growth since it is a "part" of investment. Some consideration of the balance of payments surpluses and deficits can be detected in the models. Until now this element had been left aside (for reasons explained in paragraphs dealing with the particular role of the Franc Zone).

SEDES' model-builders propose three main constraints to development: savings, balance of payments position, and manpower. The substitution effect between labor and capital is studied in order to lessen the effect of the manpower constraint. All possible combinations of the production function are thus involved.

Rearrangement of Basic Growth Models. Seven types of growth models are distinguished. Models 1 and 2 include savings and balance of payments constraints with the rate of investment changing over time. Models 3 and 4 study two-sectoral growth, with constant labor productivity, all investment foreign-financed, and one sector producing and exporting primary goods. The manpower limitations act as a constraint to sectoral growth in Model 3, while limited foreign resources are a constraint to increased imports of equipment goods in Model 4.

While labor productivity remains unchanged in the first four models, a more optimistic treatment of labor productivity is adopted in the remaining three models. In Model 5 investment contributes to productivity increases, thereby easing the balance of payments bottleneck. In Model 6 a learning function increases labor productivity.

1/ Modeles globaux de croissance, Délegation Générale à la Recherche Scientifique et Technique, Paris (in 2 volumes), mimeo. date not stated.
And, finally, in Model 7 various policies of investment allocation by sector are weighed in an effort to attain the final structure most suitable for the objectives of the economy.

90. The whole exercise is a recreation of simple models applicable to the particular set of existing conditions and objectives of a given country. It cannot be given a more extensive treatment here, as it may become too much of a specialized and involved discussion.

World Distribution of Economic Growth

91. Another notable approach to problems of growth is a statistical application of Pareto's distribution law to all countries in order to calculate the inequalities in development levels. This was done by two research groups, the first directed by Professor Maurice Allais, a free market proponent from the School of Mining Engineers, the second by Professor Alain Earrere, Chairman of the Economics Faculty from the University of Paris, a proponent of institutional (contractual) solutions on an international level.

92. Allais' function of development inequality includes quantified factors, such as industrial consumption, nutrition, education, health, etc. In the world as a whole, the difference among development levels varies from 1 to 8, while within the industrialized Western World it varies only from 1 to 2. On the basis of this Allais affirms that authoritarian and state-oriented economic policy may increase inequalities further while free market methods may flatten the inequality curve as they apparently did in the industrialized countries.

Allais advocates free decisions in the response to market signals, accepting main institutional structures as given (such as monetary policy, fiscal policy, customs policy, regional policy, social policy) as opposed to the centralized decision-making process promoted by other development concepts.

93. **Income Inequality.** Barrère's conclusions are less clear-cut, although his statistical approach is simpler. In applying the Pareto law to development, he measures gross domestic product per capita on the abscissa, and the number of countries on the ordinate. The adjustment is: 

\[ \frac{23,800}{x^{1.18}} \]

where \( N \) is the number of countries for which GDP per capita exceeds \( x \).

Given a low value for the adjustment coefficient \( (r = 0.787) \) the countries were split into two blocs. For the first (the underdeveloped countries) GDP per capita is below 900 dollars\(^1\) and the equation becomes 

\[ \log N = -0.78 \log x + 3.37 \ (r = 0.999) \]

with \( N = 2,340 \). and for the second (the developed countries) per capita exceeds \( 900 \) dollars and the equation becomes:

\[ \log N = -3.36 \log x + 12.21 \ (r = 0.972) \]

\[ N = \frac{162.10^{10}}{x^{3.56}} \]

While the distribution is widely dispersed in the first bloc, the distribution is largely homogeneous in the second bloc.

Thus, the line of discontinuity could be situated at about \$900/capita (or \$1,000/capita, if the latest findings are correct). There are 14 developed countries above this line, and 87 underdeveloped countries below it, distributed into unequal groups and concentrated around certain levels of GDP/head.

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\(^1\) Professor Barrère informed me that he is currently recalculating the distribution using 1965/66 figures. The first results situate the new threshold at \$1,000/capita, otherwise the inequalities of distribution remain unchanged.
The extent of the differences inside each bloc is much greater than that calculated by Allais. In Barrère's model, the differences range from 1 to 1.6 for the bloc of developed countries, excluding the United States, and from 1 to 21 for the bloc of developing countries.

Conclusions, derived from the application of Pareto's law are very interesting. The homogeneity of the distribution above $900/capita corresponds to the homogeneity of the structures of developed and mature systems, while the heterogeneity of the distribution for the developing world reflects the variety in their economic, social, political, and religious structure. Thus, according to Professor Barrère, while it is possible to have a single development theory for the developed world, such a unique theory is inconceivable for the underdeveloped world, because it would not consider their structural differences.

The last step in this analysis grouped countries according to their annual growth rates and GDP/capita. This statistical comparison produced very curious results. During the period 1950-60 the countries with the lowest growth rates were those situated on the extremes of the scale, i.e., the richest and the poorest. On the contrary, countries around the middle level of development had the highest growth rates.

3. Industrialization

Global Model. Interpretation of industrial development has been proposed by René Mercier. It consists of a simple and general model...

1/ The results were expected to be published at the end of 1967.

2/ In general, below 4 percent per year, and in most cases within the 1.5-3.5 percent per year bracket.

3/ Director General of the SEDES.
which became one of the guiding principles for SEDES researchers. It bears likeness to earlier Chenery growth models for developing countries (see his "candidate variables" in "A Study of Industrial Growth"). Despite the benefits of industrialization for the developing countries, its practical realization encounters enormous difficulties. The direct profitability of industrial investment is likely to be lessened because of a lack of sales outlets and the high cost of factors of production. This can be proved with two very simple formulae which demonstrate the causes of production inefficiency and weaknesses of marketing opportunities.

Let $C$ stand for the consumption of a given product in a country with a population of $P$ and a per capita income of $Y$, then

$$C = KPY^\alpha$$

where $\alpha$ is the income elasticity of demand for a given product. In general $\alpha$ tends to be greater than unity for industrial products. Mercier compares two countries with the same GDP (e.g., Brazil and Sweden) the first of which has a population ten times larger (and therefore, a GDP/capita ten times smaller) than the second. Applying the above formula to Brazil and Sweden indicates that total consumption of industrial products in Brazil is three times smaller than that in Sweden.

96. **Low Income per Head Reduces Economies of Scale.** Moreover, given the economies of scale, each increase in production is more than proportionate to the growth in technical capital which causes it. In other words, as investment grows, it becomes more efficient and productive.

This is synthetised in the formula:

$$I = hC^\theta$$

with (about $2/3$, so-called .6 rule)

$I = Investment$

$C = Capacity of production$
In addition to the inherent difficulties of the developing countries in obtaining economies of scale explained in the first formula (narrow market), heavier (compared to developed countries) construction costs resulting from the necessity to import a considerable bulk of material must be met. He also points to the costliness of fuels and foreign manpower. These cost-inflating factors reduce the profitability of industrialization in the developing countries. A low profitability has a double effect: it keeps the savings rate at a very low level and it fails to attract foreign private capital.

97. A number of noteworthy studies on African industrialization were brought to my attention. I selected from them only the methods used, not the numeric findings, which are confidential and more transient.

98. Industrial Development of Cameroon. This research was based on the following principles:

(i) In the long-run, industry which supplies the domestic market is more useful than a large export industry. A large export industry is important as a supplier of foreign currency, but a) is less apt to form its own domestic fixed capital, since its profits are usually wholly repatriated, and b) is a victim of cyclical fluctuations since it is unable to influence its sales prices. The export industry, usually, works within a thin profit margin, and its taxes are relatively negligible. Moreover, it is the master of its own trade, and the public administration is unable to check its real gains.

1/ M.H. Pasquier and A. Mercier, Développement Industriel au Cameroun (in two volumes), SEDES, 1964-65.
The best form of industrialization would probably consist of production for the domestic market, with only a small fraction likely to be exported.

(ii) In an agricultural country industrialization is inconceivable without parallel increases in agricultural production. The market for industrial products is basically created from the purchasing power of the rural sector. Even action effective in the growth of marketable agricultural production will directly aid industrialization. Three typical examples are: the Bamileke region, the Cocoa Zone, and the northern cotton belt. In these regions, consumption of industrial products was very limited until recently, now one observes increased purchases of textiles, sandals, soap, metal sheets, bicycles, enamelwares, radios, etc. The consumption of dried fish, vegetable oil, beer, and canned food is growing at the same time.

(iii) Government action is necessary to establish industry. This action must not be simply limited to investment guarantees and assurances of free transfers. It must also embrace practical measures to enable industry to balance its accounts and receive a normal profit on investment. These measures are necessary both because industrial units are small and the cost of investment is high. Factories established in Africa always require a larger amount of capital than those in Europe, the approximate excess being 25-50 percent over standards of developed countries for investment made near
seaports and even more in the interior. Reasons for this include necessities for more maintenance services, building living quarters, laying water pipes, constructing electricity stations, etc. Depreciation and financial charges increase in the same proportion, increasing production costs by 4-9 percent. This increase alone in Europe, would erode the entire profit margin. Other items contributing to high industrial production costs in Africa are:

a) the cost of energy (both kWh and fuel-per-ton is often double the European cost);
b) the cost of maintenance is much higher than in Europe, mostly because the stock of spare parts needs to be larger;
c) banking costs are generally higher than elsewhere not only because of higher interest rates, but mainly because of irregularities in turnover, created by "sales campaigns";
d) the cost of training local personnel is greater;
e) running-in periods of industrial plants are longer.

(iv) Notwithstanding all these difficulties, there are some tangible factors which favor African industrialization:

a) the low prices of local raw materials;
b) a low wage level (in spite of its tendency to increase rapidly over time and the considerable weight of European salaries in wage bills), and
(c) a fiscal policy which takes a smaller part of gross profits than in other parts of the world.

(v) Exports should be encouraged in order to increase the market for industrial products. Two principal ideas held in this field seem partly erroneous:

a) In countries suffering from underemployment, a priority should be given to industries offering the maximum level of employment at the minimum investment level (low capital-intensive industrials). First, such industries do not contribute to the process of capital formation since their depreciation funds are negligible. Secondly, the role of the machine for imposing a certain pace of production, so important in Africa, disappears. And, thirdly, highly labor-intensive industries are particularly vulnerable to wage and salary increase.

b) A large firm significantly influences economic development. A large enterprise is usually export-oriented and cares little for the domestic market, the importance of which has been underlined above. Given the structure of domestic consumption, a wide spectrum of medium and small industrial enterprises and even organized cottage industries would seem more advantageous provided their organization corresponds to basic requirements of productivity, social progress, and capital formation.
99. The above study on industrialization in Cameroon contains a very useful inventory of the existing industries. On the basis of this inventory possible new centers of industry are envisioned.

(i) Industries employing large amounts of electrical energy. The large hydroelectrical potential of Cameroon could be utilized for such activities as:

a) the electrolytic separation of various salts, either to obtain metals (aluminum, magnesium) or chemical substances (chlorate, sodium), and

b) the electric reduction of minerals by coke in electric arc furnaces.

(ii) Industries employing local raw materials. A market analysis for cement and fertilizers has been conducted (the fertilizer market being broader, including also the Central African Republic and Chad).

100. General conditions for the industrialization of Senegal. This study does not contain any strikingly new methods but gives the factor price needed for any pre-investment calculation in Senegal, such as prices (cost) of manpower, electrical energy, construction, and transportation, and estimates of customs duties and taxes.

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Prospects for Industrialization in the Ivory Coast by Establishing Small Mechanical and Electrical Industries. It was felt that it was necessary to limit the study. Thus the following groups of products consumed in the Ivory Coast were eliminated from consideration for possible industrialization:

a) investment goods and complicated tools and instruments, for which the thinness of the existing market does not justify the creation of local manufacturing industries;

b) finished metal products, such as rounds and shapes as well as all other metal construction elements, which deserve a separate study;

c) mass consumption products, for which investments projects have already been prepared or for which existing domestic capacities largely exceed expected future demand, and

d) all products which, over the next 6-7 years, must be assembled from imported parts and therefore would have little value added and so be of little interest to the economy of the Ivory Coast.

The residual, rather heterogeneous production offers the following advantages:

(i) considerable expected demand in the early 1970's;

(ii) uncomplicated technology which would not require hiring of highly skilled labor, and

(iii) relatively modest investment requirements in fixed capital.

Perspectives d'industrialisation en Côte d'Ivoire dans certains domaines de la mécanique et de l'électricité (in two volumes) prepared by Pierre Hugon, SEDES, December 1963.
Moreover, in the majority of cases the manufacturing process will produce a marketable final product from a semi-product or a raw material. This will involve neither the assembly of pre-fabricated parts, nor imports of ready sub-assemblies.

102. The absorption capacity of the domestic market in the Ivory Coast for the above products was evaluated at 2,935 million francs (CFA) in 1962 (at factory prices) and projected as 5,970 million for 1970 (plus 935 million CFA francs as exports). This equals $30 million of annual industrial production, almost entirely marketable inside the country. Considerable difficulty was encountered in gathering investment and production costs data. European producers of those industrial products feasible in the Ivory Coast were not very helpful. The scarce information that was collected was hardly applicable to the economic conditions of the Ivory Coast, either because the products manufactured in Europe differed from those demanded in the Ivory Coast, or production programs were inapplicable in enterprises of small dimensions.

103. Manual. A manual useful for studying industrialization was prepared by the Development Division of SEMA for the Development Center of the OECD. This handbook is divided into three main parts:

(i) Methodology
   a) Market studies (and market evolution)
   b) Technical studies (and production cost forecasts)
   c) Definition and analysis of different variants of production
   d) Criteria of choice from the firm's point of view
   e) Analysis of investment risk and choice of the best variant
   f) Financing and implementation of projects
(ii) Case studies (the investment possibilities in six different industrial firms are examined here).

(iii) Technological reference cards, for 18 industries (mainly of the type encountered in Africa). These contain a general description of the production process, the principal technical characteristics of each scale of production, including factory surface, employment, raw material input, electrical energy, and the original factory price of principal pieces of productive equipment. A bibliography and a list of the principal technical centers in France where additional information can be received concludes the handbook.

104. **Importance of Commercial Network and Availability of Information.**

Two other interrelated issues discussed with industrialization experts in France deserve some attention. The first dealt with possible future investors in inward-oriented (i.e., production for local markets) industries in Africa. The large merchants and importers were chosen both because they hold increasing amounts of savings and also understand the consumption patterns of the African countries. The second issue concerned production techniques. Local investors know the country, but lack the proper knowhow, while foreign investors have the necessary production techniques, but lack knowledge of the country. If a bridge between the two were built, industrialization could make a considerable step forward. The creation of an industrial bureau of projects could help the local investors allocate their savings more productively while consumption studies, preferably on a regional (i.e., overlapping political frontiers) basis could acquaint the foreign investor with the domestic market and its possibilities.
Market Research

105. The World Market for Phosphatic Fertilizers. The methodology is based on a definition of "certain (sure) minima" which represent unavoidable deficits in the supply of fertilizers. These minima might also be applied to the price level to see if the "sure" price minimum is above or below the cost of production. The advantage of the method of minima is to situate export possibilities in a pessimistic (but likely) context. Any improvement of the situation can only add to the profitability and export possibilities of the envisaged investment project.

These assumptions have enabled a forecast of the countries for which an "inevitable deficit" in phosphatic fertilizers is expected in 1970 and 1975. This deficit is calculated by subtracting a pessimistic consumption forecast from an optimistic production forecast. The result is, the minimum quantity of fertilizers the country must import to complement its domestic production (for which optimistic estimates used) in order to meet domestic consumption (calculated as the minimum compatible with economic trends in the country). The minimum prices that deficit countries might pay for fertilizers are also derived. These prices are calculated from estimates of the production costs of fertilizers in surplus (i.e., exporting) countries and from the recent trend of import prices in deficit (i.e., importing) countries. The competitive position of each exporter is a function of his production costs (information sometimes fails here) and his prices in the domestic market. These two elements determine a minimum export price.

below which the producer cannot drop. This is the minimum (or "sure") world price level, while the real level is a function of supply and demand situations at each given point of time.

106. In the forecast of demand, the following agricultural and agro-economic variables were initially considered: type of crops grown, increase in cultivated land surface, yield per hectare, size and number of farms, growth of farmers' income, domestic and foreign markets for agricultural products, soil fertility, level of the farmers' technological knowledge, and finally, ratio of fertilizer prices to agricultural product prices. These variables, however, were applicable only to relatively small, homogeneous regions. Thus, in calculating a country's fertilizer consumption the historic trend was finally adjusted. A methodological interest lies in the choice of adjustment. Out of three possibilities, linear, exponential, and logistic, it was considered that:

a) An exponential adjustment is best for countries where soils fertilization is weak or medium.

b) A linear adjustment is best for countries with a large fertilizer consumption.

c) A logistic adjustment is preferred for countries with an extremely large consumption of fertilizer (such as Japan).

Countries were grouped according to their level of fertilizer consumption:

a) Countries near the optimum level

b) Countries at an ample level with a rapid growth rate

c) Countries at an ample level with an insignificant growth rate

d) Countries at a low or medium level with a medium growth rate.
As most research in economics, one is wary of extrapolating past trends in a forecast. For example, for many countries with a small fertilizer consumption and production, mere construction of a new compound fertilizer plant is apt to change the whole fertilizer consumption structure profoundly, negating all past statistical adjustment.

107. The Market for Hydrocarbons in the Ivory Coast. This study not only analyses the Ivory Coast, but also Upper Volta, Mali, Togo, Dahomey, and Niger, in order to determine whether the capacity of the new refinery will be sufficient to meet the future demand in all these countries. Two possible approaches to forecasting were envisaged.

(i) Use of linear relationships; a choice is here between:

a) Global forecast
   correlation between hydrocarbon consumption and time;
   correlation between consumption and traffic

b) Analytical forecast
   correlation between stock of vehicles and time;
   correlation between stock of vehicles and income;
   multiple correlation between stock of vehicles, income
   and time

Unfortunately, the results are very sensitive to estimates of the average useful life of a car. This can be proved by an example of France, where, if a replacement ratio is applied to the stock of vehicles registered 10 years ago (instead of 9 as intended) there is as much as a 25 percent difference in the 7-year forecast.

c) Long-term forecast (10 to 15 years). In this case it is more plausible to adopt a logistic growth in a country’s motorization, calculating it from a medium-term forecast and a saturation level. This saturation level is fixed in advance by using the data of a much more developed country.1

These rudimentary projections could be further developed by adding data on the engine power of vehicles and the increase in distances covered annually by car owners (depending on income elasticities of gasoline demand, which, curiously, varies from 0.6 if applied to individual incomes to 0.3 if applied to the income of a country, the differences being due to the fact that a growth in a country’s average income increases new owners in the lower income brackets, who drive shorter annual distances). Also the level of the existing road network and parking facilities could be included in the calculation. Whatever analytical method is used, it must begin with a fundamental variable such as the stock of vehicles in a country. Yet, it is precisely this information which is the most inaccurate. Various evaluations of the Ivory Coast have declared this variable to be 20 percent, 35 percent, and even 40 percent overestimated.

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1/ This has also been applied in my draft paper on "Projection of Automobile Demand in Developing Countries", paragraph 27 and Graphs 5 and 6, (Divisional Paper, Economics Department, IBRD, 1967).
(ii) **Structural analysis of consumption** (by branches and sectors of economic activity)

Given the shaky foundations of the "linear" approach, it was decided to construct a matrix of petroleum derivatives (by products) and their uses (by branches). A special questionnaire was sent to distributors of petroleum products in the Ivory Coast to collect data for the matrix. A forecast was based on growth rates derived from national plans and national accounts for each branch. Fixed technical coefficients for intermediate consumption were assumed. The method used in the long-term forecast is also worth mentioning here. The future was divided into two periods. For the first period (1965-70) the rate of growth was taken from the national accounts projections. For the second period (1970-75) two possibilities were envisaged:

(a) a favorable outcome, where reality would approach the forecast;

(b) an unfavorable outcome, where reality would diverge from the forecast, necessitating a revision of the starting point of 1970.

To an extent, by using Tinbergen's definition of moving targets and moving planning, this study implicitly proposes a moving bench-mark year and thus, a moving forecast.

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1/ Although the exercise was not particularly original, it seemed worth mentioning because its sponsors so clearly realized the danger of building a complicated and elegant structure on doubtful foundations. This is not always the case in economic analyses of under-development.
108. The market for textiles in Senegal

Two elements of the research method used in this study are of interest. The first is the endeavor to find a certain income elasticity of demand for textiles. This starts with a graph based on fiber consumption and income per capita and illustrates the international income elasticity for textiles. Here again this method might be considered trite if it were not for the fact that elasticities thus established show a large concentration for the developed countries and extreme dispersion for the developing countries. In general, however, the income elasticity for textiles is higher in the developing countries, revolving around 0.8. This is an elasticity of Q/I (quantity-income), distinctive from elasticity of E/I (expenditure on textiles/income) which is slightly higher.

2/ From FAO statistics.
3/ Which confirms the conclusions of Allais and Barrère (see above paras. 91-94) of homogeneity in the upper strata of economic development and heterogeneity in the lower of underdevelopment. The same "tail-of-the-curve" problem existed for the international demand for steel and/or automobiles, where the shape of the curve was very dubious for GDP/capita below $300.
4/ Algeria 0.75, Brazil 0.6 - 0.7, Colombia 1.4.
5/ All differential notations have been omitted for the sake of brevity.
6/ The income elasticity for quantities of fibers for all countries is 0.6 - 0.8, while for expenditures it is somewhat higher, i.e., 0.7 - 0.9 (from an independent study by H. Faure "Long-term Perspectives of Demand for Textiles" in Consommation, Annales du Credoc, 1961, No.2).
The demand for industrial products in North Africa

Fifty-two mechanical and electrical equipment products produced and consumed in four countries were chosen for this study. Two methods of forecasting were used.

(i) graphical method (for Morocco and Tunisia) - The users of particular products were known and their evaluation could be considered as realistic;

(ii) econometric method - The growth in demand was assumed to equal the growth in the activity of the users, or in other words, the demand elasticity always equaled unity. The growth rates for users were taken from the economic plan.

An input-output table was constructed for the four countries for 1964 on the assumption that each of 52 industrial products was produced by one, and only one, branch of economic activity or had one, and only one, intermediate or final consumer. Two growth variants were used for projection: a rapid growth rate per year (7%) and a slow growth rate per year (4%). In a five-year projection, 1964-69, of the input-output table, the variables were divided according to the degree of certainty as to the results. Sectors such as agriculture, petroleum, mining and metallurgy, metal product, chemicals, textiles, apparel, wood and paper accounted for 47% of the value added, and where projects were to be

1/ La demande maghrébine des produits industriels, SEMA, September 1966, for Algeria, Morocco, Tunisia and Libya.

2/ One of the reasons why we mention this study is the fact that a method of projection has been adjusted to the specificity of a country concerned within the framework of a single study. A similar method was used by another consulting center (see above paragraph 105) for the world demand for fertilizers.
launched, have been considered as exogeneous variables with growth rate variants of 6.0 and 9.7% per year. The other 7 sectors were considered as exogeneous variables with growth rate variants of 2 p.a. and 4.3 p.a. of the sectors.

**Import substitution:**

10. Problems of import substitution are dealt with rather marginally in France. They are usually treated as a by-product of project analyses. However, I did encounter several people knowledgeable in the field of import substitution. The following observations seemed relevant.

111. Latin America (e.g. Argentina). Plants in the non-durable goods industries (food processing, apparel, textiles) are constructed first, next those in the durable goods industries (furniture, household electric machines, automobiles), and finally investment goods, and to a lesser degree intermediate goods are introduced.

(i) **Conditions for import substitution.** A braking effect occurred in Argentina when occasions for import substitution in industries with simple technologies and industries with low capital-intensity declined and the difficulty of importing investment goods increased because of export stagnation and an increase in the relative prices of imported equipment. The linkage

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1/ These include researchers of the Institute of Energy in Grenoble (Mr. J.B. Martin, its Deputy Director has had experience in Latin America) and the BCEOM (Mr. P. Bourrières, its Director General, has had wide experience in Africa).
effects created by industries with simple technology are extremely weak. In principle import substitution introduces industries likely to produce stronger linkage effects (chemical products, metallurgy, mechanical industries). However, without determined industrialization policy this group will never become dynamic and a country might continue to have industries with:

- limited production flows,
- prices above the international level, and
- practically no diffusion of innovations.

Industrialization as a result of import substitution shapes the industrial structure and the industrial behavior of the country in a certain way. Extreme inequality would subsist within such branches of the industrial structure where a few large enterprises coexist with many very small units. Industrial behavior would remain backward as no technological tradition would develop while industrial techniques were being copied from foreign patterns or adopted from imported equipment. The protective import-substitution policies would encourage certain industrial activities.

1/ See also J.M. Martin, "Blocage de développement et industrialisation par substitution d'importations - L'exemple de l'Argentine", Tiers Mor., Vol. VIII, No. 30, April-June, 1967.
On one hand, merchants, handicraftsmen and technicians would quickly and often con-jointly organize numerous small enterprises in search of quick profits. At the same time large foreign enterprises would install subsidiaries in order to produce on the spot the same products they exported before. No one tries to meet the demand in an import substituting developing country (of the Argentine type) by launching a new product or by innovating, since the necessary research is generally too costly. On the whole, industrial growth remains far below its potential.

(ii) Conditions for exports. Nowadays Latin American countries are industrializing by developing labor-intensive export industries. This new interest is primarily due to the fascinating example of the Japanese economic miracle, but also to a growing awareness of the inefficiency of the basic industries and to an increasing preoccupation with the slow rate of economic growth in Latin America. French economists still doubt the immediate possibilities of developing export industries there. First of all, such a development should be accompanied by a reduction in production costs which, even given low wages, implies adjustment to the high technological level of world production. In the absence of good national investment goods industries this necessitates constant recourse to imports and incurs the additional costs and delivery time imports imply. Also in this situation the propensity to innovate may remain very low.
Africa. Observations (derived from analyses of branches such as that of paper and paper industries) indicate:

(i) Import-substituting industries tend to consist of small producing units (enterprises), possible because of a strong protection and justifiable because of a thin market, and

(ii) Export-oriented industries must operate at a price level (and consequently, at a cost level) much lower than that for import-substituting industries, since they have to step below their protection barrier. Secondly, they must also descend below the protection barrier of the importing countries. Thus, given the shape of the economies of scale curve enterprises in

[Diagram]

Price (Cost)

Import-substituting industries
Export-oriented industries

Quantity of product = (size of enterprises)

Small

Large

Africa will tend to polarize in either very small (import-substituting) or very large (export-oriented) units.
Regional and inter-regional cooperation

Regional development:

113. The following aspects of regional development research carried on by France deserve our attention

(i) Studies on regional structures
(ii) Induction effect analysis
(iii) On-the-spot field research

114. The regionalization of economic development in Venezuela belongs to the first group. This study concentrates on the following "structures".

1. The physical aspect of the country, both natural and man-created.
2. The population distribution throughout the territory.
3. Demographic and professional structures.
4. Social structures and the standard of living.
5. The transportation and communication network.
6. The commercial network.
7. Sanitary and medical installations.
8. Education, culture, and leisure.
9. The financial structure (savings, credit, investment).
10. The spread of technology (information and technical training).
11. Administrative structures.

1/ La regionalisation du développement - le Cas du Venezuela, Mission by IRFED, conducted by R. Delprat, 1965, for the CORDI PLAN (Bureau of Coordination and Planning attached to the President of the Republic).
By studying these structures for each region, the research (not yet completed) hopes to determine the "polarization effect" or the existence of modern structures in various rare spots of the country. These spots are often connected by "axes of development", i.e. a network for flows of goods and services between growth spots or poles.

Classification and rating of regional structures. The rating system used by IRFED to evaluate the development level of a country is rather unique. The main aim of the study was to combine micro-analysis and macro-analysis. Micro-analysis was used to discover the living conditions and necessities of the population. Next, macro-analysis was used to draw up an inventory of a country's disposable resources which would enable the fundamental "structure" of the country to be traced.

To determine the living conditions of the population, the country was divided into zones, composed either of relatively homogeneous territorial units showing similar characteristics, or heterogeneous territorial units attached to the same economic center. The IRFED's criteria for homogeneity are as follows:

(i) Common characteristics of climate, soil, or topography
(ii) Production structure (agriculture, sylviculture, husbandry)

1/ The original word "structure" has been retained to stress the importance attached to this idea by French economists (see Chapter I of this report).

2/ This is best described in the "Besoins et Possibilites de Developpement du Liban" produced by an IRFED economic mission to Lebanon invited by the Ministry of Planning. The mission was headed by J.L. Lebret and assisted by R. Delprat and a group of researchers.
(iii) Type of housing and patterns of rural and urban agglomeration

(iv) Way of life and standard of living of the population (in particular patterns of consumption, education, leisure, mutual help and social life)

(v) Ethnic or religious ties

If a zone is proven homogeneous, random sampling of a few territorial units within the zone may be justified. Such sampling was used to:

(a) discover the needs of the population by determining the major deficiencies in their economic and social life;

(b) measure the adequacy or insufficiency of various "growth poles" in generating economic development in regions. Here analysis of economic activities was necessary;

(c) establish the short-term and long-term possibilities of satisfying the needs of the population by evaluating the inventory of human and material natural resources.

Living standards in the regions have been classified in the following level:

1. very bad (absence of any development, marked under-development)

2. bad (underdevelopment)

3. barely acceptable (passage from underdevelopment to development)
4. good (development)
5. very good (high development)

This classification is based on relatively precise criteria such as:

a. The sanitary level. For example, if more than two hours are needed to reach a physician (by local means of transportation), an O rating is given for "distance between patients and doctors" which among other items determines the "sanitary level".

b. Urbanization. If more than 80% of the streets have sewers, the item "sewage system" receives a No. 4 rating.

116. Since not all elements are of equal importance, a weighting system is necessary. For example, in considering the aggregate "level of education", the "number of schools" is more important than the "condition of classes". Aggregates, weighted sums of different ratings, represent the "structure", i.e. the level of housing, sanitary equipment, education, urbanization, technology and other development indicators in each region. Detailed questionnaires take into account the needs of rural and urban centers and the possibilities of satisfying them.

117. Analysis of the "effects of induction" is another interesting element in the regional analyses of the developing countries conducted by French economists. This is particularly well developed in the "Study of the Industrial Complex in the South of Tunisia". All possible uses

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1/ "Etude d'un Complexe Industrial dans le Sud Tunisien", in 8 volumes, prepared by Messrs. Mercier, Brule, Depardiem, Desbons, Guillemin, Potard, Roy, Tymen of SEDES in April, 1963.
of the raw materials available in the South of Tunisia are studied with the aim of developing an industrial complex which might restore equilibrium between the South and the North. The proposed complex would involve transformation of local raw materials and would activate the region. Two possible approaches have been envisaged. The first "concrete" approach deals exclusively with mineral resources uses and development of the petrochemical industry. The second approach studies the effect Southern Tunisia development might have on the economy of the whole country and, secondly, its singular influences on the region.

The induced effects of the complex were studied, i.e. the possible influence of domestic production growth (\(P\)), on the growth of incomes, savings, fiscal revenues, and so forth. The exercise resembles the calculation of a multiplier effect. It may be interesting to present its results, as they are calculated for the case of national accounts system, used in French-speaking countries. In the primary run, the coefficients obtained (for \(P = 1\)) are:

- \(xP\) (with \(x = 0.10\))
- \(mP\) (with \(m = 0.58\))
- \(nP\) (with \(n = 0.18\))
- \(rP\) (with \(r = 0.14\))

In the second run, household (\(mP\)) is used to determine:

- Consumption \(cmP\) (\(c = 0.86\))
- Taxes \(fmP\) (\(f = 0.017\))
- Savings \((1-c-f) mP\)

Household consumption is partly satisfied from increased imports \(icmP\) (with \(i = 0.16\))
and partly from local production \((1-i)\) \(cmP\). Thus \(P\) can be replaced now by \((1-i)\) \(cmP\) and the following results correspond to the usual multipliers' effect. The study distinguishes between three major effects of the regional industrial complex:

(i) the direct internal effect in the total production of the enterprises in the complex

(ii) the linkage effects from the economic cooperation between the new enterprises and other enterprises in the area, and

(iii) the induction effects from the distribution of the new value added between households, administration and enterprises.

On-the-spot field surveys also offer methods of interest for regional studies. They are best described in reports on the regional development of the Ivory Coast. Each field study in this report was coordinated by members of the original mission. However, data were collected by 80 odd field researchers from the Ivory Coast, divided into small units of three. Each unit surveyed the daily economic life of four local families. Their daily expenditures, food consumption (weighted by researchers) and crop assessments were calculated for one month, in order to establish an approximate structure of the family budget, a pattern of consumption and the average yields per hectare of different crops. About 400 families were investigated in each region.

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1/ Etudes de Développement Socio-économique - Region de Korhogo (Côte d'Ivoire) "Enquêtes Socio-economiques dans le Sud-Est frontalier de la Côte d'Ivoire et Etude de Développement Regional" "Etudes sur le Sud-Ouest de la Côte d'Ivoire", prepared successively, from 1963-1967, by SEDES' economic missions.
The field study lasted about 15 months, in order to account for seasonal variations. This data on the lowest budgetary unit was supplemented by studies of the demography, sociology, pedology, trade and transportation of each region. (This approach is interesting but highly labor-intensive.) Some of the conclusions of these studies deserve mention.

(i) The basic budgetary unit in Africa is shrinking. Until very recently, it consisted of a few families guided by a patriarch. Now one family, led by the head of the family is a wholly independent unit.

(ii) Family behavior changes in the presence of researchers, notably consumption increases. Coefficients of correction were introduced to obtain an average level. \(1^1 \)

(iii) The North of the Ivory Coast is much less developed than the South. Market outlets are notably lacking in the North because of the predominance of a-monetary incomes. To increase development in the North, growth in agriculture and husbandry and improvement of the commercial network must be achieved.

(iv) A diversification or a changing of the crop pattern by substituting one crop for another is often extremely difficult, if not altogether impossible.

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\(1^1\) This phenomenon is not only typical of underdevelopment. If my memory is correct, Kendall has proposed such coefficients to field researchers in Britain.
(v) Local officials need from one to one and a half years to digest the conclusions of economic reports before they can undertake some of the suggested measures.

**Inter-regional integration:**

119. International integration of the developing countries is thought to be an economic necessity by French academic circles, but politically a remote possibility, at least for Africa now. Certain research papers, official reports, and ideas treat this subject more or less profoundly, but there are hardly any traces of practical measures already taken in this field. One hears of paradoxical, irrational steps toward integration, such as the match factory in Dakar, which by distributing the production stages between Upper Volta and Abidjan increased the cost of production high above the justifiable level. We must wait for more inspiring examples. Projects described in the majority of reports I consulted, bypassed the economic confines of one country and clearly indicated the need for markets and contractors in the neighboring countries.

120. **National disagreements.** Among the more ample factual documents on African integration are a series of reports prepared by the
1/ Institute of Social Studies in Grenoble. The number of countries considered as potential, i.e. members of a future integrated zone in West Africa has rapidly declined from 14 to 7, then to 4 (Senegal River), and recently to 2 (Mali and Senegal). The reasons for this striking drop were multiple. On the surface each country agreed to the necessity of multinational economic harmonization. But just under the surface the forces of national discordances could be observed. Even deeper were the economic roots of failure for integration.

1/ Directed by Professor Destanne de Bernis. These are:

- "1ère Conference de Niamey" (July 1962)


- 4ème Conference sur la Coordination Industrielle en Afrique de l'Ouest a Bamako, Annex: Sidérurgie et Première Etape de Transformation (October 1964) and, finally

- Propositions Concernant la Coopération pour le Développement Economique, Rapport Redigé à la Demande des Chefs des Etats Riverains du Fleuve Sénégal (September 1966).
121. First, large projects in the fields of metallurgy, metal products or mechanical industries have been proposed in order to launch integration (see annexes listed in the footnote or previous page). No country wishes to forego an occasion to have these prestigious projects in its own territory.

Integration would be facilitated if someone stressed the impracticality of each country owning its own steel mill notwithstanding present and future demand since steel is a high cost, low labor-intensive industry requiring high technical skill. Prestigious projects are still frequently proposed for future integrated areas or separate countries—since a steel mill supposedly generates new industries and thus contributes to a rapid increase in economic activity. Usually little effort is made to justify the rationality of this, by analysing existing or projecting future market outlets for steel, machines or petrochemical products for the whole integrated territory. Even when such estimates are made, they are judged to be of secondary importance. All the possible combinations of energetic resources (e.g. natural gas from the Sahara) and mineral resources (iron ore from Niger) are sometimes considered viable, as they seem to fit the production-led integration model. Such a model presupposes that either all new productions will be absorbed by consumption, generated or created, or that the scale of such a major venture will be reduced by choosing from different production techniques (e.g., the direct reduction process which is becoming a pet conversation piece of development economists).
122. Integration of consumption. Secondly, integration inevitably applies to all branches of economic activity and relies primarily on its own market for intermediate and final products. Considerable research was conducted here by two consulting centers for West Africa. This research tried to determine the existing structure of final aggregate demand for the entire territory and to project it up until 1970. The statistical work was so time-consuming that no broad conclusions, based on the amount and pattern of future consumption, to indicate whether the new projects would be capable of supplying the whole area, were possible. So increased imports were assumed. This is more in line with the inherent logic of a statistical growth model. A classical consumption-led integration model thus evolved. There are few studies in which both future production and consumption were largely reconciled.

123. One was prepared for the Common Market by a large number of European institutes and consulting centers. Joint field research was conducted on:

(i) the West African countries (bound by the Yaoundé Agreement);
(ii) the Central African countries (grouped in the UDEAC); and
(iii) other countries: Congo Kinshasa, Rwanda, Burundi, Somalia and Madagascar.

1/ "Perspectives Economiques Globales pour treize pays de l'Ouest Africain; Tableaux des ressources et des emplois des années 1960 et 1970" in two volumes and eight annexes by SEDES and EDPA, group directed by B. Maldant, December 1964.

This distribution of the integration zones differed from those organized by the Economic Commission for Africa\(^1\) two years ago and a different approach was applied. While ECA research groups studied industrial branches, EEC economic missions studied about 250 industrial products to determine the profitability of their production and their sales outlets inside the territory. It was learned that profits were greatly diminished by very high transportation costs. This was liable to thwart the whole scheme of integration. Cabotage freights were found to be disproportionately high. African consumers showed a marked preference for imported products. Since import quotas do not generally exist in Africa and import protection is largely fiscal and not especially strong,\(^2\) import preference has every chance to subsist.\(^3\)

According to information received recently, these materials were finally put together and conclusions were drawn by the European Economic Community in October 1967. The result was an industrialization program for the next decade, proposing the construction of 109 industrial plants in the eighteen African countries associated with the EEC. The capital investment necessary to implement this program should amount to approximately 1350 million and would give employment to about 21,000 workers.

\(^1\) The Economic Commission for Africa issued a separate set of reports on industrialization in East Africa, West Africa and Central Africa.

\(^2\) 10% fiscal surcharge on products of prime necessity, about 40% on all others (French-speaking Africa).

\(^3\) For domestically-produced goods (inside an integrated zone) a fiscal imposition of 1/2-3/4 of the present fiscal charges on imported products would be retained. This is unlikely to change preferences for imported goods.
This program is meant to furnish the European Development Fund with a practical guide for future development assistance needs.

With few exceptions the plants included in the program are in the import substituting and intermediate goods industries. They include vegetable canneries, paper and pulp mills, tire factories, hurricane lamp plants and so forth.

The preamble to the program warns the African countries that no investment can be made without a joint effort and a pooling of resources. Economic cooperation among these countries and political willingness to enforce it are thresholds the African countries must pass if they wish to industrialize.

The industrial plants planned in the program are distributed rather unevenly over the whole territory. Cameroon, Senegal, the Ivory Coast and Congo-Kinshasa will most likely receive the lion's share of all the proposed plants if the principle of economic rationale is observed. Other countries removed from the coastal line and with a less-developed infrastructure would have to focus on industries utilizing local raw materials. More privileged countries, such as the four above-mentioned, may undertake a compensatory arrangement by withdrawing altogether from those branches of manufacture pursued by the interior countries.

Participants in the EEC field trips told me they found vegetable canning profitable, but fruit juice canning unprofitable. This shows both the depth and practicalities of this analysis. For instance one usually reads recommendations to develop "industry of consumption goods based on local raw materials" which includes both vegetable and fruit juice canneries.
Institutional measures. Finally, the third reason for the lack of integration is probably that institutional measures are almost non-existent. INFED has treated this problem by analyzing, first, the institutional framework of the UDEOA. Countries in this area seem to enjoy all the theoretical premises necessary for economic integration. They belong to the same monetary area, have a convertible currency, are associated with the European Economic Community, have preferential customs arrangements with EEC, and receive cultural and technical aid from France. To make these theoretical conditions practicable an incentive is needed to induce trade between the African bloc countries. Such an incentive might come from a change in the purchasing power of the population still relatively small and limited because of inadequate commercial network and the persisting high import prices. The final conclusions of a recent conference in Accra supported bilateral customs and compensatory agreements for main products. This might become effective after national infrastructures have been extended and preliminary investments made. However, an increase in trade among the thirteen participating countries should also precede these agreements as proof that there is a willingness to utilize the existing productive capacities internationally before new ones are created.

The UDECA is a preferential customs union for seven countries. It has a Council of Ministers, Committee of Experts and a General Secretariat.

1/ Union Douanière Ouest-Africaine.
2/ May-June 1967.
3/ Ivory Coast, Dahomey, Upper Volta, Mali, Mauritania, Niger and Senegal, according to the Paris convention of March 1966.
One wonders what would be the immediate possibility of creating an integrated West African area which would also include English-speaking countries. The existence of two separate groups as indicated in the IRFED study may greatly delay or even destroy success of the integration effort. On the other hand, cooperation between the two groups may be rendered extremely difficult by association agreements between the UDEOA and the EEC and imperial preferences of the Commonwealth countries. The IRFED study eliminates altogether the idea of implanting "development poles" in the integrated area, but advocates the possibility of activating trade. Decisions regarding taxation of the products produced within the area\(^1\) and improvement of transportation costs and infrastructure are necessary to do this. A less-obvious requirement is change in the banking system. The activity of the central banks in the area is inadequate for promoting the first necessary steps to integration. The search for a new equilibrium within the area and between the area and the industrialized countries of Europe may require new international monetary settlements and transfers beyond the capacity of whatever new forms a payments union may take. A new international monetary organization may be needed in the initial financing.

Problems to study. A considerable number of problems related to the integration of the West African countries deserve at least a theoretical treatment as they remain largely unexplored.

(i) Trade creation and trade deviation in West Africa might be studied for three successive periods, i.e., before association with the EEC, after association

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\(^1\) UDEOA foresees the preferential treatment of locally-produced products.
with the EEC and (as expected) during the first stages of international integration.

(ii) The possible effects of competition (between international firms and between national investors) inside West Africa might be evaluated.

(iii) Economies of scale should be considered. What will be the absorptive capacity of the new market for different products and how might this capacity shrink because of large distances and the costliness of transportation?

(iv) Who is to profit from the external economies generated by integration and how might they be spread more evenly?

(v) How is inflation to be stopped from accompanying the accelerated investment process in the area?

5. Transportation

127. Most of the transportation studies, conducted in developing countries, belonged to project analyses from which a more general method of approach was either impossible to derive or too well known to mention here. A few, nonetheless, deserve our attention:

128. Effects of investment in transport facilities. An important study synthesizes the long experience of Mr. Bourrieres, Director General of the BCEAO. It contains, along with a variety of analytical approaches, some interesting statistics, for instance, the quantification of the effects of road investment in countries belonging to former French West Africa.

While this investment amounted to about US$12 billion during 1948-1958, the cost of transportation fell (during 1950-57) from $7.3 to $3.3 per ton/kilometer. This saving in transportation costs is confirmed indirectly by the slower wear of motor vehicles. The growth rate for imports of automobiles, tires and spare parts was much below the growth rate for gasoline imports.

The whole investment went into 2,000 kms. of asphalt roads and 14,000 kms. of earth roads, as compared to the total of 80,000 kms. of roads.\(^1\) While this investment accounts for only 8% of the total network, it carries 60% of all transportation in West Africa, which explains the importance of the cost reduction.

129. **Return on road investment.** Another statistical verification of the cost efficiency of road investment was attempted in Cameroon. It was assumed that prices of products, supplied from one of the main cities (Douala) to the interior, grow at a linear function of the distance separating various consumption markets from Douala. It was found that the linear coefficient amounted to 0.078 in 1946-49 and 0.034 in 1957. Thus, while prices were 7.8% higher for each 100 kms. from Douala, they are now only 3.4% higher a decade later.

The savings in transportation costs multiplied by the volume of goods transported and related to the investment in roads in Africa gave the rates of return on these investments. They were calculated as 29 p.a. for the Ivory Coast and 10 p.a. for Madagascar.

\(^1\) Of which 16,000 receive usual conservation and maintenance works.
Another discussion of BCEO and other French economists concentrates on user charges. The results of this discussion are inconclusive. It is considered that, while users cannot bear, at least in the beginning of the development process, the entire charge of transport costs, subsidies which naturally arise, must not influence their preferences. Another query concerns the costs which should be used for fixing tariffs. The costs would almost never be known in advance, as it is difficult to forecast the future bulk of goods to be transported.

Depreciation. Also the specific attribution of joint expenditures (made jointly for various transport activities) such as the depreciation and maintenance costs of infrastructure, is not conceptually clear. French economists wonder whether users ought to carry the burden of some of the fixed investment. If not, another possibility would be simply to consider that some installations are not being subjected to physical wear.

Maurice Allais maintains,¹ for instance, that even in cases where no physical depreciation is possible one should charge at least technological depreciation, as obsolescence seems to be inevitable.

On the contrary, Alfred Sauvy² maintains that with the introduction of technical depreciation one may encourage an irrational distribution of traffic. In the presence of two railroad tracks, one very long and another much shorter but leading through a costly tunnel, the depreciation of tunnel costs may deflect traffic from the short to the long passage.

¹ M. Allais "Le problème de la coordination des transports et la théorie économique" Revue d'Economie Politique, mars-avril 1948.
Another solution proposed is to include into traffic-users charges a certain surcharge earmarked for modernization and proportionate to all other costs (thus the relation between specific tariffs would remain unchangeable).

Time savings. Given the importance of banking fees in Africa, savings in storage and transportation time can be translated into considerable gains. A calculation of the costs of exporting cotton from Chad was made a few years ago\(^1\) to show the importance of this factor. If a minimum banking fee (including insurance) of 3.25\% is assumed, a daily delay in storage or transportation of one ton of raw cotton would cost the exporter 46. The time period for transportation in Chad was reduced seven times from 1949/50 to 1954/55 and savings on banking fees alone amounted to 170 thousand annually. This saving alone would justify a 2 million investment in transportation.

Classification of cost. French transport economists have been tempted to classify transportation costs according to the exogeneous variables on which they depend. This may help in translating the effects of investment into changes of tonnage and distance and from there, to measure its repercussions on costs. Here is a tentative classification:

(i) Fixed costs, independent of transport:

a. depreciation and maintenance of protection dikes in ports

b. dredging of access channels

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\(1/\) Videau "Etude de desserte du Centre de l'Afrique" (date of publication not given).
c. navigation installations  
d. dams and sluices  

(ii) Costs proportionate to distance but independent of tonnage transported:  
a. depreciation of transportation network  
b. maintenance (conservation) of this network  

(iii) Costs proportionate to tonnage but independent of distance:  
a. depreciation and maintenance of port or airport installations  
b. packing materials  
c. insurance, losses, wreckage  
d. transit and handling costs  
e. commercial costs & fees  
f. stocking in warehouses etc.  
g. idling of vehicles  
h. landing costs  

(iv) Costs proportionate to tonnage per distance:  
a. costs of haulage and exploitation  
b. depreciation of material  
c. time-length of transportation  
d. cost of empty returns  

133. **Pricing.** French economists, and in particular French mathematicians have made some noteworthy developments in the theory of cost pricing and budget balancing as applied to transportation. According to the main line of reasoning when marginal costs are decreasing, as for instance in
railroading, marginal cost pricing inevitably leads to a deficit. Yet the condition of budget balancing has been advocated by Boiteux\(^1\) as implying an optimal disinvestment policy for the railroad industry. Here are the arguments:

**Marginal cost pricing.** Consider a particular railroad line, with existing facilities given, that is subject to competition from road carriers. For simplification, assume that the supply of road transportation services is perfectly elastic at price (\(p\))\(^2\) "equal to minimum long-run average cost for road carriers. Accordingly, (\(p\))" serves as an upper limit for the prices to be charged, and marginal costs to be incurred, by the railroad. Furthermore, let the demand for transportation services at price (\(p\)) generate a total revenue per unit of time in the amount (\(q\)) - the assumption being that revenue is constant over time.

If the transportation services demanded at price (\(p\)) can be supplied by the railroad at a full cost, including adequate charges on all its equipment (tracks, stations, rolling stock, ...), that does not exceed (\(q\)) per unit of time, then it will be economical to operate the railroad indefinitely. Road transportation will then come into use only when the railroad is saturated.\(^3\) If, on the other hand, the full cost to the railroad exceeds (\(q\)) per unit of time, but the variable cost (excluding replacement charges)

\(^1\) M. Boiteux "Reflexions sur la concurrence du rail et de la route, Paris, 1959.

\(^2\) (\(p\)) is typically a vector of prices for differentiated services (first and second class passenger transportation, a schedule of commodity rates, etc.); whenever price, or (\(p\)), is mentioned a vector interpretation is implicit.

\(^3\) Alternatively, road services may be introduced for different kind of traffic, excluded from the present analysis.
does not, then the line will ultimately have to be abandoned, and the traffic diverted to road carriers. In that case, some but not all replacements of railroad equipment are economical (e.g., the costs of replacing the rolling stock periodically can be absorbed, but not those of replacing the tracks). Two questions must then be answered. What replacements are economical? When should the line be abandoned? Clearly, these two questions must be answered simultaneously - and the answers will also depend on the pricing policy adopted by the railroad while in operation.

Again, (for simplification) assume that prices will be set at the level (p) immediately. This policy will typically maximize revenue for the railroad.\(^1\)

We may now compute, for each future date \(T\), the present value of the minimum cumulated total cost \(M_T\) of keeping the railroad in operation until \(T\) and not later. Thus consider first the value of the equipment in use at time 0, \(V_0\); this is an opportunity cost equal to the net savings that would accrue to the railroad from using some of that equipment elsewhere, plus the resale value on the market of the equipment for which the railroad would have no economical use elsewhere. Next consider the minimum costs of operation, at the traffic level corresponding to \(p\) during periods \(t = 1, \ldots, T\), say \(t (T)\)\(^2\); these costs include appropriate replacement charges for all those pieces of equipment that it will pay to replace knowing that the line is to be abandoned at \(T\).\(^2\) The dependence of the

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\(^1\) The demand curve for the railroad has a kink at \(p\) - in view of road competition.

\(^2\) Thus, the \(t\)-th period runs from time \(t-1\) until time \(t\).

\(^3\) And given their opportunity or market value at \(T\); such replacements may be regarded as "defensive investments".
replacement decisions upon the date of abandonment is, of course, the reason for expressing these costs as a function of $T$. Finally, let $V_T$ stand for the value of the equipment (old and new) at time $T$. Then:

$$M_T = V_0 - \frac{V_T}{(1 + i)^T} + \sum_{t=1}^{T} \frac{T}{(1 + i)^t}$$

where $i$ is the appropriate discount factor.$^{1/}$

This expression may be compared (for a given $T$) with the alternative cost, namely, the present value of the cumulated costs of an equal amount of road transportation services. Under our assumptions, that cost is also the revenue to the railroad, say $R_T$, if it charges the price ($p$) from now on. $R_T$ is thus defined as follows:

$$R_T = \sum_{t=1}^{T} \frac{p}{(1 + i)^t}$$

135. Specific types of transport. Considerable research, concluded in the field of transportation in recent years has resulted in a number of interesting approaches and analytical methods. It is next to impossible to list them all here. Brief descriptions of various studies have been assembled here in view of the Bank's current interest in these topics.

136. Public transport. The factors which supposedly influence an individual's choice between different modes of transport are: the cost of

$^{1/}$ The discount factor which should be used by the nationalized industries has been the subject of much thought and debate. See, e.g., the discussion by Allais and Boiteux, in CNRS, (La politique de l'énergie. Paris 1962), Proceedings of the Seminar of Professor Allais, 1959-60, and Pierre Nasse; Le Choix des investissements, Paris 1959, English translation, Optimal Investment Decisions, Englewood Cliffs, N.J. 1962.
the journey, the time lost, energy expended, safety, convenience, and comfort. In general, for any section of a trip when public and private transport are equally available, the balance of advantage is likely to be along the following lines: on the one hand, public transport rarely has an immediate cost advantage over private individual transport; on the other hand, it nearly always has a lower "time lost" factor (partly because it may be able to make use of higher speed, partly because time spent on a journey on public transport can often be put to other use) and usually has advantages in "energy expended", "safety", and potentially at least "comfort". The big disadvantage of public transport, however, is loss of convenience when the total trip is considered. For by definition public transport does not provide a service for every individual trip throughout the whole length of the trip; so, for the complete trip the individual has to make a private journey from his origin to the public network, and from the public network to his destination. These feeder-journeys may be expensive, depending partly on their length, especially if they involve the use of personalized public transport, they may involve considerable loss of time, depending on the frequency of the public transport service as well as its location; and they may introduce substantial inconvenience by the need to transfer from one form of transport to another, especially if awkward luggage is being carried. These are all disadvantages inherent in public transport; some are inevitable and constant and arise from the mere

1/ "Rentabilité d'un pont entre l'Ile de Ré et le Continent" (by René Loué of SEMA) and "Etude sur les Conditions d'application de la théorie économique au Choix des investissements dans les infrastructures de transports" prepared by SEMA for the European Economic Community (1967).
existence of feeder-journeys, others are variable depending upon the length of these journeys. Long-distance freight entails the same need for feeder-journeys to service trunk routes.

137. Many of the decision factors of passengers are subjective but much can be done to measure them and so to determine rational patterns of behavior and choice between different forms of transport in varying circumstances. With freight transport, however, most of the decision factors are directly measurable in terms of money - e.g. running costs, handling costs, breakages - though a few remain partly subjective, such as the value of reliability of service. In such circumstances the best choice is determinable for each particular set of conditions; for example, large truck loads give cheaper running costs than small loads, but the former may require additional handling costs at terminals; or again unit loads for shipping give rapid loading and discharge and high safety compared with loose stowing which however makes better use of the available cubic space. Where conflicts such as these arise, adequate research to determine the conditions in which one solution is better than another can pay big dividends in planning.

138. **Simulating of traffic movement.** The simulation method was used by engineers\(^1\) to determine whether an existing entrance lock to one of the port docks would be adequate if there was an increase in traffic. The lock was simulated on a computer.

The simulation involves the presentation of the scheduling procedure (the plan of operation for the next tide) and the actual physical operations, such as the movement of ships, barges, etc.

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\(^1\) Simulation of scheduling and movement of traffic through a ship entrance lock, Metra, No. 2, 1966.
The scheduling involves matching the draughts of ships against the depth of water available, while satisfying other constraints and priorities. The tide and its complex cycles-within-cycles were also simulated; the tide is the natural unit of time, and the depth of water is the principal factor in determining the movement of ships through the lock.

The physical operations simulated include arrival and departure rates varying with the day of the week, these rates being affected by the number of ships in dock (there is strong feedback in practice); the facility of passing two small ships through the lock at the same time; the separation of the actual operations into different stages; and the inclusion of tugs, barges and other service craft.

139. **The preferential equilibrium model.** The preferential equilibrium model is introduced in the more involved models of traffic and transportation which forecast the links between urban development and transport infrastructure. The active population is distributed over all possible routes between their homes and the location of their employment in the urban area. Usually an urban road network is designed, consistent with land use requirements and technical, economic and financial constraints. At present the model is rather sophisticated for use in a developing country, but some of its elements might be useful in designing public transport networks (highway or railway) in some of the developing countries.

6. **Miscellaneous**

**Agriculture**

140. The first group of studies on agriculture in developing countries which came to my attention are those by Profes. Rene Dumont and his

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1/ Scientific traffic models, by SEMA, 1966-67.
school. Professor Dumont visited over 60 developing countries and tried to synthesize his experience in numerous books and articles. Some of these have been translated into English. Since Dumont dealt mostly with the broad issues of each specific country, a review of his activity in the field of agriculture is a formidable, if not impossible, task.

Another group consists of agronomists and agricultural economists, pioneers in applying methods of linear programming to agriculture. Intellectual leaders of this group are dispersed throughout a number of institutions. Among others, they include Professor Joseph Klatzman from the National Institute of Agronomy, Dr. Mazurier from SEMA, Dr. Fahri from SEDES and Dr. Morin from the Department of Research of the French Ministry of Agriculture.

The application of sophisticated methods of linear programming to determine the best way of developing agriculture in developing countries is a difficult task. Certain characteristics of such a method may prove interesting, even though our main task today is probably that of convincing farmers in the developing countries to use more fertilizers in order to increase crop yields for which supply is inadequate and also to decrease progressively cultivation of crops which are excessive. This is simple truth. Tomorrow, however, we may have to start thinking in terms of multinational integrated areas, where agricultural specialization will surely pose a problem and where complex methods of linear programming will find a wider application.

Characteristics of an agricultural optimizing model. A number of models of agricultural production are discussed in France. We have
chosen for this survey one of the most important, OMTR, because it incorporates most of the characteristics of other models. It can be classified as non-probabilistic, static, optimizing and linear.

(i) Non-probabilistic, because the forecasting dates contained therein are considered as certain.

(ii) Static, because only the situations at points of departure and arrival enter the model. The passage through various stages before the terminal point of time is outside the preoccupations of the model builders.

(iii) Optimizing, because the model is not determined. It furnishes a great number of possible solutions. It allows choice in determining the most probable solution, depending on the expected behavior of farmers.

(iv) Linear, because coefficients attached to different production systems are accepted as invariable. A system of production is defined in the model as the combination of qualitative and quantitative production factors necessary to obtain a certain determined product mix.

Surfaces of arable land, upon which different production systems are to be implanted, are considered as principal variables of the model.

It differs here from other models, which attach acreage to crops and leave

1/ Opération Moyen Terme Rapide, (Medium Term Quick Operation, SEDES, July 1966.)
output to be constrained by different boundaries of the program. These boundaries are implicitly accepted in a "system". Obviously, one limitation of such an approach is that the number of systems of production is relatively small and so prevents an exhaustive study of all possible choices.

142. Solution of the model. The model is solved for three criteria:
   (i) the gross value added
   (ii) the net income from agricultural operations
   (iii) the terminal gain

This general approach has been translated into three operational models:
   (i) "Cand.ade" with prices of products not stabilized
   (ii) "Janus" with constant prices of products
   (iii) "Theleme" with constant prices of products and labor.

The solution of a linear program, based on these models yields simultaneously:
   (i) The systems of production, which if chosen by farmers, would meet the objectives of the market demand.
   (ii) The system of prices which, if set up, would induce the farmers to chose the above systems of production and would, at the same time, satisfy their own criteria (i.e. maximize their proper goals of personal gain).

We will spare the reader further details of the model, which contains over 2,000 variables.

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1/ For example technical constraints, such as salinity of soils, sociological constraints, such as reluctance to grow cattle in regions of abundant and profitable crops, and environmental constraints, such as a faulty distribution network.
Education

143. Education is a field to which French economists have devoted considerable efforts. These have been channeled mainly into two fields: the building of general models of education and the classification and stock-taking of education.

Building education models is an activity performed mainly if not exclusively by CEPRE. CEPRE's model provides a purely quantitative rationale for resource allocation to education as to one among other bidders for public funds. This, and also its complexity, may somehow limit application of this model in the developing countries where allocational priorities are very different and not always dictated by considerations liable to be used as equation variables.1/

Estimating of the "level" deemed otherwise "stock-taking" of education has been pioneered in France2/ by the IDEES.3/

144. "Stocks" of education. Stocks of education were later supplemented by so-called socio-economic indices, such as energy consumption per head,

1/ The English-speaking reader will find the essentials of these models in "Mathematical models in educational planning", Jean Bénard, OECD, 1967.

2/ Dépenses d'éducation dans les régions en voie de développement. - quelques aspects statistiques, 21 July 1965; Dépenses publiques d'éducation dans les pays du plan de Karachi, March 1965; Typologie des pays Africains, 1965, mimeo; Perspectives de développement de l'éducation en Amérique Latine 1960-1970; also the quarterly review of the IDEES "Tiers Monde" include results of the research activity in the field of education in almost each issue (see for instance April-June 1965).

number of vehicles, number of physicians, number of newspapers, which bear a more or less direct relation to the level of education and which allow a broader classification. Basic stocks of education show merely the proportion of a population, grouped according to age brackets, trained in primary, secondary and academic establishments.

The rest of IDES' exercise mostly entails statistical correlation, which aims to identify the general variables on which education may depend or, inversely, to what degree general variables, from GDP per capita downwards, may depend on education.

On the whole, one notices that while the correlation coefficient is high for some obvious relations, such as that between public expenditures on education and the GDP \( r = 0.921 \), relationship between the level of education and other economic variables is less clear.

Some of the results of IDES analyses are now being revised and expanded by the Direction of Scientific Affairs of the OECD.

Public services - pricing system

France has had considerable experience in pricing collective services.\(^1\) It may be useful to outline briefly the alternative methods.

\(^1\) For discussion in English see:
of pricing, since it may prove applicable to the developing countries and
is now the focus of Bank preoccupations. Consistent efforts, especially
among mathematical economists, were being made to define a new optimum
criterion. This would be a function not only of consumers' choices, but
also of public authorities' choices with regard to collective targets.
A distinction is made between indivisible (general) and divisible (indi-
vidual) collective services. General administration is an indivisible
collective service since it is impossible for an individual not to consume
its services. On the other hand, education is a divisible collective
service, but its external effects are indivisible (everyone benefits from
the effects of education where citizens are generally well educated but
not everyone receives direct education). On the contrary, public services
such as gas, water, etc. are perfectly divisible and they can be priced
according to rules of economics. Pricing of transportation services
represents a separate case and is treated on paras. 133-134.

146. Marginal pricing. In general, three basic pricing possibilities
are distinguished by French economists active in this field. The following
example of the tariff structure for the distribution of natural gas illus-
trates these.

(i) The first involves marginal cost tariffs for
industrial consumer and binomial\textsuperscript{1/} tariffs for
households and small trade.

a. The structure of household tariffs may be based
on a fixed price component to cover the individual

\textsuperscript{1/} A price composed of one fixed and one variable term.
installation costs and part of the installation costs of a semi-individual distribution network, and a proportional term to cover a. production costs of gas (or its supply costs from the entrance to the collective distribution network), b. the installation costs of the collective distribution network and c. the remaining part of the installation costs of a semi-individual network.

b. The structure of industrial tariffs may be based on:

1) a fixed plus proportional pricing, composed of a fixed price component to cover expenditures incurred by users of the particular service, and

2) a proportionate price component to cover subscribed consumption, varying according to the location of the user. This component will cover the individual installation costs (piping, etc.) and the individual distribution network. A likely average is calculated for consumption, unpredictable factors are ruled out. 1/ 

3) a price component proportionate to the quantities consumed and seasonally variable. During periods

1/ In cases where consumption varies or unpredictable factors influence consumption, the tariff may include two additional terms:

- one proportionate to the irregularity of consumption, and
- one proportionate to the coefficient of coincidence between these irregularities.
of low consumption this component merely covers the production costs, while during periods of peak consumption it should cover in addition, expenditures incurred to extend the collective network.

(ii) The second consists of marginal cost tariffs with surcharges (toll charge). In cases where consumption elasticities differ, a series of binomial tariffs for household consumer can be introduced. A specific tariff could be established for industrial and commercial users in sectors where elasticity coefficients have more specific values.

(iii) Under the third structure (ideal) all tariffs are established as a function of marginal cost.

Operations research

1/ The toll is calculated as the difference between the marginal production cost and the sales price. A toll is established according to the price elasticity of demand, but the shape of the function connecting these two variables depends on whether we intend to maximize the quantity of services or the gains from their sales.

systems involves creative solutions to which the present OR tool box is
of limited, if any, help. Another study, by Bernard Roy,\textsuperscript{1} tackles the
same problem but from a different angle. Roy devises a method of arriving
at a rational decision in the presence of different and often conflicting
points of view, such as those related to: production, marketing, research
and development, stability and the necessity to assimilate prior experience;
each represents the opinion of one equally important participant in the
decision process.

The last in a series of studies to demonstrate the necessity of
reformulating the operations research approach is that by Robert Fortet.\textsuperscript{2} Fortet considers the case of a group of possible solutions, each composed
of \(x\) elements. The group is limited by constraints. In the extreme case
one could envisage a situation where the area of choice is reduced to
nil, or, in other terms, the group is "empty" because of heavy constraints.
To choose a proper solution \((x)\) the decision-maker must free himself from
certain constraints. The task consists of attaching an order of importance
to the existing constraints and then considering them successively. A way
of relaxing constraints may be sought in what is called a "negociation
with the environment". This should broaden the classical field of oper-
ations research considerably.

146. **Application of operations research in developing countries.**

While a revision starts at the top, practical experiences from applications


\textsuperscript{2} Robert Fortet "Avant-propos", Série Spéciale No. 8 de METRA, Procédures
pour élaborer des tournées de distribution.
of operations research in the developing countries are still accumulating at the other end of the scale. One of these experiences in Chile in 1963-64 is worth mentioning here. OR methods were introduced in the Compañía de Acero del Pacífico in Huachipato by a British subsidiary of SEMA. They were applied, successively, to various parts of the iron and steel works, making possible an increase of production by more than one-fourth without any additional investment.

Statistical methods

149. Among many new statistical methods a number of new practical applications of mathematical statistics deserve to be briefly mentioned here. As these substantially exceed the current needs of the developing countries, it would be of no use to discuss them in more detail. However, it may be of interest to enumerate at least some of the new achievements considering all the possibilities which will be open to us when our new computer arrives.

(1) The system "Chromos", a probabilistic model which enables study of the seasonal variations of a statistical series and short and medium-term forecasts. It consists of such methods as:

a. the general adjustment of an auto-regressive model,
b. estimates of the parameters of a model with two uncertain variables,
c. the elimination of seasonal variations by using

1/ "Operational Research in Chile", Metra Vol. III No. 1.
a moving average,\(^1\) and
d. spectral analysis, which involves decomposing the
analyzed variable into many periodic and aleatory
components.

(ii) Scheduling systems, which represent the extended PERT
method, can be useful in the long-term planning of major
construction (dams, etc.).

(iii) The system "Electre" applies the theory of graphs in
order to make an economic choice possible. The points of
view or criteria which in most cases determine the proper
choice are multiple and divergent. The system allows for
successive elimination until a unique solution is obtained.

\(^1\) (a) and (b) offer a practical solution to theoretical problem intro-
duced by the French statisticians Malinvaud, Bachelet and Morlat,
while (c) provides a practical solution for problems posed by
Shishkin and Brown.
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<td>(1) Bureau de l'Étranger</td>
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<td>Robert Léon</td>
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<td>(1) Bureau des Économies Étrangères</td>
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### List of Research and Consulting Organizations Active in the Field of Development in France

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<td>(ii) Centre d'Études Afriques</td>
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<td>18. Institut des Hautes Études de l'Amérique Latine de l'Université de Paris</td>
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<td>Pierre Dehess</td>
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<td>Agricultural development</td>
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<td>19. Semaine Sociale de France</td>
<td>Paris</td>
<td>Alain Barret</td>
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<td>Institut de Science Economique Economique</td>
<td>Directeur des deux instituts</td>
<td>64</td>
<td>Économie</td>
<td></td>
<td>Économie, politique, gestion, économie et politique</td>
<td>11 Rue du Parc de France Paris 3e Tél. 334.2397fax</td>
<td>3 Rue Paul Poiré Paris 13</td>
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<tr>
<td>Name</td>
<td>Institution</td>
<td>Position</td>
<td>Research Focus</td>
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<td>FLATIERS Joseph</td>
<td>Institut National Agronomique de France</td>
<td>Professor</td>
<td>Agricultural development (choice of area or linear programs) Income from agriculture</td>
<td>15 rue Claude Bernard</td>
<td>Paris</td>
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<tr>
<td>GAGNE Pierre</td>
<td>Institut National Agronomique de France</td>
<td>Professor</td>
<td>Agricultural development (all aspects)</td>
<td>45 rue de la Gare</td>
<td>Lyon</td>
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<tr>
<td>LAMBERT Denis</td>
<td>Faculty of Law and Economics, Lyon</td>
<td>Professor</td>
<td>Inflation, monetary problems, inflation</td>
<td>2 rue du Fossé</td>
<td>Paris</td>
<td>France</td>
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<td>Inflation, Monetary Problems, Inflation</td>
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<tr>
<td>LAMARQUE Gilbert</td>
<td>Faculty of Law and Economics, Lyon</td>
<td>Professor</td>
<td>Economic development, growth, production, problems of national economy, and interventions between France and Europe</td>
<td>2 Place de la République</td>
<td>Lyon</td>
<td>France</td>
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<td>Economic Development, Growth, Production</td>
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<tr>
<td>LEBOUQ Daniel</td>
<td>Faculty of Law and Economics, Paris</td>
<td>Professor</td>
<td>Economic development, general problems</td>
<td>7 rue Albert Lebrun</td>
<td>Paris</td>
<td>France</td>
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<td>Economic Development, General Problems</td>
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<tr>
<td>MILAS Pierre</td>
<td>Institut d'Études Internationales et des Pays au Meilleur-être</td>
<td>Professor</td>
<td>Legal aspects of international trade, economic and social organization of the international community</td>
<td>21 rue Bayard</td>
<td>Paris</td>
<td>France</td>
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<tr>
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<td>MERCIER Louis</td>
<td>Société d'études pour le Développement Economique et Social (SEDES)</td>
<td>Director General</td>
<td>Algégis de mathématiques Anciens élèves de l'école Normale Supérieure</td>
<td>51</td>
<td>Economic development (models of growth, use of shadow price, sources of an optimum)</td>
<td>Various articles</td>
<td>67 rue de Lille</td>
<td>Paris 75</td>
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<tr>
<td>MERCIER André</td>
<td>SEED</td>
<td>Deputy Director General</td>
<td>Institut d'études des Études de Paris Ingénieur en Chef des Techni- ques Industriales</td>
<td>60</td>
<td>Economic development -industrialisation</td>
<td>Various articles</td>
<td>67 rue de Lille</td>
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<tr>
<td>BOYE Bernard</td>
<td>SNR</td>
<td>Scientific Director</td>
<td>Anciens élèves de l'école Normale Supérieure Ph.D. (Mathématiques)</td>
<td>35</td>
<td>Elaboration of mathematical methods applicable to economics (modelling, optimal path)</td>
<td>Various specialized articles on one of the theory of games etc.</td>
<td>51 Bld. Brune</td>
<td>Paris 16</td>
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<tr>
<td>BOHUNFIELD Peter</td>
<td>SNR</td>
<td>Vice-President of the Development Board Scientific Adviser</td>
<td>Anciens élèves de l'école Normale Supérieure Ph.D. (Mathématiques)</td>
<td>55</td>
<td>Project analysis, regional development</td>
<td>Various articles</td>
<td>15 Bld. Champs-Élysées</td>
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<td>BERNOIS Roger</td>
<td>Institut de l'École Polytechnique Appliquée (IÉPA)</td>
<td>Research Director</td>
<td>Anciens élèves de l'Institut de Statistique de l'Université de Paris</td>
<td>60</td>
<td>Economic development -analysis of projection infrastructure -influence of large firms</td>
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<td>15 Bld. Montsoult</td>
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<td>BENOIT Paris</td>
<td>Institut d'études et Développement Economique et Social (IDES)</td>
<td>Research Director</td>
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<td>65</td>
<td>Economic development -results of foreign assistance -consumption (electricity) -investment (productivity)</td>
<td>Various papers</td>
<td>67 rue de Lille</td>
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<tr>
<td>ANCIAZ Gilbert</td>
<td>SNES - Department of Rural and Social Studies</td>
<td>Research Director</td>
<td>Licence en droit Ingénieur de l'Institut National de l'Économie de la Province d'Outre-Mer</td>
<td>43</td>
<td>Economic development -agricultural development -labour and employment</td>
<td>Various papers</td>
<td>67 rue de Lille</td>
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<tr>
<td>LÉONARD Claude</td>
<td>CNRS - Direction et de Communication sur la Communauté</td>
<td>Director General</td>
<td>Ph.D. (Mathématiques) Université de Paris and Oxford (USA)</td>
<td>45</td>
<td>Consumption and merits</td>
<td>Various papers</td>
<td>65 Bld. de la Cour</td>
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<td>COCQUERES Michel</td>
<td>Centre National de Commerce Extérieur Groupe d'Études</td>
<td>Director</td>
<td>Statistiques Supérieure</td>
<td>30</td>
<td>Projections of foreign trade Survey of compatibility national accountancy -models of projection &amp; scope terms of exchanges internationally</td>
<td>Various papers</td>
<td>22 Ave. P. Roosevelt</td>
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<td>COSTE Robert</td>
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<td>Director</td>
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<td>35</td>
<td>Relations between foreign trade and economic factors</td>
<td>Economic development -integration of economic policies, social background and political targets into a meaningful whole</td>
<td>15 Rue de la Banque</td>
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<td>BÉGUIERES Michel</td>
<td>Direction des Affaires Scientifiques Direction de l'Immuno-</td>
<td>Chief</td>
<td>Anciens élèves de l'école Normale Supérieure</td>
<td>45</td>
<td>Economic development -relation between occupation regions in view of development</td>
<td>Economic development and economic variables -empoirering planning</td>
<td>3 Ave. André France</td>
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<td>BURG Paul</td>
<td>Institut de Recherche sur le Développement et l'Industrie (IPREM)</td>
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<td>DUFAY Raymond</td>
<td>CNRS</td>
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<td>Not available</td>
<td>50</td>
<td>Economic -demography -regional development</td>
<td>Various publications</td>
<td>47 rue de la Gaîtée</td>
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*Remarks:* Mostly theoretical with practical applications.
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<td>FUGET Valéry</td>
<td>Institut National de la Statistique et des Études Économiques (INSEE)</td>
<td>Chief</td>
<td>Not available</td>
<td>Statistical analysis of developing economies impact on political structure of consumption patterns</td>
<td>French-speaking</td>
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<td>MARTIN Jean-Marie</td>
<td>Institut Économique et Sociétal de l'Énergie de l'Intérieur de la France (IEO)</td>
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<td>Not available</td>
<td>Economic development - impact on energy sources due to industrialization</td>
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<td>Eral Bernard</td>
<td>Institut d'Etudes Sociales, Université de Granada</td>
<td>Chief of Research &amp; l'Institut d'Etudes Sociales, Université de Granada</td>
<td>Ph.D. (Economics)</td>
<td>Multinational industrial projects. Market analysis for products of the &quot;Gas d'Irak&quot; company.</td>
<td>1 rue Gas d'Irak, 14200 Granada - 32</td>
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<tr>
<td>Soto José (Ms.)</td>
<td>Institut Economique et Juridique de l'Energie, Université de Granada</td>
<td>Attache de Recherche au Centre National de la Recherche Scientifique</td>
<td>Ph.D. (Economics)</td>
<td>Oi industry and its role as a source of development</td>
<td>1 rue Oi d'Irak, 14200 Granada - 32</td>
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<td>Wells R. Helen</td>
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<td>Director Administratif et Planificateur de MINES</td>
<td>Regional d'objet Supérieure d'Économie Politique et de Sciences Economiques</td>
<td>Urbanization - economic development</td>
<td>67 rue de Lille, BP 74 59201 Lille</td>
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<td>Cliver Roland</td>
<td>Formerly Director MIN - Development et services privé Consultant</td>
<td>Équipe de Recherche au Centre pour le Développement</td>
<td>Ph.D. (Economics)</td>
<td>Economic planning - impacts of efforts of several stakeholders</td>
<td>42 rue Gras, BP 56 - 14200 Granada - 32</td>
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<tr>
<td>Boutetier Jean-Louis</td>
<td>Centre</td>
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<td>General Planning</td>
<td>Regional planning - efforts of establishment</td>
<td>24 rue Bourg, BP 56 - 14200 Granada - 32</td>
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