the OECD OBSERVER

THE ECONOMIC OUTLOOK – JUNE 1967 PRICE INFORMATION AGREEMENTS SCIENCE POLICY IN JAPAN REGIONAL DEVELOPMENT POLICIES IN UNITED KINGDOM INVESTING IN SURFACE TRANSPORT TO SPEED UP AIR TRAVEL SOME ASPECTS OF UNITED STATES ENERGY POLICY

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PRICE INFORMATION AGREEMENTS:

A First Exploratory Study

In view of the development of price information agreements between manufacturers in OECD Member countries and the insufficient knowledge about them, in particular about their effects on competition, the Committee of Experts on Restrictive Business Practices decided that a study should be undertaken in order to explore this relatively unknown field.

The study includes all types of information agreements, but deals primarily with price information agreements. Information was collected from the responsible authorities in OECD Member countries, the chief sources being Canada, Germany, the United Kingdom and the United States, which have had particular experience in the field of price information agreements. Since, however, the material, especially with regard to the analysis of the economic effects of price information agreements, proved to be scarce a survey of the available economic literature on this and on related topics was also carried out.

This article was written by Dr. Annelies Zisler, Secretary of the Committee of Experts on Restrictive Business Practices of the OECD.

Price information agreements which are also known as open price agreements or price reporting agreements can be defined as: agreements entered into between manufacturers belonging to the same economic sector under which they agree to inform each other regularly about past, current and sometimes future prices, and other relevant data, such as costs, discounts, rebates, whereby not only the sellers but also often the buyers are identified. Under the agreement the information is generally reported through a central agency, frequently a trade association. This obligation is very often enforced by strict control and by penalties for infringements which are laid down in the agreement.

Price information agreements are known in most Member countries. They are, however, a relatively recent development in these countries, with the exception of the United States and Canada.

It has been found that price information agreements have primarily been formed or have increased in number after the adoption of restrictive business practices legislation in a particular country. In the United States they have been known since 1911 and came into being in response to the Sherman Act of 1890. In European Member countries it appears that the number of price information agreements has increased since the mid-1950's when these countries enacted new restrictive business practices legislation or amended their existing legislation which, with the notable exception of Norway, did not specifically encompass price information agreements. Thus in those European Member countries where price agreements fell within the ambit of the new legislation, enterprises very often replaced price fixing agreements by price information agreements.

(Continued on page 4)

Effects of Price Information Agreements on Competition

Price information agreements and their effects on the economy have recently been the subject of keen controversy among economists in Germany and the United Kingdom. There seems, however, to be a large measure of agreement in modern economic theory about the effects of price information agreements on competition; but these have not yet been proved by empirical investigation. The following theory is developed in the study.

Price information agreements which aim at " perfect market transparency " (1) may serve as the means for co-ordinating the behaviour of the suppliers participating in a given market. A price information agreement seems *a priori* to have a special tendency to influence competition in an oligopoly, owing to the prevailing conditions in that market, because the greater the degree of recognised interdependence among suppliers and the awareness of these enterprises as to one another's marketing strategies, the greater the likelihood that price information agreements will lead to parallel or co-ordinated patterns of market behaviour. In addition, experience has shown that price information agreements have mainly been in existence in oligopolistic markets. In view of this and the growing importance of oligopolies in the present day economy, the analysis relates to the effects of price information agreements on oligopolistic markets.

In an oligopoly, mainly in a pure oligopoly, characterised by very closely interchangeable products, by a small number of sellers, by a strong individual awareness of competition and by close interdependence, perfect market transparency, which presupposes the identified reporting of all business transactions to all sellers, generally leads to collective behaviour, resulting in a consciously parallel policy with regard to prices, thus largely paralysing price competition. It follows, therefore, that a certain amount of imperfect market transparency is likely to be one of the most suitable elements for achieving a certain degree of effective competition in an oligopolistic market. Imperfect market transparency allows, at least temporarily, for the granting of concessions in the form of secret rebates or special terms for individual customers. These secret concessions offer an opportunity of breaking up, for a time, the rigidity of prices, discounts and terms of sale and thus revive competition. Even if such concessions are known to all competitors after a certain time, there will in any event be a time lag before all competitors know and react, which for some oligopolists will be of sufficient importance to make it worthwhile to undermine the existing price rigidity.

It follows that, since price information agreements aim at perfect transparency of the market, secret concessions are precluded and consequently the minimal amount of effective competition to be found on the oligopolistic market is eliminated. It has to be admitted, however, that secret competition is doubtless not the ideal economic solution, because discrimination cannot be avoided when granting secret concessions. Nonetheless, several economists have expressed the view that secret competition is the only means of achieving a minimum amount of effective competition on an oligopolistic market and they therefore advocate that secret competition should be allowed to exist in this particular situation.

Legal Attitudes of Member Countries Towards Price Information Agreements

The survey reveals that, with the exception of Norway, price information agreements are not specifically covered by the restrictive business practices legislation of OECD Member countries. However, in most Member countries where legislation on restrictive business practices is in force, price information agreements, provided that they correspond to the general criteria laid down in the statute, may fall within the ambit of the legislation.

At present, the United Kingdom is considering whether specific legislation should be introduced to deal with price information agreements. The previous United Kingdom Government had already announced its intention to introduce legislation on this subject. The Federal Cartel Office in Germany has been occupied for some years with the question of the applicability of Section 1 of the Act against Restraints of Competition to price information agreements and whether, and to what extent, price information agreements could be legalised as competition rules under Section 28 of the Act.

With the exception of Canada, the United States and the United Kingdom, the national authorities concerned have taken action against price information agreements only in very rare cases. In view of this situation, the study drew mainly on the practical experiences of these three countries where the respective enforcement agencies had instituted investigations in order to assess whether restraints of competition caused by price information agreements by themselves or those found in connection with wider restrictions fell within the provisions of the restrictive business practices legislation and have in some cases instituted legal proceedings.

In Canada, and, especially in the United States, where there is a sufficient body of case law, it has been demonstrated that price information agreements have in fact served as the means for co-ordinating the behaviour of the suppliers in a specific

(1) A market is perfectly transparent for the sellers if all sellers know exactly the prices asked and obtained by their competitors, the terms of sale, the quality of their competitors' products and the names of customers.

market and have thereby eliminated competition. On the basis of these undesirable economic effects certain price information agreements have been condemned by the courts.

• The dividing line in the United States

In the United States, the decisions of the Supreme Court in the 1920's in particular, demonstrated where the dividing line should be drawn between the legality and illegality of price information agreements under the Sherman Act. The following two cases have been held illegal by the Supreme Court:

The first case decided by the Supreme Court was American Column and Lumber Co. v. United States, 257 US 377 (1921). Through their trade association the defendants, producers of one third of the nation's hardwood timber, entered into an " Open Competition Plan ". Under the plan, daily reports of sales and shipments were to be made to the association, such reports, to be " exact " copies of all orders and invoices. Monthly production and stocks were to be reported and each member was required to keep up-to-date price lists on file with the secretary of the association. The secretary had to inform each member company weekly or monthly of all the data of other members. This " Plan " was held illegal by the Supreme Court. It found that the conduct of the hardwood manufacturers was not that of competitors but " clearly that of men united in an agreement express or implied to act together and pursue a common purpose under a common guide. " Finally the Supreme Court concluded that the fundamental purpose of the Plan was to promote " harmonious " action among competitors, as regards production and prices, without any specific agreement, and to rely for enforcement on business ethics and social penalties, reinforced by reports which would reveal any recalcitrant member. The facts of the second case — United States v. American Linseed Oil Co., 262 US 371 (1923) were not significantly different from the Lumber case. It seemed that the trade association had made a particularly strong effort to control its members and to bring dissidents into line.

The next two cases were held legal by the Supreme Court (Maple Flooring Manufacturers' Association v. United States, 268 US 563, 1925 and Cement Manufacturers' Protective Association v. United States, 268 US 588, 1925). The Court found that the exchange of information was not designed to provide an indirect method for controlling price or reducing competition, nor did it actually foster uniformity in practice. The Court finally held that there was no evidence of an agreement or concerted action.

From these and other adjudicated cases it can be inferred that a simple agreement to exchange normal business information has usually been treated by United States courts as an understandable and legitimate method of market research. If, however, an information agreement has been concerned with future prices, production or other business activity, undue secrecy with regard to the information collected or exchanged, excessive detail in the revelation of business data to competitors or emphasis upon uniformity in business practices, then the US courts have viewed such arrangements as circumstantial evidence establishing market collusion. Similar features have been pinpointed by the Canadian Restrictive Practices Commission to infer the existence of an information agreement in violation of the Combines Investigation Act.

• Information agreements in the United Kingdom

In the United Kingdom, two information agreements have been found contrary to the public interest by the Restrictive Practices Court. The first case concerned the motion alleging contempt of court by eight members of the Galvanized Tank Manufacturers' Association (Judgment given on 21st June, 1965). Following an adverse judgment by the Court in 1959 on a price-fixing agreement between the members of the Association, the manufacturers entered, after the termination of their price-fixing agreement, into a price notification agreement. They engaged in the practice of giving to each other, through the Association's Secretaries, advance information about the price changes they proposed to make. This resulted in a continuing identity of prices and identical notifications to customers of changes in prices and terms made at the same time. The Association admitted two breaches of their undertakings to the Court and fines totalling £102,000 were imposed. A similar case, decided on 17th June, 1966, involved a " rate notification scheme " operated by the Tyre Manufacturers' Conference Limited. As the in previous case, the manufacturers had operated an agreement which was declared contrary to the public interest by the Restrictive Practices Court in 1961 and, shortly thereafter, they had entered into the new scheme. The Court found that an " arrangement " existed which involved a registrable restriction, since it involved the acceptance of a restriction to the same effect as that which had existed in the condemned agreement. The Court imposed fines of £10,000 on each of the eight companies who were members of the Tyre Manufacturers' Conference Limited.

The study concludes that although practical evidence gathered from litigated cases is not sufficient to draw final conclusions, such evidence points to the same general conclusions as the theoretical analysis, namely that price information agreements facilitate concerted action in certain markets and thus suppress effective competition.

REGIONAL DEVELOPMENT POLICIES IN THE UNITED KINGDOM

In the economic policies of virtually all OECD Member countries, the concept of the region is becoming increasingly important. Although actual problems differ from one country to another, this emphasis on the region can be attributed to certain common threads of experience. Despite the prolonged prosperity of recent years, certain areas continue to have relatively high unemployment, low income levels, inadequate highways and other infrastructure and, in some areas, a social atmosphere of discouragement which tends to be self-reinforcing. On the other hand, there is growing concern about overcrowding in the principal cities and built-up industrial areas. Regional planning is being looked upon as a means of achieving a better balance between various parts of the country.

Because regional policies, being relatively new in most countries, are still in an experimental stage, and because of industry's key role in economic development, OECD's Industry Committee felt that it would be useful for officials concerned with this work to be able to study the techniques used and problems encountered by other countries in developing and applying a policy for the regions. It therefore set up a Working Party on Regional Development Policies which has studied the experience of France, Germany and the United Kingdom and is now preparing an examination of the Scandinavian countries. Under the auspices of this working party representatives of fifteen countries met recently in Manchester in the UK to view at first hand some of that country's planning efforts and to hold discussions with those responsible for various aspects of regional policy. A record of the exposés given and of the discussions which took place has recently been published.

The following article, which discusses the main aspects of United Kingdom policy, has been prepared in collaboration with Errol Ezra, Administrator in OECD's Industry Division.

As economic planning evolves in the United Kingdom, the intention is to work out the implications of national planning for the various regions of the country. This is considered necessary in order to allocate government funds in a rational way, to make the fullest possible use of all the country's resources and to solve certain problems that have developed at regional level. The main problem is the imbalance in industrial structure in different parts of the country. Growth industries have tended to concentrate in the southeast and midlands causing congestion and pressure on land and other resources in these areas while regions with declining industries suffer from the effects of a vicious circle : having out-dated and inadequate infrastructure, they are unable to attract modern manufacturing and service industries.

The Elements at Hand

The UK already has highly developed machinery and long experience with many of the elements that go to make up a regional policy. Land-use planning has been carried out ever since 1947 when the Town and Country Planning Act was passed. Under this legislation local authorities are required to develop plans for their area for five years ahead, against a horizon of some 20 years or more. These

plans must be submitted for approval to the Ministry of Housing and Local Government (formerly the Ministry of Town and Country Planning) and are subsequently used to guide decisions on such matters as what can or cannot be built, how the area should be zoned and where the green belts should be located. The entire country is covered by such plans.

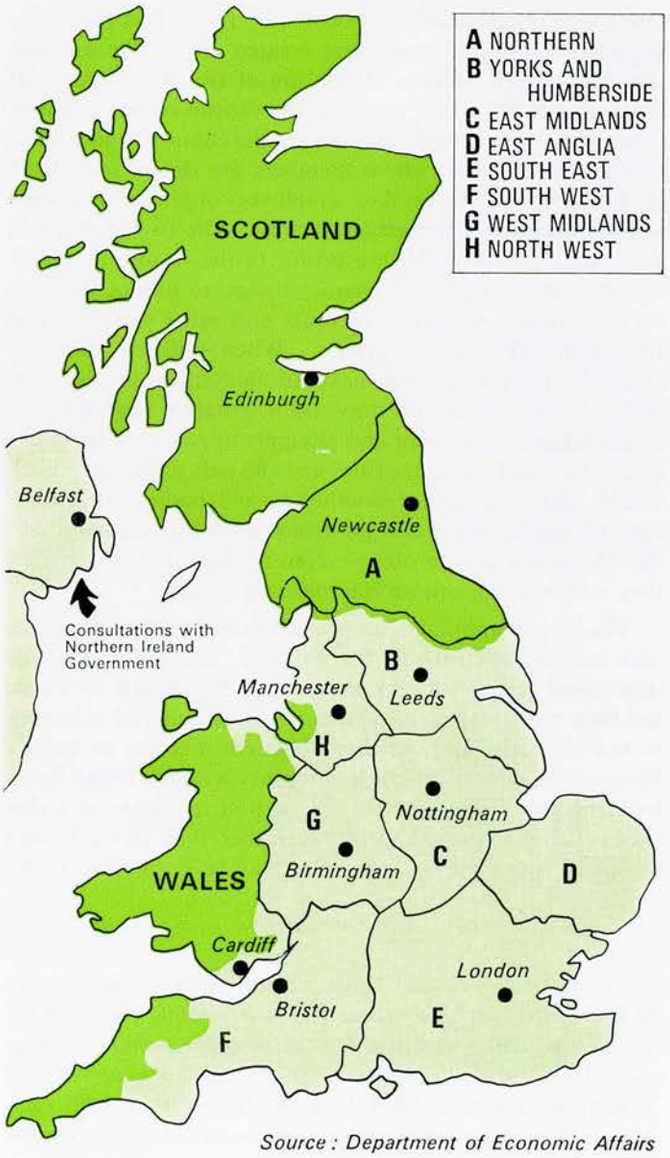
The UK also has a wealth of experience in the building of New Towns which combine physical and economic planning in that they provide not only homes but jobs, schools, shops and social and cultural facilities. The 22 towns whose planning and construction have been undertaken since the authorising legislation of 1946 have attracted the attention of town planners from all over the world.

(continued on page 8).

Planning Regions and Development Areas

New Towns in the United Kingdom

England has been divided into 8 regions for the purpose of planning, with Scotland, Wales and Northern Ireland constituting the remaining three. Areas slated for particular development efforts cut across these regional boundaries in some cases. The New Towns so far built are shown on the second map.



Source : Department of Economic Affairs

Part of Harlow New Town, Essex, near London

Finally there is a well established mechanism, administered by the Board of Trade, for guiding the distribution of industry. First put into effect in 1934 and periodically revised since then, the Board of Trade Programme provides what has been called " a carrot and a stick ". Incentives in the form of grants, loans, tax exemptions and the building of " advance factories " (1) are given to industrialists willing to set up operations in areas considered suitable for development, while enterprises wishing to build in areas considered as overcrowded or unsuitable are prevented from doing so by a system of industrial development certificates. These certificates are required for the building of any factory in excess of 3,000 square feet (300 square metres). If the proposed site is in an overcrowded area, the certificate is likely to be refused unless the builder can prove overriding necessity.

Formulating Regional Planning Policy

Integrating these programmes and others into a coherent regional planning system presents a number of problems. To begin with, there is no governmental machinery at regional level in the United Kindgom and hence no tradition of regional incentive or authority, not to mention the lack of statistics and other information. A Royal Commission is presently studying the structure of local government, and organisational changes may follow, but at the present time the power and the funds are vested in the local authorities on the one hand and the national government on the other.

Thus regional planning requires the co-operation of a multitude of separate planning authorities (in the North West Region alone there are 24 local authorities which serve as planning bodies and 130 others which have responsibility for various public services.) The local government authorities, moreover, depend directly on a variety of central government Ministries — Transport, Housing, Education and Health — for provision of services in their communities, and there has been no co-ordinating mechanism at regional level.

The approach taken by the Government in trying to fashion its regional policy is twofold. In the first place new regional organisms have been created to fill the vacuum that had existed before. These are of two sorts : regional planning boards, which represent the various central Government Ministries providing services to the country; and regional planning councils whose members are drawn from local government, employer and employee organisations, universities and other important groups. The two bodies will work together to establish a profile of the region, its physical, economic and social characteristics, to obtain statistics on employment structure, incomes and other variables and to forecast likely future trends. When sufficient data are available, the groups will make an analysis, point out possible problem areas and draw up a tentative regional plan which takes into account and attempts to reconcile the plans of the various local authorities and the national plan. Both boards and councils are strictly advisory bodies, the authority still resting with local government on the one hand and the Ministries on the other. Nevertheless it is hoped that they will develop into an intermediary force.

The second approach has been to reorient existing policies and mechanisms. Thus, for example, the programme of investment incentives administered by the Board of Trade has been reoriented so that an industrialist, instead of having to move to specific high-unemployment districts to qualify for special aid, may choose any locality within a broad development area. This should permit him to locate in a district which has growth potential rather than being bound to one in which the infrastructure may be outmoded or the

(1) Industrial Estates Management Corporations, financed and controlled by the Board of Trade, build factories for rent or sale either in advance or to meet the requirements of a particular firm. Between 1960 and 1965 an average of 70 factories covering 2.2 million square feet were built each year. This form of aid, virtually unknown outside the United Kingdom, has been in use since 1934.

INVESTMENT INCENTIVES IN THE UK
The Development Areas Compared with the Country as a Whole

		GRANTS	TAXATION ALLOWANCES	
			Investment	Initial
DEVELOPMENT AREAS	Plant and machinery Qualifying for investment grants	40%(1)		
	Not qualifying (includes secondhand)			30%
	New buildings and structures Industrial	25%(2) or 35%(3)		15%
	Non-industrial	25%(2) or 35%(3)		
NATIONAL	Plant and machinery Qualifying for investment grants	20%(1)		
	Not qualifying (includes secondhand)			30%
	New industrial buildings and structures			15%

Source : Investment Incentives, HMSO, London, January 1966.
(1) These rates have been increased to 45 % and 25 %, respectively, on a temporary basis for qualifying expenditure incurred in 1967 and 1968. (2) These grants are conditional on adequate provision of employment. (3) The 35 % rate of building grant, which is also conditional on employment being provided, will be given to certain new undertakings where the *Board of Trade* considers that the problems involved justify additional assistance.

terrain unsuitable. Five broad areas have been selected (see map) which together cover more than half the country's land surface but only 20 per cent of its employment.

Similarly the incentives themselves have been reoriented so that, instead of being exclusively tied to the creation of new jobs in the area, they are now available for modernisation and rationalisation as well. (A special allowance is given for the installation of computers.) The table shows the current level of incentives in development areas and in the rest of the country.

At the same time the programme of New Town building is changing in character. It has been found that the original 60,000 population contemplated for the New Towns is too small to support varied employment opportunities, a first-class shopping district or the social and cultural activities which make a regional centre of an urban settlement. Thus the newest projected New Towns, like Milton Keynes in Buckinghamshire, are in reality new cities with a planned population of at least a quarter of a million.

Most of the New Towns built to date are around London (see map) and are intended to take up its " overspill ". More recently towns have been constructed in other areas of the country as well. Skelmersdale in Lancashire, for example, falls within what has been designated as a development area.

The new regional emphasis will also influence the form of overall economic policy measures. One problem created by the imbalance in regional structure is that when measures have been taken to reduce inflationary pressures on a national scale, they have tended to be magnified in the less prosperous regions where more unemployment has been created than in the rest of the country. There are indications that macro-economic policy measures may make greater allowance for regional differences in future.

Thus in July 1966 when measures were taken to reduce home demand and to free resources for export, the building of office space was subjected to the same controls as had previously been applied to industry (and to offices in London and Birmingham), but the development areas were excluded from the new constraints.

As the practical framework for regional planning takes shape, a body of information is being developed that has not existed before, and considerable attention is being devoted to further research. The Government has recently granted funds to the independent National Institute of Economic and Social Research to help set up a regional research unit, and a new Urban Centre for Environmental Studies has been established to stimulate inter-disciplinary research, 60 per cent financed by the Government, the rest by the Ford Foundation. (Similar centres will, it is hoped, be set up in other countries so that ideas and experiences can be exchanged.) Universities within the regions are also being encouraged to look into the problems of their own areas and of regional planning in general.

It is too early to evaluate the results of regional planning policy in the UK. Both the organisational forms and the measures used are in an initial stage and are being applied in a spirit of experimentation, but is it hoped that the new emphasis on regions will contribute to the refinement of thinking on economic, social and physical planning.

NEUTRONICS AND PHYSICS

An Example of Scientific Co-operation

by Henri B. Smets
Head of the ENEA Research Office

From its inception, one of the objectives of the OECD European Nuclear Energy Agency has been to devise flexible machinery to further international co-operation in a number of particular fields of nuclear research.

The aim of this co-operation has been firstly to co-ordinate research programmes in Member countries, and also to promote the speedier exchange of highly specialised information through the medium of international scientific committees. Two such committees in particular, the European-American Nuclear Data Committee and the European-American Committee on Reactor Physics, have enabled extremely close contacts to be maintained between specialists in Europe, North America and Japan who are jointly engaged in furthering our basic knowledge.

It is only 25 years since the first nuclear chain reaction was initiated by Fermi and his team in the United States. This demonstration that heat could be created by splitting the atom paved the way towards a new technology which may be expected to lead gradually to the replacement of conventional furnaces at electric power stations by nuclear-fission reactors. This technological achievement, for which a Franch patent was taken out in 1939 by Joliot, Halban and Kowarski, has since led to a very considerable expansion of research in physics.

Though it took hundreds of years of study to ascertain the nature of burning, the distribution of temperatures in boilers, and the properties of materials in contact with hot gases, only a few years have been needed to determine the nature of fission, the distribution of neutrons in reactors, and the properties of materials immersed in a "gas" composed of neutrons. This achievement has been due to a massive effort in which the more advanced countries set up large national centres for nuclear research, backed by very large budgets compared with those in other research fields.

Although these nuclear centres have sometimes worked on industrial technologies, usually they have been concerned with the fundamental and applied sciences. In the first case, economic competition and technological secrecy often impeded the unrestricted exchange of information, but in the second, international co-operation was not only possible but of paramount importance, in order to avoid costly duplication and to attain as rapidly as possible the knowledge necessary for building competitive nuclear power stations.

THE SCIENTIFIC COMMITTEES

The promotion of this form of international co-operation has been one of the objectives of the European Nuclear Energy Agency since its foundation, and the Agency has arranged many meetings of scientists from the main nuclear laboratories of the OECD countries (generally heads of departments) in charge of research programmes in certain fields. In 1959 this led to the creation by the ENEA Steering Committee of the European-American Nuclear Data Committee (EANDC), and in 1962 the European-American Committee on Reactor Physics (EACRP) was likewise set up. Both these Committees were given a certain autonomy within the framework of their Statutes.

These committees, consisting of about 15 European, American and Japanese specialists, meet every eight or twelve months to discuss problems arising in their fields. They have set up temporary groups to examine certain special problems and have organised ad hoc meetings of experts, seminars and international conferences for a closer analysis of various scientific questions of major concern to their members.

NUCLEAR DATA

The most important nuclear data are the "cross-sections" for interactions between neutrons and nuclei, that is to say the probability that a neutron of given energy will be absorbed by a material it attempts to pass through,

or the number of neutrons liberated when uranium undergoes fission.

The OECD countries have more than 100 laboratories measuring these data, which are essential for reactor calculations. Since these researches deal with nearly 200 isotopes for which several properties must be measured (from 1 to 10 cross-sections) involving neutron energies varying by as much as a billion times, it is hardly surprising that the number of measurements should total well over 5 million, quite apart from the fact that certain measurements are repeated in different laboratories to check their accuracy, while others are periodically rechecked with increasingly refined instruments. The final step in this gigantic task consists in recording figures in tables or — even better — on the magnetic tapes of computers. As the cost of each separate measurement is considerable, while its economic value is relatively small, it is logical that all results should be pooled since, taken together, they represent a considerable economic contribution.

The European-American Nuclear Data Committee has so far held ten meetings, at which is has examined and compared the best methods of measurement, has promptly disseminated (often before publication) results of the most important measurements, and has critically reviewed existing measurements to determine whether individual results are acceptable or whether they need further verification.

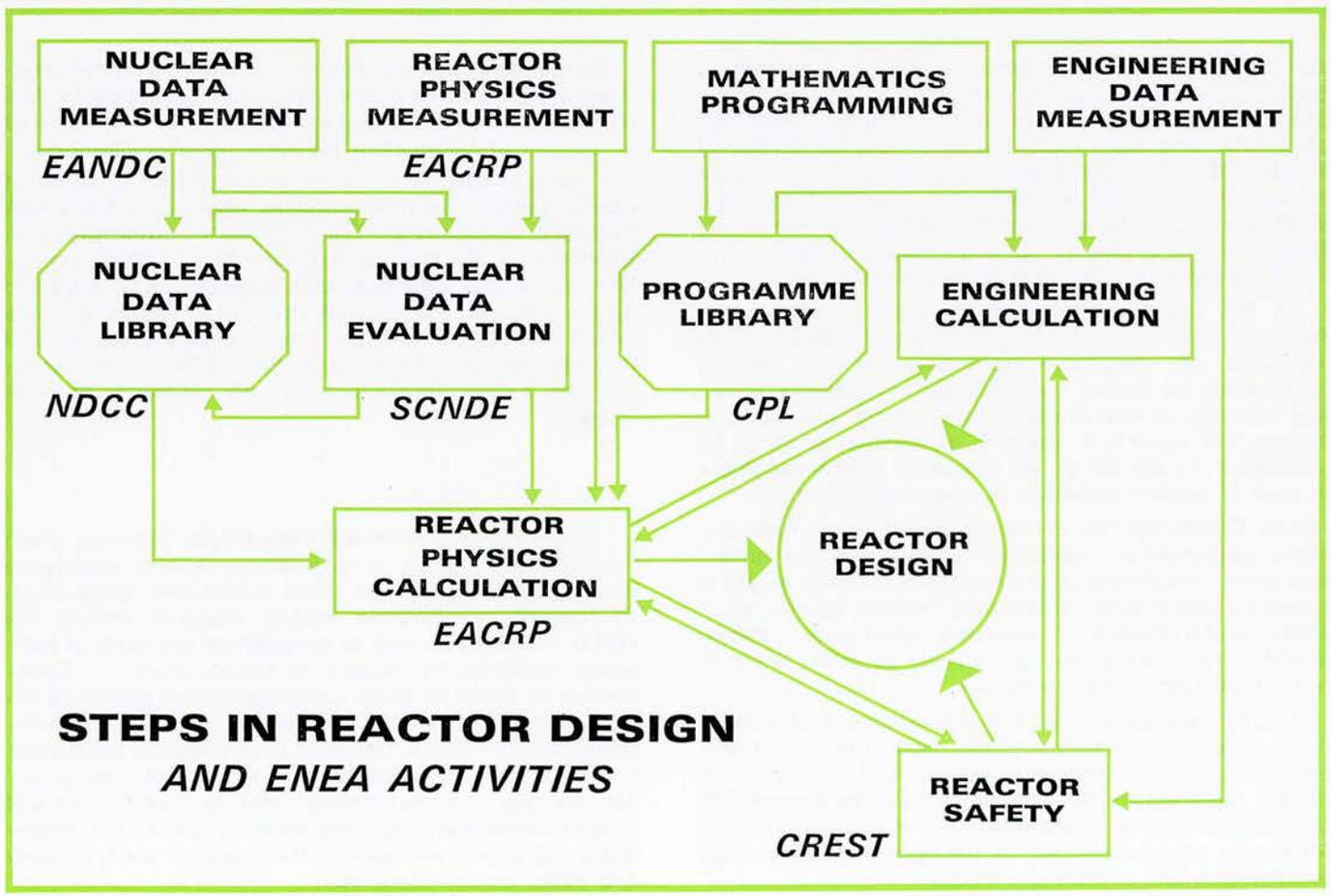
In view of the number of measurements to be carried out EANDC draws up lists of the nuclear data most urgently needed, to which it assigns an order of priority in the light of current programmes for the construction of nuclear power stations. Laboratories in the OECD countries are then encouraged to base their research programmes on these lists of requirements, and in fact a large number of outstanding requests have been satisfied by recent measurements. The lists of requirements should of course gradually decrease, despite the constant demands for greater precision and additional data to enable further improvements in power-plant designs. Such improvements may well be relatively slight, but in view of the scale of nuclear investment they can represent a considerable outlay. For this reason EANDC is careful to examine any new method, and any improved instrument, which could provide greater accuracy of measurement.

The problem of supplying the pure materials (both chemically and isotopically) necessary for many measurements has been solved with the help of a number of producer countries, which have undertaken to provide other countries with such costly materials on very reasonable terms provided they are used for measurements of general benefit.

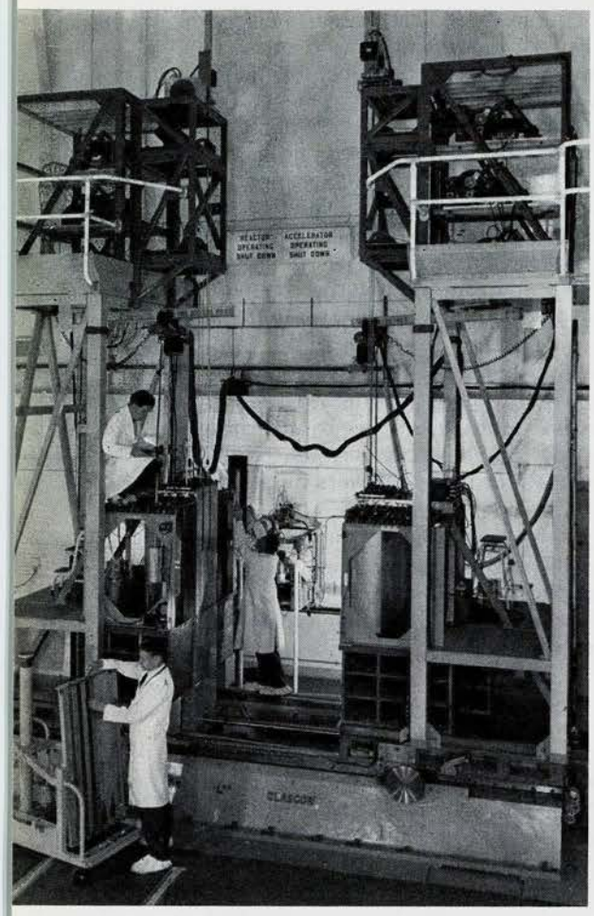
EANDC also discusses various problems of co-ordinating the work of nuclear specialists in OECD countries. In 1964 the Committee initiated the establishment of the Neutron Data Compilation Centre at Saclay, France, where the results of measurements made throughout the world are stored.

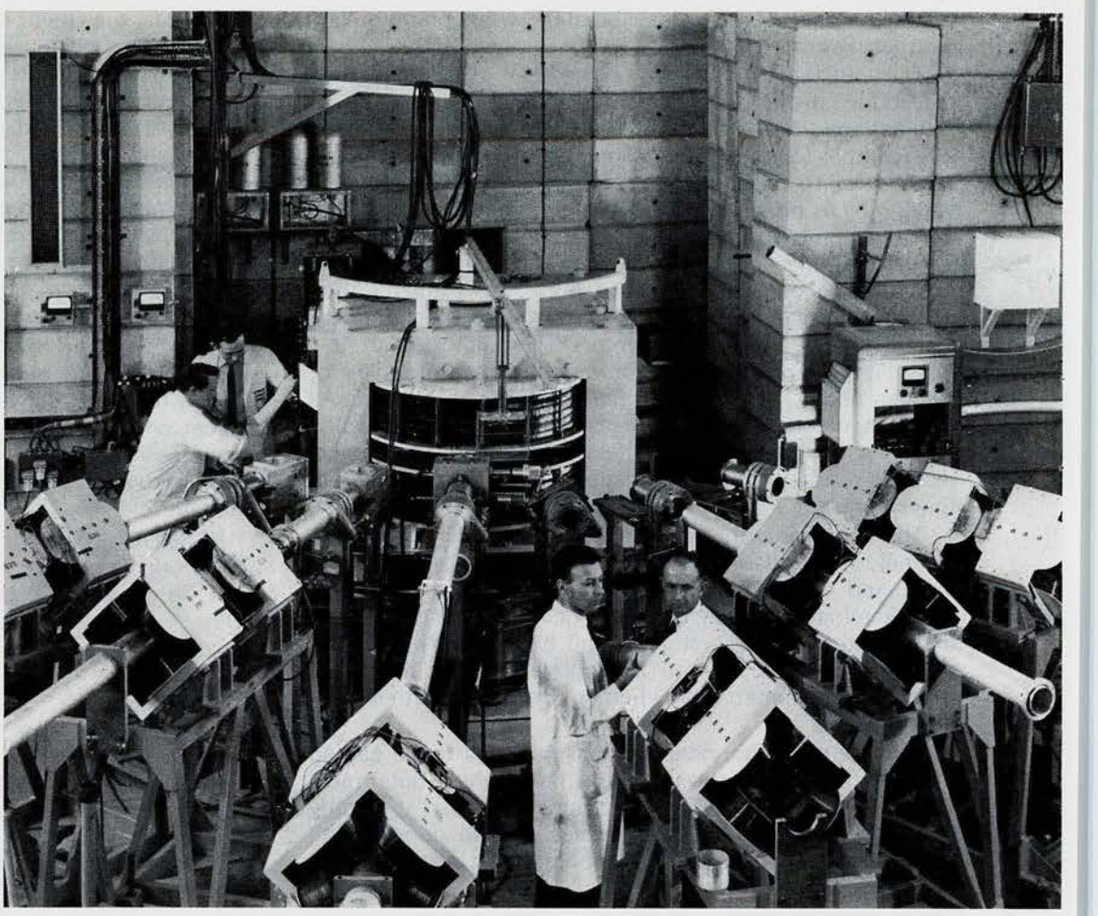
REACTOR PHYSICS

Reactor physics is essentially the study of the distribution of neutrons in reactors in terms of time and speed (or energy) of the neutrons. If neutrons had only one speed, the problem would be similar to the study of the distribu-



(Left) : VERA critical assembly (United Kingdom) for the study of fast reactor cores. The technicians insert the nuclear fuel elements in the two halves of the core which will be placed together during normal operation. (Right) : 50 MeV proton linear accelerator (Rutherford Laboratory, United Kingdom). The proton beam is deflected in the magnet (at the centre) and is directed in the tubes (being assembled) at the end of which the physics experiments will be located.





tion of temperature or electricity in the environment. However, reaction speeds in a reactor may vary up to one billion times, and methods of calculation based on physically acceptable approximations must be developed which will enable the engineers responsible for reactor calculations to obtain a satisfactory degree of precision at the cost of only a moderate increase in complexity (from two to fifty times). In many respects, reactor physics is far more complex than physics in other fields.

At the eight meetings so far held the European-American Committee on Reactor Physics (EACRP) has examined and compared techniques for the neutron calculations for several types of reactor (graphite, water, and sodium), as well as particular problems such as forecasting the maximum quantity of uranium likely to be consumed in a nuclear power station, or reactor behaviour in case of sudden variations in operating conditions.

The Committee has compared experimental measurements carried out on critical assemblies and is now undertaking the compilation of all measurements made in OECD countries (heavy water lattice data, neutron spectra, etc.). Methods of mathematical description used in caulculation models have been examined, as well as errors likely to result from certain approximations.

EACRP has considered the outstanding problems of reactor physics and discussed the need to construct new critical facilities to verify the properties of reactor cores. All the members of the Committee have co-operated in the preparation of a report describing the subjects calling for reactor physics research in the light of technological requirements and present knowledge.

By regularly circulating reports on work currently undertaken in the countries concerned, and collecting up-to-date documentation on selected subjects, EACRP has fostered exchanges of information between Member countries.

Finally EACRP is ready to attack, from the angle of reactor physics, certain problems affecting other ENEA Scientific Committees. For example it co-operates with EANDC in evaluating nuclear data, studies physics problems connected with computer programmes, is informed of the relevant activities of the ENEA Library at Ispra where all reactor computer programmes are stored, and co-ordinates its activities with the ENEA Committee on Reactor Safety Technology on all problems of joint interest.

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The European-American Committees between them now have the benefit of some dozen years of experience and, since their creation, have undeniably done much to forward co-operative nuclear research among the OECD countries as well as co-ordinate the work of individual countries in neutron or reactor physics. Sponsorship by ENEA of these Committeees has promoted the exchange among OECD countries of scientific and technological information designed to develop the production and utilisation of nuclear energy for peaceful purposes. The success achieved through this form of flexible and direct co-operation has more recently led to the organisation of similar activities in the fields of reactor safety and direct energy conversion.

THE ROLE OF FERTILISER IN SOLVING THE WORLD FOOD PROBLEM

The supply of food in the less-developed countries falls roughly 25 per cent short of what seems, in the light of current medical knowledge, to be the physiological requirement[1]. *Closing this gap, and providing for increases in population, not to mention progress beyond mere physiological needs, will require a vast rise in agricultural production in the less-developed countries as well as continued food imports. Since one of the keys to providing the food will be the availability of fertilisers, OECD's Development Assistance Committee asked the Research Division of the Development Centre to study the present and future role of fertilisers in agricultural development. The report will be published shortly. Meanwhile a special ad hoc group of the DAC has been established to pursue the subject further and to examine its implications for development aid policy.*

(1) FAO short-term nutritional target.

By 1980 something of the order of $ 5 billion a year will be needed by the developing countries in foreign exchange for fertilisers alone to prevent the food gap from widening. This figure, which is based on several very specific assumptions (1), represents around half of the total financial resources currently flowing from OECD Member countries and multilateral agencies to the less-developed world. It could amount to 8 to 10 per cent of the export earnings of the developing countries, even if the latter continued to grow, as they have in recent years, at a rate of 5 per cent a year. Thus the problem of providing fertilisers for development is one that will assume major dimensions in the next decade.

The basic explanation for the growing need for fertilisers is the fact that, during the last twenty years, growth of agricultural output in the less-developed countries has been obtained largely by increasing the amount of land under cultivation. But in future, the possibilities for raising output in this way will be increasingly limited; hence growth in output will depend more heavily on raising the yields of existing farmlands. Experience of the developed countries has shown that fertiliser is the single most important factor in raising yields, though by no means the only one. And at present the use of fertiliser is at a relatively low level in the developed world.

(1) *The main hypotheses are : that 35 million tons of fertiliser nutrients will be required to achieve the agricultural production targets and that the present mix between the different types of fertilisers — nitrogen, phosphate and potash — will shift in favour of the latter two forms which are less expensive.*

Distribution and Credit

Obtaining the necessary foreign exchange is only one of the problems involved in encouraging the use of fertiliser in less-developed countries. Another is popularising its use. In this sense fertiliser has certain advantages over other types of agricultural inputs, for unlike pesticides, for example, or irrigation, it can be applied by one farmer even when his neighbours resist, and results are quickly visible, thus easily appreciated. However, farmers must be taught how to use fertiliser and must have access to other factors of production which make the fertiliser as effective as possible. This in turn requires better cultivating practices, water availability, marketing arrangements, better seeds, etc.; in Pakistan, for example, the local varieties of wheat were unable to absorb much chemical fertilisers without " lodging ", that is falling over. Hence the recent introduction of Mexican varieties which do not have this disadvantage and yet are suitable for the prevailing soil and water conditions.

Research work in the less-developed countries, however, is in short supply. In India the ratio of research workers to farm workers was 1.2 to 100,000

in 1960 as compared with 60 in Japan and more than 130 in the Netherlands. For some of the less-developed countries, there is little research available from any source on the best cultivation practices.

Distribution problems must also be resolved : turnover of a fertiliser sales outlet is ordinarily far smaller in the less-developed countries than elsewhere both because of the lower rate of application and the smaller size of agricultural holdings. Present marketing margins — or at least those that can be estimated — range all the way from 19 per cent for urea in India, where prices are controlled, to 164 per cent for sulphate of ammonia in Colombia. And the problem is to find a rate that will both encourage effort on the part of the distributor and still not constitute a barrier for the farmers. It is perhaps noteworthy that the Indian government is now raising the margins and even in some cases freeing them from governmental control. Credit facilities with which to buy the fertiliser also need to be developed.

Action by Governments

Governments have numerous ways of trying to encourage the use of fertilisers. Direct subsidies for the purchase of fertilisers (or indirect subsidies in the form of credit assistance or transport rebates) are common in the less-developed countries. And in many cases prices of the finished agricultural product are supported as well. It is difficult to generalise about the cost-return ratio for the farmer that may be necessary to promote fertiliser use or to correlate success with particular measures. In Taiwan, for example, and Japan where yields have shown impressive increases due to the use of purchased inputs like fertilisers, agricultural producer prices are subsidised. But in Ceylon where the paddy grower receives fertilisers at a subsidised rate (half or one third the normal price, depending on whether he pays in cash or credit) and where the guaranteed price for paddy is almost twice the consumer price, yield increases have not been as rapid as one might expect. The size of the incentive needed would seem to depend on a number of factors, such as climatic conditions, the risk of crop failure and tenancy arrangements.

Local Production of Fertilisers or Imports ?

Available information leaves little doubt but that it will be more advantageous economically for the developing countries to import either fertiliser plants or the fertiliser itself than to import the food they need to close the food gap, at least in the long run. But as between the first two possibilities, general conclusions are less clear-cut because the relative advantages depend on so many different factors, and what the pattern will be is difficult to predict. To give an example of the kind of factors that play a role, the least expensive source of nitrogenous fertiliser is natural gas which is transformed into ammonia and then into finished products. Natural gas is plentiful in many less-developed countries, but ammonia plants are highly capital-intensive and therefore must be very large to take advantage of economies of scale. Markets in many less-developed countries might be too small to justify the implantation of an ammonia plant, but processing of imported ammonia into fertilisers, being less capital-intensive, may become practicable.

FOREIGN EXCHANGE REQUIREMENTS FOR WHEAT IMPORTS, FERTILISER IMPORTS AND LOCAL PRODUCTION OF FERTILISERS UNDER INDIAN CONDITIONS ($ million)

Alternatives	After years :									After 18 years	
	1	2	3	4	5	6	7	13 (1)	18 (2)	Difference over line 1	Difference over line 2
Wheat imports	69.60	139.20	208.80	278.40	348.00	417.60	487.29	904.80	1,252.80	—	+760.84
Fertiliser imports	76.52	136.76	180.71	201.46	222.21	242.96	263.71	388.21	491.96	- 760.84	—
Local fertiliser production	81.82	148.26	198.41	216.14	230.86	242.56	253.09	316.27	368.92	- 883.88	- 123.04

(1) Thirteen years was chosen because construction time was assumed to be 3 years and the following ten should produce the depreciation of the plant with prevailing depreciation procedures.

(2) Eighteen years was chosen on the assumption that the economic life of the plant is at least 15 years after coming on stream.

The Development Centre study shows how the relative advantages of importing wheat, importing fertiliser and importing the capital equipment necessary for domestic fertiliser production might be weighed in a given case. India was chosen as an illustration because it is now a substantial wheat importer with an acute food problem, but it has substantial fertiliser potential and accessible data.

First it was estimated, on the basis of Indian experience, that 100,000 tons of nutrients, (50,000 tons of P_2O_5 in the form of triple superphosphate, 50,000 tons of N, half in the form of urea and half ammonium nitrate) could produce 870,000 tons of wheat if it were applied half on irrigated, half on unirrigated land. It was further assumed that it would take three years to achieve this level of application ; that a fertiliser plant would take three years to build and three more to come up to a production level of 80 per cent of rated capacity ; that ownership would be 50 per cent Indian, 50 per cent foreign ; that profit after taxes would be 10 per cent of invested capital once capacity was attained and that transfer of profits would begin in the 7th year. The results, summarised in the table above show that the import of fertilisers presents a considerable saving of foreign exchange over the import of wheat after a relatively short period. The savings in foreign exchange requirements it produces in the second year of operation exceed the initial increase in requirements. Over a number of years the average annual saving leaves ample room for the finance of extension and fertiliser distribution services.

Compared to this solution, procuring the fertiliser locally gives considerably less return. Although some savings are obtained as soon as the plant starts producing in the fourth year, on a cumulative basis, local production breaks even with fertiliser imports only in the sixth year. Total returns are also smaller for a larger initial increase in foreign exchange requirements. It would, therefore, seem that where the urgency of the food problem is great and capital scarce, priority should be attached to importing fertiliser rather than producing it locally. Indirect effects from local fertiliser production being fairly small, the picture would not change substantially if these were taken into account.

SHARE OF DEVELOPING COUNTRIES IN WORLD PRODUCTION AND CONSUMPTION OF CHEMICAL FERTILISERS

(in thousand metric tons of nutrients)

PRODUCTION

Year	World total				less developed countries as % of world production			
	N	P	K	NPK	N	P	K	NPK
1955-56	7,330	8,110	7,180	22,620	5.7	6.8	4.0	5.5
1956-57	7,970	8,355	7,705	24,030	5.9	7.0	4.1	5.7
1957-58	8,735	8,625	7,740	25,100	5.9	7.2	4.5	6.1
1958-59	9,525	9,130	8,255	26,910	4.7	8.1	4.0	6.0
1959-60	9,955	9,750	8,710	28,415	5.6	8.2	3.8	6.0
1960-61	10,930	10,115	8,800	29,845	6.5	8.1	4.2	6.4
1961-62	11,950	10,415	9,385	31,750	8.0	8.4	3.9	6.9
1962-63	13,215	11,120	9,870	34,205	9.4	9.0	3.7	7.6
1963-64	14,845	12,440	10,600	37,885	10.2	8.8	3.6	7.9
1964-65	17,320	13,990	12,380	43,600	10.7	8.8	4.8	8.5
1965-66	19,500	15,100	13,500	48.100	10.5	9.5	5.3	8.8

CONSUMPTION

Year	World total				less developed countries as % of total consumption			
	N	P	K	NPK	N	P	K	NPK
1955-56	6,795	7,980	6,780	21,555	17.6	9.1	5.2	10.6
1956-57	7,285	8,280	7,170	22,735	19.0	10.0	5.9	11.6
1957-58	7,870	8,530	7,420	23,820	19.1	11.0	6.3	12.2
1958-59	8,775	9,050	7,915	25,740	18.5	11.2	6.3	12.2
1959-60	9,150	9,630	8,225	27,005	19.5	10.6	6.9	12.5
1960-61	10,270	9,970	8,500	28,740	20.6	11.2	7.6	13.5
1961-62	11,030	10,440	8,670	30,140	21.4	12.1	7.3	14.1
1962-63	12,470	11,130	9,280	32,880	20.9	13.0	7.7	14.5
1963-64	14,000	12,260	10,060	36,320	20.2	13.1	8.7	14.6
1964-65	15,480	13,310	11,140	39,930	20.5	13.1	8.6	14.7
1965-66	17,650	14,550	12,100	44,300	19.5	13.3	10.0	14.8

N. B. Discrepancies in totals due to rounding.

Another consideration is that partly due to the localised occurence of certain essential raw materials, only a small number of countries are in a good position to become important fertiliser producers. This applies mostly to potash and phosphates and it is reflected in the present pattern of production in the less-developed world. For example, Spain is the only potash producer in less-developed Europe, Peru and Chile the only Latin American suppliers, and Israel the only source of potash in Asia; Africa produces no potash as yet. Phosphate fertiliser production is also highly concentrated, European production being centred in Spain and Yugoslavia, more than half of African production coming from Tunisia and more than two thirds of the Latin American output coming from Brazil and Peru. At the present time such export surpluses as these main producers in the less developed world have, are shipped almost exclusively to the developed countries. However it is likely that this will change in the future.

Fertilisers and Aid

Between 1964 and 1965 some $ 800 million of assistance was directed to agriculture annually by OECD countries and the major multilateral agencies. Just how much of this goes for the import of fertilisers or the installation of fertiliser plants is not clear. Available breakdowns for the last few years show an average annual aid flow of about $ 60 - $ 80 million for construction of fertiliser plants and $ 65 million for fertiliser imports, but the latter figure may be significantly higher already, since the US alone in fiscal 1966 provided $ 100 million and plans to expand this sum to about $ 300 million in fiscal 1967.

What emerges from the study, notes Friedrich Kahnert, Head of the Research Division of OECD's Development Centre, who was responsible for its direction, is that " urgent attention is needed both from the developed countries and the developing world to promote and finance higher fertiliser consumption in the developing world as the most promising approach to raising food output. One necessary line of action in the less-developed world is to adjust government policies so as to give sufficient incentive to the farmers to grow more food by using more fertiliser and other purchased inputs. The other line of action is that aid donors will have to see whether in their present aid programmes there is not a need for readjusting priorities and giving more attention to agricultural development than in the past. Given the considerable amounts involved for fertiliser alone, this may well raise questions as to the adequacy of the total volume of aid. "

Investing in surface transport to speed up air travel

The time lost by passengers travelling between city centres and the airports which serve them has been steadily increasing over recent years in many European countries and in some cases the problem is a serious one. It cuts down the time-saving advantage of travel by air.

The Consultative Assembly of the Council of Europe suggested that the European Conference of Ministers of Transport (ECMT) comprising 18 European countries, 17 of them Members of OECD, should look into the matter. An ECMT Group of Experts was charged to study the question in collaboration with the European Civil Aviation Conference (ECAC).

After consulting the International Air Transport Association (IATA) and the Institute of Transport Aviation (ITA), the Group has now announced its conclusions. Its study, which sums up the problem at international level for the authorities concerned, will shortly appear under the title " Transport between Airports and City Centres ".

The rapid growth of air traffic in the industrialised countries poses a difficult problem for local and government authorities as regards transport between airports and city centres. It cannot be dissociated from the city and suburban traffic problem, and only adds to its difficulties. That is why the Urban Transport Group of the ECMT was chosen to carry out the study suggested by the Council of Europe with a view to seeking appropriate ways of improving transport facilities between airports and large city centres.

Basing their conclusions on the data collected, the experts point out that surface transport facilities are not entirely to blame if passengers do not benefit fully from time-saving advantages of air travel. Part of the time spent before take-off and after touch-down is in practice taken up by the formalities and procedures of airports and airline authorities who are, however, doing their best to improve the situation.

CLASSIFICATION OF AIRPORTS

To obtain precise information about conditions at the principal European international airports, the Group of Experts collected detailed data on 55 airports in 15 countries (1), and on the basis of these classified international airports according to :

- distance from the related city;
- maximum *and* minimum journey times;
- speed of journeys.

The aim was to discover whether, under each of these heads, certain ranges could be established within which a significant majority of instances fell with a view to establishing broad norms in current conditions; instances falling outside the normal range were regarded as atypical and requiring special consideration to see what factors made them exceptional in one way or another.

The assumption underlying this approach is that the normal ranges represent satisfactory conditions and that only instances which fall below them are, prima facie, open to criticism. To abandon this assumption would involve individual scrutiny of every one of the 55 airports and, possibly, the attempt to establish as a standard of comparison some arbitrary norms for surface transport between airports and city centres that would be of doubtful practical value.

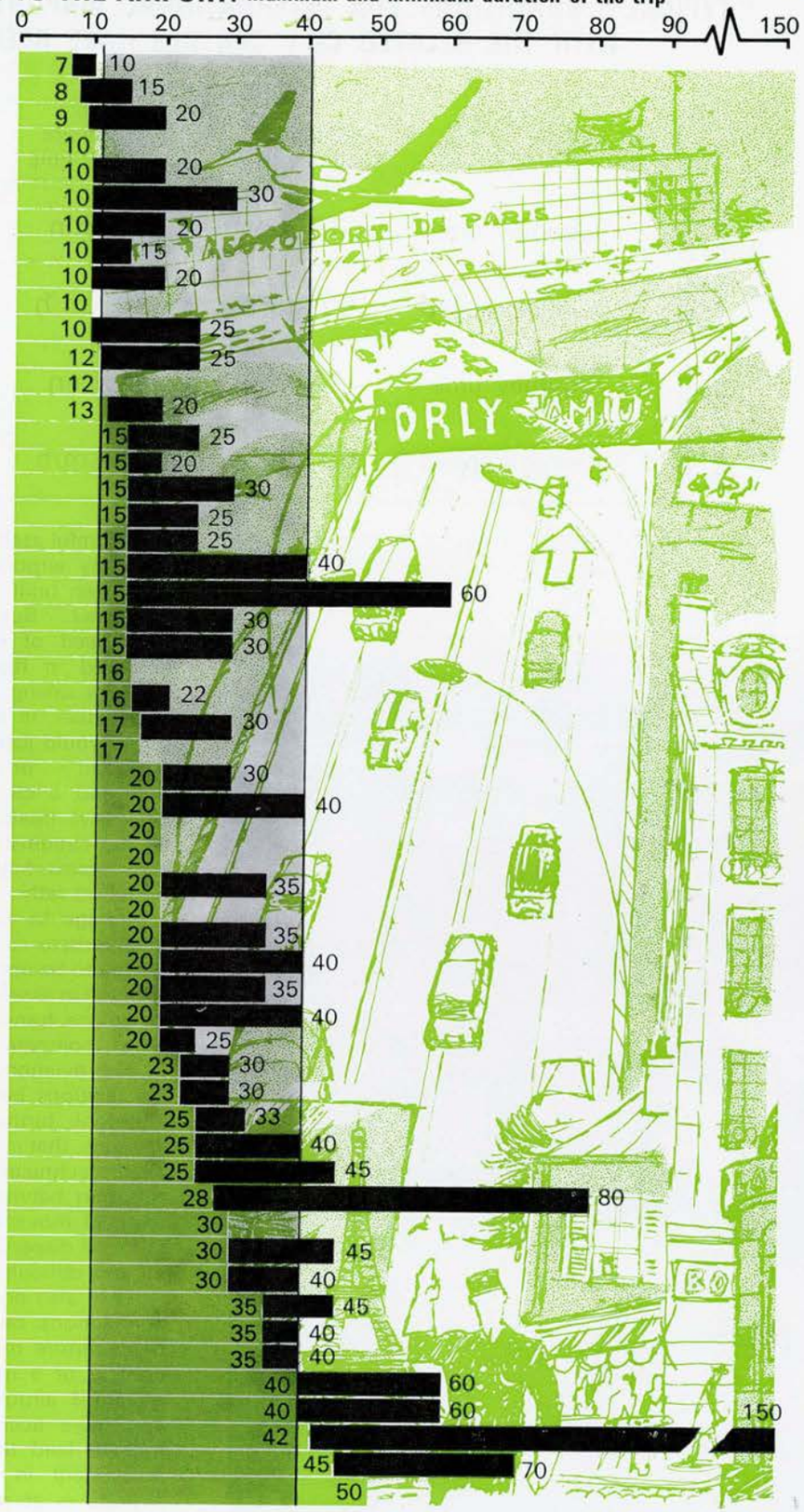
Airports which were stated to have satisfactory links by road with the related city centres were examined separately from those where road communications were stated to be inadequate. Comparisons provided " norms " of distance (minimum 6 km, maximum 20 km), maximum and minimum journey times and minimum and maximum average speeds of journeys. Two series of data were established : first, for a journey in the least favourable conditions and secondly, for a journey in the most favourable conditions (see table).

INVESTMENT STUDIES

The experts are alive to the need for improvements to be economically worthwhile. They point out that the progress made in the service speed of aircraft has obliged airlines and airport authorities to make large investments

(1) *Austria, Belgium, Denmark, France, Germany, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom. Turkey stated that conditions were satisfactory and were likely to remain so for the foreseeable future.*

FROM THE CITY CENTRE TO THE AIRPORT. Maximum and minimum duration of the trip



Minimum journey time (in mins.)

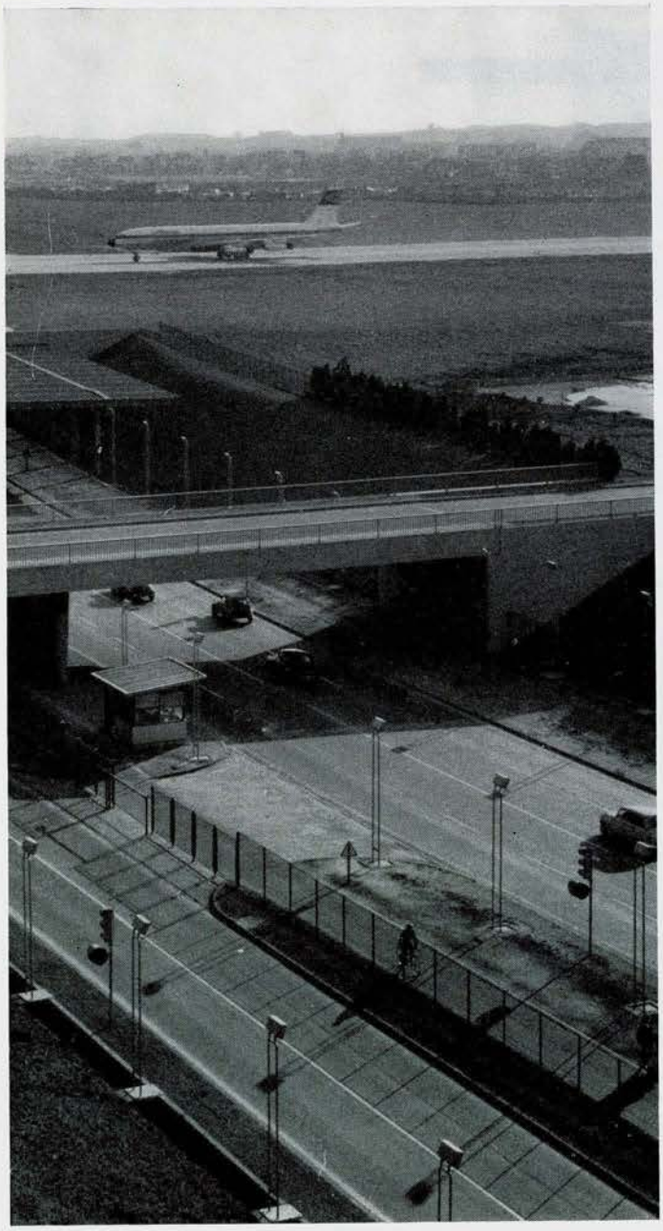
Maximum journey time (in mins.)

Norm for minimum journey time (12 mins.) | *Norm for maximum journey time (40 mins.)*

(1) Since a new stretch of the motorway E3 came into service in December 1966 the times given here have been considerably reduced (minimum 20 mins., maximum 45 mins.).

"TYPICAL" CONDITIONS FOR INTERNATIONAL AIRPORTS WHOSE CONNECTIONS WITH THE RELATED CITY CENTRES HAVE BEEN CONSIDERED

		ADEQUATE		INADEQUATE	
		Minimum journey time	Maximum journey time	Minimum journey time	Maximum journey time
Least favourable conditions	Journey time	15 mn	40 mn	21 mn	60 mn
	Average speed	60 km/h	10 km/h	40 km/h	10 km/h
Most favourable conditions	Journey time	12 mn	40 mn	11 mn	40 mn
	Average speed	60 km/h	20 km/h	58 km/h	20 km/h



after careful assessment of the benefits expected to accrue. At many airports, surface transport infrastructures have also been built — or considerably improved — again at high cost. But a proportional increase in the commercial speed of surface transport, comparable with that achieved in flight, would perhaps produce, in typical cases, a saving of 15 to 20 minutes.

Whether, in a particular case, an improvement of that order would justify the construction of a new high capacity road — or a special railway link — between an airport and a city centre must depend upon an equally close investigation of cost and benefit, taking into account all the circumstances of the case.

It seems highly probable that such justification will be found rather in cases where the new works will bring advantage to traffic as a whole in the area concerned than where air passengers alone will benefit. The criteria to be applied should be the same as those normally adopted in assessing the prospective benefits of investment in surface transport and the relative priorities of projects which compete for limited funds.

The aviation organisations take a very broad view of the relations between air transport and surface transport and look further into the future. They point out, for instance, that in transport generally, and not in air transport alone, technical and organisational progress has improved transport between two distant points; but that ancillary, terminal movements, collection and delivery, concentration and dispersal, tend to become increasingly complicated and difficult.

They also point out that the provision of better surface connections between airports and the points of origin or departure of passengers need to be examined in the context of a much fuller study of the whole economic effect of airports upon the regions they serve. Fuller and more accurate information on that subject might, indeed, lead to modifications of the criteria by which investment in surface transport infrastructures serving airports is at present assessed. ITA are now engaged in a study on the economic value of airports and the results, expected in 1967, will be very useful in the work carried out by ECMT in this field on behalf of those responsible at national level.

Improving surface transport to and from a city's airports requires careful weighing of the costs against the benefits.

THE ECONOMIC OUTLOOK

JUNE 1967

The present article assesses current economic prospects in the OECD area on the basis of information available up to 14th June 1967. A more detailed assessment will be found in the OECD Economic Outlook, a new OECD publication. The views expressed, and the estimates and forecasts shown, are those of the Economics and Statistics Department of the OECD. Similar articles appeared in the August and December 1965 and April, August and December 1966 issues of the OECD Observer. Technical notes on the statistics and methods of forecasting will be found in the OECD Economic Outlook.

✷

Economic growth has slowed down, or been halted in the three largest industrialised countries, with repercussions on growth in many other countries and on world trade. This reflects primarily action taken earlier to curb excessive demand pressures ; with the achievement of better cost and price trends, the emphasis has shifted towards more expansionary policies.

Recent events in the Middle East seem unlikely to have much impact on demand and output in the OECD area, but could have repercussions on the trade and balance of payments of individual countries.

If policies prove successful — particularly in the United States and Germany — there are reasonably good prospects for the resumption of a more normal rate of growth by the end of the year. But, for the first time for nearly a decade, there has been a simultaneous weakening of demand in several important countries, and if this were to persist into the second half of the year, significant cumulative effects could begin to make themselves felt. In view of this, governments in countries with a basically strong balance of payments should, where necessary, stand ready to take further expansionary measures even if, in the short run, this may risk some temporary deterioration in the external account.

DEMAND, OUTPUT, COSTS AND PRICES

In the second half of 1966 the growth of domestic demand in the OECD area slowed down to an annual rate of about 3 per cent. In Europe this slowdown was sharper than appeared last autumn when the last of these articles was written, mainly because of the downturn in Germany and its marked repercussions on activity in some of the smaller countries such as Belgium, the Netherlands and Austria. The decline of domestic demand in the United Kingdom was roughly in line with immediate policy objectives and expectations. The growth of domestic demand continued in France, and accelerated quite noticeably in Italy and Japan. In North America the pace of the expansion also eased off but — up to the end of the year — less markedly than in Europe.

A further slowdown is taking place in the first half of 1967. The absolute fall in domestic demand in Germany may turn out to be even greater than in the second half of last year. In the United States an inventory adjustment produced a slight fall in output in the first quarter. Since last autumn domestic demand has also shown a weaker trend in France. On the other hand, a modest recovery may be taking place in the United Kingdom, and expansion remains rapid in Japan and Italy. The total growth of demand and output in the OECD area may be of the order of 2 per cent in the first half of 1967. This will be the third successive half-year that output has been decelerating from the abnormally high rate of 6 percent experienced in the second half of 1965 (see Table 1).

This general picture of the trends in demand and output is confirmed by figures for industrial production and imports during recent months. Industrial production in the area as a whole flattened out in the summer of last year, and declined in the first quarter of 1967. And total OECD imports (including intra-trade), which had continued to increase rapidly in value until September-October 1966, has since shown an almost flat trend allowing for seasonal variation.

The following paragraphs summarise recent developments and prospects in the main OECD countries, setting these in

1. CHANGES IN REAL GROSS DOMESTIC PRODUCT AND DOMESTIC DEMAND ESTIMATES AND FORECASTS

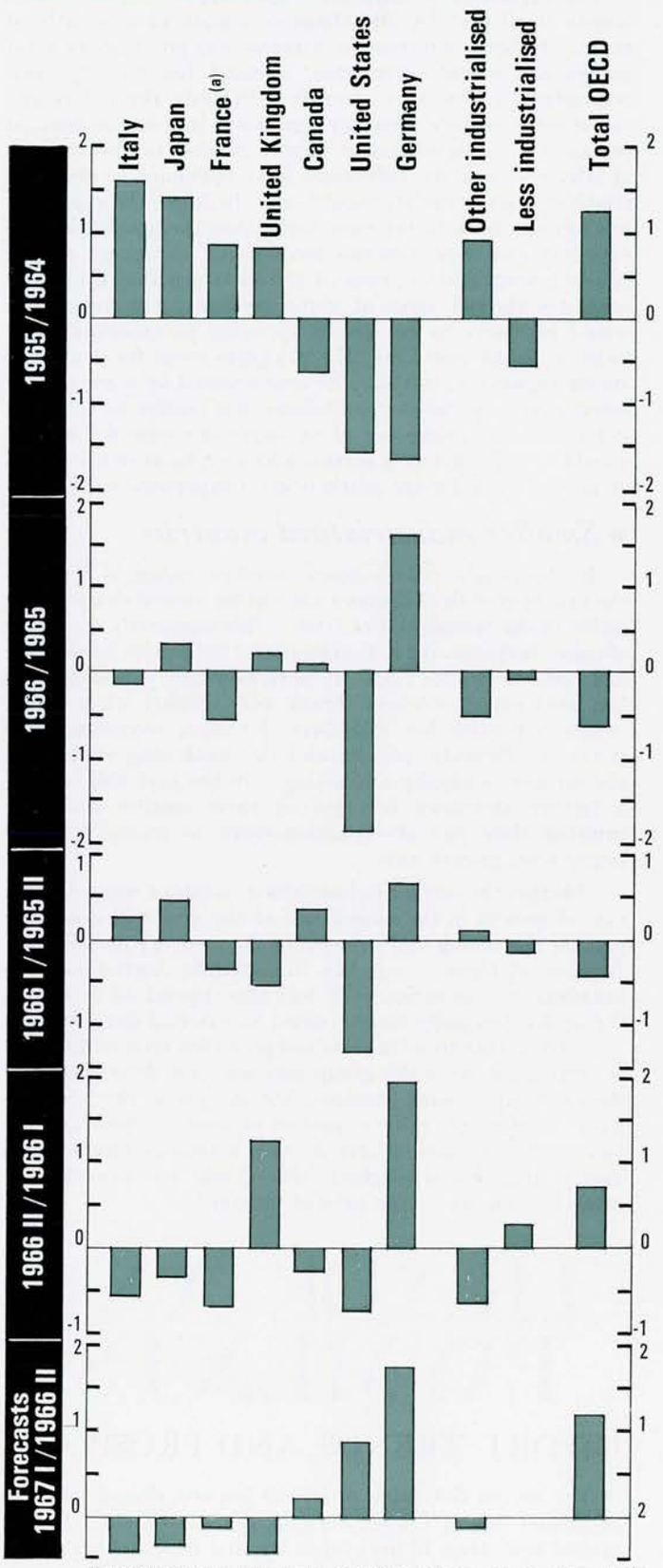
(percentages at annual rates) (a)

Country or group of countries		Weight (b) 1964	From previous year		From previous half-year (seasonally adjusted)				
			1966	1967	1965	1966		1967	
					2nd half	1st half	2nd half	1st half	2nd half
United States	GNP	52.9	5 ½	2 ¾	7	5 ½	3 ½	1 ½	4
	DD		6	2 ¾	7	6	4	1	4
Canada	GNP	3.6	6	3	7	7 ½	1	4	3 ½
	DD		6	2 ½	8 ½	7	2 ½	3	2 ½
France	GDP	7.3	4 ½	3 ½	6	4	4	3	3 ½
	DD		5 ½	3 ½	5 ½	4 ½	6	2 ½	3
Germany	GDP	8.6	2 ½	— ½	3 ½	3	½	— 3	2 ½
	DD		1	— 3	4	1 ½	— 3	— 6	2 ½
Italy	GDP	4.1	5 ½	5 ½	5 ½	5 ½	5 ½	5 ½	5
	DD		5 ½	6 ½	6	4 ½	6 ½	6 ½	6
United Kingdom	GDP	7.6	1 ½	1	1 ½	2 ½	— 1	1	3
	DD		1 ½	½	1 ½	3	— 3	1 ½	2 ½
Other Europe	GDP	10.2	4	3	5	4 ½	3	2	2 ½
Japan	GNP	5.7	9	10 ½	5	10	10	10	10
	DD		8 ½	12	5	8 ½	10 ½	11 ½	11 ½
Total OECD	GDP = DD (c)	100.0	5	3	6	5	3	2	4
of which									
OECD ex USA	*GDP*	*47.1*	*4 ½*	*3*	*4 ½*	*5*	*3*	*2 ½*	*4*
OECD Europe	*GDP*	*37.8*	*3 ½*	*2*	*4 ½*	*4*	*2*	*1*	*3*
EEC	*GDP*	*22.7*	*4*	*2*	*4 ½*	*4*	*2 ½*	*1*	*3 ½*

GDP = Gross Domestic Product. GNP = Gross National Product. DD = Domestic Demand (including stock changes).
(a) For countries which do not have quarterly national accounts these are necessarily very tentative estimates based on available information about the development of output, employment and expenditure. (b) Member countries' GDP for 1964 converted into dollars at current rates of exchange. (c) Although the current balance surplus of the OECD area with the rest of the world increased significantly in the second half of 1966 and again in the first half of 1967 (following a deterioration in the previous period), these changes are too small to modify the rate of increase of output in the OECD area as a whole. Consequently, the weighted average of the rates of change of domestic demand in the individual OECD countries is about equal to that of their aggregate GDP.

CHANGES IN CURRENT BALANCE

(billion dollars at seasonally adjusted annual rates)



(a) With the non-franc zone countries only on a transactions basis.

the framework of domestic policies and changing foreign demand (see Chart).

• *Germany*

In *Germany* the unexpectedly sharp decline in domestic demand was induced by policies which had been adopted in the face of overheating. By the first half of 1966 the growth of domestic demand had already slowed down to an annual rate of around 1 per cent. In the second half the combined effect of budgetary and monetary restraint resulted in an actual fall of domestic demand by 3 per cent (annual rate) as both private and public investment contracted significantly. In past cycles, export demand has played an important contra-cyclical role in Germany, helping to sustain private investment in the face of less favourable internal developments. On this occasion, the swing in the foreign balance was more substantial than ever, amounting to 2-3 per cent of GDP in the course of 1966 and early 1967. But while tending to mask the extent of the domestic slowdown, it was not enough to prevent the downturn gathering momentum. By the end of the year, the weakness of investment demand had begun to have cumulative effects via employment and earnings on consumers' expenditure.

As a first step the authorities allowed monetary conditions to ease as an automatic result of the growing foreign surplus. Since the turn of the year, however, more positive steps have been taken in the shape of successive reductions in the discount rate and minimum reserve requirements. In the field of fiscal policy the Government has gone beyond the decision to allow the " automatic stabilisers " to function — i.e. to accept a substantial budget deficit this year and a sizeable swing in the accounts of the social security and other non-budgetary funds — by introducing a special investment budget equivalent to about 0.6 per cent of GNP. These decisions have helped to improve the psychological climate; but much will depend on how far the private sector and the state and local authorities expand their investment programmes as a result of easier monetary conditions.

The latest business tests indicate a sharper downturn in private investment than hitherto expected; imports have dropped sharply and the rapid rise in unemployment continued through May. On the other hand, the decline in industrial production seems to have been halted in March-April; there has been some recovery in retail sales and an improvement in domestic orders. It can probably at least be said that the decline is levelling off and that with a fairly strong rise in government current expenditure, the impending impact of the contingency budget and continued good export performance, a moderate recovery should develop in the second half of the year. Whether this recovery will gain further strength depends on the behaviour of investment demand by private industry, the Länder and the municipalities.

• *United States*

In the *United States* the present slack largely reflects a delayed response to the restrictive monetary and fiscal policies taken in the course of 1966 to cope with inflationary pressures. Monetary policy had an immediate and sharp impact on housing, but business investment in plant and machinery only reacted to the Government's measures (including the suspension of the investment tax credit) with a considerable time-lag.

In the fourth quarter of 1966 output continued to rise, largely because of an involuntary accumulation of stocks. But in the first quarter stockbuilding was sharply reduced

and this resulted in a small absolute drop in output. Although the unemployment rate has remained rather stable, the rise in employment and in personal incomes has slowed down noticeably; the rate of capacity utilisation has fallen back sharply and business fixed investment has declined. The marked easing of monetary policies in the later months of 1966 led to some increase in housing starts, but the expected revival in this sector of demand has not yet fully materialised.

A resumption of expansion in the second half of 1967 seems likely and could become quite strong by the end of the year. But there are a number of uncertainties. In particular, although the inventory adjustment has been taking place in orderly fashion, it is not yet completed. And the prolonged stagnation in industrial production is having some effect on profits and personal incomes, and this could delay the early resumption of the growth of business investment in plant and machinery. Imports have levelled out and the trade surplus has risen; this may not continue when expansion is resumed, given the weaker trend expected in OECD exports.

• *United Kingdom*

In the *United Kingdom* the measures taken to stop the sterling crisis last July appear to have achieved their immediate objective. There has been a reduction of the pressure of demand and a slowing down in the rise of costs and prices. As a result of a gradual decline in private investment and some fall in private consumption, domestic demand fell at an annual rate of about 3 per cent between the two halves of 1966. The effect on output was partly cushioned by a substantial improvement in the foreign balance, helped by a temporary fall in imports.

Unemployment has continued to rise, but the general downturn seems to have levelled out in the early months of 1967 when rising government current and capital expenditure partly offset the weakness of other elements of domestic demand. Domestic demand should henceforth be modestly expansive, with relaxation of monetary restraints, a continuing rise of public expenditure and some revival of private consumption, particularly after the wage increases expected when the statutory wage freeze ends in July.

• *France, Italy, Japan*

The problems confronting *France, Italy and Japan*, where the authorities aimed at a reasonable degree of expansion after the stabilisation measures of two or three years ago, have been different. The need in these countries has been to keep domestic demand sufficiently buoyant to ensure a satisfactory growth of output in the face of weaker foreign demand, without entailing renewed inflationary pressures. In both France and Italy the adverse swing in the foreign balance in the course of 1966 was of the order of 1-1 ½ per cent of GNP. In France this seems to have affected private investment unfavourably; certainly it increased less than might have been expected. At the same time — for largely different reasons — the housing market has been weak. The slower growth of output combined with the larger number of potential entrants into the labour force has already altered the balance in the labour market and may help to explain the slower rise in wage incomes and cautious consumers' behaviour. In consequence, the deceleration of the expansion, thought to be only short-lived last autumn, has persisted into the early months of this year — as illustrated by the flattening out of industrial production since July 1966 and a gradual but significant increase in registered unemployment in recent months. This slack may continue into the summer months but may be followed by some pickup later in the year if foreign demand recovers as expected; the authorities, however, have indicated that the situation is now regarded as justifying more expansionary measures.

The expansion in Italy and Japan appears to have been largely unaffected by the changed climate in international trade. In both countries the stimulus was provided by fiscal action, and private investment demand has recently been responding to this very strongly. In Italy there does not so far seem to have been any significant increase in demand pressures — a development largely related to the reserves of labour — and the authorities have continued to maintain relatively easy monetary conditions. In Japan the expansion has recently been rather more rapid than the authorities had expected and some tensions have begun to appear on the labour market and in prices; it is understood that if demand pressures showed signs of rising seriously, the authorities would be ready to cut public spending programmes. But both in Japan and Italy, the prospects seem for continued strong expansion; this may be accompanied by some further deterioration in the current balance but insofar as this does not reflect the emergence of excessive domestic demand, it should be regarded as a normal and acceptable development at a time when foreign markets are temporarily weak.

• *Smaller industrialised countries*

In the *smaller industrialised countries*, taken as a group, the rate of growth of demand and output slowed down appreciably in the second half of 1966. This was partly the result of policy decisions, influenced by earlier tendencies for demand and costs to rise too fast. In part, however, it reflected the fact that export markets shrank very quickly when bigger countries became less expansive; for some countries, more restrictive domestic policies and the weakening of demand abroad were mutually reinforcing. In the first half of 1967 a further slowdown occurred in these smaller countries, bringing their rate of expansion down to around half the longer-term growth rate.

Whether the smaller industrialised countries enjoy a faster rate of growth in the second half of the year will depend in part on the timing and strength of the recovery in Germany. In some of them — e.g. the Netherlands, Austria and the Scandinavian countries — it will also depend on how soon the authorities judge that — aided by external developments — a satisfactory trend in costs and prices has been established. Several countries in this group may see some deterioration in their current account positions; but in view of the comparatively comfortable reserve position of some of them, and the fact that they have relatively easy access to international money and capital markets, this should not generally be cause for concern at the present juncture.

TRADE AND PAYMENTS

IMPORT TRENDS AND PROSPECTS

The rise in the value of OECD imports slowed down to an annual rate of 7 ½ per cent in the second half of 1966, against more than 10 per cent in the first half, and the exceptionally high rate of 15 per cent in the second half of 1965 (Table 2). The weaker trend has continued into the early

months of 1967, and OECD imports may only have risen at an annual rate of 5-6 per cent in the first half of the year.

In the second half, much will depend on developments in the United States and Germany. If, as expected, the growth of output in the United States picks up quite sharply, the present pause in imports seems likely to be rather short-lived, but the timing of the recovery is somewhat uncertain. In Germany, some part of the present decline in imports no doubt reflects an inventory adjustment, which should not continue much longer. But any sustained revival of import demand will depend essentially on the timing of the expected recovery of the other components of domestic demand. For most of the other countries, imports seem likely to rise in the second half of the year. Thus, if policies are successful in the United States and Germany, the growth rate of OECD imports should rise to 8-9 per cent in the second half of the year, giving a year-on-year increase of the order of 7 per cent.

This would be below the normal rise associated with full capacity growth in the OECD area, which has been put at 9-10 per cent (1), but it would represent a mild slowdown compared with the setbacks in 1958 and 1961 (Table 3). In 1958 there was a recession in the United States and a slowdown in most of the other industrialised countries. In 1961 the recession in the United States was less severe, and the slowdown elsewhere was limited to the United Kingdom. In 1967 the obvious difference is that a recession is not anticipated in the United States.

(1) *The Economic Outlook November* 1966 OECD Observer *December* 1966 *pp.* 33-34.

2. FOREIGN TRADE OF THE OECD AREA (values, per cent change)

	1965 U.S. $ billion	Year to Year Change				Change from previous half year (annual rates, seas. adj.)			
		1960-1964 Average	1965	1966	1967	1966		1967	
						1st half	2nd half	1st half	2nd half
Total									
Imports	124.7	9.0	9.5	10.9	7	10.7	7.5	6	8 ½
Exports (1)	120.4	8.1	10.3	10.6	8	10.5	9.6	7 ½	7
Intra-OECD									
Exports (1)	*82.0*	*9.8*	*11.5*	*11.7*	*7 ½*	*13.0*	*6.5*	*7*	*9*
Extra-OECD									
Imports	*39.1*	*6.7*	*6.0*	*8.5*	*5 ½*	*6.7*	*9.6*	*2*	*6 ½*
Exports (1)	*36.8*	*4.9*	*8.2*	*7.7*	*9*	*2.4*	*16.9*	*8 ½*	*3*

(1) Adjusted for the estimated shift between early-1965 and end-1964 figures due to the US dock strike.

3. OECD IMPORTS, 1958, 1961 (percentage change from previous year)

	1958		1961	
	Vol.	Value	Vol.	Value
North America	0.1	— 3.8	—0.2	—1.3
Japan	—15.6	—29.1	31.0	29.4
OECD countries in Continental Europe	1.3	— 6.6	10.0	9.2
United Kingdom and Ireland	0.5	— 6.6	—1.3	—2.6
Total OECD	— 0.1	— 7.2	6.7	5.7

OECD TRADE WITH THE REST OF THE WORLD

The impact of the slower growth of OECD imports on demand for exports from OECD countries has been partly offset by a strong increase in demand from outside the OECD area (Table 2). This had led to a sizeable swing in the trade balance of the OECD area with the rest of the world, which improved at a seasonally adjusted annual rate of $ 1 ¼ billion in the second half of 1966 and, on present trends, seems likely to improve by a further $1 billion in the first half of this year. This appears to have led to some deterioration in the financial position of the primary-producing countries, and on past experience the balance with the rest of the world may soon start swinging back.

OECD imports from the rest of the world, which weakened appreciably in the final months of 1966, should soon pick up, in line with OECD industrial production. But to preserve their financial position, a number of the primary-producing countries will probably slow down the pace of their imports. Exports to the Sino-Soviet countries should, however, continue to rise fast. Taken together, OECD exports to the rest of the world might increase at an annual rate of less than 4 per cent in the second half of 1967 against 8 per cent or more in the first half, and 17 per cent in the second half of 1966.

EXPORT TRENDS AND PROSPECTS

The export trends and prospects for individual countries have been, and will continue to be, rather strongly marked by the uneven growth of import demand. Demand from Italy, Japan, France and non-OECD countries accounted for 40 per cent of the increase in OECD exports in 1966, and perhaps 60 per cent or more in the first half of this year (Table 4). The contribution of demand from North America and Germany, on the other hand, may have fallen from one-third last year to virtually nothing in the first half of 1967. The exporting countries most seriously affected by this development have been those with important markets in Germany, the United Kingdom and the smaller industrialised

4. DEMAND FOR OECD EXPORTS

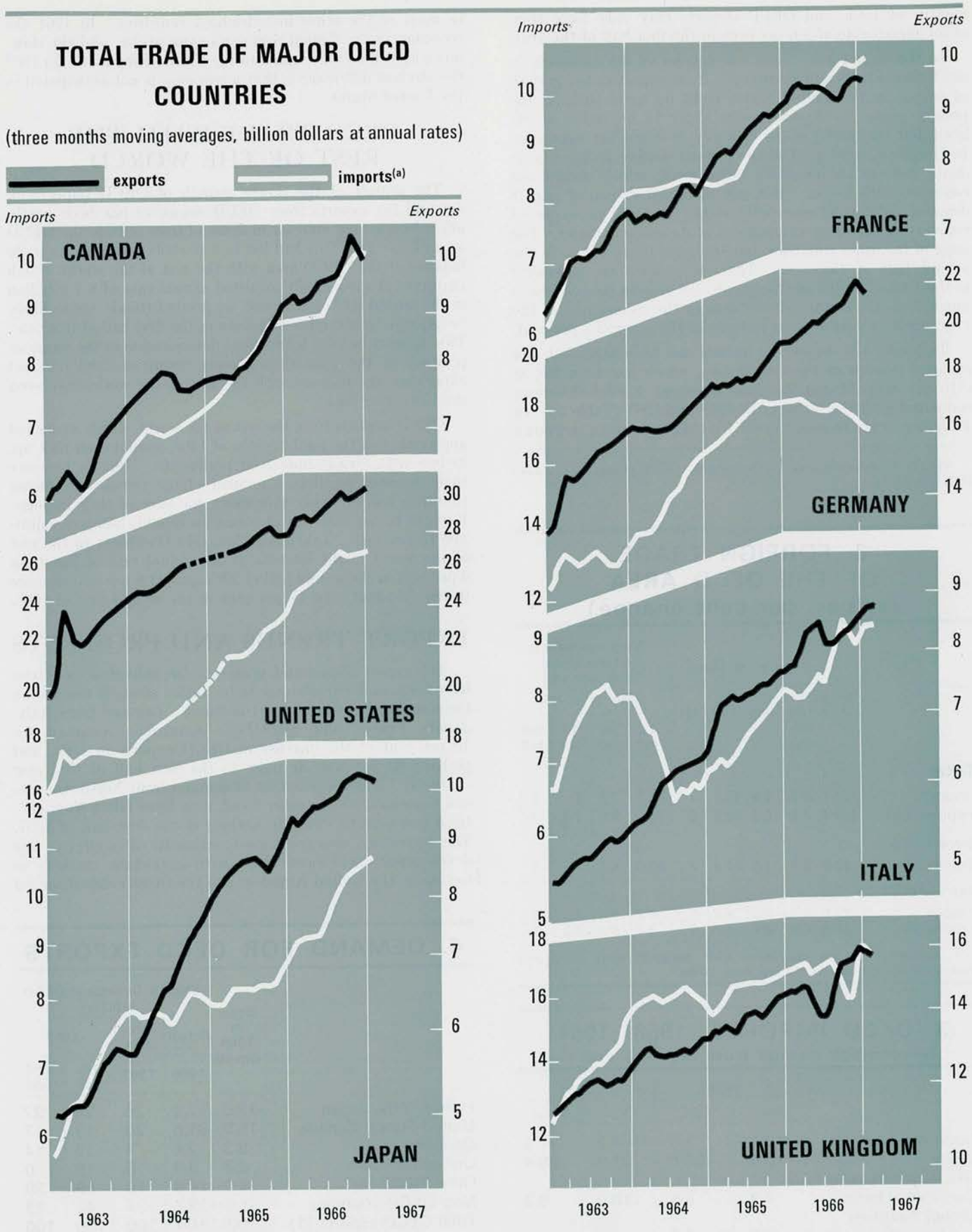
	Share in 1964 exports	Share in increase in OECD exports			
		Actual	Fore-cast	1967	
		1966	1967	1st half	2nd half
France, Italy, Japan	12.6	17.9	26	24	27
United States, Canada	15.5	31.6	20	13	17
Germany	9.3	2.6	— 4	—13	14
United Kingdom	6.7	3.3	5	15	0
Other OECD	24.0	18.8	19	19	29
Non-OECD countries	31.0	23.7	34	42	13
Total OECD exports (1)	100	100	100	100	100

(1) Including unspecified destinations.

Note : *Detail may not add, due to rounding.*

TOTAL TRADE OF MAJOR OECD COUNTRIES

(three months moving averages, billion dollars at annual rates)



Note : (a) Except for the United States and Canada, the import figures are on a c.i.f. basis, but the import scale (left) has been adjusted downwards to take into account the average discrepancy between f.o.b. and c.i.f.

countries, i.e. France, Italy, and the smaller European countries themselves. The export markets of Germany, the United Kingdom and the United States have slowed down less than those of their main competitors; the latter two countries have particularly benefited so far from the strong demand from the primary-producing countries.

Countries' export performances have also continued to be influenced by changes in relative pressures of internal demand. In 1966, Germany increased her share in world markets much more than in the previous year, and the decline in the United Kingdom's share was less marked than in most earlier years despite the loss associated with the seamen's strike. With internal demand pressures rising relative to those of other countries, France, Italy and Japan increased their share in world markets much less than in the previous year. Broadly speaking, these trends are expected to continue, and in some cases to be accentuated in 1967 (Table 5).

5. RELATIVE EXPORT PERFORMANCE

	1965 to 1966		1966 to 1967	
	Growth of country's export markets (1)	Actual growth of country's exports	Forecast growth of country's export markets (1)	Forecast growth of country's exports
France	6.4	8.5	6	6½
Germany	10.0	12.5	8	10½
Italy	9.0	11.7	5½	8
United Kingdom	8.0	6.9	7½	7
United States	12.2	10.1	9½	8
Canada	23.9	17.8	11½	10½
Japan	10.5	15.8	7	8
Other OECD industrialised	8.2	7.0	6	5½
OECD less-industrialised	9.0	17.6	7	9
Total OECD	10.5	10.5	8	8

(1) The growth which would have occurred in a country's exports if it had exactly maintained its share in total OECD exports to each market.

CURRENT INVISIBLES

In 1966, the increase in United States' military expenditure in South East Asia was only offset by cuts in net military spending elsewhere, while net investment income failed to increase and other services improved but little. Changes in other OECD countries' balances on invisible account were rather small and roughly offsetting. The balance of the area with the rest of the world would seem to have deteriorated by more than $ ½ billion. Apart from the possible impact of recent events in the Middle East, this year is likely to be marked by some further increase in United States' military expenditure, and an exceptional increase in its travel deficit (benefiting Canada in connection with the Montreal Exhibition). The slow-down in Europe may lead to a reduction in foreign workers' remittances to countries in Southern Europe, and a somewhat slower growth of intra-European travel.

CURRENT BALANCES

The main feature of 1967 is likely to be the large German current surplus, which may come to $2 1/2 billion or more (Table 6); if domestic demand revives reasonably quickly, however, it may stop increasing before the end of the year. The United States current account should improve by perhaps $½ billion, mainly in the first half of the year. Movements in the United Kingdom's current balance have been distorted by the import surcharge. In the second half of the year, when these effects have largely worn off, the surplus might be running at a seasonally adjusted annual rate of around $500 million (1), compared with a deficit on the same basis of about $800 million in the first half of 1966.

On the other side, the decline in Italy and Japan's unusually large current surpluses should continue. The current deficit of the smaller industrialised countries as a group may continue to increase, with the deterioration concentrated in those countries where domestic demand continues to be relatively strong. In France, although the current account in 1967 will no doubt show a considerable swing from last year, there may be no further deterioration in the course of the year.

While to some extent the swings in the current balances of the continental European countries have tended to offset one another, the current surplus of the EEC countries could rise to as much as $3 ½ billion in 1967. Taken together the OECD area's current surplus with the rest of the world may rise by around $1 ½ billion year-on-year.

CAPITAL MOVEMENTS AND OFFICIAL SETTLEMENTS

There were a number of unusual features about international capital movements last year, with abnormally large swings in net capital balances. The net outflow of private capital of all forms (2) from the United States fell to only $¼ billion, while the net outflow of private capital from Italy and Japan together rose to as much as $3 billion. The net inflow of private capital into Germany continued at only a slightly diminished rate, and there was a large outflow from the United Kingdom.

As in the past, most of these movements in capital balances were in the opposite direction to the change in the country's current account (Table 6), reflecting differences in the pressure of demand for credit associated with differences in the relative pressure of domestic demand (3). This tendency will normally be reinforced by changes in monetary policies. But the events of 1966 showed clearly that the direction and magnitude of international capital movements depend on the vigour with which monetary policy is used compared to other instruments of demand management. While as a general rule, the swing in a country's capital balance is smaller than that in its current account, in 1966 this was far from being always the case.

In the United States, where particularly strong use was made of menetary policy, the capital account improved by about $1 billion more than the current account deteriorated. In the United Kingdom, however, where monetary restriction was given relatively less weight in the overall policy mix, (and where speculative forces were also at work) the deterioration in the capital balance greatly exceeded the improvement in the current account. Taken together, the two reserve currency countries' current account deteriorated by $1.5 billion, while their combined capital balance improved by $ 1.6 billion.

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(1) *Excluding imports of military aircraft which are being financed by drawing on a line of credit with the Export-Import Bank.*

(2) *Including unrecorded transactions and movements of banking funds.*

(3) *See The Economic Outlook, July* 1966, OECD *Observer, August* 1966, *pp.* 29-32.

In Germany the fact that the deterioration in the private capital balance was so *small* in relation to the massive swing in the current account clearly reflected the tight monetary conditions which were maintained some time after domestic demand pressures had begun to ease. A number of the smaller industrialised countries also followed active tight money policies; taken as a group (but excluding Switzerland) their capital account improved by $0.6 billion, i.e. by about as much as their current account deteriorated.

Apart from the United Kingdom, the countries from which capital was "pulled out" were Italy, Japan, Canada and Switzerland, whose combined balance of private capital movements deteriorated by $1.7 billion — or $1.2 billion more than their combined improvement on current account. The pull exerted by the tight money countries was also felt in the Euro-dollar market where in the fourth quarter a large-scale intervention by central banks was necessary to prevent a further trightening at a time when domestic interest rates were already falling in many countries.

Since the closing weeks of last year there has been a rather radical change in the pattern of short-term capital movements, resulting primarily from the easing of monetary conditions in the United States and Germany, and the reversal of previous speculative movements against sterling. In the six months to end-March the capital outflow in all forms from the United States rose sharply, mainly as the result of a turn-around in the net movement of banking funds, while there was a substantial inflow of capital into the United Kingdom. Taking the two reserve currency countries together, however, the net capital outflow rose to around $2 ½ billion, compared to about $1 ¼ billion in the preceding six months. At the same time, private capital movements in Germany swung to a net outflow, while there has been a tendency for the net outflow from Italy and Japan to diminish.

OFFICIAL SETTLEMENTS

With the important exception of the United Kingdom the unusual pattern of capital movements recorded in 1966 tended to reduce the overall balances to relatively small amounts. Almost paradoxically the United States, with its smallest current surplus since 1960, had a small surplus on official settlements for the first time in the 1960's whereas Japan and Italy had record or near-record current surpluses but had, respectively, a small deficit and a small surplus on official account. On the other hand, although the United Kingdom's current account moved approximately into equilibrium, there was a very large deficit on official settlements of around $1 ½ billion (Table 6).

The changes in short-term capital flows in the early months of 1967, however, have significantly altered the configuration of official surpluses and deficits, particularly as between the two reserve currency countries. Over the twelve months to end March 1967 the United States recorded a deficit on official settlements of $1.5 billion (compared with $0.8 billion in 1965), whereas the United Kingdom's official account was in approximate balance. Taken together, the two countries' combined official deficit was running at about the same level as in 1965, and continued to be roughly matched by the combined surplus of the three largest EEC countries — with a shift, since 1965, from France and Italy to Germany.

At the time of writing, the outlook for official settlements is highly uncertain. The crisis in the Middle East set off large scale movements of short-term funds and heavy demands on the London gold market and subsequent events could affect the balance of payments position of several of the major countries. But apart from these uncertainties it is quite possible that monetary conditions in the second half of 1967 will be such as to continue to induce short-term capital movements which substantially reduce surpluses and deficits on official account.

6. CURRENT BALANCES, CAPITAL BALANCES AND OFFICIAL SETTLEMENTS OF OECD COUNTRIES

(US $ billion)

		Current Balances	Capital Balances (1)	Official Settlements
United States	1965	4.24	—5.02	—0.79
	1966	2.39	—2.18	—0.21
	1967 *	2.80		
United Kingdom	1965	—0.40	—0.22	—0.61
	1966	—0.05 (2)	—1.44 (3)	—1.50
	1967 *	0.40 (2)		
France (4)	1965	0.76	—0.14 (5)	0.89 (6)
	1966	0.28	—0.07 (5)	0.46 (6)
	1967 *	—0.10		
Germany	1965	—1.52	1.20	—0.32
	1966	0.11	0.51	0.62
	1967 *	2.80		
Italy	1965	2.21	—1.25	0.96
	1966	2.14	—1.87	0.27
	1967 *	1.40		
Canada	1965	—0.98	1.16	0.17
	1966	—0.91	0.61	—0.30
	1967 *	—0.65		
Japan	1965	0.93	—0.81	0.12
	1966	1.25	—1.34	—0.08
	1967 *	0.40		
Other OECD	1965	—1.53	1.78	0.25
	1966	—1.96	2.18	0.22
	1967 *	—2.20		
Total OECD	1965	3.71	—3.30 (5)	0.67 (6)
	1966	3.25	—3.60 (5)	—0.10 (6)
	1967 *	4.85		

(1) Including banking funds and unrecorded transactions.

(2) Excludes progress payments on military aircraft purchases from the United States and associated invisible expenditures.

(3) Includes progress payments on military aircraft purchases from the United States and associated invisible expenditures.

(4) Balance with non-franc countries, on a transactions basis.

(5) Excluding settlement on behalf of Overseas Franc Area.

(6) Including settlement on behalf of Overseas Franc Area.

Note : *Details may not add, due to rounding.* * *Forecast.*

SOME ASPECTS OF UNITED STATES ENERGY POLICY

OECD Member governments will be confronted with important policy decisions in the next few years as new types of energy reach the commercial stage, new sources become available and pollution becomes a growing problem. OECD's Energy Committee is currently passing under review the present policies and problems of Member countries in this field as well as their possible development. The following article is based on a description of US energy policy by US Assistant Secretary of the Interior J. Cordell Moore and on general comments made by representatives of the countries - Germany and Italy - chosen by the Committee as examiners for the discussion of US policies.

Even though energy production and marketing in the United States are largely in the hands of private enterprise, the US Government plays a multi-faceted role in the energy field. The Federal Government is not only owner of the land on which some 10 per cent of total domestic oil and gas supplies are produced, it is also a producer of energy (3 per cent of total energy requirements), mostly hydroelectric power; an investor in rural electric systems, which are financed by low-interest government loans; and it is the nation's largest consumer of energy. In addition the Government affects the supply of energy and its cost and prices through a multiplicity of measures including tax incentives, regulation of rates of natural gas and electricity in interstate commerce, control of oil imports and research and development programmes. Finally, energy policy is considered as an important ingredient of policies having to do with national security, financing of the budget, balancing external accounts, and, to an increasing extent, preventing air, water and thermal pollution over which there is growing concern.

Present Policies

The prime objectives of energy policies are, in the words of Assistant Secretary of the Interior, J. Cordell Moore, " to assure an adequate supply of cheap energy, diverse in form and geographic source but drawn largely from domestic sources — produced and used in ways that cause no permanent damage to either health or environment. We try to achieve these purposes by stimulating initiative in the private sector, by encouraging and trying to maintain interarea, interfuel, and interorganisational competition, by regulating standards of service and rates of public utilities and similar enterprises where competition is impractical, by using public resources wisely and working with the states to avoid waste and reduce production costs, by helping to advance technology through research and development, and by avoiding as much as possible protective measures and selective excise taxes that would add to cost. "

Action to implement these objectives originates in a variety of bodies, for the energy-related tasks of government are dispersed among some 85 Departmental bureaux (1) and 10 special boards, committees and quasi-official agencies. The states too have authority in this field, regulating rates, for example controlling the spacing of oil wells, " prorationing " the production of oil, i.e. limiting output to conform to market demand. State and local governments also produce and market electric power.

(continued on page 28)

(1) 15 of these bureaux are in the Department of the Interior which is the body most nearly analagous to the energy agencies or ministries to be found in other countries; its scope covers functions as diverse as resource appraisal, oil import control and water pollution.

At federal level, domestic production is encouraged through a variety of means. Oil exploration is treated as a current expense rather than as an investment for income tax purposes and hence can be written off in one year; the same is true of drilling and development costs. In addition, depletion allowances equivalent to 27½ per cent of gross revenue for oil and gas and 23 per cent for fissionable materials (up to a maximum of 50 per cent of net revenue) are offered as an incentive to finding and developing new reserves.

Encouragement of nuclear energy has primarily taken the form of government research and development programmes. The light water reactor now used in commercial nuclear energy stations was developed mainly with government funds, and now federal research and development have turned to the breeder reactor and advanced forms of energy conversion such as m.h.d., thermionics and the fuel cell. About $ 350 million per year is being spent by the government directly on energy research and development, mostly in the nuclear field although some $ 50 million is for research in coal and other conventional fuel industries. In addition, the Federal Government is backstopping reactor insurance. The first $ 74 million of the insurance required on a given nuclear power facility is to be underwritten by private companies, but the Federal Government stands ready to underwrite further indemnity up to a sum of at least $ 560 million.

Another approach to encouraging domestic industry is the restriction of oil imports practiced since 1959 and extended to cover oil transported overland from the country of origin. In the western part of the US imports are limited to an amount estimated to represent the difference between domestic supply and demand; east of the Rocky Mountains they are limited to a certain percentage (currently 12.2 per cent) of domestic production. " Although the measure is protective, its intent is not to protect the industry for economic or social reasons but to protect productive capacity for security reasons ", the US Assistant Secretary of the Interior noted before OECD's Energy Committee. Since the price of imported oil is generally less than that of US production ($ 12.60 per ton was cited as the order of magnitude of crude oil in Venezuela, for example, as compared with US prices of $ 21.50 per ton), the policy represents a cost to the nation for achieving these objectives, although the exact amount involved is difficult to reckon. Emergency supplies are ensured in some measure by the US Navy which holds title to four reserves of petroleum and three of oil shale representing a combined total of 160 million tons (1.2 billion barrels) of proved reserve; one of them — Elk Hills California — has 1,055 existing wells capable of producing about 8.6 million tons a year (175,000 barrels a day). Apart from this provision, there is no stockpiling programme; however, excess capacity exists in the main energy branches — oil, gas and coal — amounting to about 25 to 30 per cent of current production.

Underground loading onto conveyors at the Old Ben Mining Company in Illinois.

Oil derricks dominate the scene in Kilgore, Texas.

Future Problems

For the time being at least, the US Government intends to maintain the viability of a full range of domestic energy industries, in order to have flexibility during a period in which there is uncertainty as regards the various sources of supply. Thus for example the breeder reactor is expected to become commercially feasible in the 1970's and nuclear energy is expected to account for some 17 to 18 per cent of total energy consumption by 1980, but there is as yet no experience on which to base estimates of cost.

As for coal, it seems likely that demand will be sustained since methods of obtaining synthetic gasoline and other hydrocarbons from it are now being developed (a pilot plant is under construction), but the extent to which it will remain competitive in the production of electricity is not clear. EGD (electro-gas dynamic) processes, in which a high-temperature ionized gas operates in an electrostatic field to generate electricity without the need for moving parts, may prove to be competitive. But the need for greater expenditures to counter pollution would tend to discourage the use of coal. In any event, the nuclear energy industry itself estimates that coal consumption for power generation will increase from 245 million tons a year at present to about 500 million by 1980.

The amount of domestic oil that will be available in the years to come is also uncertain. At present proved reserves amount to a 12 to 13 years' supply at current rates of consumption, but this represents stock on the shelf, and it is not known how much additional oil or gas there may be in unproved acreage. Recently the rate of exploration has fallen off, and the National Petroleum Council predicts that net additions to production capacity will diminish from 18.5 million tons per year at present to about 2.5 million tons by 1970. As for hydroelectric power, although only 30 per cent of the country's potential capacity has been developed, there is growing resistance to the construction of hydroelectric installations in some areas making it necessary to resort to more costly sites.

There may come a time, Mr. Moore noted, when diversity in either sources or forms of energy will not be considered as important as it is now. If, for example, breeder reactors should indeed prove to be the least expensive source of electric power, and if other advances such as the air-metal battery for automobiles (which permits storage rates of 50 watt hours or more per pound) were to make possible a nearly all-electric energy system (1), policy needs would change. The introduction of the breeder reactor would permit the use of thorium and of higher cost but plentiful uranium ore and hence would solve the problem of security of supplies. Air pollution problems would be eliminated or vastly reduced, and instead of placing so much emphasis on interarea and interfuel competition, government attention would focus more on interorganisational competition and regulatory procedures. *(continued on page 30)*

(1) A bill is pending in Congress to authorise federal research on the electric automobile, and several companies now have prototypes.

Energy Transport

The problem of energy souces is only one of many that will confront the Government in the next years. The power blackout in the northeast of the US in November 1965, for example, raised the question of how the public can be protected from crippling failures of this sort and what should be the Federal Government's role vis-a-vis multi-state power grids. One proposal now pending before the Congress is that construction of extra-high voltage transmission grids be required to have the approval of the Federal Power Commission, which regulates wholesale electric power rates and natural gas in interstate commerce but which as yet has no control over intrastate systems.

The safety of pipelines is another issue that could become crucial. Regulation of oil pipelines from the safety point of view is vested in the Interstate Commerce Commission, and legislation is pending to give similar authority to the FPC for gas piplines.

Environment

Finally, the production and use of energy is now on such a large scale that it is modifying the total environment in ways that adversely affect other resource values and public health as well. Air pollution from unburned carbon, hydrocarbons and sulfur dioxide is substantial in many industrial areas. Thermal pollution (the heating of rivers and lakes) from power production is becoming a problem in some places; and stream pollution and damage to land and scenery from mining are substantial in the eastern part of the country. " In developing a new land from a raw frontier over a relatively short period ", the Assistant Secretary of the Interior comments, " the prime concern of the American people was for material values, for economic betterment ... Now we see that we have created a bit of a shambles in our rush for material advance. We are therefore setting about the task of cleaning up, and we

Joint Statement by the Delegations of the

... " *The basic purpose of the Committee's examinations of energy policy is not merely an exchange of factual information, but also an exploration of fundamental policy orientation which could prove useful both in the formulation of the policies of other countries and in harmonisation of national energy policies... The report of the United States is, in our opinion, a straightforward, skillful and simple presentation of an extremely complex subject...*

None of us, either personally or as representative of his government, believes that the policy for a sector which is as complex in every aspect as the energy sector can be perfectly rational.

The variety and complexity of the factors which have accumulated in the course of time in regard to both sources of energy and the economic, political, social, legal and administrative structure in which they have gradually been introduced and have developed are sufficient justification for the fact (and at the same time make it virtually inevitable) that American energy policy does not conform to a uniform and rational plan.

The listing of the objectives pursued by the US through its energy policy makes it clear enough that regulation of the energy sector is aimed not so much at the sector itself from an economic and technical aspect as at the achievement of more general national aims which are so varied that they necessarily involve the finding of empirical solutions to the problem of the ratio and equilibrium between them.

The point that should rather be stressed is that this policy has effectively met and meets the requirements of the American economy and society as they have been developing with extremely positive practical results, even if certainly not the best theoretically obtainable. An appraisal of the possible effects of a certain choice as against another may be so difficult that the de facto *nature of the policy actually followed in a particular sector is a natural consequence of the impossibility of knowing in advance " the optimum that could be ".*

And we think that from this we can draw a conclusion and a true lesson for all the countries — or groups of countries — about the way in which they must face this problem having regard to their individual situations : i.e. that the pursuit of national interests, as expressed by society, is the yardstick by which energy — and certainly not only energy — policies must be measured and that this is a right, the free exercise of which cannot be curtailed by loyalty to economic concepts and political ideologies.

This is confirmed by a comparison of the more important aspects of actual American energy policy and the ideas which are believed to be — and in a very general sense are — at the base of the United States philosophy and way of life.

No one can in fact fail to note that American energy policy contains a liberal element and a strongly protectionist and dirigistic element combined so as to give the impression that — on the whole — the latter prevails over the former.

The substance of a liberal economic system is the free play of market forces. But we see that the United States, far from keeping to an abstract theory of laissez faire, intervenes with the full force of the public authorities to make the market work in the direction of precise objectives of national interest.

Both the legislative and administrative systems — which are made complex by the country's federal structure — are designed to facilitate the active intervention of the authorities to control, direct and promote operations in all energy sectors and in all their aspects in order to obtain results in line with the relative importance of general and specific objectives.

This is what happens when the States or the Federal Government control the rate of crude oil production or imports to ensure national self-sufficiency of supply, with repercussions on costs and therefore on the income of various groups of people, foregoing — in this particular field — obtaining the lowest cost of the factors of production which is nevertheless at the base of the American competitive economy's efficiency. The same freedom of action may be noted in the use of the means to achieve objectives. For instance, whilst in the case of crude oil, production is controlled and prices are free, in the case of natural gas, production is free and prices controlled.

are trying also to reach a balance in the use of our resources and environment that will enable us to continue to progress economically without destroying the quality of our environment ". During the last few years the Federal Government has passed a Clean Air Act, A Water Pollution Act and a Solid Waste Disposal Act, and recently Congress appropriated $ 3.6 billion to assist cities and states in reducing water pollution. Nearly all of the states now have some legislation regulating the discharge of air, water and thermal pollutants. Some states also have, or are developing, regulations regarding restoration of the surface of land mined by open-cut methods, and the Federal Government has several programmes directed to means of preserving land and scenery. But more needs to be known about the hazards so that reasonable standards can be set, and research is needed to find new methods of pollution control.

The existence of numerous authorities — federal, state and local — in the energy field calls for better policy co-ordination, Mr. Moore suggested, though it is considered impossible for a single body to be responsible for all the diverse aspects of energy policy. And means must be found to reconcile the various, and often conflicting, objectives of energy policy. Here technology may help to find the answers. " Technological advance appears again and again as the common denominator for reconciling policy objectives ", Mr. Moore notes. " Research and development can be a massive factor in determining the course of events in almost every aspect of the energy field... For many years now, scientific research and development have been deliberately employed as problem-solving tools by both industry and government. And as R & D have become prime instruments of policy, research strategy has become one of the prime components of policy strategy. In planning for the future it is essential, therefore, that plans for government research and development be fully co-ordinated with the objectives of energy policy and with other mechanisms for achieving it. "

Examining Countries (Germany and Italy).

And not only prices, as is shown by the fact that the Supreme Court has recognised the Federal Power Commission's authority to go into the end use of natural gas before authorising investments in gas transport.

Freedom of private enterprise and competition are qualifying objectives of the American system. But in the energy sector they are hedged by legal and administrative checks which give them a different real content from their theoretical content to the benefit of other national objectives.

It is not merely a case of the — quite normal — action of Federal or State agencies to control public utilities and defend the consumer, i.e. action which concerns the purely domestic aspects of the American energy economy.

It is also a case of the prorationing policy or restrictions on crude oil imports, which on the one hand affect the oil firms' freedom to make the most of their production possibilities and obtain the resulting advantages and on the other prevent consumers from enjoying more favourable market conditions. Or of the common carrier system and control of natural gas transport rates and prices which, by placing restraints on the more powerful firms, protect the unintegrated small producer and at the same time the consumer. There are also measures having the opposite effect, like the depletion allowance which in a protected market benefits the lucky explorer and guarantees his theoretically indefinite development at the expense of the Treasury, whilst the absence of specific exploration incentives penalises new enterprises or those which are initially unlucky.

Thus fiscal policy in the oil sector distorts the effect of competition not only inside the United States but also abroad and prompts other countries to adopt counterbalancing measures, not necessarily in line with American measures because of the different situations.

Anti-trust legislation is regarded as a king-pin of American economic freedom, but its significance and efficacy require correct interpretation in the case of the present oil situation. In the first place it does not prevent the formation — encouraged by specific oil policy measures — of huge groups which affect competition at home and still more abroad. It is effective only in respect of certain kinds of agreement which regulation of the oil industry already makes rather improbable. Indeed it seems obvious that in an isolated market where restrictions on production and imports determine price and guarantee outlets for all permissible production, most of the causes which might in different circumstances lead to unbridled competition or to agreements in restraint of competition are eliminated.

It may be further observed that in spite of the extent of indirect — legislative and administrative — public action to regulate the energy economy there is no lack of intervention aimed at achieving certain objectives through direct public enterprises. Examples are to be found mainly in the electricity sector, in particular the Tennessee Valley Authority conceived as a regional development agency but whose competitive function as against private enterprise in the electricity utilities industry cannot be overlooked.

If the variety of ways in which energy policy is implemented in the United States is borne in mind, it is understandable that other countries with a totally different pattern of government and of the energy sector, seek to surmount certain problems and achieve certain national objectives by other methods than those followed in the US.

It has been shrewdly remarked that public enterprise in some European countries represents a means of protecting the freedom of the market and certain government interest in the same way as antitrust legislation and other measures in the US. The same may be said of measures which make certain operations subject to concession or which give direct incentives, as opposed to indirect incentives through tax rebates, to national projects at home and if necessary abroad.

This means that however different the system of checks and balances applied, in general or to a particular sector, may be in different countries in order to deal with national situations and requirements, the nature of the objectives pursued does not change and the means employed cannot be approved or rejected according to whether they are or are not adapted to an ideological plan or a given concrete plan.

SCIENCE POLICY in JAPAN

Since 1962, *OECD has conducted reviews of national policy for research and development in its Member countries. The review of Japan, the seventh in this series, will be completed in June with the publication of a background report, together with an analysis by an international group of experts. The material available as a result of this review makes it possible to put Japanese research and development activity in the perspective of similar activities in other industrial nations.*
The following article was written by T.D. Long, rapporteur for the group of experts.

In the two postwar decades, Japan has overcome tremendous obstacles, presented by an almost total lack of natural resources and relative isolation from the foreign markets at which her export-oriented economy is aimed, to become one of the greatest trading nations in the world — first among shipbuilders, third among steel-makers, third among motor vehicle manufacturers. Although certain historical factors — among which might be mentioned the continuity of public administration, a long history of universal compulsory education and close co-operation between leaders of government and industry — created conditions favourable to this remarkable achievement, increasing investments in scientific research and development in both the private and public sectors also play an important role. While the Japanese economy grew at a rate of 10 per cent per annum from 1953 to 1963, research and development expenditure of the government alone increased by an average of 18 per cent per annum, and for the nation as a whole by an even greater amount. Research expenditure in 1953 was roughly 47 billion yen (US $ 129 million) while in 1963 it had reached 321 billion yen (US $ 982 million). The level of national research and development expenditure with respect to the total national product put Japan on a par with France and FR Germany by 1962 (1).

Japanese research and development expenditure per head of population, at best a rough measure of the research effort of the entire national society, is rather small in comparison with other industrial countries. This is so for several reasons, but principally because Japanese national product at conventional exchange rates is relatively small, while population is large. It should be remembered that conventional exchange rates do not reflect real costs of living to which most research expenditures are related, and that the same quality of research may be done much more cheaply in countries where these costs are lower.

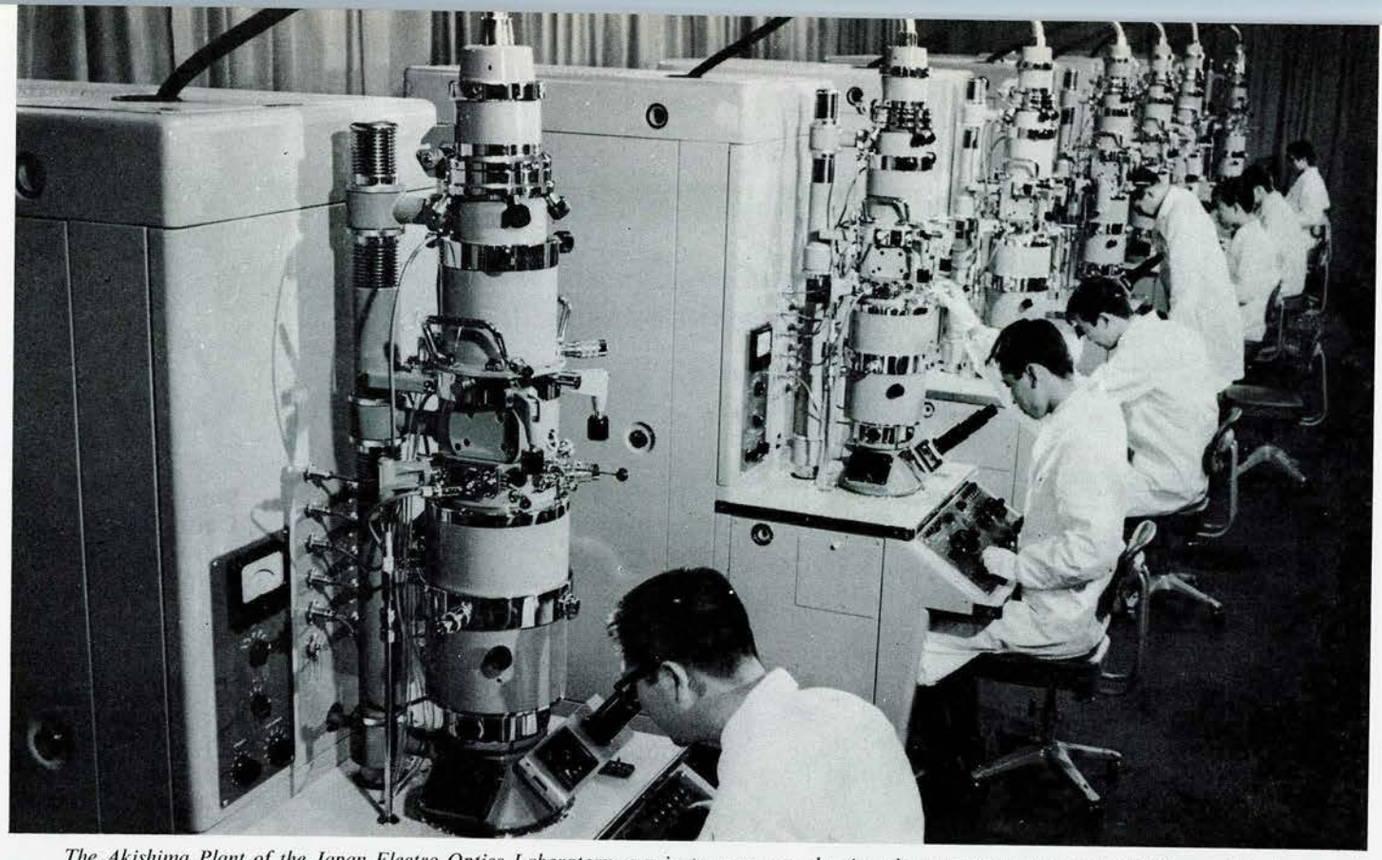
The growth of research in Japan has some distinctive features compared with that of other OECD nations. For constitutional and other reasons, the investment of funds in military research and development is very small compared to most other OECD nations. The latter allocate from 16 to 50 per cent of their national budgets to defence while Japan allocates about 8 per cent. While the share of military and space research in defence budgets of other countries runs from 8 to 80 per cent, in Japan it is about 5 per cent. In sum, research and development is overwhelmingly civilian-oriented.

The share of industry in research expenditure has increased more rapidly than that of any other sector — from 54 per cent of the total in 1953 to 64 per cent a decade later. If one includes private research in universities and

GROSS EXPENDITURE ON RESEARCH AND DEVELOPMENT (1)

	GERD as per cent of GNP	GERD/Capita United States Dollars
United States	3.1	93.7
United Kingdom	2.2	33.5
Netherlands	1.8	20.3
France	1.5	23.6
Japan	1.5	8.2
Germany	1.3	20.1
Belgium	1.0	14.8

(1) *The national ranking in this table is confirmed by the preliminary results of OECD's International Statistical Year for Research and Development.*



The Akishima Plant of the Japan Electro Optics Laboratory, a private company, showing electron microscopes of 250,000 magnifications produced by the Laboratory.

non-profit institutions, the private sector accounted for about three-quarters of total research expenditure in 1963. These funds are supplied and research is performed exclusively by firms and other private institutions. Similarly the 25 per cent which is supplied by public authorities (principally the central Government) is both produced and consumed within the public sector. There was probably not more than 1 per cent cross-funding of industrial research expenditure to universities in 1963, and somewhat less than 0.5 per cent of government research funds were contracted to industry.

The absence of significant transfer of funds between sectors is perhaps related to another feature of Japanese science — the compartmentalisation of different types of research. Basic investigation tends to be the exclusive sphere of the universities, especially in medical science, while applied research on the whole takes place in government laboratories, and development work is the province of industry.

In terms of research and development personnel Japan has also attained parity with other major OECD countries. As to qualified scientists and engineers only — the top strata of R and D personnel — Japan is even more richly endowed.

This growth is partly the result of a conscious effort of the Government to increase scientific and technical enrolments in the universities, and to improve scientific and technical education at the secondary level as well as in higher education. From 1957 when the first plan of the Ministry of Education for an increase of scientific and engineering places in higher education went into effect, until 1966 when the most recent of such plans had reached capacity, university places in science and engineering increased from about 20,000 to 110,000 — roughly a 50 per cent expansion of scientific and technical enrolments relative to enrolments in the social sciences and humanities.

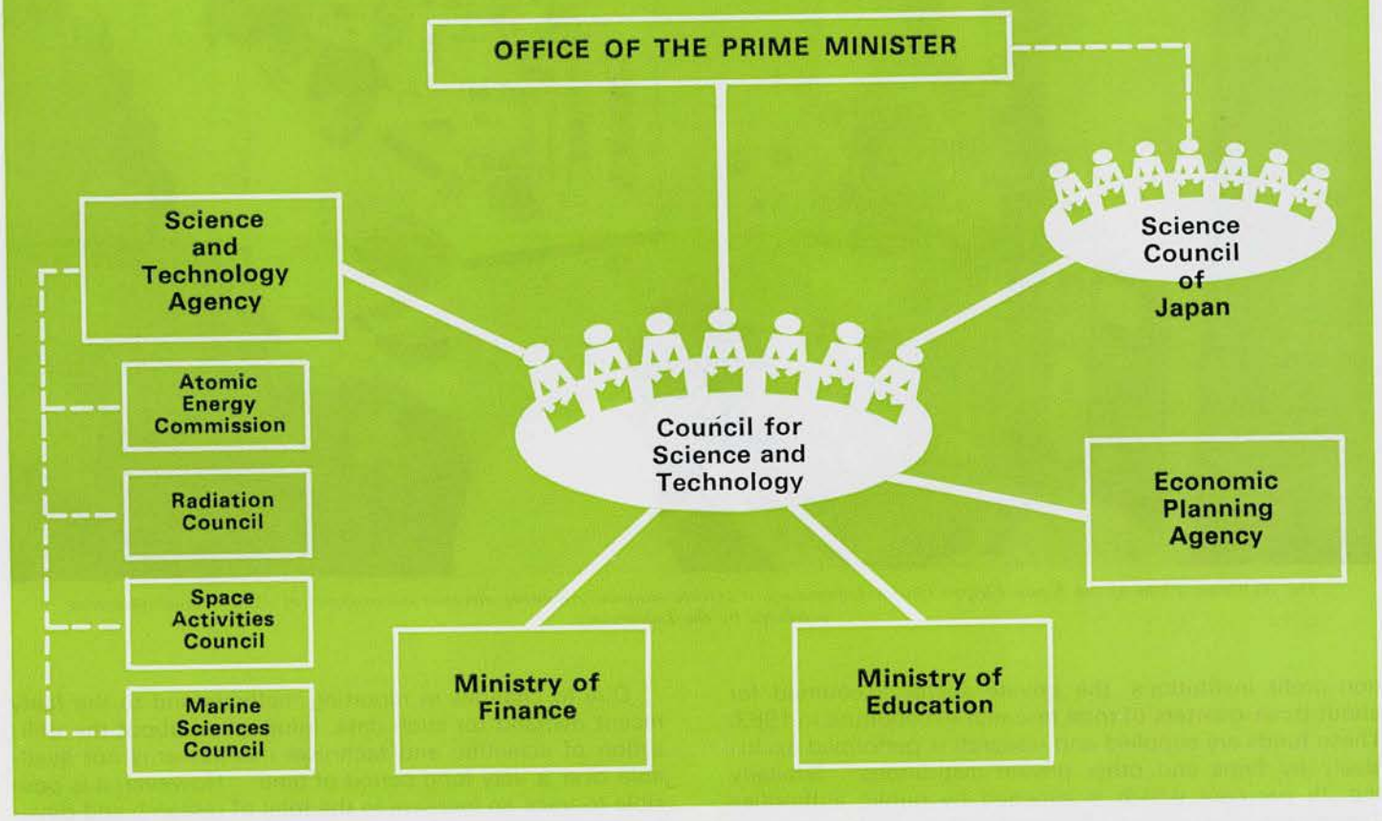
Due to changes in reporting methods and to the fairly recent demand for such data, information about the utilisation of scientific and technical manpower is not available over a very long period of time. However, it is possible to trace an increase in the total of research and development personnel in Japan, from 253,000 in 1960 to 289,000 in 1964. This increase (14 per cent) is less remarkable than that of qualified scientists and engineers, whose number rose by 40 per cent in the same period, from 82 thousand to nearly 115 thousand.

	R and D Personnel / 1,000 Population (1962)	Qualified Scientists and Engineers / 1,000 Population (1962)
United States	6.2	2.4
United Kingdom	4.0	1.1
Netherlands	2.8	1.1
West Germany	2.6	0.7
Japan	2.5	0.9
France	2.4	0.6
Belgium	2.3	0.9

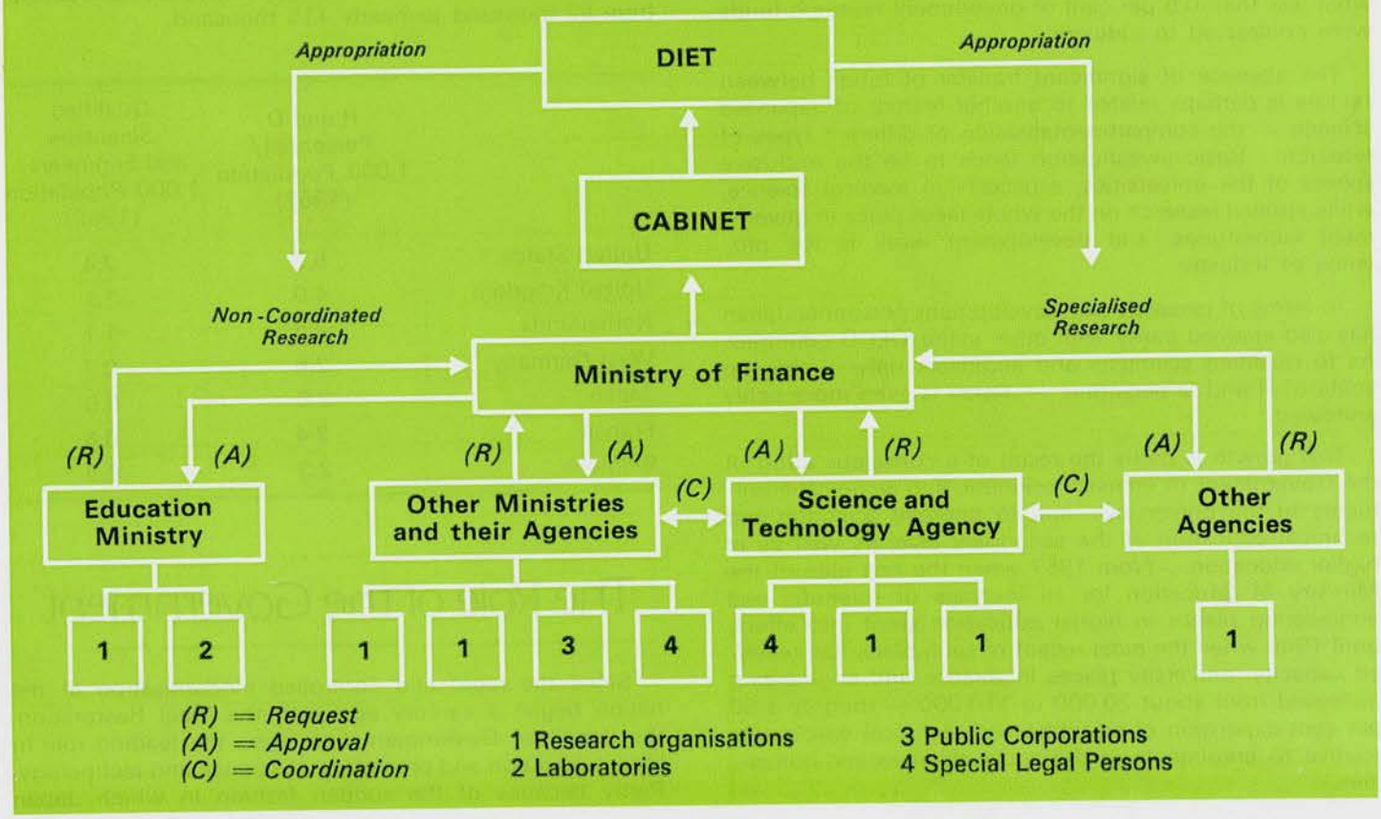
The Role of the Government

Since the rapid and controlled modernisation of the nation began a century ago with the Meiji Restoration, the Japanese Government has taken the leading role in the introduction and promotion of science and technology. Partly because of the sudden fashion in which Japan

ADVISORY-ADMINISTRATIVE SYSTEM



SYSTEM OF BUDGETARY CONTROL



Children are shown some of the wonders of the Science Museum of the Japan Science and Technology Promotion Foundation.

— after two and a half centuries of isolation — was thrust into the contemporary world, the nation had a recognisable science policy from the beginning of this era, principally with respect to the development of manpower.

The role of Government has, of course, varied with time and circumstances — for example, in the establishment of national industries which were turned over to private enterprise, later nationalised, and after the Second World War again de-nationalised. Yet whatever the particular events at a given time, it remains true that Government has been the principal sponsor of science and often the principal advocate of innovation. For this reason, the arrangements within and around the Government for scientific advice and for the performance of various research and development activities are extremely important. (They are, at the same time, complex to the outside observer since they appear to confuse private with public responsibilities.)

Basically, two types of governmental body have been created to deal specifically with science policy — advisory organs on the one hand and administrative bodies on the other. The advisory system, through which the Japanese scientific community makes available to the Government its advice and recommendations on scientific and technical matters, is in most respects comparable to that of the United States, the United Kingdom, and several European countries. However, there are two distinct bodies in Japan on which the Prime Minister may call for opinions and recommendations and which are empowered to offer advice on their own initiative. The first is the Science Council of Japan, established in 1949, which is composed of 210 members elected from among all qualified researchers in the natural *and* humanistic sciences; the second is the Council for Science and Technology (STC) which was established at Cabinet level in 1959, when similar events were taking place in France, Germany and the United States. This body has 11 members approved by the Diet and drawn from the top levels of Government (five are members of the Cabinet), the scientific community (one member must be the president of the Science Council of Japan) and other groups. Its function is to study and issue reports on such matters as global trends in research expenditure and manpower, the nature and objectives of government research activities and long-term planning. Because of their very different composition and procedures, the two councils often concentrate on quite different matters, but on problems such as funds for basic science and the training of researchers, which are of general national significance, they sometimes find themselves in conflict.

The administration of research carried out under government auspices is widely dispersed among ministries, agencies, and chartered corporations which have a special semi-public status. Since 1956, co-ordination of these diverse bodies has been entrusted to a Science and Technology Agency (STA) which, in addition, has almost exclusive authority to fund research and development in the field of atomic energy and to finance travel abroad of government researchers. It also has a small but growing emergency allocation to undertake inter-ministerial projects arising out of unforeseen events. Examples are the recent intrusion of a cold water mass into the *Kuroshio* or "gulf stream", which gives Japan its temperate climate and rich fishery resources, and unusually heavy snowfalls in northern Japan.

The Tools of Policy

Creation of the STA coincided with utilisation of one of the principal policy tools available to governments in implementing a science policy — the research budget, which groups together all government research and development expenditures. In Japan, as elsewhere, this sum has been increasing rapidly in recent years, from 22 billion yen in 1955 to 109 billion yen in 1964 — or at a rate of about 14 per cent a year. Almost half of

these funds are accounted for by the Ministry of Education and are spent mainly for research and development in the national universities. The remaining funds are divided among the various ministries and other agencies, but are co-ordinated by the STA which is empowered to consult with other agencies and ministries about their research budgets. It does so before submission of individual estimates to the Ministry of Finance, and also gives a comprehensive opinion on the Government's entire allocation for research and development afterwards. While the power to "co-ordinate" is less decisive than the power to spend, it is nevertheless a powerful force for rationalisation of the Government's entire research and development budget.

The fact that the STA's co-ordinating role does not extend to the Ministry of Education funds means that research in the national universities is only indirectly co-ordinated with other government research. Most government officials are agreed that there should be some better method of monitoring, and when possible utilising, the output of new knowledge. Legislation now being considered by the national Diet and organisational reforms being pondered by the administration would change this situation.

The second principal tool of science policy in OECD nations is research planning. This matter, which in many other industrial Member nations is still at the stage of private discussion, has actually been incorporated into the public administration in Japan, where to a great extent scientific planning is integrated into economic planning.

"Indicative" economic planning in Japan was born shortly after the war, and has been progressively refined in the following two decades. The plan of 1960 which projected a rate of economic growth over the decade 1960-1970 sufficient to double the national income was based on a series of studies of underlying tranformations in fields such as energy, agriculture, education, and research for the twenty-year period to 1980. While this plan has been subsequently revised to some extent, it continues to provide the basic structure for thinking about the growth and transformation of the Japanese economy and consequent developments in the society at large.

A ten-year plan for research was published by the advisory STC almost simultaneously with the appearance of the Double Income Plan of 1960. The major goals of the research plan were co-ordinated with those of the economic plan. Both endorsed an increase in total research expenditure from about 1 per cent to 2 per cent of national income by 1970 (1), and both proposed increased training of scientific and technical personnel to meet anticipated shortages of 70,000 scientists and engineers and 440,000 technically trained secondary graduates in 1970. The research plan spelled out in considerably greater detail other steps necessary to strengthen research at all levels, such as attention to the problem of scientific and technical information, improvement of the Government's administrative system, and development of tax and other fiscal measures in support of industrial research. Perhaps the most significant points are the co-ordination of basic objectives, and the fact that science and technology gained an important place in a national economic plan.

(1) A recent report of the Council for Science and Technology has raised this goal to 2.5 per cent.

Government-Sponsored Research

Two of the most comprehensive, well funded and highly organised forms of research are atomic energy and space. Atomic energy research has flourished despite the absence of any form of military nuclear research (the Constitution prohibits the maintenance of military forces other than for self defence) mainly as a result of a government-led effort to promote the research and applications necessary to keep Japan abreast of developments in peaceful nuclear technology. Space research has also reached an extremely sophisticated level (it is likely that Japan will become the fourth nation to orbit a satellite, sometime in 1968) as a result of the research activities and organisational efforts of a group of scientists and engineers at Tokyo University's Institute of Space and Aeronautical Research.

Other government research activity is distributed widely among twelve ministries (almost all of which perform some research), four agencies (including the STA), and a number of so-called chartered corporations. More than seventy research laboratories perform a broad spectrum of research tasks, much of which is routine but vital scientific work on industrial standards, transportation and communications, health, safety, and other matters within the province of government. In some of these laboratories — notably those of the Agency for Industrial Science and Technology, the Ministry of Health and Welfare, and the Science and Technology Agency — programmes have been established, especially in electronics and aircraft, to provide direct support for industries which the Government wishes to strengthen to meet international competition. In other areas the Government has acted to meet a serious national need through co-operative programmes of research in several government laboratories, relying on the support, co-ordination, and often participa-

JOINT RESEARCH INSTITUTES AT UNIVERSITIES

University	Institute
Tokyo	1. Cosmic Ray Laboratory 2. Institute for Nuclear Study 3. Institute for Solid State Physics 4. Ocean Research Institute 5. Institute of Space and Aeronautical Science
Nagoya	Institute of Plasma Physics
Kyoto	1. Research Institute for Fundamental Physics 2. Research Institute for Mathematical Science 3. Institute of Reactor Research
Osaka	Institute for Protein Research

tion of the STA. Such programmes include research in marine science and technology, air and water pollution, urban development, ergonomics, and cancer. Some of these activities have been initiated with allocations from the STA's emergency fund and then incorporated into the regular annual appropriations of two or more ministries or agencies.

The chartered corporations are organisations which have been set up with government funds, but whose legal status is not that of a government agency. They have considerable flexibility in their personnel policies and in private contractual arrangements, without the requirement that they balance their books or show a profit on their operations. Three of these corporations are found in the atomic energy field : the Japan Atomic Energy Research Institute (the Government's principal organisation for atomic research) ; the Nuclear Ship Development Corporation ; and the Nuclear Fuel Corporation, which buys, processes, and re-processes the fuel used in private and public nuclear installations.

Chartered corporations have been established in other fields as well and support a diversified national research and development effort. The Japan Information Centre for Science and Technology, for example, is, as its name implies, a central clearing house for information, mainly that which originates abroad. It publishes several series of abstracts and provides other types of service to the entire scientific and technical community. A very different organisation — but one which has the same legal form — is the Institute of Physical and Chemical Research. It had a distinguished pre-war history (it was there that Shinichiro Tomonaga did some of the work for which he received the Nobel Prize in 1965), but for various reasons was in decline after the war. It was reconstituted in 1958 with the object of providing, within government, a centre of fundamental research activity ; at the same time one section was made responsible for seeking applications for promising research ideas. This work was expanded and given substantial new funds by a chartered corporation having yet another type of function, the Research Development Corporation which was established in 1961 to act as a middleman between individual researchers or laboratories, which have ideas but lack commercial contacts, and firms, which are seeking development work but lack risk capital.

Research performed by the laboratories of ministries and by chartered corporations is generally project-oriented ; research in the national, public, and private universities, which grows out of the teaching and research interests of staff members, is predominantly discipline-oriented. Since it was felt that this division of labour allows only with difficulty for the introduction of research on new or inter-disciplinary subjects, the Ministry of Education, in co-operation with the Science Council of Japan, has established research institutes which are physically located at particular national universities but are administratively independent. Many of the recently established institutes are so-called "joint" research institutes designed to answer the need for concentration of personnel, equipment and overhead expenditure above a " threshold " level. Such institutes have been set up for ocean science, for the study of the atomic nucleus, for space and aeronautical science, for protein research and in several other fields. They are open to researchers of all universities, and function as national centres for advanced research in their fields.

Science Policy Issues

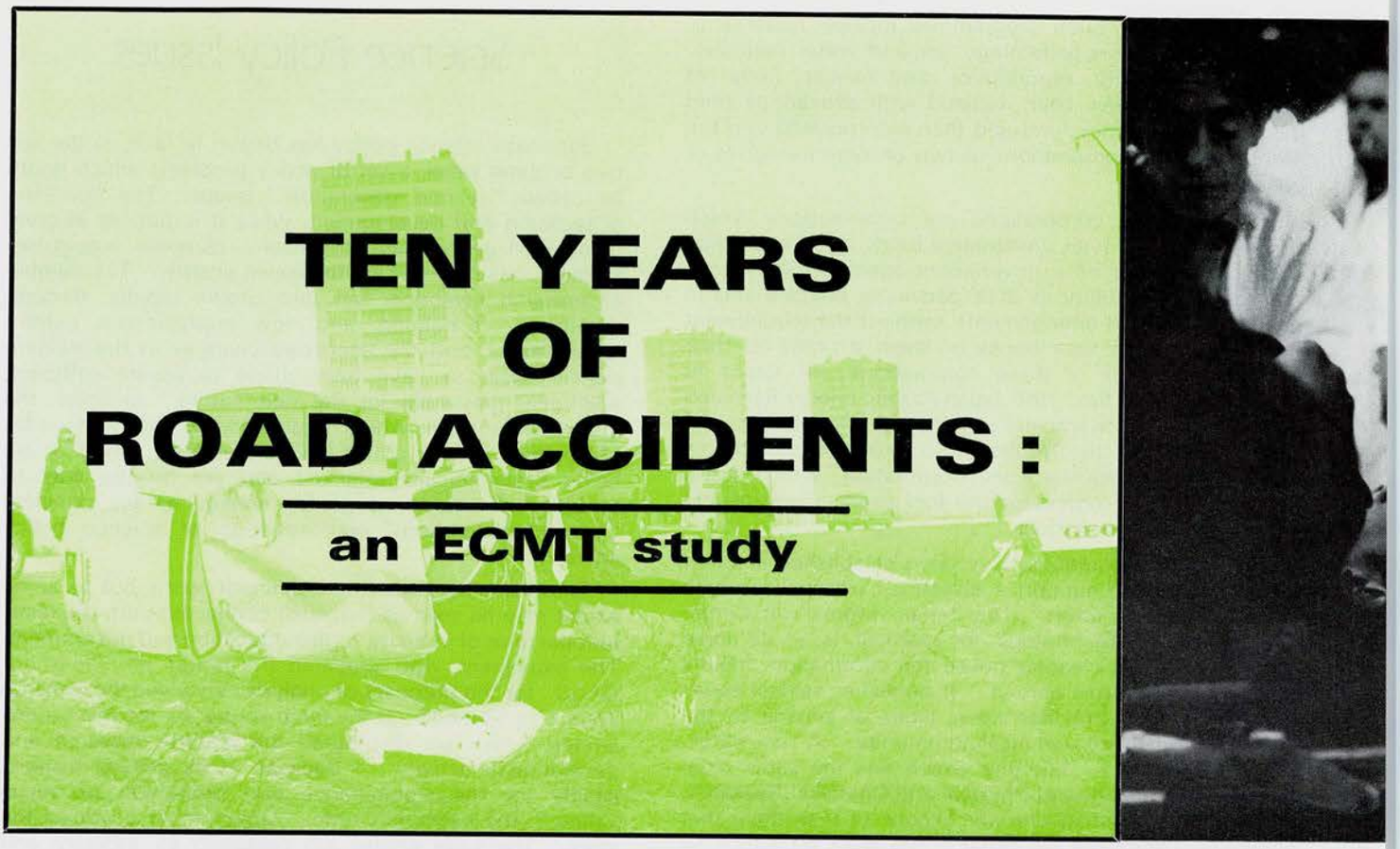
Japanese science policy has begun to face, in the last two or three years, a set of policy problems which might be called " second generation " issues. The financing of research and development, while it is not yet as great or as well-defined as government planners would like to see it, has nevertheless increased greatly. The number of research personnel has also grown rapidly, through training or re-training, and now approximates current requirements, and the necessary changes in the training system seem to have been made to assure sufficient additional personnel for the near future. In short, the quantitive problems which dominated the first two decades of postwar science policy have either been solved or are being systematically attacked and are on the way to solution. Problems of quality emerge as the principal " second generation " preoccupation of science policy advisors.

These quality issues take different forms but to some extent may be seen as problems connected with the institutional roles of industry, higher education and government. The examiners, who prepared the report on Japan for OECD ; for the purposes of analysis conceived the research system as a triangle : at the three angles are the institutions among which are distributed the nation's research and development activity : " Because of its general responsibility for the maintenance and promotion of social values ", the examiners note, " Government occupies the apex. The base angles are occupied by industry and the universities, which form the foundation of the research structure through production of material goods and cultivation of human talent. The base and sides of this triangle are conceived as channels through which ideas, funds, and personnel flow in both directions. This flow is the life-blood of the system : without it, the concept is only geometry. "

In concluding their report, the examiners noted that this concept has still to be fully articulated : " Up to now, Japanese policy-makers have been more concerned with effective utilisation of resources within institutions, since a willingness to transfer resources is partly a consequence of higher levels of expenditure. But in the next decade there will be a need and an opportunity for experiment with such transfers, beyond the present limited level.

" Not only funds, but ideas and people must move freely and flexibly, to and from the universities, Government, and industry. This form of movement depends not so much on increased levels of expenditure as on continuous and progressive re-thinking of the research needs of the nation. It requires new arrangements to promote consultation between various parties and the movement of resources of all kinds to the points of greatest need as they shift over time.

" Government has a large, but not exclusive responsibility for the progress of the research system. In the last analysis, industry will probably continue to be the leading spender for research and development and the leading employer of research personnel. Stimulating the kinds of co-ordination and mobility of which the system is inherently capable is, however, the appropriate area for government initiative. We are confident that policy leadership will, as in the past, be forthcoming. "



TEN YEARS OF ROAD ACCIDENTS :

an ECMT study

The European Conference of Ministers of Transport (ECMT) whose object, inter alia, is to improve the utilisation and rationalise the development of internal European transport could hardly fail, in the face of so acute a problem, to consider ways of making the roads as safe as possible.

The countries represented in the Conference — the European OECD Member countries, except for Iceland and with Yugoslavia — are to this end attempting to define forms of concerted action. They deemed it essential to assess the extent of the problems to be solved and also to investigate the effectiveness of the measures taken. Thus the ECMT has taken care to keep a careful check on road accident trends and has decided to draw up a report on this subject every other year.

A preliminary study has been completed : in a great number of statistical tables, some of which are published hereafter, it sets out the data available of the period 1955 to

INDICES OF THE NUMBER OF CASUALTIES AND MOTOR VEHICLES TRENDS FROM 1955 TO 1964 (1955 = 100)

Countries	Deaths	Total casualties	Motor vehicles	Total casualties per 1,000 motor vehicles
Austria (1)	133	123	261	47
Belgium	163	195	199	98
Denmark	148	140	223 (2)	63
France	138	149	226	66
Germany	130	123	200	61
Ireland	121	94	183	52
Italy	166	207	255	81
Luxembourg (3)	178	134	180	75
Netherlands	153	173	277	62
Norway	181	168	277	60
Portugal	176	167	226 (2)	74
Sweden	132	137	180 (2)	76
Switzerland	139	116	255	45
Turkey	203	159	201 (2)	79
United Kingdom	142	144	196	74
Yugoslavia	263	495 (4)	••	••

(1) The statistical basis was changed in 1961. On the previous basis the casualty figures would be higher.
(2) Excludes motor-assisted bicycles.
(3) The index figure for Luxembourg for any given year should be interpreted with caution. The absolute figures for deaths and casualties on which the index is based are extremely small and small changes in these figures can therefore produce large changes in the index. The actual number of deaths in 1964 rose to 103.
(4) Killed and seriously injured only.
•• Not available.

CASUALTIES FOR MOTOR CYCLE AND SCOOTER USERS TRENDS FROM 1955 TO 1964

Countries	Motor cycle and scooter casualties				
	% increase or decrease from 1955 to 1964	% of total casualties		per 1 000 vehicles of this type	
		1955	1964	1955	1964
Austria	••	••	13	••	35
Belgium	— 28	27	10	62	59
Denmark	— 25	25	13	36	35
France (1)	— 11	39	29	24	16
Germany	— 70	35	9	53	43
Ireland (1)	25	13	17	33	17
Italy	33	42	26	••	19
Luxembourg (1)	— 42	28	12	30	14
Netherlands	— 14	16	8	38	32
Norway	••	••	11	••	14
Portugal	••	••	16	••	10
Spain	••	••	30	••	17
Sweden	— 67	19	5	13	14
Switzerland	— 37	32	18	59	55
Turkey	45	3	2	••	18
United Kingdom	40	23	22	59	63
Yugoslavia	— (2)	7 (3)	17 (3)	••	••

(1) Includes casualties to users of mopeds, motor cycles and scooters. Casualties per 1 000 vehicles of this type total 29 in France and 17 in Luxembourg, in 1964.
(2) Actual casualties in 1964 were 1,750 and in 1955 were 154. The percentage increase in this case is not a meaningful index.
(3) Killed and seriously injured only. •• Not available.

CASUALTIES FOR MOTOR-ASSISTED BICYCLE USERS TRENDS FROM 1955 TO 1964

Countries	Casualty to users of motor assisted bicycles				
	% increase from 1955 to 1964	% of total casualties		per 1,000 motor-assisted bicycles	
		1955	1964	1955	1964
Austria	••	••	20	••	26
Belgium	584	5	16	17	38
Denmark	48	12	13	••	8
France	215	12	25	••	15
Germany	9	8	7	32	25
Italy	293	4	8	••	14
Luxembourg	••	••	7	••	12
Netherlands	230	19	36	13	15
Norway	••	••	7	••	5
Sweden	66	8	10	••	••
Switzerland	166	4	9	18	8
United Kingdom	113	1	2	15	14
Yugoslavia	— (1)	— (2)	9 (2)	••	••

(1) Actual casualties in 1964 were 956, and in 1955 were 6. The percentage in this case is not a meaningful index.
(2) Killed and seriously injured only.
•• Not available.

1964. During this period, all ECMT countries able to supply figures report an increase in the number of deaths caused by road accidents; with the exception of Ireland, they also report increases in the total number of injuries and fatal accidents. The increase is never below 21 per cent for the number of deaths and 16 per cent for the total number of casualties, except for a decrease in this last category in Ireland, to a total of 6 per cent.

During the same period, the number of motor vehicles on the road rose more sharply than the number of casualties. Thus except in rare cases, the proportion of deaths and the proportion of the total number of casualties per 1,000 vehicles showed an appreciable reduction. The reduction varies considerably from one country to another but is sometimes as high as 55 per cent. A more meaningful comparison could be made between the number of road victims and the density of automobile traffic expressed in vehicle-miles (kilometres), but only France and the United Kingdom have complete indices for vehicle-miles covering the period under consideration for all classes of vehicle. Existing indices show that the number of vehicle miles increased rather less quickly than that of the number of registered vehicles.

Figures showing the proportion of victims to the various classes of vehicle also vary considerably from one country to the next. It is however clear that :

(continued on page 40)

CASUALTIES TO USERS OF OTHER MOTOR VEHICLES (PRIVATE CARS, GOODS VEHICLES, ETC.) TRENDS FROM 1955 TO 1964

Countries	Casualties to users				
	% increase from 1955 to 1964	% of total casualties		per 1 000 vehicles of this type	
		1955	1964	1955	1964
Austria	173	22	42	31	26
Belgium	182	34	49	28	36
Denmark	220	17	42	9	11
France	173	27	50	12	13
Germany	255	19	56	25	25
Italy	398	17	40	15	18
Luxembourg	101	47	70	29	25
Netherlands	183	16	25	14	12
Norway	144	34	49	8	7
Portugal	••	••	26	••	15
Spain	••	••	39	••	24
Sweden	121	39	64	8	8
Switzerland	131	22	44	19	15
Turkey	68	55	58	••	50
United Kingdom	100	33	46	18	18
Yugoslavia (1)	231	44	29	••	13

(1) Killed and seriously injured only. •• *Not available.*

- the casualty rate for users of motorcycles and scooters is considerably higher than for other classes of vehicle;
- by and large in most countries users of motor-assisted bicycles and "other motor vehicles", i.e. private cars, goods vehicles, etc., have broadly similar casualty rates per 1,000 vehicles.

PEDESTRIAN AND PEDAL CYCLIST CASUALTIES TRENDS FROM 1955 TO 1964

Countries	Casualties to Pedestrians			Casualties to Pedal-cyclists		
	% change from 1955 to 1964	% of all casualties		% change from 1955 to 1964	% of all casualties	
		1955	1964		1955	1964
Austria	+ 16	18	17	+ 46	19	8
Belgium	+ 36	15	11	+ 48	18	13
Denmark	+ 39	15	15	+ 22	29	16
France	+ 40	16	19	— 37	16	7
Germany	+ 8	20	17	— 24	17	10
Greece	••	••	31	••	••	••
Ireland	— 15	27	24	— 53	24	12
Italy	+ 69	21	17	— 24	13	8
Luxembourg	+ 8	16	13	— 32	9	5
Netherlands	+ 23	19	13	— 1	30	17
Norway	+ 35	28	22	— 15	19	10
Portugal	+ 44	51	43	+ 11 (1)	17 (1)	11 (1)
Spain	••	••	23	••	••	5
Sweden	+ 19	16	14	— 35	17	8
Switzerland	+ 14	19	19	— 48	19	10
Turkey	+ 65	35	36	+ 37	2 (1)	2 (1)
United Kingdom	+ 26	24	21	— 28	20	10
Yugoslavia (2)	+ 332	34	30	+ 404	14	14

(1) Includes users of motor-assisted bicycles. (2) Killed and seriously injured only. •• *Not available.*

It follows that the annual casualty rates of users of motor vehicles tend to fall as persons switch from motor cycles and scooters to cars or mopeds.

Enquiries have also been made as to the share, in the general accident trend, of accidents concerning the various types of road users. It emerged among other things that the proportion of pedestrian and pedal cy-

PERSONS

Country / Year	Austria	Belgium	Denmark
PERSONS KILLED (1)			
1955	1 485	(4) 828	605
1956	1 618	902	617
1957	1 984	925	645
1958	1 814	1 097	620
1959	2 041	906	770
1960	1 918	1 097	735
1961	1 640 (3)	1 079	841
1962	1 622	1 127	810
1963	1 811	1 207	808
1964	1 975	1 351	893
KILLED AND INJURED			
1955	51 100	51 200	17 800
1956	55 900	54 900	17 600
1957	61 300	63 700	19 000
1958	62 800	69 700	18 400
1959	67 600	71 600	20 000
1960	67 100	79 300	21 000
1961	58 100 (3)	85 600	22 500
1962	57 200	85 400	23 000
1963	59 800	87 200	22 300
1964	62 800	99 900	24 900
THOUSANDS OF MOTOR VEHICLES OF ALL KIN			
1955	655	995 (5)	(6) 449
1956	823	1 114	486
1957	949	••	524
1958	1 080	1 351	563
1959	1 200	••	623
1960	1 311	1 565	694
1961	1 421	••	772
1962	1 523	1 761	863
1963	1 620	••	927
1964	1 710	1 983	1 002

(1) Except where otherwise specified : death within 30 days of accident. (2) For 1955 and 1956, the figures do not include Saarland. (3) Basis of statistics changed in 1961. (4) Death at the scene of the accident. (5) Number of vehicules available

clist casualties, compared with the number of vehicles, has substantially decreased. Yet generally speaking the casualty rate for private cars and goods vehicules did not change and no improvement was recorded.

The reduction in the rate of injury accidents may be partially explained by various safety measures, including speed limits, for example. Sweden feels that the temporary speed limits imposed outside built-up areas reduce the number of casualties by some 20 per cent. In Germany also, the imposition in 1957 of speed limits in towns helped to reduce by 5 points the index of the proportion of fatal accidents recorded between 1957 and 1958 in built-up areas, whereas in non-built-up areas the indices rose by 10 points for casualties as a whole and by 5 points for road deaths.

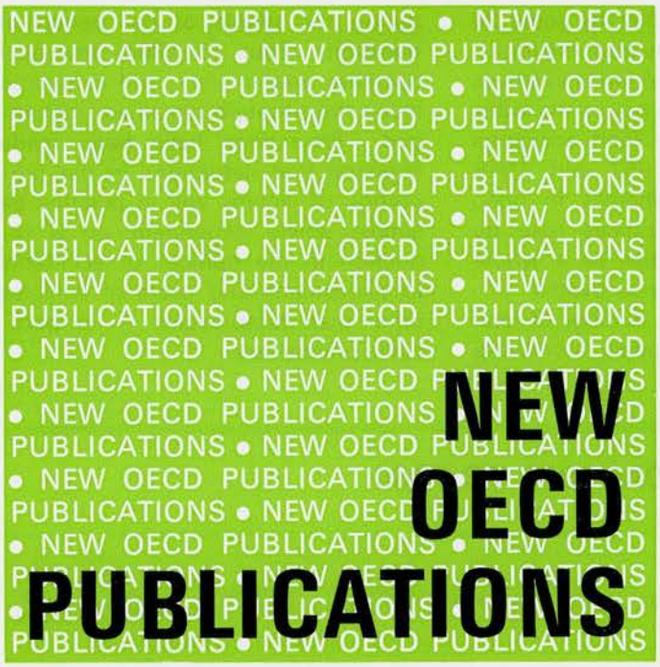
On the whole, the number of fatal accidents never stopped increasing during the whole of the period in question. Thus in 1964, the only decrease was in Italy, and in Ireland alone the situation remained unchanged. Projections have been made showing that reductions in the proportion of victims will in practice be almost solely dependent on a reduction in the number of accidents to pedestrians and users of vehicles other than motorcycles — in particular, private cars.

KILLED AND TOTAL CASUALTIES, TRENDS FROM 1955 TO 1964

France	Germany	Ireland	Italy	Luxem-bourg	Nether-lands	Norway	Portugal	Spain	Sweden	Switzer-land	Turkey	United Kingdom	Yugo-slavia
(7)			(8)										
8 058	12 651 (2)	282	5 752	58	1 552	213	496	••	902	992	1 247	5 526	556
8 283	13 220 (2)	323	6 746	91	1 628	289	506	••	889	1 011	1 083	5 367	495
8 517	13 004	••	6 936	88	1 701	294	497	••	946	1 127	1 329	5 550	738
8 126	12 169	297	7 137	79	1 926	269	548	••	1 036	1 269	1 552	6 970	783
8 409	13 822	306	7 160	74	1 718	306	584	••	1 000	1 066	1 301	6 520	995
8 295	14 406	302	8 197	79	1 926	310	634	1 760	1 036	1 269	1 552	6 970	1 044
9 140	14 543	332	8 987	77	1 997	365	718	1 808	1 083	1 381	1 822	6 908	1 204
9 928	14 445	339	9 683	85	2 082	351	786	1 998	1 123	1 370	2 123	6 709	1 122
10 027	14 513	335	9 839	94	2 007	371	774	2 230	1 121	1 310	2 422	6 922	1 168
11 105	16 494	341	9 558	103	2 375	385	874	2 488	1 189	1 382	2 526	7 820	1 461
													(9)
184 400	377 500	5 500	117 300	2 000	35 600	5 000	11 700	••	19 000	28 700	9 900	267 900	2 100
188 900	389 600	5 300	143 300	2 100	38 300	5 200	12 600	••	20 100	29 100	8 500	268 000	2 300
192 300	389 100	••	155 300	2 000	41 200	5 200	13 300	••	20 900	30 600	9 500	273 900	3 700
184 200	384 700	4 700	160 800	2 000	41 400	5 700	13 400	••	21 800	31 100	7 800	299 800	4 600
187 200	433 600	4 800	175 000	2 200	45 200	6 200	14 100	••	22 500	32 000	8 900	333 500	5 700
193 300	469 400	5 800	209 500	2 200	50 300	6 500	14 400	43 400	22 600	35 700	9 500	347 600	6 100
222 700	462 500	5 400	227 900	2 500	52 200	7 200	17 100	48 800	24 000	37 700	12 100	349 800	7 300
239 300	442 900	5 500	234 100	2 600	52 600	7 400	17 200	48 700	23 600	37 200	13 900	341 700	7 300
251 000	438 800	4 800	240 600	2 600	53 100	8 000	18 100	43 600	23 500	32 600	14 400	356 200	8 200
275 200	462 700	5 200	242 500	2 700	61 600	8 400	19 600	59 000	26 000	33 200	15 800	385 500	10 300
)S													
							(6)		(6)		(6)		
7 024	6 301	227	3 903	52	1 042	279	156	368	1 180	544	124	6 044	••
7 805	7 277	243	4 223	57	1 274	309	173	450	1 266	607	137	6 540	••
9 340	8 043	253	4 846	63	1 475	362	188	539	1 390	668	137	7 027	••
10 464	8 688	263	5 254	69	1 670	411	206	702	1 484	726	143	7 490	••
11 706	9 318	278	5 736	71	1 817	463	224	849	1 584	792	154	8 175	••
12 349	10 217	303	6 378	75	2 014	526	238	1 005	1 675	865	173	8 941	••
12 839	10 940	327	7 018	82	2 244	600	254	1 223	1 778	983	190	9 455	229
13 668	11 356	355	7 786	86	2 462	662	276	1 464	1 892	1 127	211	10 052	251
14 665	12 015	382	8 993	90	2 678	713	327	1 707	2 019	1 257	221	10 919	278
15 850	12 583	415	9 958	98	2 889	771	352	1 985	2 122	1 389	249	11 831	318

for alternate (even) years 1955 estimated from $\frac{1954 + 1956}{2}$.

(6) Excludes mopeds. (7) Death within three days of the accident. (8) From 1955 to 1963, death at the scene of the accident or during transport to hospital. For 1964, death within seven days of the accident. (9) Killed and seriously injured only. •• *Not available.* — *Nil or negligible.*



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