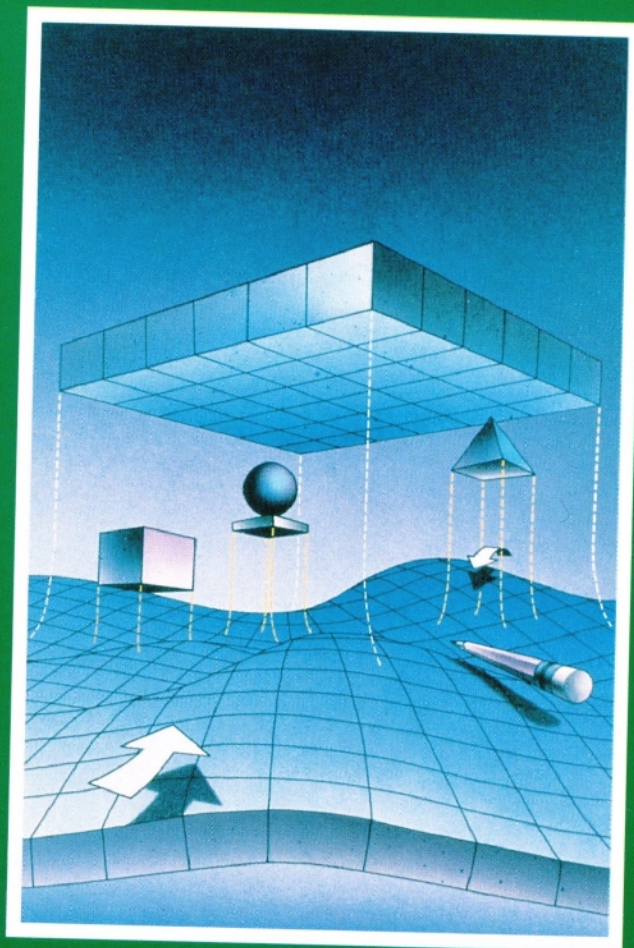


# 1991 ANNUAL REPORT



Statistisk Sentralbyrå



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RESEARCH DEPARTMENT  
THE CENTRAL BUREAU OF STATISTICS, NORWAY



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RESEARCH DEPARTMENT

THE CENTRAL BUREAU OF STATISTICS, NORWAY





One of the lesser world events of 1991 was that the Central Bureau of Statistics underwent a major reorganization. It is worth recording in this Annual Report, however, for the following reasons: The Research Department parted with the National Accounting Unit which has been an integral part since the Department was born. The importance of the close relation between the national accounts and the macroeconomic modelling as it developed from the late 1950s can hardly be overestimated. Also demography, environmental statistics and natural resource accounts were moved out of the Department after having resided there since 1983. Furthermore, the reorganization – in addition to the usual window dressing – has yielded the Research Department more self-sufficiency in the control over administrative, economic and computer resources.

Hopefully, this much needed reform will benefit the Department in pursuing its basic aims which include – as earlier – to provide the public with high quality and objective analyses of the state and the functioning of the Norwegian economy. Another aim has been to provide tools – often in the form of computerized models – for government authorities to be used in day-to-day tasks as well as for more occasional investigations within their respective spheres of responsibility. To pursue these aims it is of importance to adapt to the agenda of political relevant issues, as has been reflected e.g. in the Department's recent work related to climate issues, tax reform and unemploy-



ment. To succeed in this endeavor it is necessary to stay aloof from political interest groups and to maintain a high degree of academic integrity and scholarship.

None of these aims and requirements are easy to fulfill. One of the Department's experiences in 1991 was the overly optimistic judgement of the short-term outlook of the Norwegian



economy presented at the beginning of the year. Although partly explainable by the continued recession in the US economy, the misleading forecasts also reflected an insufficient assessment of private savings behaviour in the aftermath of the “atypical” years of the late 1980s. It is cold comfort that few others did any better. The experience is a good reminder that when good forecasts are most needed, they are also most difficult to make! Worth recording is also that last year brought forth public attacks on the objectivity and integrity of the Department’s work and “complaints” to the Ministry of Finance from two prominent interest groups: the Norwegian Bankers’ Association and the Confederation of Norwegian Business and Industry. The latter organization demanded that the Central Bureau of Statistics and its leading employees should refrain from any opinion about how the economic policy should be conducted. The Bankers’ Association’s complaint was more pathetic. Quoting the somewhat critical remarks made about the functioning of the banking system and the credit market over the last five years in the Department’s annual survey of the Norwegian economy, the Association apparently demanded retribution and full documentation of the basis for such remarks. Four months later the Norwegian banking system reached an abysmal state of impending collapse of major banks with government takeover as the outcome. Can macroeconomic models ever proceed to a stage of reliable predictions, even in the short term? The idea of a general model – a universal tool

that can provide answers and analyses to a wide range of questions and issues – has always had an appeal to model builders. Perhaps is this a faint remnant of Laplacian ideas in science. The great French astronomer, Pierre-Simon Laplace, put forward in 1812 his famous conception of a Divine Calculator, who, knowing the velocities and positions of all the particles in the world at a particular instant, could calculate all that would happen in the future. In the words of an authoritative historian of science: “The Divine Calculator was the mathematical physicist writ large, a being who appeared to be outside of the system he was investigating, and who contemplated the world as though it were a play, deducting from the events of the moment the preceding and the consequent action.” Behind some early economic models, in particular of the general equilibrium type, there may have been a similar philosophy with divinity replaced in recent years by computer power. Observation and measurements are of a different nature in physics and economics, but curiously enough, it was becoming apparent about the same time as Laplace propounded the conception of the Divine Calculator that observations depended on the observer as well as on the object observed. Quoting the same historian: “From the seventeenth century on it had been known in astronomy that the observation of the same object by different observers often gave slightly different results. By the end of the eighteenth century it was appreciated that observers as well as instruments had their own errors, and techniques were devised for obtaining

the most accurate measurements by averaging several observations.” The most notable method was, of course, that of least squares developed by Legendre and Gauss around 1810. Most practitioners in the field of using economic models nowadays have little belief in ideals such as that represented by the Divine Calculator, while the more dreary ideal of squeezing data by means of the least squares technique is still common practice. The practitioner in the field of providing government authorities with model based information, often find himself between on the one side critics – often inside voices – who can point out incompleteness, methodological weaknesses, sources of error, and uncertainty in the whole model exercise, and on the other side the eager users who request a picture of the future they can believe in. The situation is well known, and the most devastating critic, with regard to the predictive value of the often large arrays of numbers spewed out by the computer, may often be the practitioner himself. As the philosopher said: “I have pondered upon the futility of it all, but now I can see it is meaningless”. As we continue to do calculations on our models with as much divinity as we have been awarded, we reveal our faith in the worthwhileness of it all.

*Olav Bjerkholt*

**Olav Bjerkholt**  
*Head of Department*  
*Assistant Director General*





**Olav Bjerkholt**  
*Assistant Director General*



**Hanne Finstad**  
*Head of Administration*



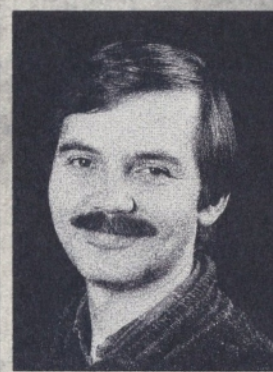
**Bjørn Helge Vatne**  
*Head of Division*



**Olav Ljones**  
*Dir. of Research*



**Torstein A. Bye**  
*Dir. of Research (acting)*



**Ådne Cappelen**  
*Dir. of Research*



**John K. Dagsvik**  
*Dir. of Research*



## ORGANIZATION CHART OF DEPARTMENT

### Research Department

Olav Bjerkholt

### Unit for Administra- tion

Hanne Finstad

### Computing Resources Group

Bjørn Helge Vatne

### Division for Public Eco- nomics

Olav Ljones

### Natural Resources Division

Torstein A.  
Bye

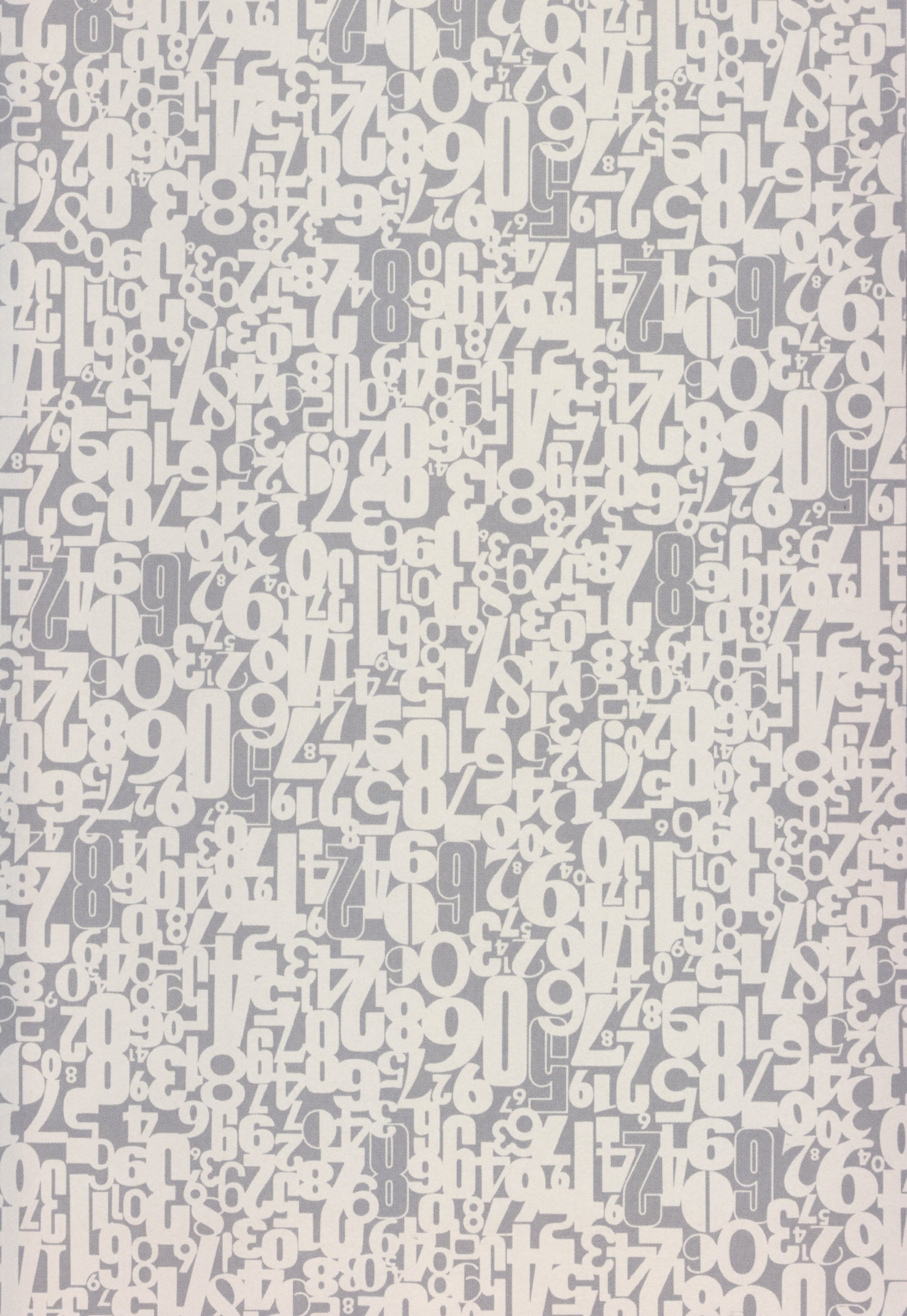
### Macroeco- nomic Division

Ådne  
Cappelen

### Microeconometric Research Division

John K. Dagsvik







### Objectives and main tasks

The research activities of the Central Bureau of Statistics (CBS) have roots far back in the CBS's history, but it was not until 1950 that a separate Research Department was established. In the first decade it was largely characterized by work on national accounts, tax research, analysis of business cycles and other economic research with particular emphasis on utilization of the national accounts data. In the 1960s development of macroeconomic models was established as a comprehensive and central part of the CBS's activities. The scope of research activities in the CBS was further extended by the establishment of the Socio-Demographic Research Group at the end of the 1960s and the Group for Resource Accounts in 1978.

Funding frameworks for research activities have been gradually extended. The growth in budget posts was greatest in the 1970s, while the growth in project activities continued throughout the 1980s. Over the years the CBS has been assigned research and analysis tasks for societal planning purposes that have resulted in research activities more extensive in scope and addressing other issues than at other central statistical institutions. In some important areas the CBS has gained a dominant position among Norwegian institutions doing research in the social sciences.

The orientation of the CBS's research toward producing results and analytical tools of interest to public authori-

ties has made research for societal planning a primary goal of its activities. General access to its results and analytical tools has always been greatly emphasized.

In connection with the reorganization of the CBS in 1990/1991, socio-demographic research, national accounts and resource accounts were moved out of the Department, so that the Research Department's activities were limited to 4 main areas: macroeconomic analysis, resource and environment analysis, public economics and regional development and micro-econometric research. General primary objectives are linked to the activities in each of these central subject areas:

\* Research activity shall be a source of factual knowledge. The task will consist of analyzing and arranging available data on the basis of theoretical understanding, methods for analysis and utilization of a major body of knowledge. The factual knowledge proceeding from this is different in nature from that which can be obtained directly from primary data. The results are formulated partly as overall pictures of societal developments as in contributions to certain public reports, partly as overviews of developments in one area, e.g. overviews of business cycles and environmental overviews, and partly as statements, e.g. on the workings of the Norwegian economy, on the consumer behaviour of certain groups, on pollution conditions and economic activity etc.



\* Research activities shall comprise development of analytical tools for societal development. Utilization of empirical insight to design tools for societal planning, usually in the form of models. It is a prerequisite that this activity be carried out in close contact with user interests and with considerable emphasis on societal planning needs. Signals concerning needs will generally be channelled through research council programmes and direct contact with ministries. Analytical tools will often involve substantial operational commitments. In order to avoid an accumulation of operational tasks in the Research Department continual attempts must be made to make operation of existing models more efficient, at the same time as there should be ongoing assessment of society's need and willingness to pay for continued operation.





\* Research activities shall exploit the source material of the Central Bureau of Statistics. Researchers in the Central Bureau of Statistics have a unique position close to the sources of data. The Statistics Act clearly stipulates that this shall not be utilized to monopolize access to data in any way. This closeness, however, provides special opportunities for exploitation of the data expertise in the Central Bureau of Statistics, for special organization of data material and link-ups with other sources and for influencing methods of collection. This applies particularly to primary data collected by the CBS. Feedback effects on statistics are an important reason for this objective, but it is also of obvious importance to fulfilment of the other goals above.

\* Research activities shall include development of a high degree of scientific expertise in those fields where the Central Bureau of Statistics' research takes place. Adequate expertise is an obvious and necessary prerequisite for successfully performing the research tasks mentioned above. The reason this is formulated as a separate objective is firstly to emphasize that the level of ambition in academic terms is high. Activities shall give results that can be utilized in Norwegian society at the same time as emphasis is placed on documenting that high scientific standards in the analyses are maintained. In this connection emphasis will be placed on maintaining good contact with relevant foreign research institutes and educational institutions.

Secondly, development of expertise demands considerable resources. The PhD programme in social science at the University of Oslo will be a main source of competence enhancement, and the aim is to exploit this in close collaboration with the University.

## Organization of the Department

The Research Department is organized in 4 divisions each led by a research director as head of division. The Head of the Department is also Assistant Director General of the CBS. The divisions are organized somewhat differently internally, depending on work areas and tasks. Most of them are organized around 3–4 ongoing projects. See also the description of the individual divisions.

## The Research Department's divisions are:

1. The Division for Public Economics (SPA)
2. The Natural Resources Division (SRM)
3. The Macroeconomic Division (ØKA)
4. The Microeconomic Division (GØK)

In connection with decentralization of the tasks pertaining to administration, publication and EDP, two groups directly linked to the Assistant Director General have been established:

- The Unit for Administration (GAF)
- The Computing Resources Group (GEM)



## Personnel

Division/ Group	Govt. project	Project- financed	Total
Management	1	-	1
Unit for Administration	6.5	2	8.5
Computing Resources Group	5	3	8
Division for Public Economics	10	8	18
Natural Resources Division	10	11	21
Macroeconomic Division	15	10	25
Microeconomic Division	6	3	9
Research Department	53.5	37	90.5

There are 70 academics in the Department, 8 of whom have PhDs.

### Distribution according to education:

Cand. oecon.:	47 persons
Cand. real./scient.:	12 persons
Cand. polit.	3 persons
Siv.ing.:	1 person
Cand. mag.:	5 persons
Foreign:	2 persons

### Financing

The Research Department had a salaries and operating budget (excluding joint expenses covered centrally) of approximately Nkr 35 million in 1991. Of this Nkr 16 million was financed by revenues from external projects. The bulk of project revenues comes from major long-term (several years) projects linked to the research councils. Another important part of project revenues comes from the ministries, primarily the Ministry of Finance, Ministry of the Environment, Ministry of Labour and Government Administration and Ministry of Petroleum and Energy. Approximately 70 per cent of costs are salaries.

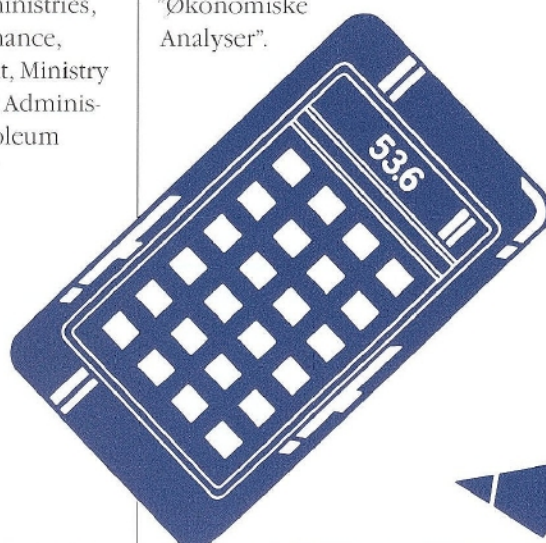
### Publishing

Research results are reported and published in the following series from the CBS:

Social and Economic Studies (SØS)  
Reports (RAPP)  
Discussion Papers (DP)  
Reprint Series (REPRINT)  
Interne notater (Internal Notes)

In addition the Research Department publishes "Økonomiske Analyser" (Economic Surveys), 9 issues per year. The first issue of each year, "Økonomisk Utsyn" (Economic Survey), presents an economic review of the past year. Other issues contain economic surveys both of Norwegian and international economic developments, quarterly and annual Norwegian national accounts figures with comments, and short articles presenting findings from ongoing research projects.

"Economic Survey" with 4 issues a year is an English language version of "Økonomiske Analyser".





### Objectives

The objectives of the Division are to carry out analyses and develop economic models within the following fields:

- Taxes and transfers
- Public expenditures and municipal economy
- Distribution of income
- Labour market and education
- Regional economic development

The goal is to develop models and analyses with a firm empirical basis in the Bureau's data. Models and analyses will be largely based on microdata and micro-simulation, but also with links with macro-models. Analyses and models will often be based on data concerning populations and individuals linked to demographic analysis.



### Activities in 1991

#### Ongoing commitments

The Division has ongoing commitments in relation to:

- Tax computations for the Finance Committee of the Storting, the Ministry of Finance and other ministries and the general public.
- Tax estimates in the national accounts.
- Tax overviews.
- Regional analyses.

#### Overviews of taxes and subsidies

The publication "Taxes and Transfers to the Private Sector" provides overviews of tax regulations and rates, while the publication "Current Tax Figures" provides statistical descriptions of Norwegian and foreign tax

systems. A broader overview, assembled in one publication – "The Norwegian Tax System" – is now being prepared. When it comes out in 1992 it will also include a description of the reform passed in 1991.

#### Tax models and analyses

In connection with treatment of the tax reform comprehensive calculations have been carried out, both for the Ministry of Finance and the Storting. In these calculations both the typical-house model ODIN and the micro-simulation model LOTTE have been utilized. The reform has been extensive and has placed great demands on the models. In autumn 1991 the computation service for the Storting was extended in principle also to include macroeconomic calculations of various budget proposals.



This will take place in practice through joint use of the LOTTE tax model and the MODAG micro-model in collaboration with the Macroeconomic Division.

In order to make the LOTTE model even more effective, in 1991 it was transferred to a work station. LOTTE is now used as a micro-model when the tax functions that are used in the MODAG macro-model are to be created.

As a model population LOTTE uses a sample of persons (the Income and Wealth Surveys), which causes sample uncertainty. A promising method has been developed which makes it possible to utilize such total information for individual characteristics from total registers to adjust sample weightings so that we get increased precision in the sample estimates. It is planned that the method should also be utilized in ongoing computations from 1992. The LOTTE tax model gives figures for income components which correspond to the Income Survey's income accounts. This deviates from the national accounts' income accounts for the household sector. Attempts have been made to build a bridge between the two types of income concepts, which would improve the income accounts in the national accounts and increase the usefulness of the LOTTE model. The model has also been improved in other aspects; for example, an examination of the calculation routines for the self-employed in the model has been carried out. It is also necessary for the model to be able to carry out analyses of the distributional effects of indirect taxes. Based on an econometric model for private consumption, development of a model which, based on the disposable incomes in LOTTE, simulates consumption of a total of 13 groups of products, has been started. This makes it possible to simulate the effects of changes in indirect taxes. The model exists as a provisional prototype.

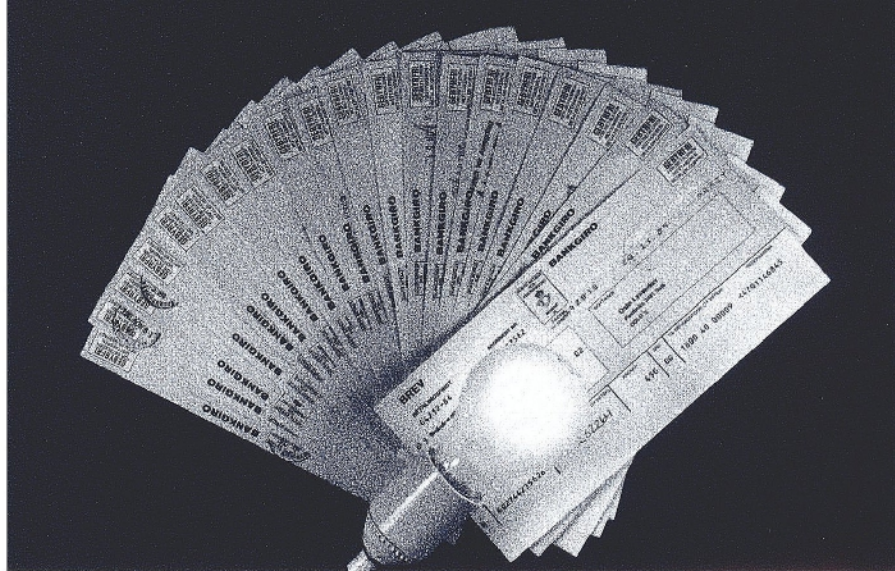
Work on the tax analyses under the Tax Research Programme (NORAS) has continued. Work is being done on an econometric model for the adjust-

ment of households to the credit market, which will improve our insight into what determines interest costs and interest revenues in the taxmodels. Another project work is being done on an econometric model for business taxation. Here much effort has been made to organize appropriate data material. A starting-point for these analyses is to find out more about what determines adjustments in enterprises, since it would seem that enterprises have not fully exploited all the possibilities for deductions, so that they pay more tax than the formal tax regulations might indicate.

Besides implementing and completing development projects that have been initiated, using the LOTTE model as a basis, we will further develop a model population and regulation module so that transfers of various forms can be included in distribution and income simulations. Work on a project aimed at transfers to families with children has already been initiated.

#### Regional analysis

Development of a regional model for the labour market and relocation has continued. This work consists among other things of an analysis of regional demand for labour based on the demand function in MODAG. The model tools have also been used in analyses of ripple effects and restructuring problems in connection with a substantial future decline in the agricultural sector. We have also made a contribution to an analysis of the regional consequences of adjustments to the EC's internal market – the so-called sensitive industries.



#### Municipal economy

The model system for municipal economy, MAKKO, which contains a budget module and a client module, has been used in analyses of how the development of municipal costs is affected by the expected population development. The projected results have been incorporated in the macroeconomic models (MODAG and MSG) and used in various analyses. Work on developing the model so that it can contain investment relations and relations for municipal behaviour has been carried further.

#### Human models, labour market, education and welfare

Work on the micro-simulation model MOSART has resulted in published projections of the supply of labour and the population according to educational characteristics. The results also say something about the relationship between the working section of the population and the section that will have to be supported. Work on further development of the MOSART model system into a projection model for welfare and household characteristics has continued. An econometric project concerning disequilibrium on the labour market within a model framework involving several sub-markets is now approaching its conclusion.





### Objectives

The primary objective of ØKA is to develop and disseminate knowledge of how the Norwegian economy function by development and utilization of econometric models which is used in our analyses and by the public administration.

### Activities in 1991

#### Economic analyses and reports on short term economic conditions

The quarterly economic surveys of the Norwegian economy will largely continue as in 1991. The quarterly KVARTS model has been utilized in all short term analyses this year. An attempt has been made to place more emphasis on projections than previously. This has been well received by our readers, and will be continued next year.

In the course of autumn this year some effort has been made to construct a system for transferring selected series from the NORMAP database on TROLL to PC format (spreadsheet). The purpose of this is to simplify access to this information on short-term economic conditions. In 1992 the aim is to implement corresponding projects for other types of data.

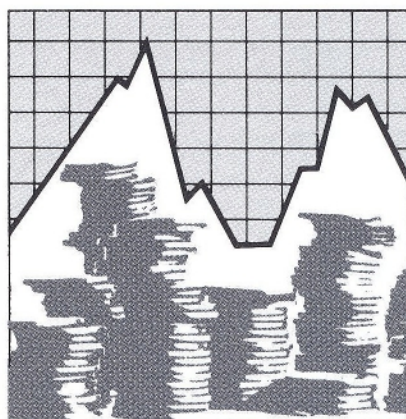
As a supplement to the quarterly reports, we will prepare a monthly commentary on short term economic conditions to be included in Økonomske Analyser in between the quarterly surveys.

### Other externally oriented activities

As usual the Division has contributed to work in the Technical Calculation Commission for Income Settlements, and this activity will be carried on in 1992. In the latest reports KVARTS simulations have constituted a central element in an analysis of future price developments. In addition, last year the Division has started to assist the various factions in the Storting's Finance Committee using our models. In addition to these regular tasks the Division utilizes much of its resources on communications, lectures and consultancy on a contract basis.

### MODAG

MODAG is a disaggregated macroeconomic model (specifying about 40 commodities) used for short and medium term analysis of the Norwegian economy. It is the main model framework used by the Ministry of Finance in preparing the annual national budgets. In addition, the model has during recent years been used quite intensively by the Research department.



The MODAG model has been further developed and re-specified on a number of points.

- A sub-model for import prices is developed and its implementation in the model will be considered. Documentation of this work is almost ready and will be published in the "Rapport" series.
- The sub-model for government transfers to household is also being completed and documented.
- The ongoing work on wage relations was to be concluded in 1991 and a doctoral thesis will be submitted in 1992.

In addition to ordinary use in the Ministry of Finance, in 1991 MODAG was used for simulations within the KLØKT project, the Welfare State project and in a project for the Ministry of Labour and Government Administration. In 1992 the model will also be used intensively in connection with work in the Employ-



ment Committee, which the Division will assist in specific areas. For all the macroeconomic models work on updating was significantly rationalized in 1991 by a national accounts model databank. Toward the end of 1992 adaptation of the models to the new version of TROLL will also take place.

A general documentation of MODAG is currently being published in a conference volume issued by North Holland, and is also available as a Discussion Paper.



#### **KVARTS**

KVARTS is a quarterly model used for business cycle analysis and preparations of term forecasts for the Norwegian economy. The economic structure of the model is more or less the same as in MODAG.

No significant changes in the model structure of KVARTS have been made in the past year. In 1991 we were more successful in integrating KVARTS in our work than before. In addition the model has been used in connection with work in the Calculation Commission. In 1992 the aim is to carry out the following projects:

- Development of a quarterly labour supply block. This will largely follow the setup in MODAG.
- Evaluation of wage relations on the basis of experience gained through current work in the CBS and Norges Bank.

- Introduction of government transfers relations a la MODAG.
- Incorporation of relations for interest determination.
- Development of quarterly investment equations for fixed capital and stocks.

#### **The business cycles project**

The business cycles project is mentioned in a project description from autumn 1989. There has been little progress of this project, first and foremost due to the Division's engagement in and contribution to KLØKT. The work will be split up into sub-projects which can be carried out by and large independently of one another.

#### **MSG/general equilibrium models**

On the basis of several years' research a new "official" version of MSG, MSG5, has been established. A special consumption block with consumption systems for 14 household groups has been developed, including a system that distributes incomes to households. As far as producer behaviour is concerned, development of user cost of capital formulae and implementation of these in the model have had a central position.

In 1991 substantial resources were used in addition to generate an alternative MSG model in connection with "Energy and Society", a project that has now been virtually concluded. We do not envisage any significant changes in the official MSG version in 1992, but in the course of the year the model will be documented. In addition an article will be written for Economic Modelling which will place a greater emphasis on the model's empirical properties. The most important research projects related to general equilibrium models are the development of an intertemporal model based on perfect foresight. The goal is to produce a disaggregated version of such a model based on work performed by Jorgenson and Wilcox (Harvard University), but with different treatment of the capital markets (exogenously interest rate, endogenous financial wealth). This project is described in detail in the project application for the NORAS project

SAMMEN, and it is intended that the model be used initially for analysis of CO<sub>2</sub> taxes and other environmental schemes.

Efforts to document work within the field of capital taxation have been delayed, primarily as a result of the fact that more time than planned has been spent on the development of the intertemporal model. The plan now is to complete this documentation in the course of the first six months of 1992.

#### **Doctoral dissertations – international contacts**

In the course of 1991 a PhD project on various applications of general equilibrium models was concluded. The aim is to publish parts of this thesis internationally. Another doctoral thesis on analyses of the labour market and wage formation will be submitted early in 1992. A further three theses are currently in progress in the Division. One of these seeks to utilize microdata in analysis of the enterprise's strategic position on the export and domestic markets. Another concerns analysis of the formation of expectations, while the third concerns intertemporal modelling.

As far as international contacts are concerned, the milieu associated with D. Jorgenson at Harvard is excellent and satisfies the needs found in connection with equilibrium modelling. Otherwise the contacts concerning macro-models are spread more widely (the LINK Project model builder in other Nordic countries and Warwick University). As far as econometrics is concerned, for several years we have been participating in a Nordic joint project on estimation in multiple time series where the idea of co-integration is central. It is intended that the project be concluded in 1992, so particular emphasis will be placed on publishing papers related to this work in 1992.

In 1991 the Division participated actively in the work of the Department on aid to model development in other countries (China, Hungary, Indonesia). Work on these joint projects will be continued in 1992.



### Objectives

The primary goal of SRM is to develop and operate models and analysis apparatus that makes it possible for the government to view important matters concerning natural resources and the environment in the context of economic development. Up till now work has been concentrated on analyses of economically important natural resources such as oil, gas and hydro power and on high-priority air pollution problems.

Target groups in public administration are first and foremost the Ministry of the Environment, Ministry of Finance and Ministry of Petroleum and Energy, but other ministries like the Ministry of Industry and the Ministry of Transport and Communications are also users of the Division's services. Emphasis is also placed on disseminating research and analysis findings concerning natural resources and the environment to the general public.



### Principal features of work in 1991 and 1992

In 1992 the work of the Division will be organized around three major projects: International Energy and Environment Models, The Methods Project within Economy and Ecology, and Energy, Environment and Society. The first two are direct continuations of 1991 projects. In the course of 1991 the Energy and Society Project was concluded. This project has now been replaced by a new project, Energy, Environment and Society.

### The Methods Project within Economy and Ecology

The tasks of the Methods Project in the Economy and Ecology programme can be divided into three: I) Responsibility for conducting independent research/ methodology studies on questions of relevance to the Economy and Ecology programme.

II) Responsibility for initiation and coordination of cooperative projects – transversing the various sub-programmes under Economy and Ecology.

III) Responsibility for the secretariate function of the programme management for the Economy and Ecology research programme.

The independent methodology research, item i) above, can be divided into three main fields of work:

- a) Indicators of the state of the environment.
- b) Integrated environment-economy models.
- c) Principles for administration of national wealth in an extended sense.



So far activity has been concentrated on development of expertise within the relevant subjects, development of a set of environmental indicators for Norway, and schemes of a coordinating nature aimed at the whole research programme (arrangement of working meetings, seminar series etc.). In 1992 the work on indicators will be taken further with the emphasis on data collection and development of a set of indicators for renewable natural resources. Work will be done on welfare indicators and on constructing an integrated environmental economy model. In the course of the year a number of seminars will be arranged for the whole research programme.



### Energy, Environment and Society

SRM has conducted a three-year project aimed at establishing a new long-term equilibrium model (alternative MSG model) where the main emphasis has been placed on better specification of important factors with a view to improve the description of generation of pollution and links from the state of the environment back to the economy. Among special elements one could mention better modelling of the transport sector, power production, factor demand in production sectors and the composition of energy consumption in households. Factors related to atmospheric emissions that cause ill-health and corrosion have also been specified. Possible links back to the economy have been specified. The project was to be completed in 1991. Documentation work of the model will proceed for a couple of months in 1992.

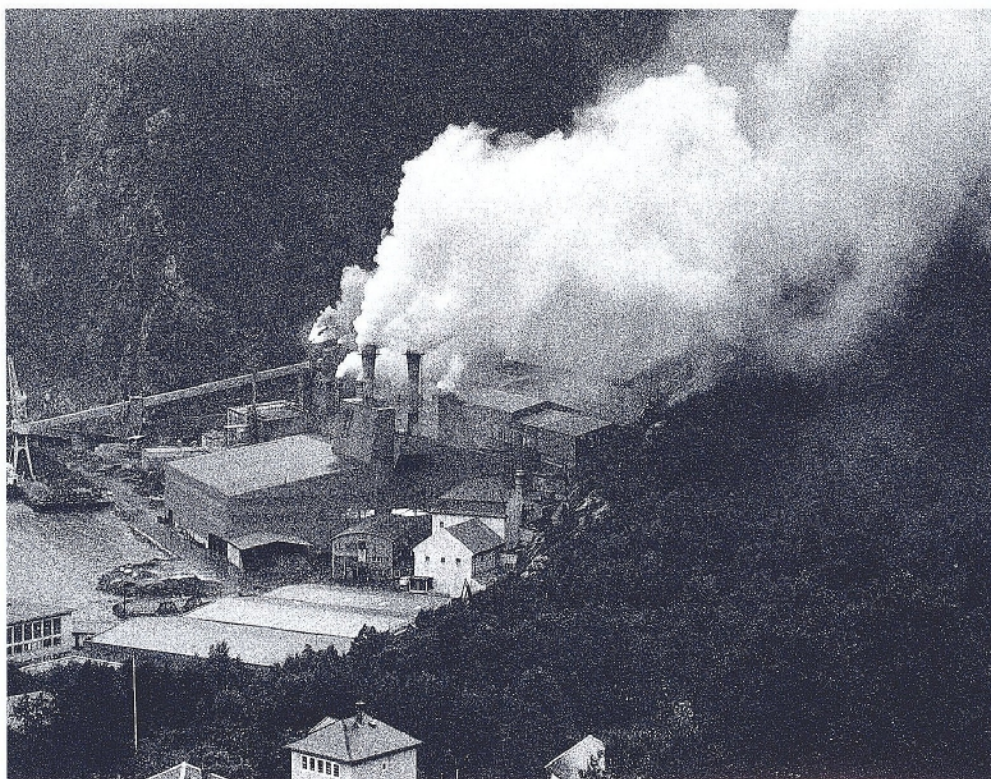
In 1992 SRM will take up a new programme, Energy, Environment and Society, which will partly be a continuation of Energy and Society and partly an extension of it. Some central themes in the sub-projects which will be taken up are (in note form):

- Attempt to establish a climate cost function, i.e. look at the connection between various regimes of climate taxes and macroeconomic consequences.
- Norwegian and Nordic energy and emissions markets. Analysis of how the Nordic countries can gain by acting in unison vis-a-vis international climate restrictions versus acting on their own.
- Study substitution possibilities within transportation.
- Evaluation of different economic paths in a macro-model. What measure should be used? GNP, NNP, NNI, consumer and producer surplus.
- Compensated energy and environment taxes. How should one compensate? Income taxes, capital taxes, corporate taxes etc.
- Intertemporal optimization. What significance does this approach have in studies of consequences of climate taxes?

- Production technology. How can information about this be gathered? Relevance to projections. Historical time series, cross-sections, front technology.
- Energy use in households. Use of the theory of discrete continuous choices based on microdata.
- Transport in the household sector. Use of the theory of discrete continuous choices based on microdata.
- Potential demand for transport in households linked to attributes by new transportation technology.

analyses on the models will be carried out, and the models and analyses will be documented.

The objective of this work is to improve knowledge concerning foreign energy markets, so that the effects on Norwegian energy markets and the Norwegian economy of changes in international energy and environment policy can be better analyzed.



### International energy and environment models

The Division has a number of projects that are relevant in international contexts. The most important ones involve development of:

- a *European demand model for energy*, and
- a *disaggregated version that covers the Nordic energy markets*.

Both models became operative in the course of 1991. In 1992 the models will be equipped with post-calculation routines which will provide estimates of emissions to air of a number of pollution components as a result of energy consumption. Further, in 1992

### Other work

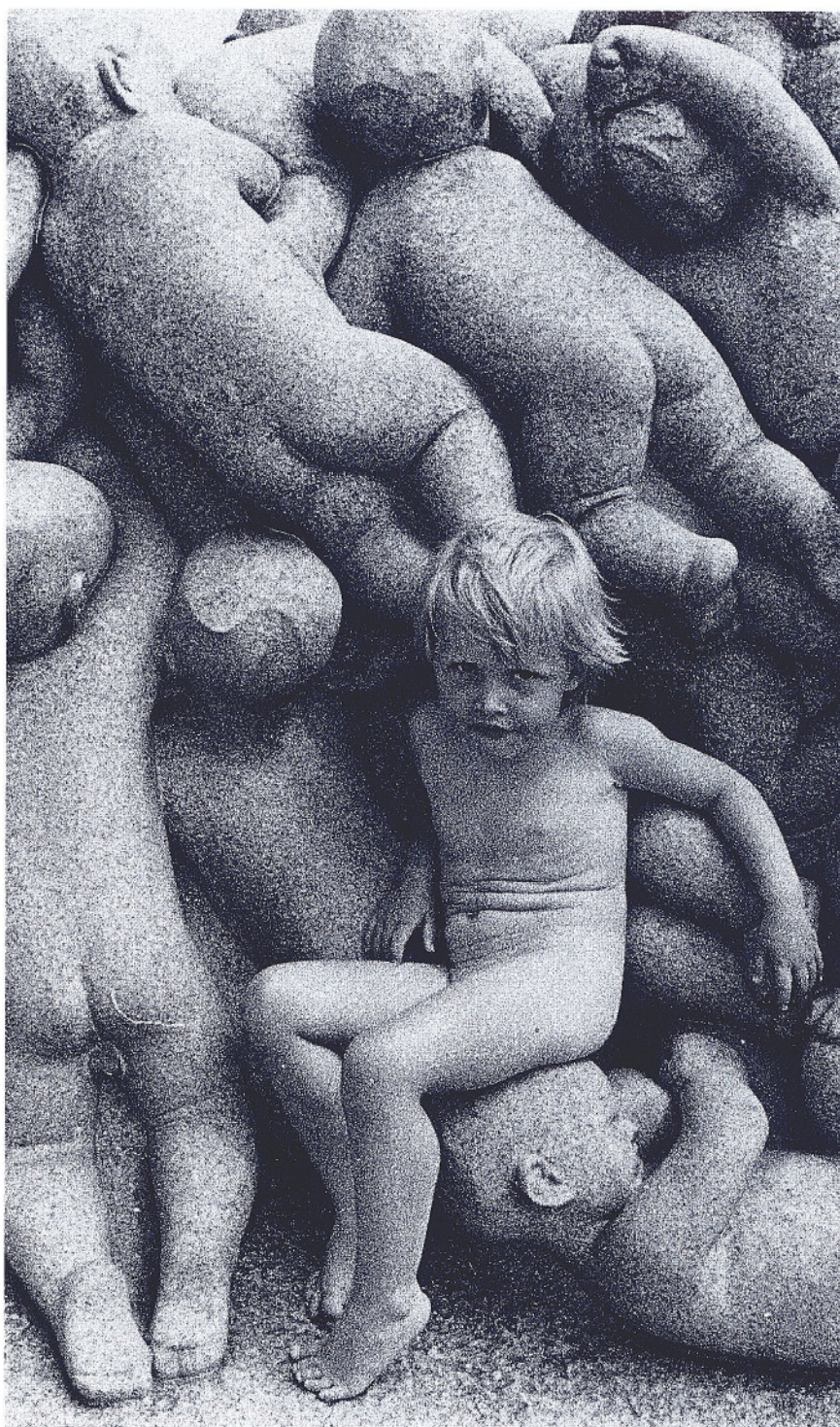
The Division is engaged in projects targeting developing countries, first and foremost countries in Central America and Indonesia. This work is being performed in counterpart with the Norwegian Ministry of Foreign Affairs and Norwegian Directorate for Development Cooperation, the World Bank and the Asian Development Bank. The projects are aimed at developing integrated energy/environment/macro-economic models, to improve the possibilities of performing analyses of connections between macroeconomic conditions, utilization of natural resources and certain aspects of environmental conditions.



### Objectives

The primary function of the Division is econometric analysis of the CBS's microdata and use of estimated behavioural relations and distribution relations in the Research Department's models. The Division has a special responsibility for adopting and further developing theory and methodology in this connection. To ensure that the work on theory and methodology will be as relevant as possible, it is regarded as important that the Division itself should be responsible for empirical studies and participate in implementation of empirical results in operational models. Further, the Division has a responsibility for providing information and input to the statistics department concerning the quality and relevance of microdata. One important purpose of the establishment of a special econometric unit is to strengthen the whole econometric milieu in the Research Department. Since the level of expertise and activity within the field of econometrics is a neglected area at Norwegian universities, the Division also has a national responsibility for maintaining reasonable academic standards.

The long-term goal of the Division is to establish micro-based structural model relations for the lifetime adjustment of households in relation to consumer goods, the labour market, family affairs and education.





### Main features of work in 1991

In summer 1990 a new consumption model was introduced in MSG based on microeconometrics and household demography, and the collaboration with the Macroeconomic Division on further development is still in progress. In collaboration with the Division for Public Economics a prototype of a consumption block for implementation in the LOTTE tax model has recently been developed. Work is also being carried out on the processing of findings from the econometric analyses of consumption surveys with a view to international publication.

Within the field of labour supply analysis the Division has carried out re-estimation of previously established labour supply models. The findings from this work indicate that there is a high degree of stability in the structural relations over a period of time. Further, attempts have been made to link the models for labour supply and consumption. This work has not been completed yet due to difficulties in establishing relations for durable consumer goods.

In addition, labour supply analyses have been performed in collaboration with Finnish and Italian university researches based on Finnish and Italian data. In collaboration with the CBS in Beijing analyses of Chinese household data on income, consumer expenditure and savings have been carried out.

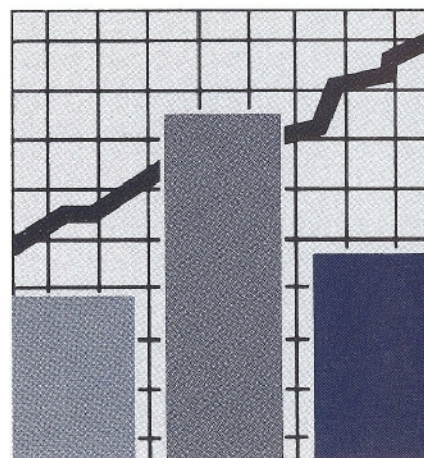
In 1991 a number of analyses based on business data were performed,

based among other things on a new method for simultaneous estimation of mark-ups and the advantages of large-scale operation. This method will be useful in further work where the importance of R & D investments and owner relations to productivity development will be analyzed. Some work has also been done on complementing the corporate data with accounts and R & D data. This work has not been concluded.

Moreover, analysis of factors affecting the closure of businesses has been performed.

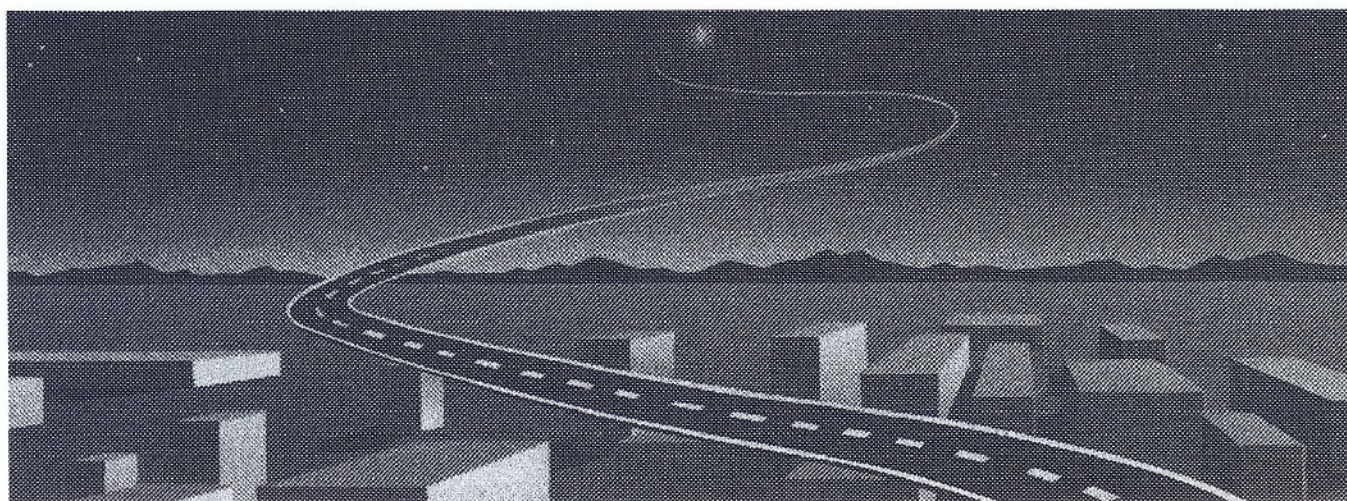
Collaboration with the Macroeconomic Division on linking the Division's labour supply model with MSG was started in autumn 1990. An aggregated version of the labour supply model has now been implemented in MSG: Testing of the properties is still in progress. One important test consists of studying how sensitive the findings are in relation to the approximations utilized during aggregation. This is done by performing simulations in an interplay between the micro-model and MSG.

In addition to the empirically oriented projects referred to above, the Division is engaged in more theoretically/econometrically oriented efforts. We regard this part as extremely important since many of the methods and models found in research literature are based on unrealistic prerequisites and ad hoc specifications. Our contribution in this field covers inter alia theory concerning



utilization of defined goals for welfare and income inequality, and development of stochastic choice of action models that cover situations where the choices are discrete and continuous and where the budget conditions are complicated for example due to tax regulations and restrictions on quantity. Work is continuing on modelling intertemporal choice situations subject to uncertainty when the quantity of choice is discrete/continuous and the budget conditions are non-linear. In 1991 significant progress was made in this field. Some of these findings have been documented with a view to international publication.

The Division regards maintaining contact with various domestic and foreign institutions as important. It is in regular contact with a number of university milieux in the USA and Europe, as well as the University of Oslo.









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DP	= Discussion Papers
RAPP	= Rapporter (Reports)
REPRINT	= Reprint Series
IN	= Interne notater (Internal Notes)
ØA	= Økonomiske analyser (Economic Surveys)
ES	= Economic Survey

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