

ANNUAL REPORT 1992

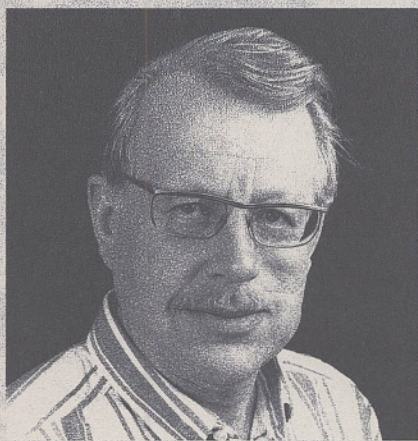


RESEARCH DEPARTMENT
THE CENTRAL BUREAU OF STATISTICS, NORWAY

ANNUAL REPORT 1992



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Olav Bjerkholt

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Head of Department

1992 has been another inglorious year for the Norwegian economy. Unemployment increased for the sixth year in a row and was in 1992 three times as high as in 1986. The financial collapse which in 1991 brought the largest banks into government ownership, continued with the ungraceful demise into government receivership of the largest insurance company. The government deficit increased to unprecedented heights, and cutdowns in welfare and other benefits were initiated. The crisis in European monetary system brought forth the (usual) government promises of standing steadfast by the currency until floating was the only (and not necessarily bad) alternative. Needless to say, this development has not been according to (what once was) long-term government perspectives, and may have contributed towards less concern about the longer-term development.

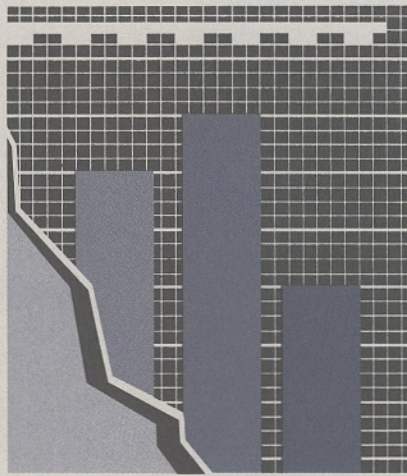
Norway is sharing these traits to a higher or lower degree with a number of other countries (but with an ace in the hole in the shape of large oil and gas reserves which do not seem to be diminishing: in 1992 Norway reached the remarkable position of being the largest oil exporter outside OPEC!). For the research priorities the quandary over the national economic development plays relatively little role, major projects such as the efforts to develop appropriate model tools for long-term environmental policies and improving the modelling of the macroeconomy continue unabated. The Research Department takes some pride in having constructed an arsenal of tools suitable for analysing major issues in the social and economic development, in particular integrating an overall model-based macro picture or scenario with distributional concerns, environmental control measures, fiscal policies, and other issues. These tools were called for on a number of occasions in 1992 in connection with the government appointed committees, ministerial white papers and other work. Of particular importance was the work for the Employment Commission appointed to achieve broad political consensus on strategies to reduce unemployment. The stricter meting out of welfare benefits and other transfers which accompanies the fiscal tightening of a long-lasting recession will in a welfare state like Norway call for equity considerations in the sharing of the burden. The Research Department has a long tradition in distributional issues related to tax and transfer policies, and methodologically this tradition has in recent years been much enhanced and invi-

gorated by the use of micro simulation models based on random samples of real persons or households. On a number of occasions these models have been called upon in the preceding year to undertake distributional evaluations of policy changes. There are, however, unresolved issues in getting clearcut unanimous answers from these tools, perhaps not surprising in view of the judgemental nature of distributional choice, but the difficulties are not only judgemental. Basically, it is still the Lorenz curve and related measures such as the Gini ratio which hold sway. There are conceptual and definitional issues (as well as data deficiencies) related to the measurement of income, cost-of-living and family size. The life-cycle perspective is often absent in practical applications. Statisticians and econometricians argue for separate approaches. The underlying issue of utility comparisons can hardly be avoided. The contribution of Max Otto Lorenz stems from 1905, Corrado Gini's more elaborate theoretical approach is a few years younger. Many more recent theoretical contributions have refined the approach, but have left surprisingly little impression on the bulk of empirical distribution studies. In a history of science perspective it can be noted that Lorenz' unassuming paper was published in a year of great scientific achievements, such as Einstein's theory of relativity and Freud's "Wit and its relation to the unconscious" both of which have long been outmoded in their respective sciences. This observation says nothing about Lorenz versus Einstein and Freud, but perhaps something on the progress of empirical economics.

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The research activities of the Central Bureau of Statistics, (CBS), have roots far back in the CBS' 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 the utilization of national accounts data. Since the early 1960s development of macro-economic models – especially input-output models – was established as a comprehensive and central feature of the CBS' research activities. During the 1970s and 1980s, demography, energy and environmental studies were also incorporated into the Research Department's activities. Most of the research activity has been oriented towards providing public information and servicing the needs of government planning and analysis. The research activity of the CBS has ventured into areas seldom encountered in central statistical institutions. In important areas the CBS has achieved a dominant position among Norwegian research institutions. The orientation of the CBS' research activity toward producing results and analytical tools of interest for government planning and policymaking has been strengthened in recent years with the emphasis on integrating environmental considerations in macro-economic and sectoral policies. The autonomy of the research activity relative to the government administrations, is, however, a major concern. The general availability to the public of research results and analytical tools, such as models is emphasized.



The Research Department's activities has traditionally been funded via the central government budget, but in recent years the budget has shrunk and an increasing share, now approaching 50% is project financed via research council grants and research contracts.

During reorganization of the CBS in 1990/1991, national accounts, resource accounting and parts of demographic research were transferred out of the Department with the consequence that the Research Department's activities now comprise the following four subject areas:

Macroeconomic analysis, Resource and environmental analysis, Public sector economics and Microeconomics.

Some general objectives are pursued in all subject-areas:

Increased empirical knowledge.

Statistics alone is an insufficient source of information for understanding the social and economic

development. Analysis of data based on theoretical considerations and analytical methods may give more empirical insight and deeper understanding of the phenomena under consideration. Such analytic knowledge is inherent in the surveys of the Norwegian economy or of the state of the environment in Norway which are published by the Research Department. Key parameters in an analytic description of the workings of the Norwegian economy, say, the interest sensitivity of household saving or of relation between economic growth and emissions to air, are examples of embodiments of empirical knowledge beyond the realm of statistics.

Development of analytical tools for monitoring economic and environmental development for government planning.

An important use of empirical insight gained is embodied in the design of tools for government planning, usually in the form of simulation models. Modelling activities are carried out in close contact with user interests and with emphasis on government 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 is made to make operation of existing models more efficient, and assessing the society's need and willingness to pay for continued operation.

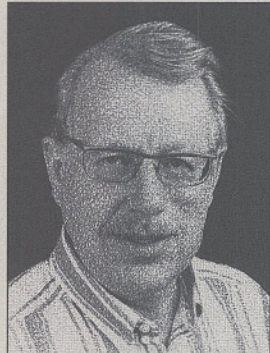
Analysis of the CBS' statistics.

Researchers in the Central Bureau of Statistics have a unique position close to the sources of data. The Statistics Act clearly states that this position should not be utilized to monopolize access to data. The proximity with the statistical work provides special opportunities for exploitation of the data expertise in the Central Bureau of Statistics, for special organization of data material and links to other sources, and for influencing the methods of collection of primary data. The analytic use of CBS' statistics gives feed-back effects to the statistical work and may serve to improve the quality of the official statistics.

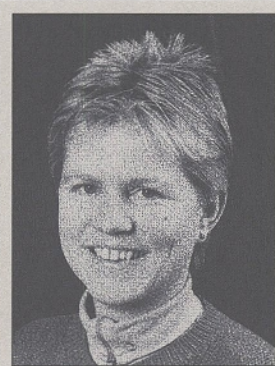
Development of a high level of competence within the designated fields of research.

Adequate expertise and scientific competence are obvious prerequisites for successful performance of research tasks. The research activity shall give results that can be utilized in the Norwegian society and provide documentation that high scientific standards in the analyses have been maintained. Good contact with research institutes and universities abroad and at home is a necessity. Competence building and the maintenance of a high scientific level demands considerable resources. The PhD programme in social science at the University of Oslo is a recruitment channel of particular importance, and several research associates in the Research Department is currently enrolled in this programme.





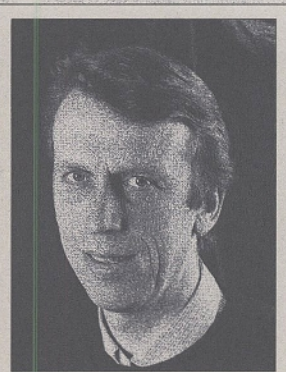
Olav Bjerkholt
Assistant Director General



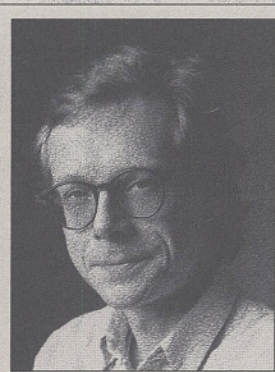
Hanne Finstad
Head of Administration



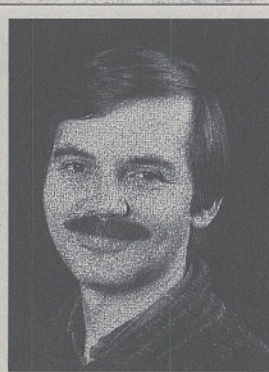
Bård Lian
Head of Division



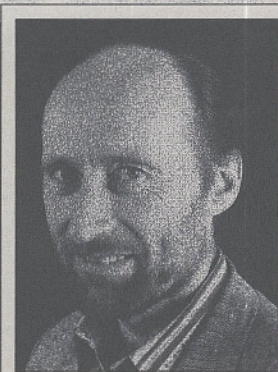
Olav Ljones
Dir. of Research



Knut H. Alfsen
Dir. of Research



Ådne Cappelen
Dir. of Research



John K. Dagsvik
Dir. of Research

ORGANIZATION CHART OF THE DEPARTMENT

Research
Department

Olav Bjerkholt

Unit for
Administra-
tion

Hanne Finstad

Computing
Resources
Group

Bård Lian

Division for
Public Eco-
nomics

Olav Ljones

Natural
Resources
Division

Knut H.
Alfsen

Macroeco-
nomic
Division

Ådne
Cappelen

Microeconometric
Division

John K. Dagsvik

The Research Department is organized in four divisions each led by a Research Director. The divisions are organized somewhat differently internally, depending on work areas and tasks. Most of them are organized around 3–4 major ongoing projects.

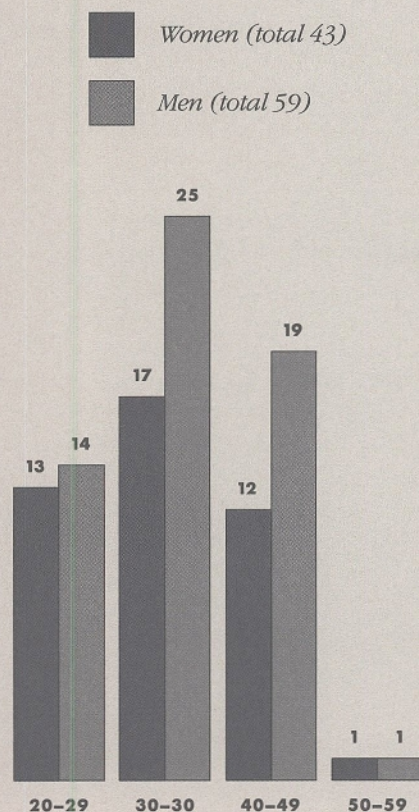
Two staff units deal with administration and EDP for the whole Department:

- Unit for Administration
- Computing Resources Group

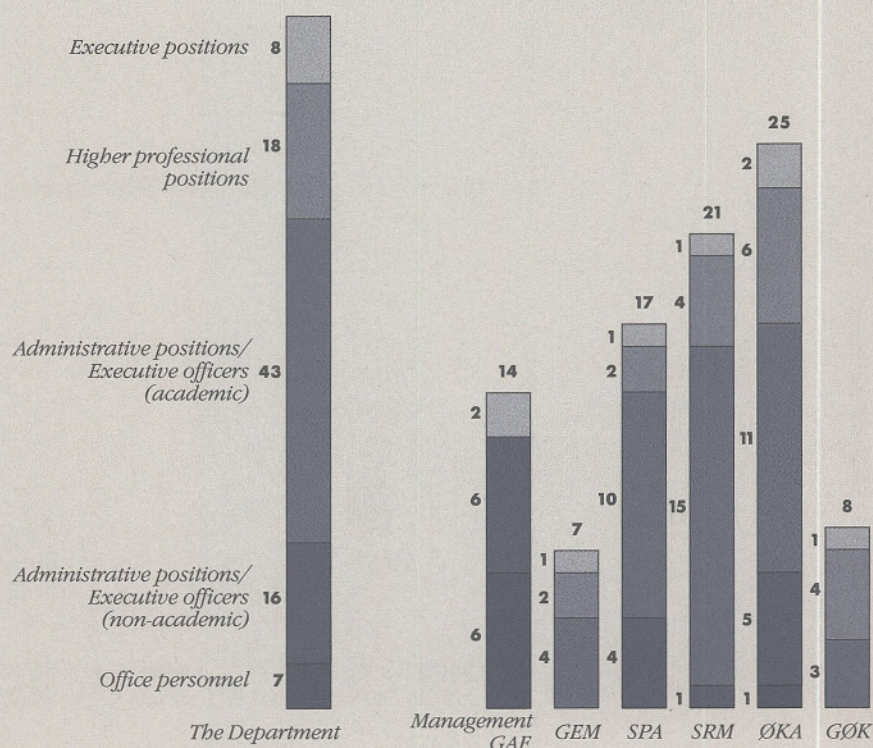
Personnel in the Research Department, (by December 1992)

Division/ Unit	Government budget	Project	Total
Management	1		1
Unit for Administration (GAF)	6.5	3	9.5
Computing Resources Group (GEM)	5	3	8
Division for Public Economics (SPA)	10	8	18
Natural Resources Division (SRM)	14	10	24
Macroeconomic Division (ØKA)	15	10	25
Microeconomic Division (GØK)	6	3	9
Research Department	57.5	37	94.5

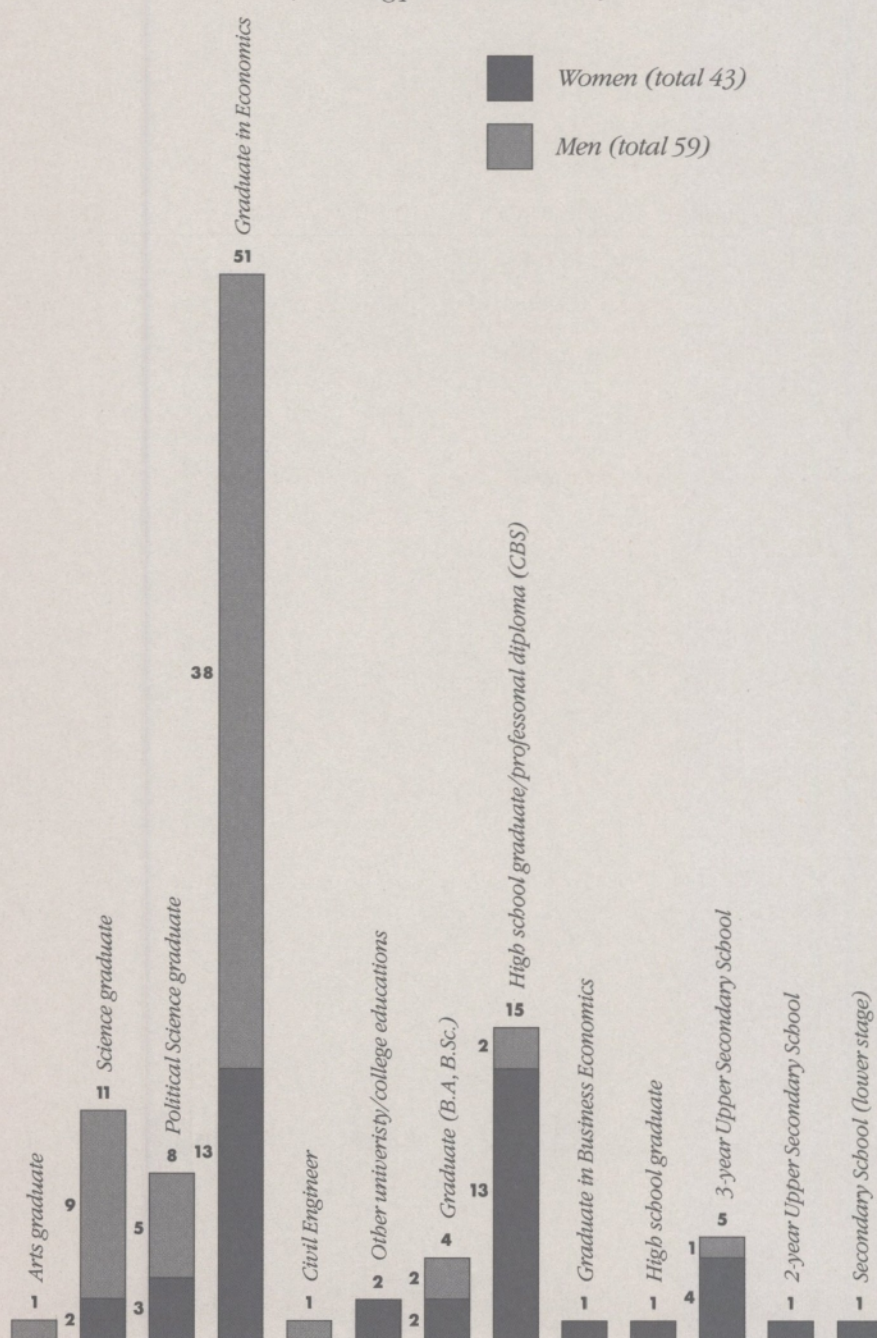
Age group structure in the Research Department (including personnel on leave)



Distribution according to Occupational Group



Education by sex
(including personnel on leave)



Financing

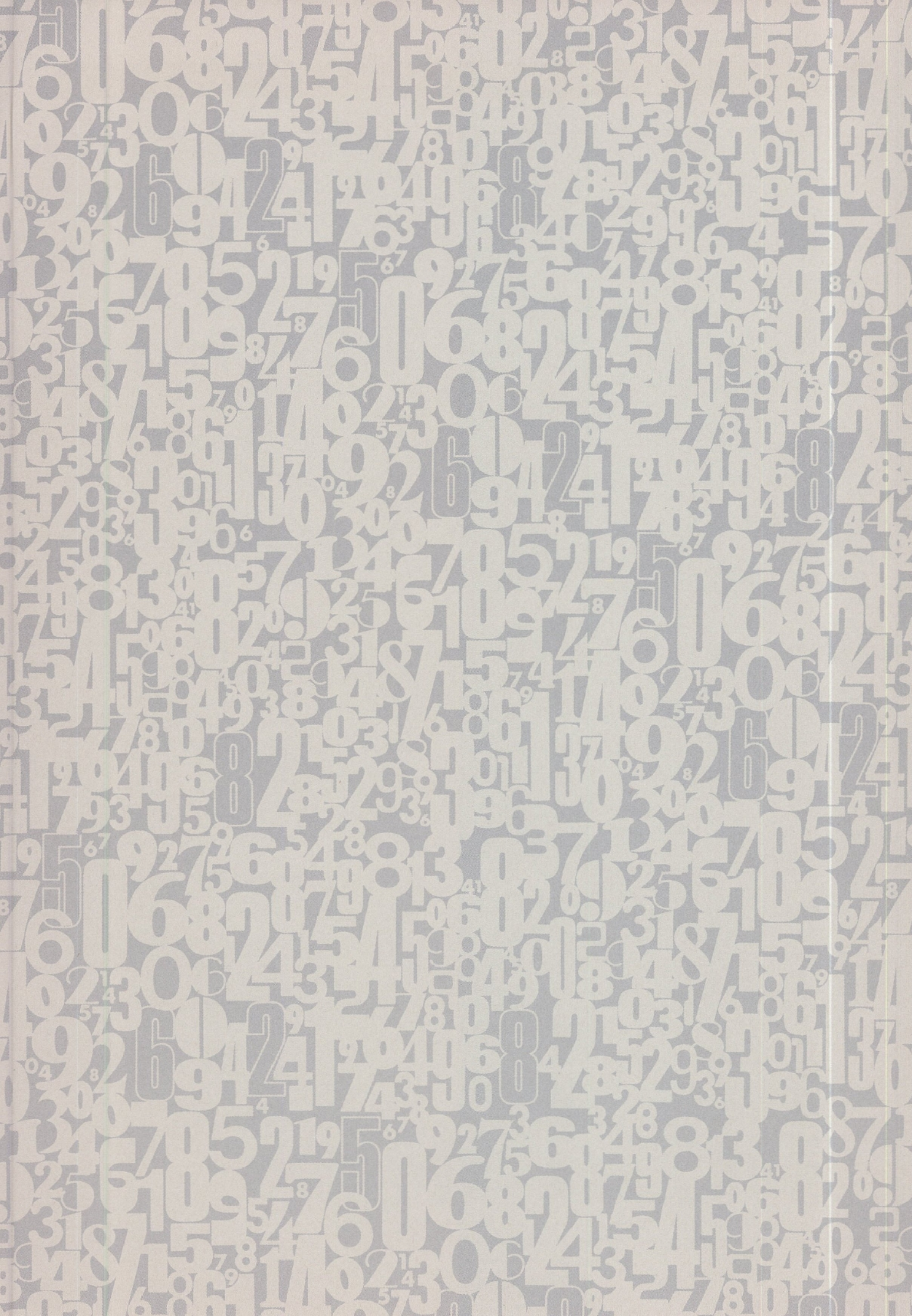
The Research Department had a salaries and operating budget (excluding overhead expenditures covered centrally) of approximately NKr 37 million in 1992. Of this NKr 17 million was project financed. The bulk of project revenues comes from major long-term research council contracts. Another important part of project revenues comes from the ministries, primarily Ministry of Finance, Ministry of the Environment, Ministry of Local Government and Labour and the Ministry of Industry and Energy.

Publishing

In 1992 research results was reported and published in the following series from the CBS:
Social and Economic Studies, Reports, Discussion papers, Reprints and Internal Notes/Working Papers

The Research Department publishes the periodical "*Økonomiske Analyser*", with 9 issues per year and an English edition "*Economic Survey*" with 4 issues a year.

A complete list of publications from 1992 including papers and articles published outside the CBS, is given in page 36.



4.1 Objectives

The objectives of the Division for Public Economics are to carry out analyses and economic modelling within the following areas:

- taxes and transfers
- public expenditures and local government economics
- distribution of income
- labour market and education
- regional economics

Much of the research activities is based on micro models which can be used as premodels to the macroeconomic planning models. The Division is also responsible for macromodels which are used as post- or pre-models to other macromodels within the Department. The Division is working with models which form a bridge between demographic models, public sector models and macroeconomic models.

The Division is continuously involved in computations for ministries and the Parliament.

A special objective is to construct models which give a closer insight into questions relating to income-distribution. While the projects were previously limited to taxation, the Division will in future attach more importance to comprehensive analyses, including transfers, social security and public services. In order to accomplish this, it will be useful to establish a database including micro-data on income, transfers, use of public services and living conditions in a broad context; i.e. a model population. Further development of this



model population will be given priority in 1993.

Some models are static and constructed to simulate relevant laws and regulations for example to describe the actual income-distribution and the immediate consequences of changes in the tax laws (LOTTE). Another approach is based upon the dynamic microsimulation model MOSART which gives long term projections of population, education, labour market and the social security system. This model is rather unique in its wide scope since it uses a large real sample as model population. The aim of the regional analyses is to provide a closer insight into regional economics and their interplay with

demographic changes (migration, labour supply). These regional analyses give both regional and national insight into adjustment problems concerned with regional imbalances. The municipal analyses is at present mainly based on an assumption that demographic change is the main explanatory factor in expenditure growth. One objective of a closer integration of municipal and regional analyses is to analyze the possible effect on regional economic development of the quality of public services, and whether choice of location for firms and individuals is affected by the level of activity in the public sector.

4.2 Main activities in 1992 and plans for 1993.

TAX MODELS

The purpose of tax models is partly to analyze wage distribution effects for various household groups of incomes in direct and indirect taxation and benefit regulations, and partly to study the connection between taxation and benefit regulations, income level and public revenues and expenditures.

The LOTTE tax model is particularly aimed at estimating the distribution and profit-related effects of changes in taxable net income (e.g. changes in rules for deductions) based on given formal tax rates. The model can also be used to analyze the effects of simultaneous changes in the tax basis and tax rates. The model is updated annually with total figures from the Income and Wealth Surveys (IF)

The ODIN model is a representative household model which calculates taxes and transfers on the basis of characteristics of households. The code of regulations for ODIN covers the tax regulations and most transfer regulations from 1980 on. The user can utilize already specified households and the correct historical regulations or create his/her own regulations and households in order to calculate the effects of changes in regulations.

4.2.1 Tax, transfers and income distribution

The tax simulation model LOTTE is extensively used and is updated annually with data from the Income and Wealth Surveys. In 1992 a new method called the register method, was used to ensure closer correspondence with aggregated data from the tax-register. Yearly updating with data survey has to be finished during the summer months to make the model ready for use by the Ministry of Finance in their work with the National budget. A macro-micro connection between LOTTE and national income accounts continues to have high priority. The task is to establish a file with imputed micro-data based on national accounts income concepts. An important development would be the macro-micro connection of consumption data. In this field further work will be based on the model LOTTE-KONSUM, which may be used for calculation of distribution effects of indirect taxes.

The aim is to have this model in operational use during 1993. LOTTE can at present not be used to simulate the tax reform for self-employed persons. Accounts collected from self-employed forms in a supplementary sample to the Income and Wealth survey are to be incorporated into LOTTE in the autumn of 1993. An analysis of transfers to families with children, including child allowance and public subsidies to kindergartens, were presented at the CBS' Poverty Conference in November 1992. In addition to pure distribution analyses, the project will examine changes in behavioural patterns as a consequence of public transfers. Another important step in the model strategy is the development of an expanded LOTTE which may be used in the calculation of social security, taxes and disposable income under different tax and social security policies.



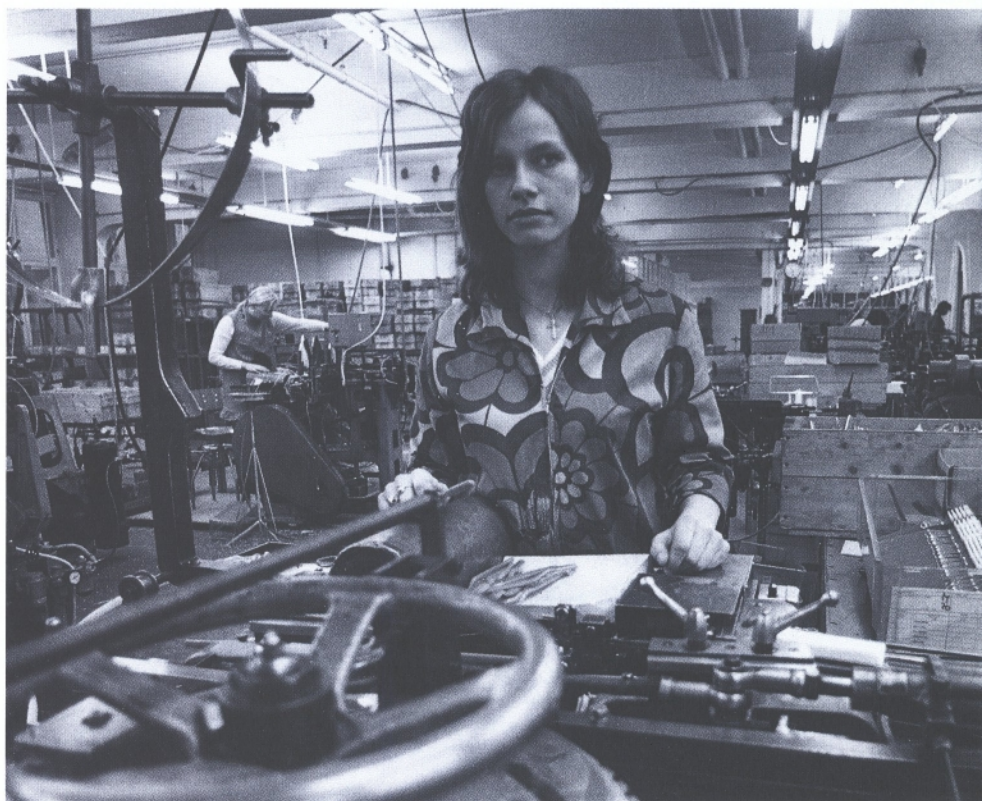
Work has commenced to collect data from registers in the National Insurance Administration. One present problem is the small sample size used in the Income and Wealth survey, something which will be solved in the future when tax-reports will be available on data files.

The representative household-model ODIN is currently used both by the CBS and ministries. In 1992 a module for self-employed persons was developed. A user guide for ODIN and a documentary note have been published.

Both ODIN and LOTTE are installed in work stations (UNIX), which has necessitated some changes in the user interface. In the autumn of 1992 this was made available for external users of ODIN with direct access to our computer via modem. A similar arrangement is under preparation for LOTTE.

An analysis of corporate taxation and capital depreciation rules for the period 1981–92 has been made. A comprehensive contract has been signed between the Ministry of Finance and CBS (Division for Income and Wages) on data collection regarding firms and self-employed persons.

An important aspect for further research is the distributional effects of the tax reform, is for both employed and self-employed persons. In our work with corporate taxation we have been concerned with the effects through the stock market of income/wealth for the owners. This work will be continued in order to provide further insight into the combined distribution effects of the tax reform.



4.2.2 Regional models and local government economics

***REGARD** is a regional model system for the labour market and demography. A sub-model for production and income projects regional key figures for 28 industries in 7 Norwegian regions. A demographic model block describes changes in the regional population pattern and participation in economic activity, as a result of aging, education, commuting and relocation. The model system as a whole provides projections of developments in regional labour markets in the light of the interplay between*

economy and demography. In addition the model system can be utilized to analyze regional effects in the short and medium term as a result of changes in different economic framework conditions.

***MAKKO** is a macro-model for municipal economy which describes how municipal employment and production of services depend on standards and level of coverage in different service sectors, and on population distribution according to age-group. The model is used to project number of clients, man-hours performed and costs on municipal administration.*



In 1992 the main projects included:
A regional model for the labour market and migration (REGARD)
A model system for municipal economy (MAKKO)
In addition, a project on regional divisions and the European Common Market, EEC, has been completed (NUTS).

The complete equation system of the model REGARD has been compiled and documented and the input data have been prepared. Some programming remains before REGARD is fully operational. A report has been published on migration rates and specified levels of education. An article on the estimation of regional demand for labour equations in manufacturing industries has been published in the series *Economic Survey*.

During 1992 calculations have been made to estimate unemployment and gross product per inhabitant for the 65 NUTS-regions.

Outlines have been prepared for several new analytical projects, including regional variations in producer behaviour in industrial

sectors. This represents an expansion of previous work done on REGARD. Provisional plans for a continuation of this work include estimation of regional production and investment behaviour with a basis in panel data for individual firms. When implemented in REGARD, these developments will make the model more suitable for long term analyses of regional industrial structures. The macromodel for the municipal sector, MAKKO, will be updated and revised, and as a part of this the sector structure will be revised. It is also desirable to improve several modules to make the model more suitable for analytical purposes. An evaluation of the model will be made. Existing time series analyses for the municipal sector are generally too short to be included in other time series analyses. Since municipal data are readily available, cross section analyses may provide a deeper understanding of municipal behavioural patterns. A project on econometric relations for public investment will be completed.

4.2.3 Demographic models – Microsimulation of schooling, work and social security

MOSART is a demographically-based micro-simulation model. The model extracts a sample of the population and simulates the continued life-path of each individual as regards demographic characteristics, education, welfare status and labour supply/income. The result of this simulation is a model population which, given the assumptions, can be used to show (long-range) national development features for the specified characteristics.

The dynamic microsimulation model for education and employment projections, MOSART, is under constant development and results have been used in several connections. A four percent-sample of the Norwegian population, 160.000 persons, is projected for the period 1990–2040. The basic version – MOSART 1 – was transferred to a workstation during the past year and updated with new employment data for 1991 and fertility estimates for 1989. Transition rates for education were adjusted upwards to gain consistency with the number of pupils and students in 1991, which had increased sharply from previous years. In addition to updating the model, a sampling procedure was introduced which reduced the uncertainty in future labour force projections, and new routines were employed for generating tables. The updated version of MOSART 1 was used to project the labour force and educa-

tion system for a governmental commission on unemployment and the Government's Long-term Programme 1994–1997. A report documenting the model is ready for publication.

During 1992 work has been carried out to develop MOSART to include social security status and income. Priority was also given in 1992 to conclude a provisional version of the social security model for use in the

Long-term Programme. Projections include the proportions of old-age pensioners, disabled pensioners, payments from the National Insurance Fund to cover old-age and disablement pensions, together with calculations of the income basis and the labour force.

Improvements of MOSART are taking place by expanding the model to a household model, provisionally called MOSART-H. The first version of this household model is expected to be completed during 1993 and later be merged with MOSART 2. A number of problems are associated with this merger since the populations are considerably different in the two models, and also because MOSART-H may impose restrictions on further work with MOSART. The merging will not commence until the next updating of the basis data for the social security model is completed, at the earliest in 1994



4.2.4 Foreign assistance

The Division has had responsibility for coordinating projects related to development assistance, and the Division participated in the negotiation of an agreement with the Ministry of Foreign Affairs/NORAD.

The Division is also advising NORAD on population questions. In addition to on-going matters and development of competence in this area, the activity has been focusing on the demographic and societal consequences of AIDS in Africa.

5.1 Aims and long-term priorities

The primary objective for the Natural Resources Division is to develop and operate models and other analytic tools which enable the government administration to analyze important natural resource and environmental questions associated with the economic development of society. Hitherto, work has been concentrated on analyses of important natural resources such as oil, gas and hydro power, as well as air pollution problems. The work has been oriented towards the needs of the Ministry of the Environment, the Ministry of Finance and the Ministry of Industry and Energy, but also other ministries are occasional users of the Division's services. Importance is also attached to disseminating results of research and analytical findings related to natural resource and environmental questions to the general public, both directly and through the mass media.

Over the years the Central Bureau of Statistics has contributed to the integration of resource and environmental analysis into Norwegian economic policy and planning. The key to this lies in the establishment of a suitable data base which combines economic data and data on resource use and environmental conditions, and a corresponding linkage on the model side. In this area we have had considerable benefit of the integrated activity within the CBS covering both production of statistics and research activities.

There is, nevertheless, much virgin



territory concerning methodological questions within the field of natural resource economics and environmental economics. Thus, the Division focus on the project research for methodological development and programme coordination (Method Project), financed as part of the *Economy and Ecology* research programme and which has methodology development as its primary area of enterprise. Efforts in this area will provide impulses to the development of the next generation of analytical tools for resource and environmental management in society planning. The work includes the development of an appropriate set of indicators for the evaluation of welfare effects of an environmental and resource policy, and the development of methods providing improved possibilities for long-term dynamic analyses with due regard to the significant level of uncertainty facing the planner.

The further development of the long term planning model MSG-EE is another research priority. The model is based upon earlier versions of the MSG-model. It will be further elaborated in three particular areas: (1) modelling of power production under new market conditions, (2) modelling of inland transport and the significance of transport as a factor of production, and (3) the modelling of the interaction between the environment and economic productivity. Parallel to the development of methodology and elaboration of the traditional macroeconomic models, the Division will also give priority to maintaining, and preferably to expanding the level of expertise on conditions related to the demand and supply of the central energy resources of oil, gas and hydro-power. This requires competence in analyzing international energy markets.

5.2 Main trends for activity in 1992 and plans for 1993

Since late 1991, the Division's activities have been structured by and focused on three main projects:

- International energy and environment models
- Research for methodology development and programme coordination (Method Project)
- Society, environment and energy (SAMMEN)

The latter two projects are subsidiary projects in the research programme *Economy and Ecology*. The objective of this programme is to "develop research-based management techniques which contribute to sustainable national and global development". The programme will last throughout 1995¹. The three main projects will provide the overall structure of the Division's activities in 1993. In addition to three main areas listed above, the Division is planning to continue its engagement in some smaller collaborative projects relating to Indonesia, Nicaragua and some African countries.

5.2.1 Research for methodology development and programme coordination (Method Project)

The main task of the Method project is the development of methods for long-term economic management which integrate environmental considerations and management of the natural resource base.

During 1992, work on the Method project was concentrated on the theme "indicators", in particular environmental indicators. A series of colloquia has contributed significantly to increasing the groups expertise in the welfare-theoretical basis for estimating different welfare indicators. Studies of these indicators has been presented at several seminars and conferences, and additional work has been carried out with wealth indicators and the evaluation of proposals for a "green" GDP. The project hosted an international seminar on uncertainty in environment and resource management in 1992, and a new seminar on valuation of environmental goods is planned for the summer of 1993. Further, the Method project has taken the initiative to a

series of inter disciplinary seminars for economists and ecologists. This has provided new contacts and at least one joint economy-ecology paper will be published. The Method project has also initiated an inter disciplinary study with the research programme Management of the ocean under *Economy and Ecology*, where the objective is to carry out an empirical evaluation of various management tools. This work is still at the initial stage.

The development of integrated environment-economy macro models will be initiated in 1993. The objective of this work is partly to evaluate the possibility of integrating aspects of other analyses carried out within the research programme *Economy and Ecology* into macroeconomic models. Work with management of fisheries resources and use of models for long term planning will provide the basis for pilot models, alternatives to those employed today. The project also includes modelling of intertemporal optimization and stochastic conditions. The work will be commenced in 1993 and will continue throughout the project period, i.e. until 1995.

1) Altogether five sub-programs have been initiated under the programme related to the following issues:

- Agriculture and pollution
- Management of the ocean
- Ecology and development
- Society, environment and energy (SAMMEN)
- Methodological oriented studies

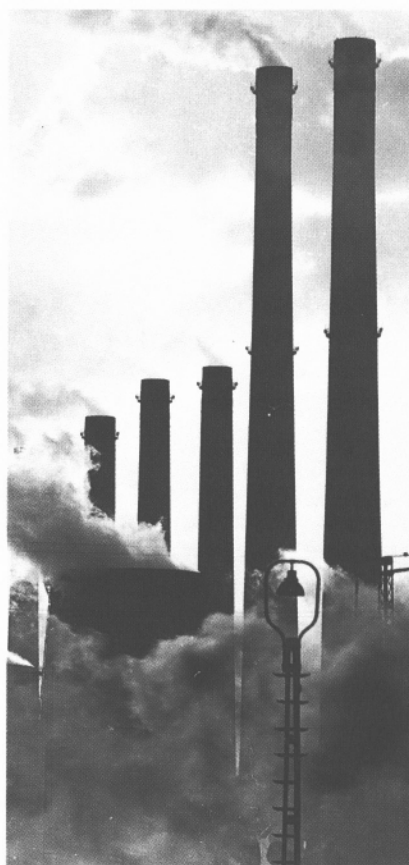


5.2.2 Society, Environment and Energy (SAMMEN)

In 1992 the Central Bureau of Statistics received grants from the SAMMEN-programme for a total of nine projects. Eight projects commenced in 1992 and six of these were joint projects between the Natural Resources Division and other divisions in the Research Department.

Three of the projects were completed in 1992. In the project Energy demand for heating purposes in households, estimates were made of household choice of heating equipment and household energy consumption for heating purposes given the choice of equipment. The findings will be published nationally and internationally during 1993. Data on household energy consumption was a project integrated with this project. Experience from the data analysis has provided the basis for specifying the need for new and/or improved data in this area. The project was completed by the end of 1992. The results are presented in a forthcoming report.

Since 1989, the Division has contributed personnel resources to a major study at the Institute of Economic Analysis, commissioned by the United Nations and partly financed by Norwegian authorities. The objective of the study, entitled International scenarios for energy use, climate policy and economic development, was to analyze the prospects of sustainable global development in a long-term perspective for presentation at the United Nation Conference on Envi-



ronment and Development (UNCED) in Rio de Janeiro in 1992. The final report from the project is currently under preparation.

Work on Climate cost functions proceeded according to plans during 1992. Various climate policy scenarios will be simulated in 1993 using the MSG-EE model with repercussions of air pollution on the economy, in particular related to human health, labour supply and productivity. The power sector model of MSG-EE has been revised and include power generation from natural gas in addition to hydro power. Work in this field will

continue in 1993 in the project A model for the power sectors. The aim is to improve the modelling of the energy sector in MSG-EE by including the load profile of power production and demand, and increasing the time-resolution.

The project Transport demand from the households will estimate the use of cars and car ownership from cross section data in the Consumer surveys. Two approaches are pursued. The first approach is to model the households choice in car acquisition. The second approach also models household demand for cars, but pays attention to the heterogeneity in the auto market, i.e. to the range of choice of different automobiles characterized by attributes which are only partly observed. The project will be completed in 1993.

Two of the projects carried out in 1992 had a more preparatory character: Potential demand for transport in households surveyed the literature and research status in this area and dealt with demand for transport technologies under development, i.e. not yet commercial technologies. The other project Energy macromodels was carried out in collaboration with the Institute for Energy Technology (IFE). IFE operates a technical energy model called Markal. In this model various forms of energy consumption and production technologies and associated cost structures are specified. Such technological information may be valuable in order to evaluate energy forecasts modelled by MSG-EE. Experience from this project will be summarized and published in a joint memorandum.

5.2.3 International models

Nordic energy demand model

This model is a regionalised partial equilibrium energy model for the Nordic countries (Norway, Denmark, Sweden and Finland) covering the most important energy carriers in this region. Supply functions and an energy transport network is linked to a demand model comprising three manufacturing sectors, a service sector, four transport sectors and the households. The demand for energy in Iceland is covered in a separate model.

Sectoral European Energy Model (SEEM)

The Sectoral European Energy Model (SEEM) is a model for the calculation of future demand for fossil based energy in nine Western European countries given an economic development path, and price paths for oil gas and coal at the import level (cif). The model calculates end user prices including taxes and demand for solid, liquid and gaseous fossil fuels from manufacturing industry, services, transportation, power production and households. For given supply paths of non fossil electricity, the model computes equilibrium prices and quantities of electricity based on the average incremental cost of conventional power and relative energy prices. The model also comprises a routine for calculating emissions of CO₂ from fossil fuel use.





DYNOPOLY – A DYNAMIC Oligo-POLY model for the European gas market

The game depicted by the model is essentially an investment game between dominant natural gas suppliers (Algerie, former USSR and Norway) facing a deregulated gas market with no intermediate barrier between suppliers and end users. The demand region is continental Western Europe. Each player possesses a bundle of strategic investment options. In the beginning of each five-year period they can make use of one or more of the remaining options, or none. The moves are made

simultaneously, only previous investments are known. The investments are operative from the next period. The players maximize discounted cash flows over the remaining horizon. They have full information of demand, options and costs and can predict the other players' best moves. The model is solved by dynamic programming, and the solutions are perfect Nash equilibria. In equilibrium, the players balance the profits from discouraging the opponents' supplies by making an investment, against the profits from restricting supply by postponing the investment.

The Division is responsible for several projects related to international energy markets. The two most important of these are concerned with the development of an European demand model for energy and a more disaggregated version which covers the Nordic energy markets. Both models will be supplemented by emission modules which will provide estimates of emission to air of sulphur dioxide (SO_2), nitrogen oxides (NO_x) and carbon dioxide (CO_2) from the model's forecasts of energy use. The ultimate purpose of these studies is to improve our knowledge of foreign energy markets such that the effects upon the Norwegian energy markets

and the Norwegian economy induced by changes in international energy and environmental policies may be analyzed more efficiently.

The Nordic model

This project is aimed at establishing a regionalized demand model for the most important energy carriers in the Nordic countries. Consumption is modelled in several industrial sectors, services, households, energy production and the transport sectors. Supply functions and the transport network for the energy sources is established and emission models for CO₂, NO_x and SO₂ are linked to the energy demand model. The model will be used to analyze possible future development in energy use and atmospheric emissions. Particular interest lies in the analysis of a Nordic market for energy and its possible contribution to the fulfilment of environmental targets including the cost effectiveness of measures aimed at reducing emissions to air.

Econometric models for the demand for oil and electricity in three industrial sectors, households and services, together with four transport sectors have been completed and are now ready for simulations. Demand for alternative energy sources such as coal, other solid fuels, gas, and district heating can be significant in the future, but it has not been possible to estimate robust relations for these. These relations are therefore determined partly exogenously, and partly calibrated on the basis of other information.

Work in establishing an equilibrium model with trade in energy has

commenced, but is not yet completed. In a pilot project of the equilibrium model, data for these technologies is included in the optimizing programme package GAMS together with data for the existing capacity. The criteria function is the combined consumer surplus in the energy markets. To make this functionally operative, demand functions are given a linear form. Further, data for transmission costs has been included. Results and documentation have been presented at three Nordic seminars in 1992; Hankø in June, Helsingfors in September, and Oslo in October.

Sectoral European Energy Model (SEEM)

SEEM is a model for the calculation of future demand for fossil based energy in nine Western European countries. The model includes demand for the three major fossil energy sources together with electricity demand from manufacturing industry, households, services, transport and power production. The model also comprises a routine for calculating emissions of CO₂. On the agenda for 1993 is a "soft link" project using IIASA's RAINS model and SEEM to obtain least cost SO₂ and NO_x emission paths.



The model is particularly relevant in studies of taxation as a feature of energy and environmental policy. This is particularly relevant when seen in the broader context of the consequences for Norway as an exporter of petroleum following the introduction of an European CO₂ tax. The model is now complete and the commissioning party has received documentation and a version of the model. Publishing and documentation remain to be completed. Simulation of a reference scenario and a CO₂ tax scenario have been published. Further, analyses have been carried

out employing the model for the Ministry of Finance in connection with the long-term programme. The Norwegian oil company Statoil has also requested a test of the industry model employing flexible function forms in alternative formulations of the model in a comprehensive econometric test program. This has been carried out. A comparison of the results with the present simulations of the model remains to be carried out. Other projects having a natural association with work on international models are:

Consequences of the EC gas directive for Norway as an exporter of gas

The aim of this project is to improve Norway's ability to evaluate the EC directive on third parties' admission to the gas network. It is intended that previous analyses by the Central Bureau of Statistics will be updated. It is also intended to utilize the output from SEEM and a dynamic game theoretic model for the European gas market (DYNOPOLY). The project will be completed and reported early in 1993.



European gas markets. Cooperation with the Netherlands research institute ECN.

A joint project with the Netherlands Energy research Foundation, ECN, aiming to develop a partial equilibrium model for natural gas in Western and Central Europe is planned for 1993. The ECN will have responsibility for the management and operation of the model. Sofregas, (an engineering company and consultancy in gas, France) will have the responsibility for the cost data with particular emphasis on Southern Europe; the Central Bureau of Statistics will provide North Sea data and assistance in modelling. It is applied for financial support from the EC Commission (DG XII).

Strategic decision-making in Norwegian oil policy

The aim of this project, which is in cooperation with SNF within the Petro research program, is a theoretical and empirical discussion of how changing institutional circumstances in the European gas market can influence the price of Norwegian gas and the extraction profile of Norwegian gas reserves. The project comprises a theoretical section where game theory and resource management theory are utilised to analyze possible future changes in the European gas market. In the empirical section, numerical illustrations will be presented used to illustrate how changes in oil and gas prices may be influenced by international measures aimed at reducing discharge of CO₂.

5.2.4 Other work

The Division carries out continual reporting and analytical work for the Ministry of the Environment and the Ministry of Finance. For 1993, we have been especially requested to contribute to reports associated with the international negotiations on climatic problems and acid precipitation.

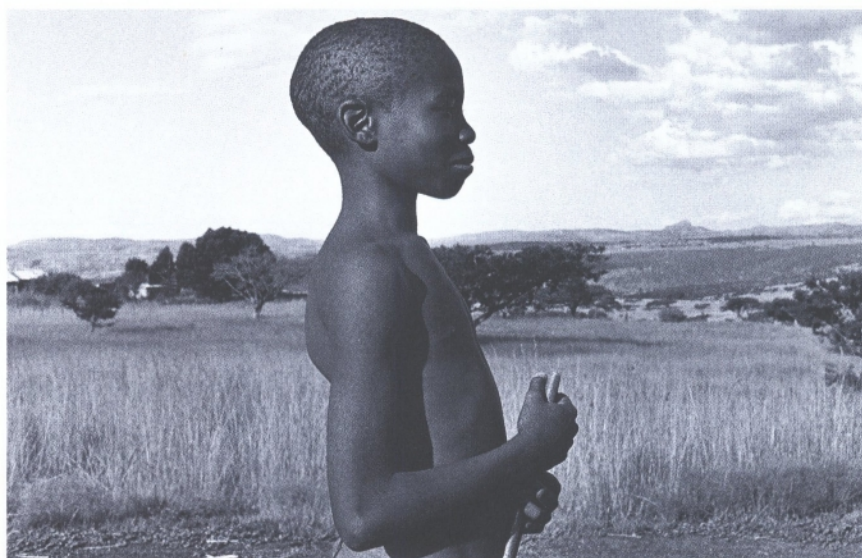
5.3 Doctoral dissertations

Snorre Kverndokk was the only doctoral candidate from the Division in 1992. His thesis on international CO₂ agreements (cost effectiveness, optimal emission reductions, and justice) will be defended in 1993. Pål Børing and Karine Nyborg, have been admitted to the doctoral study programme at the University of Oslo from 1993. Børing has a grant from the Norwegian Research Council to work on problems of long-term planning under conditions of uncertainty,

while Nyborg examines welfare theory problems within resource and environmental economics.

5.4 International work and international contacts

The Division is engaged in three projects associated to developing countries. The Nicaragua project develops an integrated erosion and macroeconomic model for Nicaragua, with the purpose of analyzing specific environmental consequences of alternative policy proposals. The work is proceeding in collaboration with the Central American College of Economics and Business Administration (INCAE) which has a division in Managua, Nicaragua. Norwegian participation in the project was financed by NORAD in 1992, and this part of the work will be completed in the summer of 1993. An application for further support will be sent to the World Bank.

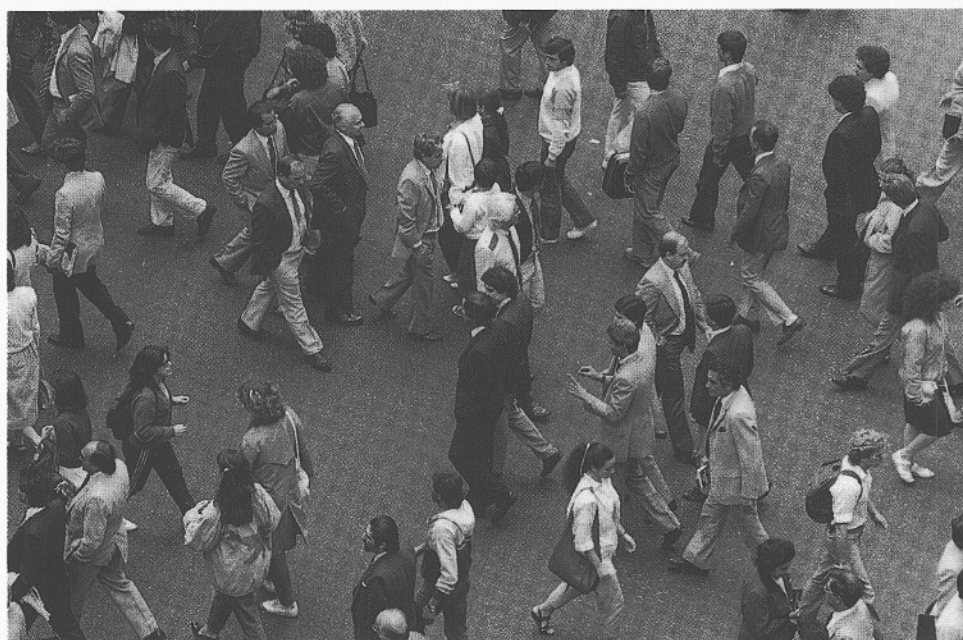


6.1 Objectives

The primary objective of the Macroeconomic Division is to develop and disseminate knowledge about the functioning of the Norwegian economy by developing and utilizing macroeconomic models for own analyses and for government planning purposes. All the macroeconomic models of the Research Department are related to the national accounts, both conceptually and empirically. The MODAG model appeared around 1980, and gradually replaced MODIS as the central model tool used by the Ministry of Finance in conducting National Budgets. The MSG model is based more or less on the same division of industries and commodities as MODAG. However, while the structure of MODAG may be characterized as basically Keynesian, MSG is an applied general equilibrium model, intended for long term analyses and projections for the Norwegian economy. The third major model is the KVARTS model. This is a quarterly model used in connection with the business cycle analyses carried out regularly by the Macroeconomic Division.

MACROECONOMIC MODELS:

All of the CBS' macroeconomic models have been built up on the basis of the account system of the national accounts. The core of the models is input-output connections for supply and utilization of specified goods and services. Linked to this core are behaviour relations etc. for different sectors of the economy.



*The **MODAG** model has an input-output core with 41 goods and 33 production sectors. This model is particularly suitable for analysis in the medium term. The behaviour relations cover production, consumption, investment, imports-exports, prices, interest rates, and wages and the labour market. The Ministry of Finance is an important user of the MODAG model for forecasts and economy policy analyses.*

*The **KVARTS** model is a quarterly model which contains largely the same type of behaviour relations as MODAG, but is more aggregated. The input-output core has 24 goods and 18 production sectors. In the model great emphasis is placed on dynamic short-term contexts, meaning that much of the progress is deter-*

mined by developments in previous quarters. The model is used in business cycle analyses and for work in the Expert Committee for Income Settlements

*The **MSG** model is an applied general equilibrium model which describes an economy characterized by perfect competition, flexible prices and full utilization of labour and capital. The aggregation level and input-output structure in the official version of the model, MSG5, are identical to the MODAG model. The model is particularly suitable for studies of changes in industry structure along a growth path for the economy and for analyses of policies that affect the economy's supply side. The Ministry of Finance is an important user of the MSG model.*

6.2 Main trends for activity in 1992 and plans for 1993

6.2.1 Business cycle analyses

In 1992, the publication *Økonomiske analyser/Economic Survey* (nine issues in Norwegian and four in English), comprised the annual *Economic Survey 1992*, three quarterly economic surveys, *Economic Trends*, and the monthly *Economic Trend* which was initiated in 1992.

The Division contributes with statistical information included in the so-called "key indicators" in the new bulletin *Weekly Statistics* from the Central Bureau of Statistics. In addition to the Quarterly National Accounts, the Macroeconomic Division also provides seasonally adjusted figures and volume statistics, and time series data for the production of diagrams. A summary of each issue of *Economic Trends* is also published in the *Weekly Statistics*.

During the last year the Macroeconomic Division has provided calculations and participated in the work of the Expert Committee for Income Settlements. The KVARTS model has been the central analytical tool in calculating the future developments in consumer prices.

6.2.2 KVARTS

KVARTS is a quarterly model based upon quarterly national accounts data. In 1992 a disaggregated employment vacancies module (seven groups) and a social transfers module (a mini-version of that in MODAG) have been implemented. Further, gross invest-

ments in fixed capital (including housing investments) have been endogenized in the model. A new wage module has been added in 1992 where unemployment, alternative wage and factor income deflator and productivity are determinants in the long-term solutions for manufacturing industries, and alternative wage, consumer prices and income tax determine wages in private services. Equations for interest rates have also been estimated. Finally, a new relation for non-durable consumer products with strong interest effects and income elasticities differing with socio-economic groups has been incorporated. The wage module, the price and employment modules and the employment vacan-

cies module will be documented as reports.

In 1992 a new aggregated KVARTS-model has been developed. A more aggregated model will be simpler to handle and more attention may be given to improving the econometrics of the model. In the new model aggregation is carried out for the manufacturing sector, primary and public sectors. Many econometric relations remain the same as in the previous version. Both models will be operational in a transitional phase until the next updating in May 1993. The models will be tested against each other before a decision is made on the validity of the aggregated version. The new model will be documented in English during 1993.



6.2.3 MODAG

During 1992, the MODAG model has been further developed. A sub-model covering social benefits is documented in the series *Social and Economic Studies*. The development of the model for social benefits, was a part of the Welfare State Project financed by the Norwegian Research Council. In the light of results from this work, the sub-model of labour supply has also been revised.

Long-term properties for the implicit product functions have been aligned with theoretical considerations to a greater degree. In addition, the determinants of interest rates have become more closely allied to traditional theory. Further work has been carried out in improving the consumption and housing investment elements in the model. MODAG now contains relations which give a much better description of the development of consumption during recent years, even though we are still some way from a complete satisfactory model. The attempts to compile a model based on a very flexible consumption system (AIDS) within a dynamic error-correcting framework is documented in the reports series of CBS. This work will be continued in 1993. A project financed by the Directorate of Labour, studies the labour market balance for various types of labour. On the demand side, employment by industry from MODAG are distributed by education categories using exogenous shares. The composition of the supply side in the labour market is derived from MOSART. Estimation of demand relations for various types of labour will be carried

out in 1993, and if successful, the results will be included in a new version of MODAG.

In the autumn of 1992, a thorough examination of the import share relations was made. Moreover, during the last year, detailed historical time series for user prices of fixed capital were prepared. Together with the established data for wages, these will be utilized in an extensive respecification and reestimation of the factor demand of the MODAG model.

In conjunction with the Ministry of Finance, an examination of the opera-

tional and updating routines of MODAG will be made prior to the next updating in an attempt to reduce maintenance cost.

Since 1991 the Macroeconomic Division undertakes macroeconomic calculations on request for the fractions in the Finance Committee of the Storting (Parliament). In connection with the preparation of the National budget for 1992, only one model simulation of this type was made, while several were carried out for the 1993 National budget.





6.2.4 MSG/equilibrium models

The MSG model has been intensively used in 1992 by the Ministry of Finance in connection with the Government's Long-Term Programme 1994–1997. In the development work on the model, priority has been given to the construction of a more detailed model for household consumption, focusing on the interrelations between income, expenditure, saving and wealth. The model also differs from the preceding one by allowing substitution between different forms of transport. The sub-model will be documented as a Discussion Paper. A new module for the electricity market was incorporated into the MSG model in 1992.

The work on the compilation of an intertemporal equilibrium model based on perfect foresight has been delayed. A disaggregated model along

the lines of Jorgenson and Wilcoxon is expected to be completed during 1993.

A project to incorporate endogenous labour supply and decreasing returns to scale in production sectors will be completed in 1993. A model of this type will be of interest for the studies of the welfare effects of tax changes. A project to calculate the so-called "Effective Rates of Assistance" (ERA) financed by the Ministry of Finance was initiated in 1992. ERA is an aggregate measure summarizing all forms of industrial subsidies to an equivalent price change, and a corrected gross product for each industrial branch. The relative ERA between the industries is an indicator of distortions in the resource allocation. A project report including both discussion of methods and results will be completed in 1993.

6.2.5 Business cycle history project

The Business cycle history project aims at analyzing fluctuations in the Norwegian economy since the mid-1970s and to examine these in the light of recent business cycle theory. The project may be distinguished in two parts:

(1) Continuation of work with counterfactual KVARTS analyses

The developing work carried out on KVARTS in 1992 made the model more suitable for analyzing the effects of cyclical impulses in the Norwegian economy. A study of the dramatic increase in unemployment between 1987 and 1991 was undertaken in 1992 and will be documented as a report. In 1993 a similar analysis will cover a longer timeperiod. In 1993 we will focus specifically on the cyclical

impulses arising from investments in the oil industry (project financed by the Norwegian Research Council).

(2) Time series analyses of macro data

A considerable amount of literature has been published on the time series characteristics of macroeconomic variables. This type of analysis can provide knowledge on correlations in data which may prove useful in an evaluation of business cycle developments. The Macroeconomic Division aims at utilizing the increased expertise within time series analysis to carry out a study of macroeconomic fluctuations. The characteristics of central macroeconomic variables such as seasonal components, cyclical components and trend elements will be described.

6.3. Competence building and doctoral dissertations

Several associates in the division have participated in a Nordic methodological project on time series econometrics (co-integration in multiple time series). A paper was presented at the European Econometric Society meeting in 1992. Further publications of the work will be discussed at a workshop in the midsummer of 1993. Of the four current doctorate students in the Macroeconomic Division, one, – Nils Martin Stølen – will submit his thesis on labour market studies early in 1993. The other three are financed by the Norwegian Research Council. Kjersti-Gro Linquist's thesis on producer behaviour and market adjustment in manufacturing comprises both microeconomic and

macroeconomic studies, and is expected to be submitted at the end of 1993. Ingvild Svendsen's work on expectation formation has been delayed due to leave and will not be submitted until 1994. Brita Bye's thesis on intertemporal equilibrium models is also delayed due to leave. In connection with the Welfare State project, one associate is doing post-graduate studies at London School of Economics during 1992/93, continuing his work modelling household consumption.

6.4 International work and contacts

The Division has international contacts including Dale Jorgenson at the Harvard University, the Macro-model bureau at the University of Warwick, and through the LINK system. We also have contact with other Nordic modelling groups. In connection with the work on business cycles we have contact with several foreign institutions (LINK, AIECE and Nordic business cycle institutions).

The Division has contributed to the Research Department's work with macroeconomic models in other countries (China, Indonesia, Estonia and Hungary).



7.1 Objectives

The central area of the Division's activities is econometric analyses of CBS' micro-data, and application of estimated behavioural relations and inequality measures in policy simulation experiments. The Division has a long-term aim of establishing a micro-based system of structural behavioural relations for households and firms. The Division has, furthermore, a particular responsibility for developing adequate theory and methods for microeconomic analysis. To ensure that the activity shall be of relevance to CBS it is considered important that the Division takes responsibility for empirical studies and participates in the implementation of empirical results in operational macroeconomic and microsimulation models. An important purpose for establishing a separate econometric division is to strengthen the level of expertise in microeconomic analysis.



7.2 Status and events in 1992

– During the current year considerable efforts have been made to establish a theoretical foundation for the choice of functional forms when specifying behavioural empirical models. The important stages in this process are:

- (i) Establishment of a theoretical foundation for welfare measures and measures of inequality.
- (ii) Theoretical justification and characterization of functional form for transition probabilities for individual choice over time.
- (iii) Functional form for structural choice probabilities under two-sided search/matching with flexible contracts in a market with limited information.

In labour supply analyses the main efforts have been spent on revising and extending empirical work with particular reference to a theoretically satisfactory and econometrically convenient framework when preferences are assumed to depend on non-pecuniary job-attributes.

Application of results from microeconomic consumer demand studies continued throughout 1992, and includes the implementation of a consumer demand system in the general equilibrium model MSG, in the macro model MODAG (including detailed and updated rules for indirect taxation), and in the microsimulation model LOTTE (with detailed and updated rules for direct taxation).

This system of models can be applied to study implications for the distribution of welfare from changes in direct and indirect taxes. A new approach for estimating consumption in the national accounts by combining micro and macro observations has been developed. Currently, a labour supply module is being linked to this system of simulation models.

In the research on firm behaviour much effort has been exerted on studies of market power and economies of scale at the plant level. The relationship between R&D-investment and firm performance, such as profits and productivity, has been investigated.

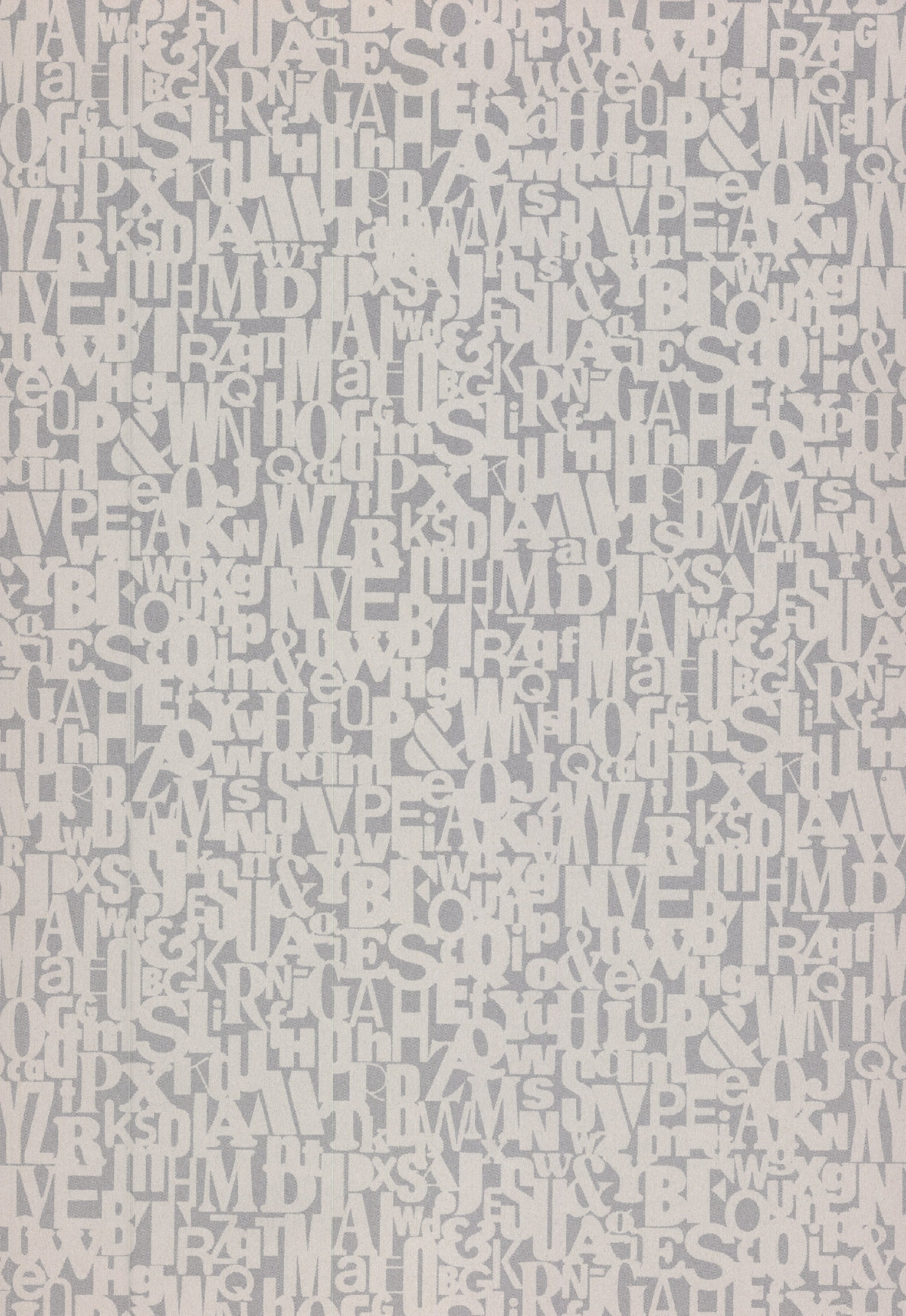
The relationship between physical investment and the financial condi-

tion of the firm and the pattern of entry and exit of firms and industry evolution are other topics where work is in progress.

The Microeconomic Division is cooperating closely with the other divisions in the Research Department. Furthermore, the Division maintains contacts with a number of universities and other research institutions in USA and Europe. In 1992, the Division has had joint projects with the State Statistical Bureau in Beijing on analysis of income inequality and consumption for Chinese urban households.

Part of the research on firm behaviour has been carried out in cooperation with Professor Zvi Griliches at Harvard University.





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Discussion Papers

- 68 **Bye, Brita:** *Modelling consumers' energy demand.* September 1992.
- 69 **Alfsen, Knut H.; Anne Brendemoen and Solveig Glomsrød:** *Benefits of climate policies: Some tentative calculations.* March 1992.
- 70 **Aaberge, Rolf; Xiaojie Chen, Jing Li and Xuezheng Li:** *The structure of economic inequality among households living in urban Sichuan and Liaoning, 1990.* April 1992.
- 71 **Alfsen, Knut H.; Kjell Arne Brekke, Frode Brunvoll, Hilde Lurås, Karine Nyborg and Hans Viggo Sæbø:** *Environmental indicators.* April 1992.
- 72 **Bye, Brita and Erling Holmøy:** *Dynamic equilibrium adjustment to a terms of trade disturbance.* May 1992.
- 73 **Aukrust, Odd:** *The Scandinavian contribution to national accounting.* Paper for the IARIW twenty-second general conference, Flims, Switzerland, August 30 – September 5, 1992. June 1992.
- 74 **Aasness, Jørgen; Erling Eide and Terje Skjerpen:** *A criminometric study using panel data and latent variables.* December 1992.
- 75 **Aaberge, Rolf and Li Xuezheng:** *The trend in income inequality in urban Sichuan and Liaoning, 1986–1990.* September 1992.
- 76 **Dagsvik, John K. and Steinar Strøm:** *Labor supply with non-convex budget sets, hours restriction and non-pecuniary job-attributes.* September 1992.
- 77 **Dagsvik, John K.:** *Intertemporal discrete choice, random tastes and functional form.* November 1992.
- 78 **Vennemo, Haakon:** *Tax reforms when utility is composed of additive functions.* January 1993.
- 79 **Dagsvik, John K.:** *Discrete and continuous choice, max-stable processes and independence from irrelevant attributes.* January 1993.
- 80 **Dagsvik, John K.:** *How large is the class of generalized extreme value random utility models?* January 1993.
- 81 **Birkelund, Hugo; Eystein Gjelsvik and Morten Aaserud:** *Carbon/energy taxes and the energy market in Western Europe.* February 1993.
- 82 **Bowitz, Einar:** *Unemployment and the growth in the numbers of recipients of disability benefits in Norway.* March 1993.
- 83 **Andreassen, Leif:** *Theoretical and econometric modeling of disequilibrium.* February 1993.

Reports

- 1/92 *Naturressurser og miljø 1991.* (Natural resources and the environment 1991).
- 1A/92 *Natural resources and the environment 1991.*
- 2/92 **Ljones, Arne; Runa Nesbakken, Svein Sandbakken and Asbjørn Aaheim:** *Energibruk i husholdningene.* (Use of energy in Norwegian households).
- 3/92 **Moum, Knut (red.):** *Klima, økonomi og tiltak (KLØKT).* (Effects on the Norwegian economy of national and international climate policies).
- 5/92 **Langørgen, Audun:** *En økonometrisk analyse av lønnsdannelse i Norge.* (An econometric analysis of wage formation in Norway).
- 7/92 **Cappelen, Ådne; Tor Skoglund and Erik Storm:** *Samfunnsøkonomiske virkninger av et EF-tilpasset jordbruk.* (Economic effects of adapting CAP to Norwegian agriculture).

- 15/92 **Stambøl, Lasse S.:** *Flytting og utdanning 1986–1989. Noen resultater fra en undersøkelse av innenlandske flyttinger på landsdelsnivå og utdanning.* (Migration and education 1986–1989. Some results from an investigation of regional migration and education).
- 17/92 **Brendemoen, Anne; Solveig Glomsrød and Morten Aaserud:** *Miljøkostnader i makroperspektiv.* (Macroeconomic perspectives on environmental costs).
- 20/92 **Johnsen, Tor Arnt:** *Ressursbruk og produksjon i kraftsektoren.* (Input structure and production in electricity production).
- 22/92 **Magnussen, Knut A. and Terje Skjerpen:** *Consumer demand in MODAG and KVARTS.*
- 23/92 *Skatter og overføringer til private. Historisk oversikt over satser mv. Årene 1975–1992.* (Taxes and public transfers. Historical overview: 1975–1992.)
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- 2/93 **Brendemoen, Anne:** *Faktoreterspørsel i transportproduserende sektorer.* (Demand for inputs in transportation sectors).

Reprints

Stambøl, Lasse S.: Migration projection in Norway: A regional demographic-economic model. *Reprint from John Stillwell and Peter Congdon (eds.): Migration models. A macro and micro approaches, 1991.* Belhaven Press. REPRINT 58.

Cappelen, Ådne; Nils Petter Gleditsch and Olav Bjerkholt: Guns, butter and growth: the case of Norway. Reprint from Steve Chan and Alex Mintz (eds.): *Defense welfare and growth perspectives and evidence.* Routledge, London. 1992. REPRINT 59.

Holmøy, Erling: The structure and working of MSG-5, an applied equilibrium model of the Norwegian economy. Reprint from Lars Bergman and Øystein Olsen (eds.): *Economic modeling in the Nordic countries.* Contributions to Economic Analysis no. 210, Elsevier Science Publishers B.V. (North Holland), 1992. REPRINT 60.

Cappelen, Ådne : MODAG, a macroeconometric model of the Norwegian economy. Reprint from Lars Bergman and Øystein Olsen (eds.): *Economic modeling in the Nordic countries.* Contributions to Economic Analysis no. 210, Elsevier Science Publishers B.V. (North Holland), 1992. REPRINT 61.

Holtmark, Bjart and Kyrre Aamdal: Befolkning, offentlig tjenesteyting og makroøkonomiske konsekvenser. (Demographic change, the demand for public services and macroeconomic consequences). Reprint from NOU 1992:1 *Trygghet – Verdighet – Omsorg*, Annex 4. REPRINT 62.

Internal Notes/Working papers

Aslaksen, Iulie and Charlotte Koren: *A women's perspective on poverty: Time use, income distribution and social welfare.* In Working paper no. 7/1992 (Part 4) from Department for Statistics on Individuals and Households.

Brunborg, Helge: *Demographic consequences of AIDS, with special reference to Zambia.* In Working paper no. 4/1992 (Part 1) from Department for Statistics on Individuals and Households.

Brunborg, Helge and Nico Keilman: *MOSART-H: A combined micro-macro model for simulation of households.* In Working paper no. 4/1992 (Part 1) from Department for Statistics on Individuals and Households.

Fredriksen, Dennis: *Datagrunnlaget for trygdemodellen MOSART-T.* (Data set for MOSART-1: A model for the National Insurance System). Internal Notes 7/92.

Fredriksen, Dennis: *Analyser av overganger til uførbet og opptjening av pensjonsgivende inntekt for trygdemodellen MOSART-T.* (Analysis of labour supply and transitions into disabled pension). Internal Notes 8/92.

Langbraaten, Nina; Halvard Hansen and Jon Ivar Røstadsand: *Sosio-økonomisk husholdningsregnskap. Reiserapport fra studietur til Netherlands Central Bureau of Statistics, Voorburg.* (Socio-economic accounts. Report from a study tour to the Netherlands Central Bureau of Statistics, Voorburg). Internal Notes 12/92.

Li, Jing: *The potential of Norwegian official consumption statistics in marketing research.* Internal Notes 4/93.

Ljones, Olav: *Eldrebølgen og pensjonssystemene i Norden. Synspunkter fra Norge.* (Ageing and social security: Norwegian viewpoints). In Working paper no. 4/1992 (Part 1) from Department for Statistics on Individuals and Households).

Mohn, Klaus; Lasse S. Stambøl and Knut Ø.

Sørensen: *REGARDs formelle struktur.* (The formal structure of the regional model REGARD). Internal Notes 3/93.

Thoresen, Thor Olav: *Child care subsidies and inequality.* In Working paper no. 7/1992 (Part 3) from Department for Statistics on Individuals and Households.

Aasness, Jørgen and Jing Li: *A microsimulation model of consumer behavior for tax analysis.* In Working paper no. 7/1992 (Part 3) from Department for Statistics on Individuals and Households.

Social and economic studies

Ljones, Olav; Bjørg Moen and Lars Østby (red.): *Mennesker og modeller. Livsløp og kryssløp.* Artikkelsamling tilegnet Per Sevaldson. (Men and Models, Lifecycle and Input-Output Models. Articles dedicated to Per Sevaldson). SØS 78 (Contributions from the Research Department).

Bjerkholt, Olav: *Hvordan kryssløpsanalysen kom til Norge.* (How Input-Output analysis came to Norway).

Brunborg, Helge: *Nye og gamle trekk ved dødelighetsutviklingen i Norge.* (New and old mortality patterns in Norway).

Ljones, Olav: *Om personmodeller og konsekvenser av befolkningsutviklingen.* (Demographic models and modeling of demographic consequences).

Skoglund, Tor and Knut Ø. Sørensen: *Regionale forskjeller i bruttoregionprodukt pr. innbygger.* (Regional Differences in Gross Domestic Product per capita).

Lasse S. Stambøl: *Utdanningsnivået er av stor betydning for flyttingene.* (The educational level is of great importance for regional migration).

Gabrielsen, Inger: *Det norske skattesystemet 1992.* (The Norwegian tax system 1992). SØS 79.

Bowitz, Einar: *Offentlige stønader til husholdninger. En økonometrisk undersøkelse og modellanalyse.* (Government transfers to households. An econometric investigation and model analysis). SØS 80.

Økonomiske analyser

ØA 1/92 **Økonomisk utsyn over året 1991.** (Economic Survey 1991).

ØA 2/92 **Cappelen, Ådne; Tor Skoglund and Erik Storm:** *Nasjonale og regionale virkninger av et EF-tilpasset jordbruk.* (National and regional effects of adapting norwegian agriculture to CAP).

Epland, Jon: *Inntektsfordelingen i 80-årene.* (Income distribution in the 1980's).

Fredriksen, Dennis and Steinar Strøm: *Arbeidsledigheten i Europa 1970–1990.* (Unemployment in Europe 1970–1990).

Hansen, Kirsten; Nina Langbraaten and Thor Olav Thoresen: *Utviklingen i lønnsbeskatningen 1986–91 belyst ved skattemodellen LOTTE.* (Changes in the taxation of employees 1986–1991 illuminated by the tax model LOTTE).

ØA 3/92 **Konjunkturbildet.** (Monthly Economic Trends). *Revidert nasjonalregnskapsstatistikk for 1989 og 1990.* (Revised National Accounts Statistics).

Bjerkholt, Olav and Eystein Gjeldsvik: *Konkurransen om markedsandeler på det europeiske gassmarked.* (The struggle for market shares on the European gas market).

Bye, Torstein and Lorents Lorentsen: *Energi-loven og miljøet.* (The new Energy Act and the environment).

Magnussen, Knut A. and Terje Skjerpen: *Fordelingen av privat konsum i MODAG.* (The distribution of private consumption in MODAG).

ØA 4/92 **Konjunkturbildet.** (Monthly Economic Trends). *Offentlig forvaltnings inntekter og utgifter etter art og formål for 1987–1991.* (General government incomes and outlays by type and function 1987–1991). *Revidert nasjonalregnskapsstatistikk for 1991.* (Revised National Accounts Statistics).

Aslaksen, Iulie and Charlotte Koren: *Husholdsarbeid og inntektsfordelingen: Individ eller husholdning som beskatningsenhet?* (Taxation, time use, and the value of unpaid labour: Policy implications for the redistribution of income).

Bye, Torstein and Tor Arnt Johnsen: *Utviklingen i kraftmarkedet.* (The electricity market).

Stølen, Nils Martin: *Strukturelle problemer på arbeidsmarkedet.* (Structural Problems in the Norwegian labour market).

ØA 5/92 **Konjunkturtendensene for Norge og utlandet.** (Economic Trends).

Næsheim, Helge Nome: *Om sammenhengen mellom offisielle mål på arbeidsledighet.* (A discussion of various measures of unemployment).

ØA 6/92 **Konjunkturtendensene for Norge og utlandet.** (Economic Trends).

ØA 7/92 **Aarbu, Karl Ove:** *Gjennomsnitt- og marginalskatter for personlige næringsdrivende før og etter skattereformen.* (Average and marginal taxrates for self-employed before and after the norwegian tax reform).

Alfsen, Knut H. and Solveig Glomsrød: *Å spare på skillingen, men la dalerne gå: Nytte og kostnader av klimapolitikken.* (Benefits and costs of climate policies).

Birkelund, Hugo; Eystein Gjelsvik and

Morten Aaserud: *Energiforbruk og CO₂ – utslipp i Vest-Europa – EFs karbon/energiskatt analysert i en modell med energisubstitusjon.* (Energy demand and carbon dioxide emission in Western Europe – the EC carbon/energy tax analyzed in an interfuel substitution model).

Koht, Berit and Tom Andersen: *Forbrukerpriser utvikling og prisnivåforskjeller. 1985–1990–1992. En jevnføring mellom de nordiske land og EF-området.* (Consumer prices – development and differences in comparative price levels. A comparison between the nordic countries and the EC).

ØA 8/92 **Konjunkturbildet.** (Monthly Economic Trends).

Bowitz, Einar: *Arbeidsledighet og uførepensjon.* (Unemployment and disability benefits).

Holt, Per M.: *Distriktsskatteloven.* (Tax free allocations to reserves, for regional investments).

Mohn, Klaus: *Industrien i REGARD: Produktivitet og sysselsetting i et regionalt perspektiv.* (The industry sector in the regional model REGARD: regional aspects of employment and productivity).

Wass, Kurt Å.: *Prisindekser for boligmarkedet.* (Price index for dwellings).

ØA 9/92 *Konjunkturtendensene for Norge og utlandet.* (Economic Trends).

ØA 1/93 *Økonomisk utsyn over året 1992.* (Economic Survey).

Economic survey

ES 1/92 *Economic Survey 1991. Norway.*

ES 2/92 *Economic trends in Norway.*
Stocks, catches and quotas in Norwegian fisheries.

ES 3/92 *Economic trends in Norway.*

Holmøy, Erling; Bodil Larsen and Nils-Øyvind Mæhle: *Growth and productivity in Norway 1970–1991.*

ES 4/92 *Economic trends in Norway.*

Miscellaneous (Alphabetical)

Aaheim, Asbjørn: Miljø og økonomi – venner eller fiender? (Environment and Economy – friends or enemies?). *Human Ecology* no. 1, 1992.

Alfsen, Knut H.: Use of macroeconomic models in the analysis of environmental problems in Norway, and consequences for environmental statistics. *Statistical Journal of United Nations ECE* 8, 1992, pp. 1–22.

Alfsen, Knut H. and Lorents Lorentsen: Miljø og forurensning som økonomisk problem. (Environment and pollution as an economic problem) I H. Pleym m.fl. (1992): *Miljøstudier*. 3. utgave. NKI Forlaget, Bekkestua, 1992.

Bergman, L. og Øystein Olsen (eds.): *Economic Modeling in Nordic Countries*. North Holland. 1992.

Bjerkholt, Olav; Nils Petter Gleditsch and Ådne Cappelen: The economics of military spending and the role of R & D. In *Proceedings of the International Conference on International Cooperation in Peaceful Use of Military Industrial Technology*, Oct. 22–25, 1991, Beijing, China. International Academic Publishers: Beijing, 1992, 105–119.

Bjerkholt, Olav and Eystein Gjelsvik: Common carriage for natural gas: the producers' perspective. In Hope, E. and S. Strøm: *Energy Markets and Environmental Issues: A European Perspective*. Scandinavian University Press: Oslo, 1992, 131–162.

Bjerkholt, Olav and Kjell Arne Brekke: Practical aspects of policy analysis under uncertainty. In Strøm, S. and J. Trilling (eds): *Global Climate Change: European and American Policy Responses*. (Forthcoming).

Brekke, Kjell A.; Eystein Gjelsvik and Asbjørn Aaheim: Forvaltning av oljeinntekter, sparing og fond-soppbygging; Norge sparer mens statens oljefond går med underskudd. (Management of oil revenues, savings and reserve fund; Norway saves while the government fund declines). *Sosialøkonomen*. 7/8.

Brekke, Kjell A. and B. Øksendal: Optimal switching in an economic activity under uncertainty. *SIAM Journal of Optimization*. (Forthcoming). (Also as Preprint No. 9, April 1992, Department of Mathematics, University of Oslo.)

Brunborg, Helge; Liv Hobbelstad Simpson and Lasse Røgeberg: *The statistical situation in Namibia after independence*. Research Report No.7, NEPRU (Namibia Economic Research Policy Unit), Windhoek, 1992.

Cappelen, Ådne; K.O. Moene and R. Nymoen: Fra full sysselsetting til varig ledighet? (From full employment to permanently high unemployment). *Nordisk tidsskrift for politisk økonomi*, nr. 27/28, 1992, 17–38.

Cappelen, Ådne: Tiltak mot arbeidsledighet. (Policy measures against unemployment). In H. Bakke (ed.): *Arbeidsledighet – hvordan redusere den?* Universitetsforlaget, 1992, 101–110.

Cappelen, Ådne: Noen merknader til Skånland's årstale. (Some comments to Skånland's Annual Statement). *Sosialøkonomen*, 4/92.

Fredriksen, Dennis og Nils Martin Stølen: Arbeidsmarkedet i Norge gjennom 1970- og 1980-tallet. (The Norwegian labour market 1970–1990). In Hallvard Bakke (ed.): *Arbeidsledighet – hvordan redusere den*, (Policy measures against unemployment). Universitetsforlaget 1992, 9–35.

Fagerberg, Jan; Ådne Cappelen and Lars Mjøset: Structural change and economic policy: the Norwegian model under pressure. *Norsk geografisk tidsskrift*. 46/92, 95–107.

Glomsrød, Solveig; Haakon Vennemo and Tor A. Johnsen (1992): Stabilization of emissions of CO₂: A computable general equilibrium assessment. *The Scandinavian Journal of Economics*, Vol. 94, 1, 53–69.

Kobila, T.Ø. (I. Aslaksen, O. Bjerkholt, K.A. Brekke, T. Lindstrøm and B. Øksendal): A class of solvable stochastic investment problems involving singular control. Preprint No. 3, Februar 1992, Department of Mathematics, University of Oslo. Forthcoming in *Stochastics*.

Kobila, T.Ø. (I. Aslaksen, O. Bjerkholt, K.A. Brekke, T. Lindstrøm and B. Øksendal): An application of reflected diffusions to the problem of choosing between hydro and thermal power generation. *Stochastic Processes and their Applications* 44, 1993, 117–139.

Mohn, Klaus: *Finanssektor og økonomisk utvikling.* (Financial sector and economic development). Rapport 28/92, Senter for samfunns- og næringslivsforskning (SNF), Bergen.

Proceedings from the Research Department's international Seminar on Uncertainty in Management of Natural Resources and the Environment, Oslo 4–5 March 1992.

Strand, J.; Knut. H. Alfsen and E. Wenstøp: *Verdsetting og bruk av miljøkostnader under SAMMEN-programmet.* (The valuation and use of environmental cost data in the SAMMEN (Society, Environment and Energy Research) programme. Forprosjektrapport. Arbeidsnotat nr. 107/1992, Stiftelsen for samfunns- og næringslivsforskning, Oslo, 1992.

Vennemo, Haakon: *Five studies of tax policy using applied general equilibrium models.* Økonomiske doktoravhandling nr. 10. Department of Economics, University of Oslo, 1992.

Vennemo, Haakon: Skatter og avgifter: Hvor stort er allokeringstapet?. (Taxes and subsidies: How big is the efficiency loss?). *Norsk Økonomisk Tidsskrift* nr. 4, 1992.

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