



Research Department

Statistics Norway

Annual Report 1996

Annual Report

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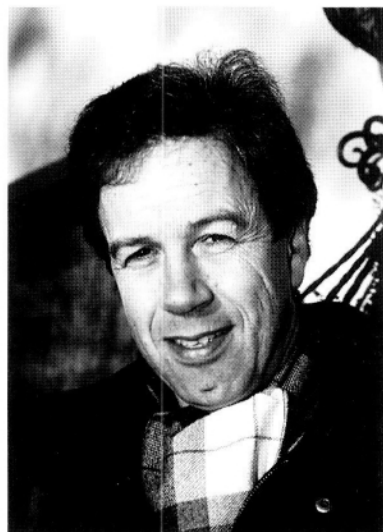
1996

Annual Report 1996

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The Annual Report 1996 for the Research Department of Statistics Norway presents in outline major programmes and projects in 1996-97 with complete lists of publications and staff. The Annual Report also gives a brief history of the Department and its role as a social and economic research institution, related to the statistical responsibilities of Statistics Norway.

The ultimate aim of the research activity of Statistics Norway is to contribute towards a better foundation for social and economic policies. To an increasing degree theories and methods pertinent for this aim are drawn from international research pools



The Research Department welcomes interests in our publications, and we are happy to forward these on request or as institutional exchange subscriptions.

Oslo, March 1997

*Øystein Olsen
Assistant Director General
Head of Research Department*

Brief history of the Research Department

The research activities of Statistics Norway have roots far back in the history of the institution. The statistical bureau of Norway was founded in 1876 by separating a small statistical office from the Ministry of the Interior. In the historical chronicles of Statistics Norway the background for the separation of the statistical service from the ministerial environment was stated as follows: "The work of the Office would be facilitated by more distance from the government offices; the scientific character of the Office would thus be better understood by the public." Since then Statistics Norway, or as it was known until 1993 - the Central Bureau of Statistics - has been the national statistical institution of Norway, part of the government administration but with an autonomy in statistical matters, like similar institutions in other countries.

The first Director General of Statistics Norway, Anders N. Kiær (1876-1913), took an active part in the international statistical cooperation and was a pioneer in the use of representative samples as a basis for statistics, especially with regard to income statistics. Kiær pioneered also in technical advances: a Hollerith electrical machine was employed in Norway for the first time in the compilation of statistics of incomes and wealth for 1891, shortly after its invention. The research activity of Statistics Norway in the early years was modest and mostly related to analysis of data from the population census and income statistics. Later on after the turn of the century statistical investigations of social issues and poverty conditions became an important area. After World War I Statistics Norway started to publish regular economic surveys.

A separate Research Department was not established, however, until 1950 on the initiative of the new Director General Petter Jakob Bjerve (1949-1980) who had strong academic interests and to whom applied economic and econometric research was a natural extension of the statistical work. In the years just preceding 1950 intensive efforts had taken place in establishing National Accounts, based on production statistics as the primary data source. The pioneering national accounts work of this period was an empirical research frontier which later would provide a basis for macroeconomic modelling and other planning and policy oriented tools. The national accounts system was completed in the early 1950s as one of very few, which at that time integrated detailed annual input-output tables within the national accounting framework.

In the first decade the work of the Research Department comprised in addition to national accounts, tax research, monthly and annual economic surveys, and other research activities often directed towards improving methods of economic

planning in the postwar period. Towards the end of the 1950s the first macroeconomic model of Statistics Norway - the MODIS I model - was developed as a simple input-output model, large in relation to the computer capabilities of the time. The model drew on inspiration from W. Leontief's pioneering work as well as the modelling experiments of Ragnar Frisch at the Institute of Economics (University of Oslo). The computer used to solve the MODIS I model from 1960 until its replacement in 1965 was a British built first-generation vacuum-tube computer called DEUCE, the only one of its kind in Scandinavia.

Throughout the 1960s and 1970s models of the MODIS family, ever increasing in size continued to be developed and used intensively by policy makers. Around 1980 a new breed of macroeconomic models were finally taking over, and constituted the family of models used today. The 1960s also initiated an era of computer based tax models run by the Research Department as a service directed primarily towards the Ministry of Finance and the Storting (Parliament).

In the 1970s natural resource accounts and energy economics became new adopted research fields, later on after 1980 petroleum economics followed. During the 1980s and even today, a major emphasis is placed on developing microsimulation models, combining advances in computer technology, econometric methods, and data availability. These models, although far from having reached perfection, have been extremely versatile and useful vehicles for the analysis of societal change as a result of demographic development, economic growth, and government policy.

From 1996, research activities and publications of the Division for Social and Demographic Research are included in the Annual Report of the Research Department. In its present form, this research unit was established in 1991 as a separate division for research activities within the Department of Social Statistics. In a historical perspective, however, the present unit continues a more than 100 year long tradition of social and demographic research within Statistics Norway.

Thus, by including the research activities in this area in Annual Report, it comes closer to convey the broad, interdisciplinary range of present research activities within Statistics Norway.

General research objectives

The general objectives of the Research Department's function within Statistics Norway are four-fold:

Enhanced empirical knowledge

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

lopment. Analysis of statistical data by means of relevant theory and analytical methods and the use of models when appropriate may give enhanced empirical insight and deeper understanding of the phenomena under consideration. Such analytic knowledge beyond what can be derived from data alone, is inherent in many of the published results of the Department on the state of the economy, the environmental situation etc. Key parameters, such as the interest sensitivity of household saving or of the relation between economic growth and environmental deterioration, are examples of embodiments of empirical knowledge beyond the realm of statistics.

Analytical tools for monitoring economic and environmental development or 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.

Feed-back to the statistics

Researchers in the Statistics Norway 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 Statistics Norway, for special organization of data material and links to other sources, and for influencing the methods of collection of primary data. The analytic use gives feed-back effects to statistical work and may serve to improve the quality of the official statistics.

Cumulating competence

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.

Chairman of the Board
Åge Danielsen

Director General
Svein Longva

Each division has its own responsibilities and research tasks. On an ad hoc basis the divisions join forces to cooperate on major studies or special investigations. A staff unit deals with personnel, finances, publication, and computer resources.

<i>Department</i>	<i>Division</i>	<i>Office</i>
Economic Statistics	National Accounts	Administration
	Environmental Statistics	Systems Development
	External Trade, Energy and Industrial Production Statistics	
	Economic indicators	
	Public Finance and Credit Market Statistics	
	Labour Market Statistics	
Social Statistics Johan-Kristian Tønder	Social and Demographic Research Lars Østby	Administration Gro Halvorsen
	Population and Education Statistics	Systems Development
	Health Statistics	
	Sample Surveys	
	Social Welfare Statistics	
Industry Statistics	Business Register	Administration
	Income and Wage Statistics	Systems Development
	Primary Industry Statistics	
	Transport and Tourism Statistics	
	Data Registration	
	Construction and Service Statistics	
Research Øystein Olsen	Public Economics Nils Martin Stølen	Administration and Computer Services Otto Gerhard Vaagen
	Resource and Environmental Economics Torstein A. Bye	
	Macroeconomics Ådne Cappelen	
	Microeconometrics Jørgen Aasness	
Administrative Affairs	Budget and Accounting	Joint Services, Oslo
Coordination and Development	Computer Systems and Development	Joint Services, Kvgr.
	Statistical Methods and Standards	
	Information and Publishing	
Units without department connection	Computer Services	International Consulting

The Research Department has for many years had the responsibility for tax simulation models used by the Ministry of Finance and the Storting (Parliament). The models are also used for income distribution studies. The current model strategy aims at further development of microsimulation models, both static and dynamic.

Microsimulation model tools for projection of the labour force by gender, age and education and social security rights are used for projections of the labour market. Other model tools have been developed for analyses of labour market imbalances, regional development and municipal economics.

Taxes and transfers

Tax-benefit models LOTTE and ODIN

The tax-benefit models LOTTE and ODIN are the main tools in analyses of effects of direct taxes and social security benefits. From a core model of personal taxation LOTTE has developed into a system of models that can be used separately or in combination. An advantage of this system is that e.g. taxes and social security benefits can be simultaneously analysed with consistency between tax rules and social security entitlements for each individual in the sample. LOTTE is a microsimulation model and is based on anonymized micro data sets - model populations - from 1994. Recent applications of the model range from analysis of the tax reform for corporate taxation and transfers to families with children (see below) to studies of taxation of old age pensioners.

The basic LOTTE model includes only direct taxes but has been extended by a module for econometric simulation of consumption, LOTTE KONSUM, which allows calculation and simulation of policy mixes of indirect taxes as well.

ODIN is a "law model" that calculates direct taxes and social security benefits for stylized household types. The model simulates taxes, disposable income, and average and marginal tax rates for households with given characteristics such as family composition, socio-economic group and pension status. ODIN is used in research projects and by the Ministry of Finance. A new framework for using the "law model" structure of LOTTE to characterize stylized household types is now being developed. ODIN thus will be abandoned from 1997 on.

Project workers: *Iulie Aslaksen (project leader), Marie W. Arneberg, Hanne A. Gravningsmyhr, Kirsten Hansen, Bård Lian, Ann Synnøve Moe, Ingeborg Foldøy Solli, Thor Olav Thoresen and Arild Torgersen.*

Financial support: Ministry of Finance.

Documentation: see under each project below.

Transfers to families with children

Most of our research in 1996 on the distributional consequences of transfers to families with children has been directed towards a government appointed committee for evaluation of effects on income distribution and labour supply from changes in these transfers. This project has utilised data and simulation modules from the tax-benefit model LOTTE with additional simulation procedures, e.g. a simulation module for child care subsidies. The latter module also includes behavioural effects of changes in child care subsidies and, hence, explicitly considers labour supply effects of changes in taxes and transfers.

The measurement of income distribution and poverty for different household types raises many problems, e.g. the choice of unit (household/individual) and the use of equivalence scale. The project has given extensive illustrations of how the distributional conclusions depend upon the unit of measurement.

Motivated by the recent studies of parents' labour supply responses to various transfer programs for children, a new project aims at supplementing LOTTE with algorithms for adjusting income before tax in relation to labour supply elasticities.

Project worker: *Thor Olav Thoresen.*

References given under Documentation are to issues in Statistics Norway Publications, see pp. 23-27, or for numbers in brackets to External Publications, see pp. 28-32.

The microsimulation model LOTTE

LOTTE is a static tax-benefit microsimulation model that simulates direct taxes and social security benefits. Simulations are based on a sample of income tax returns, with additional information from administrative registers. Household characteristics are recorded by interview. The sample size varies from year to year. The sample from 1994 includes approximately 41 000 individuals (15 000 households). Sophisticated calibration methods are applied to ensure consistency between model estimates and the corresponding totals from the tax register. The individual records can be aggregated to households and married couples, and are weighted in terms of consumption units. The model keeps track of the link between each individual's income, tax, pension entitlement and pension income. For any change in tax or benefit rules, the model simulates taxes, disposable income, and average and marginal tax rates, for individuals and households. Model results comprise total tax revenue, as well as effects on tax revenue and income distribution of specified policy changes. LOTTE is extensively used by the government, especially Ministry of Finance, by the Storting (Parliament), and for special projects, e.g. OECD-studies.

Financial support: Ministry of Children and Family Affairs.

Documentation: [38], [84], [85], [86], [87].

Income distribution and household behaviour

The tax reform - distributional effects and efficiency aspects

A previous project on distributional effects of the tax reform indicated that there are signs of an increase in income inequality after the tax reform of 1992. The large reductions in marginal tax rates especially on higher incomes might have led to an unequal growth in pre-tax income in the period after the reform, but no such effects are found when a panel data set is employed. This indicates a very low efficiency loss from tax progression in Norway, which is in accordance with results from Sweden and Denmark. A post-reform increase in capital income is contributing to the observed increase in inequality.

Project workers: *Thor Olav Thoresen* and *Karl Ove Aarbu*.

Financial support: The Research Council of Norway.

Documentation: [88].

Labour supply

This project aims at providing more information about the labour supply effects of various reforms, in addition to the revenue and distributional effects described by the LOTTE model. The framework will be extended to a life style perspective. As part of this study, extensive microeconomic research has been directed towards estimating stable parameters for distributions of wage income. A model for female labour supply is estimated, employing a version of a labour supply model developed at the microeconomic division. In order to exemplify the use of such tools, an ongoing project simulates the effects of various reforms discussed by the committee for evaluation of transfers to families with children (see project described above).

Project workers: *Tom Kornstad*, *Ingeborg Foldøy Solli* and *Thor Olav Thoresen*.

Financial support: The Research Council of Norway.

Analysis of changes in income distribution

A recent project involves a methodological approach to the issue of comparing measures of inequality before and after substantial changes in policies influencing income distribution, or large structural changes in e.g. labour market conditions. A main conclusion is that the effect on income distribution from a policy change should be analysed by decompositions of the Gini-coefficient rather than by merely comparing Gini-coefficients

before and after the policy change. The new methodology has been applied to a study of the effect on inequality in personal income distribution of increased labour market participation of married women. This study uses data from a sample of income tax returns over the last 20 years.

Project workers: *Julie Aslaksen* and *Rolf Aaberge*.

Documentation: DP 182.

"Time puzzle" - Time use and consumption patterns

Within the framework of household production theories, this project analyses the relation between time use - for both paid work, unpaid household work and leisure - and consumption patterns of various household types. The focus is to describe the "time puzzle" encountered by especially families with children. The aim of the project is to link partial analyses to the microsimulation models.

The first part of the project has focused on developing household production tables, where consumption expenditure is allocated to household productive activities by various allocation rules. These tables show considerable variations in consumption patterns and time use across various household types. Household production tables have a natural interpretation as input-output tables and may thus be linked to the satellite accounts for household production within the national accounts framework.

Project workers: *Julie Aslaksen* and *Hanne A. Gravningsmyhr*.

Financial support: The Research Council of Norway.

Documentation: [4], [5], [6], [45], [63].

Corporate taxation

The choice between owner's wages and dividends under the dual income tax

Most tax systems give clear incentives for a single owner of a corporation in the choice between dividends and owners' wages. In this project, a model is developed for testing the hypothesized effects on micro data for Norway 1991, combining tax return data of owners and corporations. The model identifies and measures tax incentives induced by the progressivity in the personal taxation and by some properties of the corporate tax code. The empirical results show that the owners are strongly aware of the optimal mix of dividends and wages induced by the progressivity in the personal taxation of wage income. The results also indicate that the owners are clearly aware of the effects induced by the corporate tax code, but the behaviour is less affected by these incentives than by the incentives in the personal tax code.

Project workers: Erik Fjærli, Diderik Lund and Jeffrey K. Mackie-Mason.

Financial support: The Research Council of Norway.

Documentation: SES 94.

Taxation of hydropower plants: A micro-simulation model

The government proposed in 1995 new legislation on the taxation of hydro power based on the recommendations of a 1992 report from an expert committee. A model has been developed to evaluate the consequences of this tax reform for the local and national tax revenue and for the tax burden falling on the rent accruing to the owners of hydro power plants. The model is based on economical, historical and technical micro data from hydroelectric plants and firms and was extensively used in connection with the legislative debates in 1996.

Project workers: Torstein Bye, Erik Fjærli and Bård Lian.

Financial support: Ministry of Finance, Ministry of Industry and Energy.

Documentation: ØA 4/96

Labour market

Projections of labour force, education and social security in the MOSART model

In 1996 parts of the MOSART model have been completely updated. The model is based on a new initial population from 1993 and the demographic module has been reestimated and expanded to include household characteristics. In addition the relationships describing educational choice, labour force supply, and transitions into disability and rehabilitation have all been reestimated.

In 1996 there has also been done some work to include capital income and taxes in the model. This project will be completed in 1997.

In 1996 the model has been used by several government ministries to analyse the consequences of increased immigration and to evaluate government policy regarding disability and old-age pensions covered by the Norwegian National Insurance System. There are at present several government committees considering pension reforms. Work on evaluating these proposals has entailed intensive use of MOSART. This work will continue in 1997.

Project workers: Leif Andreassen (project leader), Helge Brunborg, Øystein Dahl, Dennis Fredriksen, André Hansen and Inger Texmon.

Financial support: The Research Council of Norway, Ministry of Finance, Ministry of Local Government and Labour.

Documentation: [44].

Labour market imbalances

In order to analyse the possibility of disequilibrium in different segments of a labour market a simple submodel to the macroeconomic model MODAG and the microsimulation model MOSART is constructed. In this model supply and demand for different kinds of labour by education is compared by using the number of persons as the unit of measurement.

As a result of the marked increase in the educational propensities during the last years, expected growth in supply of persons with education at the university level is much stronger than the expected growth in demand, indicating that a lot of persons within these groups may get trouble in finding a job in accordance with their education.

The projections are rather simple regarding the assumptions about the composition of demand for the different kinds of education. To improve the projections, further work is carried out to analyse the factors determining the composition of employment by education in different industries. In the metal industry technical progress has caused a significant decrease in demand for unskilled workers. Growth in supply of skilled workers and engineers has also contributed to a shift in employment away from unskilled workers.

Project workers: Nils Martin Stølen and Turid Åvitsland.

Financial support: Directorate of Labour.

Regional and municipal economics

Analyses of regional labour markets and migration

REGARD is a regional model for the Norwegian economy based on regional national accounts and other statistical sources. The present economic part of the model is a simple submodel to the macroeconomic model MODAG where national figures for gross production, gross investments and employment in 28 industries are distributed on 19 counties by coefficients from 1992. A demographic model block takes care of internal migration and labour force participation. The model provides projections of labour market imbalances, illuminating the

The microsimulation model MOSART

MOSART is a dynamic cross-sectional stochastic microsimulation model which projects population size and composition, labour force, educational level, and future pension benefits. The simulation sequence for each year in the projection period starts with the demographic events death, birth, marriage, divorce and education, continues with the simulation of disability and retirement and concludes by simulating labour force participation and wage income. The model keeps track of the link between spouses and of each individual's pension entitlements and pension income. The initial population and the transition probabilities in the model are based on data registers covering the whole population. MOSART is extensively used by government ministries, especially the Ministry of Finance, in analysing long-run developments in the labour force and in disability and old-age pensions. The current version of the model simulates life histories for a one per cent sample of the Norwegian population from 1994 to 2200.

implications for regional employment and the labour force of a given macroeconomic scenario. Further, the model may be applied to analyse the effects on regional employment and population from changes in economic policy.

A project investigating the migration patterns for persons in the labour force was extended in 1996 by a cooperation with researchers in other Nordic countries, making a comparison of internal migration patterns.

Project workers: *Eva Ivås, Lasse S. Stambøl, Nils M. Stølen and Turid Åvitsland.*

Financial support: Nordic Council of Ministers, Sparebanken Nord-Norge.

Documentation: SES 88, [58], [59], [61], [70].

Municipal economics

MAKKO is an aggregated model for the local government economy. For given standards of man-hours per client and coverage levels (number of clients in proportion to the population in separate age groups) the model describes how employment and service production is affected by population changes. The model is used to project employment and the number of clients in local public services in Norway.

An econometric analysis of the determinants of local government expenditures based on data from municipal accounts was in progress in 1996. A linear expenditure system has been applied to the estimation of price and income elasticities in local public services.

Another project analyses factors of importance for supply and demand for 18 professional groups in health and welfare services. A submodel to the population projections on the supply side and the macroeconomic model MODAG on the demand side is used for analyses of labour market imbalances.

Project workers: *Audun Langørgen, Knut Olav Oftedal and Rolf Aaberge.*

Financial support: Ministry of Local Government and Labour, Ministry of Health and Social Affairs.

Documentation: DP 153, REP 96/15, ØA 8/96.

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* on leave

Norwegian and Nordic energy markets

NORMEN: A general equilibrium model for the Nordic countries

The aim of this project has been to extend partial equilibrium model for the Nordic electricity market to include the interdependency between the electricity market and the general economy. The new model is well suited to analyse the long term effects on the electricity market of different kinds of energy, environment and general economic policies. Preliminary model simulations indicate that both increasing carbon taxes and the early decommissioning of Swedish nuclear power plants result in important changes in the composition of electricity production and in the electricity trade patterns between the Nordic countries. However, the macroeconomic effects seem to be small.

Project workers: *Finn Roar Aune, Torstein Bye, Tor Arnt Johnsen and Alexandra Katz.*

Financial support: Nordic Council of Ministers, The Research Council of Norway.

Documentation: DOC 96/19.

The Norwegian power market in the year 2020

New electricity transmission lines between Norway and Europe will increase the electricity trade between these regions. Norway will tend to export power in peak European periods, and when prices in Europe are low Norway will normally import. Simulations indicate an annual average electricity price level of 22-24 øre/kWh in Norway in the year 2020, which is approximately the same price level as in 1996. Lower transmission tariffs, however, result in falling end-user prices.

Project workers: *Mona Irene Hansen, Tor Arnt Johnsen and Jan Øyvind Oftedal.*

Financial support: Statnett SF.

Documentation: REP 96/16.

International energy markets and the environment

The European gas market

In 1995, Norway exported some 30 billion Sm³ of natural gas to Europe. Approximately 40 percent of this volume ended up in Germany and about 26 percent in France. In 2005 Norway is committed to deliver more than 60 Sm³, and if the ongoing negotiations are successful total exports could reach 80 Sm³. The development in the European gas market has thus important implications for the development of the Norwegian economy. In this project, we analyse the investment behaviour and production patterns of the three large gas producers – Norway, Algeria and Russia – to see how these are influenced by different assumptions

A prime objective of the Research Department in recent years has been to analyse the interactions between the environment, natural resource use, and economic development. The main user groups are governmental bodies, in particular the Ministry of Environment and the Ministry of Finance, although informing the general public is also emphasized. The work is currently organized under five headings: Norwegian and Nordic energy markets, International energy markets and the environment, The macro-economy and the environment, Methodological issues and Developing economies and the environment.

about the European gas market developments. Our results suggest that the Russian investment behaviour is most sensitive to changes in the market structure.

Project workers: *Elin Berg, Kjell Arne Brekke, Emmanuel Canon and Yves Smeers.*

Financial support: EU's Research Program Joule II.

Documentation: Statistics Norway & Center for Operation Research and Econometrics, Université Catholique de Louvain (1996): *Modeling strategic investments in the European Gas Market*, Final report to the contract J0U2-CT92-0260.

Increased CO₂ taxes and the crude oil market

A binding international agreement about global harmonized CO₂ taxes will have consequences for both oil producers and consumers. In the medium term, increased CO₂ taxes will lower the crude oil prices, increase the consumer prices, and thus reduce the total demand for oil. How the burden of these losses is shared among oil producers and consumers depends upon OPEC's strategic behaviour. If OPEC prefers increased production and thus lower crude oil prices, this obviously leads to a smaller increase in consumer prices than if OPEC pursues the opposite strategy.

Project workers: *Ann Christin Bøeng, Sverre Grepperud and Lars Lindholt.*

Documentation: NOT 96/10.

Cartel gains in the crude oil market

Since 1973, OPEC's market power has been an important element in the crude oil market. By holding back on total production, the cartel has managed to keep the crude oil price level relatively high. For the cartel, this has obviously been a profitable strategy, but the gains have been even larger for the non-OPEC producers. In this project, we analyse the possible cartel gains in the crude oil

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market and how these gains depend on the strategies made by non-OPEC producers and large consumer countries. Our results suggest that the cartel gains obtained by OPEC are reduced and may even vanish as non-OPEC producers increase their searching activity and build up their reservoirs.

Project workers: *Elin Berg, Snorre Kverndokk and Knut Einar Rosendahl.*

Documentation: DP 181.

The macroeconomy and the environment

Taxes on solid waste

During the last few years, several measures have been implemented for sorting and recycling package waste, but practically no instrument has been directed at the production processes, like for instance taxes on waste generation. In this project, we study some possible effects of introducing taxes on the generation of waste within a general equilibrium model framework. Taxes on waste imply a cost increase for raw materials and thus they reduce production in the waste-generating sectors, which again reduces air pollution from these sectors. Our analysis shows the importance of including several environmental effects when studying waste policy, since the direct effects from reduced waste are rather small, while the indirect effects on other pollutants may be significant.

Project workers: *Annegrete Bruvoll, Karin Ibenholt and Henrik Wiig.*

Financial support: Norwegian Research Council, MILFOR and Ministry of Environment.

Documentation: ØA 9/96, NOT 96/31.

A. Bruvoll and K. Ibenholt: Green Throughput Taxation, Possibility of a Welfare Improving Tax System? To appear in the series Documents, Statistics Norway, 1997.

Air pollution and health effects in Oslo

Air pollution may have severe impacts on health. In this project, some health effects and the resulting social costs from pollution in the capital of Norway, Oslo, are calculated. Our results suggest that nearly 100 individuals die prematurely each year because of local emissions. This and other health damages imply a social cost of around 1.7 billion Norwegian kroner, of which approximately 90 per cent is linked to non-market valuations.

Project worker: *Knut Einar Rosendahl.*

Financial support: Ministry of the Environment.

Documentation: REP 96/8, ØA 5/96.

Increased low level ozone and reduced agricultural production

Increased ground level ozone reduces the production of wheat, potatoes and cultivated meadow, which again reduces the profitability of cultivated land. Based on calculations of the ground level ozone in 1992, we have estimated the economic losses from these changes to be approximately 2,4 per cent of the agricultural sector's total production in Norway. Since the total level of Norwegian agricultural production depends heavily on agricultural policy our estimates on losses are sensitive to future changes in policy.

Project workers: *Anett Christin Hansen, Henning Høie, Leiv M. Mortensen, Knut Einar Rosendahl and Kjetil Tørseth.*

Financial support: Norwegian Pollution Control Authority.

Documentation: K. Tørseth, K.E. Rosendahl, A.C. Hansen, H. Høie og L.M. Mortensen (1996): Avlingstap som følge av bakkenært ozon. Vurderinger for perioden 1989-1993 (Crop damages caused by ground level ozone. Evaluations for the period 1989-1993). To appear in the series Reports, Norwegian Pollution Control Authority.

A green tax reform and environmental benefits

A green tax reform may gain the environment and reduce external effects from road traffic. In this project some of these benefits are documented and valued by applying an integrated economy and environmental model. A significant increase in CO₂ taxes combined with reduction in labour and

International models

Nordic energy demand model (NORMEN)

This model is a regionalized 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

The Sectoral European Energy Model (SEEM) is a model for the calculation of future demand for fossil based energy in thirteen Western European countries given an economic development path, and price paths for oil, gas and coal (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 OligoPOLY model for the European gas market

The game depicted by the model is essentially an investment game between dominant natural gas suppliers (Algeria, 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. 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.

investment taxes result in environmental and traffic benefits. On the other hand, such a policy change induces economic losses in terms of reduced activity level.

Project workers: Solveig Glomsrød, Anett C. Hansen and Knut Einar Rosendahl.

Financial support: Ministry of the Environment.

Documentation: REP 96/23.

Reducing CO₂ emission costs. A general equilibrium approach

An important task in Statistics Norway's research activity is to develop and maintain operational tools for policy analysis. The development of empirically based general equilibrium models in order to study long term economic growth represents a long tradition at the department. This project reports the empirical basis for one such model, MSG-EE, and analyses macroeconomic effects and the interdependences between environment, energy markets, and the transport sector.

Project workers: Knut H. Alfsen, Torstein Bye, Erling Holmøy, Bjart Holtsmark, Tor Arnt Johnsen, Bodil M. Larsen, Hans Terje Mysen and Birger Strøm and Jørgen Aasness.

Financial support: Ministry of the Environment and Norwegian Research Council.

Documentation: SES 96.

Methodological issues

The political man and estimating the value of the environment

In economic theory, it is usually assumed that consumers maximize utility. In some situations, however, it may be reasonable to assume that individuals also consider themselves as political observers, and thereby take into account social consequences. If individuals roles are unclear, when their willingness to pay for keeping a given environmental standard is investigated, it becomes difficult to conduct an elaboration on the basis of their response. This may be one reason why studies of willingness to pay are hard to evaluate on the basis of traditional consumer theory.

Project worker: Karine Nyborg.

Financial support: The Research Council of Norway.

Documentation: DP 180.

Why do we want sustainable development?

When discussing the limits to growth one cannot exclude the concepts of justice and distribution. Rules for sustainability presented in the economic literature often come into conflict with the most important criteria for justice. In this article we

conclude that the definition of sustainability either should be redefined, or else it should not be a moral claim but rather be restricted to certain situations, for instance when it is costless to redistribute resources between generations.

Project workers: Kjell Arne Brekke and Richard B. Howarth.

Documentation: K.A. Brekke and R. B. Howarth (1996): Is welfarism compatible with sustainability? in Nordic Journal of Political Economy, 23, 69-74.

Developing economics and the environment

Managing soil in developing countries

Soil erosion is one major factor behind the slow productivity growth in tropical agriculture. In this project, we identify factors which explain why degradation of cultivated land takes place and analyses how risk attitudes can influence farmers' incentives to carry out soil improving initiatives.

Project worker: Sverre Grepperud.

Documentation: DP 186. S. Grepperud: The Impact of Policy on Farm Conservation Incentives in Developing Countries: What can be learned from Theory? Forthcoming in Quarterly Journal of International Agriculture 1, 1997.

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Multisectoral Growth – Energy and Environment: MSG-EE

MSG-EE is a variant of the MSG model, distinguished by a more detailed modelling of transport activities. Domestic commercial transport is produced in five sectors covering road traffic, rail, air and boat transport as well as post and telecommunication services. Transport is also produced in other producing sectors for own consumption (own transport). In MSG-EE transport is treated as a separate input factor in production, in addition to the usual capital, labour, energy and materials.

The objective of macroeconomic analysis within Statistics Norway is to analyse the state, functioning and development of the Norwegian economy by exploiting internal and external data sources and by developing and utilizing macroeconomic models. Key users of the models are the Ministry of Finance and the Storting (Parliament), although general availability to the public of models and results is emphasized. Business cycle analysis reports are published quarterly. Current work is organized under four headings: Business cycle analysis, Macroeconometric models, General equilibrium models and International projects.

Business cycle analysis

Business cycle reporting

As in earlier years the Research Department has published the annual economic survey of the preceding year and three quarterly surveys in parallel editions in *Økonomiske analyser* and *Economic Survey*. The summary and the National Accounts are also available on Internet. Besides presenting the quarterly national accounts, these surveys also offer a brief presentation of the main international economic trends and forecasts of the macroeconomic development of the Norwegian economy. The forecasts are constructed using the quarterly macroeconometric model KVARTS (see below). The KVARTS model is also used to provide alternative scenarios for the Government appointed Expert Committee for Income Settlements in connection with the annual wage and income negotiations.

To appraise international economic developments, the Research Department also employs the NIGEM model of the National Institute of Social and Economic Research in London, UK. The Research Department is also a member of the now UN-based LINK system which links national macromodels to a global model. The LINK forecasts also provide an important source of information in our forecasting activity.

Project workers: *Knut Moum* (project leader) and *Mette Rolland*.

Business cycle history

The aim of the project is to analyse business cycles and growth in the Norwegian economy. In one part of the project we specify structural vector autoregression (VAR) models in order to identify different types of domestic and foreign shocks that generate cyclical fluctuations in the economy. The structural disturbances are identified by imposing different short run and long run restrictions on the VAR model. Especially, we have analysed the

dynamic effects of aggregate demand, supply and real oil price shocks in Germany, Norway, United Kingdom and United States. Oil price shocks are included explicitly in the model, to investigate their role in explaining periods of global recessions. In another project, we have investigated the effects of oil and gas extraction (energy booms) in Norway and UK, to analyse whether there is evidence of a "Dutch Disease", that is whether energy booms have had adverse effects on manufacturing output.

Project worker: *Hilde Christiane Bjørnland*.

Financial support: The Research Council of Norway.

Documentation: DP 174, DP 179.

A parallel study of possible "Dutch Disease" effect in Norway has been undertaken using the KVARTS model in an counterfactual study of the Norwegian economy during the years 1973-1993. In this study we analyse both the consequences for the industry structure as well as the macroeconomic development in Norway of oil exploration and the spending of oil revenues. The study concludes that the oil sector in Norway has had an important effect both on the level and composition of GDP. In addition the cyclical variability of the economy has been much affected by the oil sector.

Project workers: *Ådne Cappelen*, *Robin Choudhury* and *Torbjørn Eika*.

Financial support: The Research Council of Norway.

Documentation: SES 93.

Oil price shocks have played an important role in the macroeconomic development of the world economy since the first oil price shock in 1973. In one study the macroeconomic effects of the oil price shocks are analysed using NIGEM which includes fiscal policy rules and explicit modelling of the behaviour of the OPEC countries. Based on an alternative scenario with constant real oil prices, the study shows that the recessions in the OECD area in 1974/75 and in 1980 would have been milder without the preceding oil price hikes, while the 1982 recession seems unrelated to oil prices. Another simulation also indicates that the oil price drop in 1985/86 prevented a small recession from developing. The study shows quite different results for various large OECD countries both with regard to real and nominal effects.

Project workers: *Ray Barrell* and *Knut A. Magnusson*.

Documentation: DP 177.

Another counterfactual study using the KVARTS model analyses fiscal policy during the years 1973-1993. Discretionary fiscal policy is defined as deviation from trend policy where the estimated

References given under Documentation are to issues in *Statistics Norway Publications*, see pp. 23-27, or for numbers in brackets to *External Publications*, see pp. 28-32.

trends vary for a large number of fiscal policy variables in the model. The results show that fiscal policy has reduced output volatility by approximately 10 per cent during the period as a whole. However, fiscal policy has been procyclical during certain episodes probably because policies were aimed at stabilizing the current account and not GDP. On average, local government policy has been procyclical, so that the stabilizing effects are due to central government policy only.

Project workers: *Einar Bowitz and Stein Inge Hove.*

Documentation: DP 178.

The project also includes a number of other studies which are still work in progress. One study undertakes an analysis of income policies in Norway during 1973-93. In another we study the effects of the deregulation of credit markets in the mid-1980s. A third project analyses the effects of changes in world market demand on the Norwegian economy. Documentation is nearly completed for these three projects.

Macroeconometric models

Model applications and development

The Research Department operates two large macroeconometric models – KVARTS and MODAG. The KVARTS model is used for forecasting and analysis in our business cycle reports. In addition, the KVARTS model has been a central tool in the historical business cycle project described above. The MODAG model is used mainly by the Ministry of Finance for forecasting and policy analysis.

Both models are updated using the most recent final national accounts data. The current input-output structure and base year of the models is 1993. No major changes in the models were undertaken in 1996. Neither have econometric studies been carried out in 1996, as we are waiting for the recently revised national accounts data to be available for a sufficiently long period to be relevant for econometric studies. The quarterly data are expected to be published during the first quarter 1997.

Project workers: *Pål Boug, Einar Bowitz, Ådne Cappelen (project leader), Robin Choudhury, Torbjørn Eika, Inger Holm, Stein Inge Hove, Laila Haakonsen, Kjersti-Gro Lindquist, Knut Moum, Bjørn Naug, Jørgen Ouren, Terje Skjerpen and Ingvild Svendsen.*

Financial support: Ministry of Finance, Ministry of Planning and Coordination.

General equilibrium models

Model development and applications

The research department has for more than 20 years developed and used successive versions of the Multi-Sectoral Growth (MSG) model which originated in the late Professor Leif Johansen's doctoral thesis of 1959.

The new model, labelled MSG-6, exists in several versions reflecting the need for different model users to design the model simulations according to their particular priorities. During 1996 much effort has been devoted to checking and testing the different versions. The most sophisticated versions include endogenous labour supply and intertemporal consumer and producer behaviour based on perfect foresight. In 1996 a somewhat simpler version was used extensively by the Ministry of Finance for long term projections, which serve as input to the preparation of the government Long Term Programme to be published in March 1997.

The model was also used in two internal projects. First, to analyse welfare effects of a green tax reform, where taxes on labour are reduced while taxes on fossil fuels are increased. Such a tax reform appears to be beneficial even without taking environmental considerations into account. The long run welfare effects, but not the dynamic adjustments, were found to be nearly insensitive to a change in the expectations formations from being rational to static.

In the second internal project the MSG model was used to assess the social cost of public projects as well as the additional cost associated with different ways of financing such projects. The simulation results indicate that costs are considerably lower compared to previous Norwegian studies. Sensitivity tests identify that the results are robust with respect to changes in a number of exogenous parameters and model specifications. On the other hand, and not surprisingly, the results are quite sensitive to alternative assumptions about the allocation of time between leisure and labour supply.

In addition to the applications of the new MSG-6 model, projects based on previous version of the MSG model were completed. First, the

Macroeconomic models:

All of Statistics Norway's macroeconomic models are based on the national accounts. The core of the models consists of input-output relations for supply and utilization of specified goods and services. Linked to this core are behavioural relations etc. for different sectors of the economy.

The MODAG model is an annual model and has an input-output core with 45 goods and 29 production sectors. This model is particularly designed for medium term analysis. The behavioural relations cover production, consumption, investments, imports, exports, prices, interest rates, wages and the labour market. The Ministry of Finance is an important user of the MODAG model for forecasting and economic policy analyses.

The KVARTS model is a quarterly model which contains largely the same type of behavioural relations as MODAG. The input-output core is identical to that of MODAG. In the model great emphasis is placed on short-run dynamics. 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 based on optimising individual behaviour and market clearing flexible prices. In 1995 a new version, MSG-6, became operational, which specifies 45 commodity groups and 38 production sectors. Producer behaviour is typically based on the theory of monopolistic competition with free entry and exit of heterogeneous firms. MSG-6 is intended to be particularly suitable for long-run growth projections and to assess welfare and allocation effects of various policy changes, including taxation, energy policy and various kinds of industry assistance. The Ministry of Finance is an important user of the model.

consequences for resource allocation and welfare of recent leaps towards trade liberalisation were quantified. Second, several studies of the links between the economy, energy markets and the environment were undertaken.

Project workers: *Brita Bye, Erling Holmøy* (project leader) and *Birger Strøm*.

Financial support: Ministry of Finance.

Documentation: DP 176, DP 185, SES 96.

Welfare analysis of environmental taxes

The introduction of environmental taxation will in addition to short term effects on prices and costs, also have long term welfare effects through changing the rate of capital accumulation and economic growth. In addition to making a quantitative assessment of these effect by using the MSG-6 model, these issues were also studied analytically within a more stylised aggregated intertemporal general equilibrium model. More precisely, the possibility a "double dividend" from an environmental tax reform was analysed in a setting where nominal wage rigidity causes involuntary unemployment. The analysis suggests that increasing the tax on fossil fuels combined with a revenue neutral reduction in the labour income tax may have a positive effect on both employment and total welfare, even when the welfare gain from reduced pollution is not accounted for.

Project worker: *Brita Bye*.

Financial support: The Research Council of Norway.

Documentation: DP 183.

Structural indicators

Effective Rates of Assistance (ERA) are summary measures of the effective assistance to labour and capital implied by direct Government transfers, indirect taxes and subsidies, import protection through tariffs and non-tariff barriers and price regulations. The relative dispersion of ERAs between industries in the business sector can under certain conditions be interpreted as indicators of resource allocation effects of these policy measures. ERAs have previously been calculated for 1989 and 1991 and was updated to cover 1994 in 1996. The ERAs were presented in the National Budgets of 1997. In 1996 the quantification of protective trade policy was given special attention. This resulted in a computation of so-called Effective Rates of Protection and an examination of the extent to which different service sectors are exposed to international competition. This work has been used as input in a project undertaken by the OECD on quantification of non-tariff trade barriers.

In 1996 a theoretical framework for organising information about the welfare implications of structural policy was developed. The framework is a generalisation of the traditional growth accounting framework, but emphasise how different policies contributes to distortive wedges between the marginal social valuation of alternative uses of different economic resources. Quantification of some of the components in this account of welfare changes will be undertaken this year.

Project workers: *Taran Fæhn, Leo Andreas Grünfeld, Erling Holmøy* (project leader), *Torbjørn Hægeland* and *Birger Strøm*.

Financial support: Ministry of Finance.

Documentation: REP 96/18.

International projects

Planning models for Saudi Arabia

The Research Department has contracted with UN to develop a system of models for the Ministry of Planning in Saudi Arabia. The first phase of the project - the development and documentation of three models - were completed in 1996. These models are a macroeconomic models for monitoring the short and medium term economic development, a general equilibrium model for planning purposes and finally an aggregated long term model for analysis of the relationships between population growth, oil extraction and water supply within a macroeconomic framework. In 1997 the project will continue with more emphasis on training and use of the models as well as some adjustments of the model frameworks.

Project workers: *Olav Bjerkholt, Kjell Arne Brekke, Ådne Cappelen, Robin Choudhury, Per Richard Johansen* and *Knut A. Magnussen*.

Financial support: UN/DDSMS.

Documentation: DOC 96/7, 96/8, 96/9, 96/10, 96/11, 96/13, 96/14.

E3ME

The Research Department is an associate contractor to Cambridge Econometrics, UK, in a project that involves extending and revising a macroeconomic model designed for analysis of environmental and energy issues in Europe. Our responsibilities are to deliver an input-output basis for the Norwegian model including a time-series databank, and to estimate energy demand for all European countries. The project started in 1996 and will be completed in 1997.

Project workers: *Pål Boug, Ådne Cappelen, Inger Holm* and *Alexandra Katz*.

Financial support: European Commission, Ministry of Finance.

The Peace Dividend

For some years the Department has been involved in an international project on the economic consequences of disarmament. In 1996 this project was completed and a large number of national studies and global as well as regional studies were published in a book on North-Holland.

Project workers: *Olav Bjerkholt* and *Ådne Cappelen*.

Documentation: Gleditsch et al. (1996).

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A long tradition within the Research Department is econometric analyses of micro-data collected by Statistics Norway and application of estimated behavioral relations and welfare measures in policy simulation experiments.

The overall aim has been to establish a micro-based system of structural behavioral relations for households and firms. Adequate theory and methods for econometric analysis is developed and adapted for this purpose.

The microeconomic research activity within Statistics Norway emphasise empirical studies and the application of findings from these in the Department's inventory of macroeconomic models and microsimulation tools.

Labour market

The labour market studies are focused on developing empirical models of labour supply, models for structural multistate duration analysis, and equilibrium models of labour supply and demand in a matching market. Also work concerned with analysing earnings functions is in progress.

The labour supply models are designed to account for non-standard budget constraints (such as kinked and non-convex tax systems), and non-pecuniary job-attributes (such as type of work). Currently, the models for labour supply are being updated and extended to include both payed work as well as the selfemployment sector. The framework for multistate duration analysis, which is under development, will be applied to study unemployment patterns, and in particular the significance of incentive systems (taxes, allowances, wages), for transitions in and out of employment and between different unemployment states. By applying the general framework for matching behaviour in DP173 as a point of departure, work is going on to integrate labour supply and demand in an equilibrium model. In a series of papers in the sixties and seventies, Mandelbrot argued that the properties of stable and selfsimilar processes make them very useful for a number of applications in economics. The current analyses of wage and earnings functions exploits new statistical techniques related to stable and selfsimilar processes.

Project workers: *Rolf Aaberge, John K. Dagsvik* (project leader), *Tom Kornstad* and *Tom Wennemo*.

Financial support: The Research Council of Norway.

Welfare and inequality

The importance of employing labour supply studies as basis for examining the distributional effects of taxes and tax reforms has long been acknow-

ledged. In 1996 a microeconomic labour supply model has been applied to study the welfare effects, and thus who gains and who loses, from relaxing the progressive structure of the tax system. The study also discusses whether the conclusions attained from these type of analyses depend on the assumed informational basis for making interpersonal comparisons of welfare.

A joint project with the Nordic countries compares the extent, the structure and development of poverty during the recent 15 years. The results demonstrate the importance of distinguishing between temporary, short-run low-income and long-run, permanent low-income.

Project workers: *Rolf Aaberge* (project leader) and *Tom Wennemo*.

Financial support: Nordic Council for Economic Research.

Documentation: DP 168, DP 171, DP 182, NOT 96\16, ØA 8/96 [1], [40].

Consumer behaviour

Systems of household demand functions are estimated, tested, implemented into a network of macro- and microeconomic simulation models, and used for policy analysis.

Statistics Norway carried out their first household expenditure survey in 1888 and has collected such data every day since January 1 1973. The survey design includes a module of two-year rotating panels since 1975. We have recently started up a systematic work on building databanks for microeconomic analysis from these surveys and combining them with price data from the consumer price index and income data from tax files. Flexible aggregation over consumer goods can be performed, with the most detailed starting point being about 700 different consumer goods, and the documentation includes content of each good and how new goods have entered over time.

Systems of Engel functions with demographic effects, using 9, 37, 149, and 478 commodity groups, have been estimated. The results have been used to discuss distributional effects of indirect taxes, including green taxes, food subsidies and VAT on services. Results have been reported to different governmental agencies and a full research report will be finished in 1997.

An estimation of equivalence scales was documented in [78], taking account of economies of scale in household production and different needs of children and adults. The equivalence scale, and the underlying system of expenditure functions, was estimated as a continuous function of the age of each person in the household.

References given under Documentation are to issues in *Statistics Norway Publications*, see pp. 23-27, or for numbers in brackets to *External Publications*, see pp. 28-32.

We have earlier calibrated and documented a household consumer demand model, based on a multilevel non-homothetic utility tree with demographic effects, exploiting both our microeconomic estimates of Engel functions and macroeconomic estimates of price elasticities. This demand system has been implemented in an applied general equilibrium model (MSG). An analysis of the effects of CO₂ taxes on the growth of the standard of living of different household types, exploiting the household demand and cost functions, was published in *Energy Economics* [2]. We have also earlier implemented such a consumer demand model in the microsimulation model LOTTE. A policy analysis based on this microsimulation model, including sensitivity analysis of choice of equivalence scales when aggregating standard of living across households, has been published (ES 3/96).

Econometric experiments have been performed on estimating price elasticities from the Norwegian household expenditure surveys using (i) observed endogenous unit prices for each household in the survey, exploiting methods developed by Deaton, and (ii) average prices in different regions and seasons from the price survey used in the Consumer Price Index. The results are promising and have been used in Leif Brubakks licentiat dissertation at the University of Konstanz, september 1996. Further experiments, using methods developed by Dagsvik, was also started up, see the paragraph on Discrete and continuous choice below.

Project workers: *Jørgen Aasness* (project leader), *Leif Brubakk*, *Erling Røed Larsen* and *Knut Reidar Wangen*.

Financial support: The Research Council of Norway.

Documentation: ES 3/96, [2], [79].

Producer behavior and productivity

Studies are conducted on R&D, education, scale economies, investment, job creation and productivity. The role of internal and external finance for investment at the micro level has been investigated. We have also completed studies on job creation and the relationship between job creation and innovation. Another ongoing study examines the relationship between productivity, wages and education profiles at the plant level, on the basis of a matched panel with plant and individual worker information. In collaboration with Zvi Griliches (Harvard University) we are working on a new framework for studies of the relationship between R&D, profits and productivity.

Project workers: *Svein Erik Førre*, *Torbjørn Hæge-land*, *Frode Johansen*, *Tor Jakob Klette* (project leader) and *Jarle Møen*.

Financial support: The Research Council of Norway.

Documentation: SES 95, DP 184, [18], [19], [20], [30], [37], [64], [73], [74].

Discrete and continuous choice

Many important choice settings can be formulated as discrete and continuous choice processes where heterogeneous decision makers face different and partly unobservable choice constraints. This is a typical challenge with which the theory of discrete choice is concerned.

The research activity in this field includes the development of theory and methodology for structural analysis of data generated by individual choice from a continuous or finite set of alternatives. In particular, it is focused on topics such as

- characterization of transition probabilities for individual choices;
- modeling two-sided search/matching behaviour in markets with flexible contracts and limited information;
- characterization of models for discrete and continuous choice;
- development of models of consumer demand for commodities with unobservable quality attributes;
- application of the methodology in empirical analysis, and in the construction of price indexes;
- stochastic models for choice among strategies when the outcomes are uncertain.

Project workers: *Rolf Aaberge*, *Leif Brubakk*, *John K. Dagsvik* (project leader), *Rune Johansen*, *Bjørn H. Vatne*, *Tom Wennemo* and *Yu Zhu*.

Documentation: DP165, DP166, DP167, DP172, DP 173, [33].

Numerical algorithms in econometrics

Microeconomic research often requires specialized computer programming and development of new algorithms. The current activities focus on the following topics: estimation of nonlinear models with emphasis on discrete choice, numerical integration of unobservable heterogeneity, stochastic simulation and bootstrap analysis, and descriptive methods for microdata.

Project worker: *Bjørn Helge Vatne*.

Documentation: NOT 96/36, B.H. Vatne: A simulation-based estimation method for discrete choice models, Ph.D. thesis submitted in December 1996 to Department of Economics, University of Oslo.

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Population projections

BEFREG - population projections 1996-2050

A new set of regional population projections has been produced, starting from the observed population by age, sex and municipality as of 1 January 1996. The projections cover the period 1996-2050. First results have been published in *Ukens statistikk* nr. 36, 46 end 48. The previous projections date back to 1993.

Project workers: Nico Keilman, Arve Hetland, Erik H. Nymoen and Sverre-Erik Mamelund.

Methodological work

An evaluation of the accuracy of the United Nation's population projections since 1950 has been carried out. Published results on age structure, births, and deaths for seven major world regions in 13 rounds of projections between 1950 and 1985 are compared with ex-post observed data on real trends. A paper which summarizes the main findings has been submitted to Population and Development Review.

Project workers: Nico Keilman, Sverre-Erik Mamelund and Bjørn Møller.

Financial support: Norwegian Research Council.

Demographic research

A substantial part of research activities over the later years has focused at structural changes in central demographic processes, in particular fertility, family formation (nuptiality) and family dissolution. The retrospective Family and Occupation Survey of 1988 (and its predecessor, the Fertility Survey of 1977), has been a major data source for these analyses. With time, however, it is increasingly important to supplement data from the 1988 survey with more recent data sources. Since 1994, survey data on consensual unions are collected on a regular basis through Statistics Norway's Omnibus Surveys. Survey data are also supplemented with data from registers.

Family formation in post WWII Norway - demographic change, historical and sociological perspectives

The aim of the project is twofold: The first part is a descriptive and demographic presentation of trends in family building patterns over the last fifty years. The second and more analytical part is interdisciplinary, combining sociological theories and historical knowledge. Special attention is called for by the growth in consensual unions, which is considered as the most important change in the family formation pattern in the postwar period.

Project workers: Turid Noack and Bjørn Møller.

Documentation: [55], [56], [76], [77].

The general objective is to analyse demographic development and changes in economic and social living conditions of the population. The research activities combine a microanalytical approach focusing on demographic and socioeconomic processes, with a macro level approach directed at describing changes in social and demographic structure. Research results from demographic analyses also serve as input for revising model structure and parameters of forecasting and simulation models in Statistics Norway. The division is responsible for BEFREG (Statistics Norway's model for national and regional population projections).

Fertility and labour force participation in the Nordic countries - a comparative analysis of Norwegian, Swedish and Finnish women

The main purpose of this project is to study the determinants of female fertility and after-birth employment in the Nordic countries by comparing the development in Norway, Sweden and Finland since the late 1960s. The Nordic countries are characterized by very high female employment rates as well as relatively high fertility rates compared to most other Western European countries. At the same time, the Nordic countries are renowned for their extensive social welfare systems, such as subsidized child care, generous parental leave and other economic support to families with children. The study gives special emphasis to the effects of family policies.

The analyses are based on longitudinal data from similar Family and Fertility Surveys that have recently been conducted in these countries. The surveys are part of a large international project coordinated by the United Nations Economic Commission for Europe, and contain complete retrospective life histories on childbearing, cohabitation and marriage, educational activities and employment.

Project workers: Marit Rønsen and Marianne Sundström.

Financial support: Joint Committee of the Nordic Social Science Research Councils (NOS-S).

Documentation: Reprints 92, Reprints 93, [10], [22], [81].

BEFREG - A model for regional population projections

BEFREG is Statistics Norway's model for population projections at the national, provincial and municipal level. It projects the population broken down by one-year age group, sex, and municipality (435 on 1 January 1996). It consists of two sub-models: In the first sub-model projections are made at the level of 101 so-called forecast regions. These calculations require assumptions on future trends in fertility, mortality, immigration, emigration, and internal migration. Numbers of immigrants and outmigrants for each forecast region are projected by means of a migrant pool approach. Births, deaths, and international migrants are handled by a standard cohort component approach for each forecast region. The second sub-model divides the projected growth over the municipalities that make up each forecast region. It undertakes a further breakdown of future population trends computed in the first step for each combination of age and sex into developments at the level of municipalities.

References given under Documentation are to issues in *Statistics Norway Publications*, see pp. 23-27, or for numbers in brackets to *External Publications*, see pp. 28-32.

Immigration and social change

Over the period 1992-1996, the Department of Social Statistics has carried out the so-called «Immigration Statistics Project», under financial support from and in collaboration with the Ministry of Local Government and Labour. Initially, the prime objective of the project was to develop a statistical register on the immigrant population with coherent register formation which could serve as data base for statistical information and analyses. With better data facilities, increased attention could be given to initiating analyses. Previous projects include a study of changes in the degree of residential segregation of immigrants in Oslo and a register based study of the behaviour of different cohorts of refugees with respect to employment, education and reception of social benefits, depending on the year of settlement and duration of stay. Present projects include an on-going study of the development of attitudes towards refugees and immigrants. From 1993, yearly opinion data are collected and published.

Project worker: *Svein Blom*.

Financial support: Ministry of Local Government and Labour.

Documentation: REP 96/5, NOT 96/49, [65].

Level of living survey 1996

A representative sample of eight major immigrant groups, aged 16-70, was interviewed in their mother tongue about different aspects of their material and social welfare. Results from this Level of living survey among immigrants in 1996 are being compared to results from a similar survey among foreign citizens conducted by Statistics Norway in 1983 and the ordinary Level of living survey 1995. The research objective is to contrast differences in the level of living between immigrants and non-immigrants, to investigate conditions for a successful integration of immigrants in the host society, and to describe the process of social integration of immigrants over time. The first results from the survey will be published early in 1997. The program of analyses will continue until 1999.

Project worker: *Svein Blom*.

Financial support: Ministry of Local Government and Labour.

Return migration

In the autumn of 1996, a six-month project started which analyses emigration among foreigners who have ever lived in Norway. Register data on demographic, geographic and legal status is the main source of information.

Project workers: *Nico Keilman* and *Tone Tysse*.

Financial support: Ministry of Local Government and Labour.

Social research

Until 1996, a considerable part of the activities in this area was linked to Statistics Norway's responsibility for social reporting and primary analyses of data from the level of living surveys and other social surveys. From 1996, the general reporting tasks are taken over by a new Division for Social Welfare Statistics. This reorganization facilitate a concentration on more specialized analyses and research projects. Analyses of living conditions of particular population groups and analyses of effects of social welfare policies will constitute a larger part of future research activities in the years to come. It is also a challenge for the division to combine commissioned research activities with continued and cumulative research efforts on distributional processes and changes in social structures.

Big cities, little welfare? Segregation and inequality in Norwegian cities

This project has used surveys of level of living and other data sources to describe inequalities in this level between the cities and other parts of the country, and also differences within the cities. Particular attention is given to the large differences in level of living within Oslo. The analyses will be reported in a forthcoming publication in the SES-series (early 1997).

Project worker: *Anders Barstad*.

Financial support: Ministry of Local Government and Labour.

Documentation: SA 10.

Welfare changes, living conditions and social integration. Norway 1973-1995

This project aims at studying the development and consequences of social integration in Norway the last 20-25 years. Are there tendencies towards social isolation and disintegration, and for which groups? Can such tendencies explain the growth in «new» welfare problems, like suicide and violence? The project started in 1996 and is planned as a doctoral dissertation project.

Project worker: *Anders Barstad*.

Financial support: The Norwegian Research Council.

Time Use Research

Research on changes and variations in people's allocation of time supplement surveys of level of living by focusing on the opportunities and limitations inherent in their living standards. Also, the Time Budget Surveys, of which Statistics Norway has conducted three, are our most

important sources of information about how much, and what forms of unpaid work is performed in society, and who performs this work. Research activities in 1996 include a project on changes in the time use of parents the last 25 years, and a project discussing the extent and changes in the use of domestic help among Norwegian women during the 1980s and 1990s.

Project worker: *Ragni Hege Kitterød*.

Financial support: Ministry of Children and Family Affairs and Ministry of Planning and Coordination.

Documentation: SSP 1/96, SSP 2/96, [36], [52], [72].

Single parents - living conditions and economic provision

The project analyses living condition and economic provisions of single parents, on the basis of a level of living survey of a sample of single parents receiving social security support (transitional benefit) in 1991 and register data on income from the tax and income registers. The project emphasizes the economic adjustments in a life cycle perspective, in particular individual human capital at the time of transition to the single parent life cycle stage.

Project worker: *Randi Kjeldstad*.

Financial support: Ministry of Children and Family Affairs, Ministry of Planning and Coordination and Ministry of Health and Social Affairs.

Life chances in the melting pot

The project has a twofold purpose: At the first stage, survey data from the level of living surveys of 1991 and 1995 and register data from the tax and income registers are used for analysing status and development of economic living conditions and activities over the period 1990-1995 for younger generations (defined as the birth cohorts 1961-1975). At the second stage, the analysis will focus on longitudinal changes in socioeconomic structures and demographic processes and their contribution to differences in opportunity structures and individual adjustment of young women and men in the transitional period from adolescence to (established) adulthood.

Project workers: *Mette Ryen* and *Kari Skrede*.

Financial support: The Norwegian Research Council.

Documentation: REP 11/96, SSP 3/96.

Staff

Østby, Lars, *Director of Research*

Keilman, Nico, *Senior Research Fellow*

Kjeldstad, Randi, *Research Fellow*

Noack, Turid, *Research Fellow*

Skrede, Kari, *Senior Research Fellow*

Barstad, Anders, *Sociologist*

Blom, Svein, *Sociologist*

Hansen, Liv, *Executive Officer*

Hetland, Arve, *Senior Executive Officer* (Graduate Student, Informatics)

Kitterød, Ragni Hege, *Sociologist*

Mamelund, Sverre-Erik, *Executive Officer* (Graduate Student, Human Geography)

Møller, Bjørn, [*Conscientious objector*], (Graduate Student, Statistics)

Nymoen, Erik H., *Geographer*

Roalsø, Kari-Mette, *Sociologist* (until July 1996)

Ryen, Mette, *Economist*

Rønsen, Marit, *Economist*

Sannes, Joar, *Sociologist* (from September 1996)

Tysse, Tone Ingrid, *Economist* (from September 1996)

Sevaldson, Per, *Adviser* (former Director of Research, Sociodemographic Research Unit)

Personnel and budget

The total staff in 1996 was roughly 100 in total number of persons. The distribution by division is given by the table below.

The financial resources of the Research Department stem partly from the government budget as allocated within Statistics Norway. About 42 per cent of total total expenditures in 1996, or approximately Nkr 15 million are project financed. The bulk of the project revenues comes from research grants from the The Research Council of Norway and from contracts with Ministries, primarily the Ministry of Environment, the Ministry of Finance, the Ministry of Industry and Energy, the Ministry of Local Government and Labour, and the Ministry of Foreign Affairs.

Staff Research Department

Vaagen, Otto Gerhard, *Head of Administration*

Dihle, Anne Kari, *Senior Executive Officer (Personnel)*

Rambøl, Hanne, *Senior Executive Officer (Finances)*

Karlsen, Anne Strandli, *Executive Officer (Publications)*

Boquist, Siri, *Clerical staff*

Gundersen, Marit Berger, *Executive Officer*

Kronlund, Tone, *Clerical staff**

Lysell, Kari Anne, *Clerical staff**

Mysen, Lise Nevjar, *Clerical staff*

Salvesson, Sigmund G., *Clerical staff*

Skoglund, Anne, *Clerical staff*

Tillereggen, Geir, *Computer Scientist*

Vågdal, Marit, *Executive Officer*

Walseth, Aud, *Clerical staff*

* on leave

Distribution of operating costs in 1996. 1000 Nkr

	Government Budget	Project	Total
Personnel	18 310	12 636	
Office expenses etc.	2 235	2 404	
Research Department	20 545	15 040	35 585
Social and Demographic Research	2 509	2 439	5 359

Personnel in Research Department in 1997

Division/Unit	Government Budget	Project	Total
Head of Department	1	-	1
Public Economics	13	8	21
Resource and Environmental Economics	14	13	27
Macroeconomics	17	11	28
Microeconometrics	7	5	12
Administration and Computer Services	9	2	11
Research Department	61	39	100
Social and Demographic Research	7,5	6	13,5

Age structure of the Research Department (including personnel on leave). Women, Men

Division/Unit	20-29		30-39		40-49		50-59		>60	
	W	M	W	M	W	M	W	M	W	M
Head of Department/Administration and Computer Services	2	-	4	1	5	1	-	1	-	1
Public Economics	3	1	1	8	2	2	2	1	-	-
Resource and Environmental Economics	3	4	8	8	1	2	-	1	-	-
Macroeconomics	-	2	5	11	4	3	2	1	-	-
Microeconometrics	-	5	-	5	-	2	-	1	-	-
Research Department	8	12	18	33	12	10	4	5	-	1
Social and Demographic Research	2	1	1	2	2	3	3	1	-	-

Social and Economic Studies (SES)

- 93 **Cappelen, Å., R. Choudhury and T. Eika:** *Petroleumsvirksomheten og norsk økonomi 1973-1993* (The Oil Industry and the Norwegian Economy 1973-1993). 1996.
- 94 **Aarbu, K.O. and B. Lian:** *Skattereformen og delingsmodellen: En empirisk analyse* (The Norwegian tax reform and the capital income imputation method: An empirical analysis). 1996.
- 95 **Klette, T.J. and A. Mathiassen:** *Vekst og fall blant norske industribedrifter: Om nyetablering, nedlegging og omstilling* (Growth and turnover among Norwegian manufacturing plants). 1996.
- 96 **Alfsen, K.H., T. Bye and E. Holmøy (eds.):** *MSG-EE: An Applied General Equilibrium Model for Energy and Environmental Analyses*. 1996.

Statistical Analyses (SA)

- 10 Natural Resources and the Environment 1996.

Reports (REP)

- 96/1 **Bowitz, E., N.Ø. Mæhle, V.S. Sasmitawidjaja and S.B. Widoyono:** *MEMLI - The Indonesian Model for Environmental Analysis: Technical Documentation*.
- 96/5 **Blom, S.:** *Inn i samfunnet? Flyktningkull i arbeid, utdanning og på sosialhjelp* (Successfully integrated? Employment, education and reception of social benefits among cohorts of refugees).
- 96/8 **Rosendahl, K.E.:** *Helseeffekter av luftforurensning og virkninger på økonomisk aktivitet: Generelle relasjoner med anvendelse på Oslo* (Health effects of air pollution and impacts on economic activity: General relationships applied to Oslo).
- 96/9 **Mamelund, S.E. and J.K. Borgan:** *Kohort- og periodedødeligheten i Norge 1846-1994* (Cohort and period mortality in Norway 1846-1994).
- 96/11 **Skrede, K. and M. Ryen:** *Levekår i støpeskjeen. Status og utvikling i ungdomsgenerasjonenes materielle levekår 1990-1995* (Life chances in the melting pot. Status and development of economic living conditions in younger generations 1990-1995).
- 96/12 **Alfsen, K.H., P. Boug and D. Kolsrud:** *Energy Demand, Carbon Emissions and Acid*

Statistics Norway monographs are published in the series Social and Economic Studies and Statistical Analyses, other research reports and documentation in the Report series or as Documents/Notater. The Discussion Papers series comprises research papers intended for international journals or books. There is also a Reprint series of journal articles and book chapters by staff employees. The Research Department publishes two periodicals: Økonomiske analyser, in Norwegian with 9 issues a year, and Economic Survey, in English with 4 issues a year.

Rain: Consequences of a Changing Western Europe.

- 96/13 **Arneberg, M.W.:** *Theory and Practice in the World Bank and IMF Economic Policy Models: Case study Mozambique*.
- 96/15 **Oftedal, K.O.:** *Framskrivning av markeds-situasjonen for helse- og sosialpersonell fram mot år 2030* (Projections towards 2030 for labour with education in health and social services).
- 96/16 **Hansen, M.I., T.A. Johnsen and J.Ø. Oftedal:** *Det norske kraftmarkedet til år 2020: Nasjonale og regionale fremskrivninger* (The Norwegian electricity market up to 2020. National and regional forecasts).
- 96/18 **Fæhn, T. and T. Hægeland:** *Effektive satser for næringsstøtte 1994* (Effective rates of assistance by industry 1994).
- 96/23 **Glomsrød, S., A.C. Hansen and K.E. Rosendahl:** *Integrering av miljøkostnader i makroøkonomiske modeller* (Integrating environmental costs in macroeconomic models).

Discussion Papers (DP)

- 161 **Hægeland, T.:** *Monopolistic Competition, Resource Allocation and the Effects of Industrial Policy*. January 1996.
- 162 **Grepperud, S.:** *Poverty, Land Degradation and Climatic Uncertainty*. April 1996.
- 163 **Grepperud, S.:** *Soil Conservation as an Investment in Land*. February 1996.
- 164 **Brekke, K.A., V. Iversen and J. Aune:** *Soil Wealth in Tanzania*. June 1996.

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Dagsvik, J.K., D.G. Wetterwald and R. Aaberge: *Potential Demand for Alternative Fuel Vehicles*. February 1996.

Dagsvik, J.K.: *Consumer Demand with Unobservable Product Attributes. Part I: Theory*. February 1996.

Dagsvik, J.K.: *Consumer Demand with Unobservable Product Attributes. Part II: Inference*. February 1996.

Aaberge, R., A. Björklund, M. Jäntti, M. Palme, P. J. Pedersen, N. Smith and T. Wennemo: *Income Inequality and Income Mobility in the Scandinavian Countries Compared to the United States*. March 1996.

Nyborg, K.: *Some Norwegian Politicians' Use of Cost-Benefit Analysis*. March 1996.

Berg, E., S. Kverndokk and K. E. Rosen-dahl: *Market Power, International CO₂ Taxation and Petroleum Wealth*. April 1996.

Aaberge, R., U. Colombino and S. Strøm: *Welfare Effects of Proportional Taxation: Empirical Evidence from Italy, Norway and Sweden*. April 1996.

Dagsvik, J.K.: *Dynamic Choice, Multistate Duration Models and Stochastic Structure*. April 1996.

Dagsvik, J.K.: *Aggregation in Matching Markets*. April 1996.

Bjørnland, H.C.: *The Dynamic Effects of Aggregate Demand, Supply and Oil Price Shocks*. June 1996.

Bruvoll, A. and K. Ibenholt: *Future Waste Generation. Forecasts Based on a Macro-economic Model*. June 1996.

Fæhn, T. and L.A. Grünfeld: *Recent Leaps Towards Free Trade. The Impact on Norwegian Industry and Trade Patterns*. June 1996.

Barrell, R. and K.A. Magnussen: *Counter-factual Analyses of Oil price Shocks using a World Model*. July 1996.

Bowitz, E. and S.I. Hove: *Business cycles and fiscal policy: Norway 1973-93*. August 1996.

Bjørnland, H.C.: *Sources of Business Cycles in Energy Producing Economies: The case of Norway and United Kingdom*. August 1996.

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Nyborg, K.: *The Political Man and Contingent Valuation: Motives Do Count*. August 1996.

Berg, E., S. Kverndokk and K.E. Rosen-dahl: *Gains from Cartelisation in the Oil Market*. October 1996.

Aaberge, R. and I. Aslaksen: *Decomposition of the Gini Coefficient by Income Components: Various Types of Applications and Interpretations*. October 1996.

Bye, B.: *Taxation, Unemployment and Growth: Dynamic Welfare Effects of «Green» Policies*. November 1996.

Klette, T.J. and F. Johansen: *Accumulation of R&D Capital and Dynamic Firm Performance: A Not-so-fixed Effect Model*. November 1996.

Bye, B.: *Environmental Tax Reform and Producer Foresight: An Intertemporal Computable General Equilibrium Analysis*. December 1996.

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Kverndokk, S.: Tradeable CO₂ Emissions Permits: Initial Distribution as a Justice problem. 1996. Reprint from *Environmental Values* 4, 1995, 129-148.

Aslaksen, I., T. Fagerli and H. A. Grav-ningsmyhr: Measuring Household Produc-tion in an Input-output Framework: the Norwegian Experience. 1996. Reprint from *Statistical Journal of the United Nations* 12, No. 2, 1995, 111-131.

Aslaksen, I. and C. Koren: Det ubetalte husholdsarbeidet - omfang og fordeling (Unpaid household work - value and distributional). 1996. Reprint from *Tidsskrift for samfunnsforskning*, No. 1, 1995, 3-30.

Aslaksen, I. and C. Koren: Taxation, Time Use and the Value of Unpaid Labor: Policy Implications for the Redistribution of In-come. 1996. Reprint from *Review of Radical Political Economics* 24, No. 2, 1992, 8-16.

Alfsen, K.H., M.A. De Franco, S. Gloms-rød and T. Johnsen: The Cost of Soil Ero-sion in Nicaragua. 1996. Reprint from *Eco-logical Economics* 16, No. 1, 1996, 29-145.

Naug, B.E. and R. Nymoen: Pricing to Market in a Small Open Economy. 1996. Reprint from *Scandinavian Journal of Economics* 98, No. 3, 1996, 329-350.

- 88 **Naug, B.E.:** Hva bestemmer utviklingen i importprisene? (What determines the development of import prices?). 1996. Reprint from *Sosialøkonomien*, No. 1, 1996, 32-40.
- 89 **Holmøy, E. and H. Vennemo:** A General Equilibrium Assessment of a Suggested Reform in Capital Income Taxation. 1996. Reprint from *Journal of Policy Modeling* 17, No. 6, 1995, 531-556.
- 90 **Kverndokk, S.:** Global CO₂ Agreements: A Cost-Effective Approach. 1996. Reprint from *The Energy Journal* 14, No. 2, 1993, 91-112.
- 92 **Ellingsæter, A.L. and M. Rønsen:** The Dual Strategy: Motherhood and the Work Contract in Scandinavia. 1996. Reprint from *European Journal of Population* 12, No. 3, 1996, 239-260.
- 93 **Rønsen, M. and M. Sundström:** Maternal Employment in Scandinavia: A Comparison of the After-birth Employment Activity of Norwegian and Swedish Women. Reprint from *Journal of Population Economics* 9, No. 3, 1996, 267-285.

Documents (DOC)

- 96/1 **Kolsrud, D.:** *Documentation of Computer Programs that Extend the SEEM Model and Provide a Link to the RAINS Model.*
- 96/2 **Bowitz, E., V.S. Sasmitawidjaja and G. Sugianto:** *The Indonesian Economy and Emission of CO₂: An Analysis Based on the Environmental-Macroeconomic-Model MEMLI, 1990-2020.*
- 96/4 **Berg, E.:** *Some Results from the Literature on the Impact of Carbon Taxes on the Petroleum Wealth.*
- 96/7 **Bjerkholt, O., K.A. Brekke and R. Choudhury:** *The Century Model - on the Long Term Sustainability of the Saudi Arabian Economy.*
- 96/8 **Choudhury, R.:** *The Century Model. Technical Documentation of Computer Programs and Procedures.*
- 96/9 **Choudhury, R. and K.A. Magnussen:** *The Implementation Model. Technical Documentation of Computer Programs and Procedures.*
- 96/10 **Choudhury, R.:** *The Selection Model. Technical Documentation of Computer Programs and Procedures.*

- 96/11 **Choudhury, R.:** *The OM95 – An Oil Model for the Kingdom of Saudi Arabia. Technical Documentation of Computer Programs and Procedures.*
- 96/12 **Nyborg, K.:** *Environmental Valuation, Cost-Benefit Analysis and Policy Making: A Survey.*
- 96/13 **Johansen, P.R. and K.A. Magnussen:** *The Implementation Model. A Macroeconomic Model for Saudi Arabia.*
- 96/14 **Cappelen, Å. and K.A. Magnussen:** *The Selection Model. A General Equilibrium Model for Saudi Arabia.*
- 96/15 **Boug, P. and L. Brubakk:** *Impacts of Economic Integration on Energy Demand and CO₂ emissions in Western Europe.*
- 96/16 **Dagsvik, J.K.:** *Probabilistic Models for Qualitative Choice Behavior: An Introduction.*
- 96/17 **Alfsen, K.H. and K.E. Rosendahl:** *Economic Damage of Air Pollution .*
- 96/18 **Alfsen, K.H.:** *Why Natural Resource Accounting?*
- 96/19 **Aune, F.R., T. Bye, T.A. Johnsen and A. Katz:** *NORMEN: A General Equilibrium Model of the Nordic Countries Featuring a Detailed Electricity Block.*
- 96/20 **Rolland, M.:** *Military Expenditure in Norway's Main Partner Countries for Development Assistance.*
- 96/21 **Bjerve, P.J.:** *Contributions of Ragnar Frisch to National Accounting.*
- 96/22 **Stølen, N.M.:** *Effects on Wages from Changes in Pay-roll Taxes in Norway.*
- 96/25 **Bye, T. and S. Kverndokk:** *Nordic Negotiations on CO₂ Emissions Reduction. The Norwegian Negotiation Team's Considerations.*

Notater (NOT)

- 96/3 **Smestad, I.M.:** *Valg under usikkerhet: En analyse av eksperimentdata basert på kvalitative valghandlingsmodeller (Models for qualitative choice behavior: An analysis based on stated preference data).*
- 96/8 **Lian, B. and K.O. Aarbu:** *Dokumentasjon av LOTTE-AS (Data sources for the model LOTTE-AS).*

96/9 **Fredriksen, D.:** *Datagrunnlaget for modellen MOSART, 1993* (The microdata underlying the dynamic microsimulation model MOSART, 1993).

96/10 **Grepperud, S. and A.C. Bøeng:** *Konsekvensene av økte oljeavgifter for råoljepris og etterspørsel etter olje. Analyser i PETRO og WOM* (The impact of carbon taxes of oil prices and the demand for oil: WOM and PETRO).

96/16 **Gerdrup, K.:** *Inntektsfordeling og økonomisk vekst i norske fylker: En empirisk studie basert på data for perioden 1967-93* (On the relationship between income inequality and economic growth in Norwegian counties).

96/31 **Bruvoll, A. and H. Wiig:** *Konsekvenser av ulike håndteringsmåter for avfall* (Economic consequences of implementing different instruments to deal with solid waste).

96/33 **Rolland, M.:** *Militærutgifter i Norges prioriterte samarbeidsland* (Military expenditure in Norway's main partner countries for development assistance).

96/35 **Hansen, A.C.:** *Analyse av individers preferanser over lotterier basert på en stokastisk modell for usikre utfall* (A study of individual preferences for wages based on a random utility model).

96/36 **Vatne, B.H.:** *En dynamisk spillmodell: Dokumentasjon av dataprogrammer* (A dynamic game model: Documentation of the computer programs).

96/44 **Lindquist, K.G. and B.E.Naug:** *Makro-økonometriske modeller og konkurranseevne* (Macroeconometric models and competitiveness).

96/45 **Golombek, R. and S. Kverndokk (eds.):** *Modeller for elektrisitets- og gass-markedene i Norge, Norden og Europa* (Electricity and gas models for Norway, the Nordic countries and Europe)

96/49 **Blom, S.:** *Holdning til innvandrere og innvandringspolitikk* (Attitudes towards immigrants and immigration policies).

96/53 **Aune, F.R.:** *Konsekvenser av en nordisk avgiftsharmonisering på elektrisitetssområdet* (Consequences of a nordic electricity tax harmonization)

97/2 **Berg, E. and K. Rypdal:** *Historisk utvikling og fremskrivning av forbruket av noen miljøskadelige produkter* (Historical development and projections of the consump-

tion of some environmentally damaging products).

97/5 **Cappelen, Å.:** *SSBs arbeid med investeringsrelasjoner: erfaringer og planer* (Models of investment equations in Statistics Norway, experiences and plans for future work).

Økonomiske analyser (ØA)

1/96 **Økonomisk utsyn over året 1995** (Economic survey 1995).

2/96 **Berg, E., S. Kverndokk and K. E. Rosendahl:** *Markedsmakt, internasjonal CO₂-avgift og petroleumsformue* (Market power, international CO₂-taxation an the petroleum wealth).
Naug, B.E.: *Om konkurranseevneindikatorer* (On measures of competitiveness).
Alfsen, K.H.: *Grønt BNP – trenger vi det?* (A green GDP – Do we need it?).
Urdal, H. and N. Keilman: *Barnløshet i fremtiden - en formell demografisk analyse* (Childlessness in the future: A formal demographic analysis).

3/96 **Nyborg, K. and I. Spangen:** *Politiske beslutninger om veinvesteringer* (Political decisions concerning road investments).
Eika, T.: *Utbyggingen av petroleumssektoren og konjunkturforløpet 1973-93* (Oil explorations and business cycles 1973-93).
Grünfeld, L.A.: *Norske konjunkturbølger fra 1900 til i dag. Noen tidligere antakelser og nyere avsløringer* (Norwegian business cycles from 1900 to the present. Previous suppositions and recent results).
Nygård, T.: *Turismens økonomiske betydning for Norge* (The Importance of Tourism for Norwegian Economy).
Dahle, A.B.: *Sesongjustering og publisering av utenrikshandelstall* (Seasonal adjustment and publishing of external trade figures).

4/96 **Bye, T.A. and E. Fjærli:** *Kraftbeskatning. En analyse av ulike skatteopplegg i forhold til kraftverk* (Taxing power plants. An analysis of revenue effects of different taxing rules).
Arneberg, M.W.: *Lønner det seg å jobbe? Kompensasjonsgrader i den norske velferdsmodellen* (Work or welfare? compensation degrees in the Norwegian welfare state).
Magnussen, K.A.: *En kontrafaktisk analyse av oljeprissjokk. Virkninger på internasjonal økonomi* (A counterfactual analysis of oil price shocks. International effects).
I. Svendsen: *Forventninger i norsk økonomi* (Expectations in the Norwegian economy).
Nossen, J.P.: *Offentlige finanser i Norge sammenlignet med EU-landene, USA og Japan* (General government finances in Norway in an international perspective).

- 5/96 *Konjunkturtendensene for Norge og utlandet* (Business cycle report).
Rolland, M.: *Økonomisk utvikling utenom OECD-området* (Economic Prospects for non-OECD countries).
Eika, T.: *Petroleumsvirksomheten og norsk økonomi* (The oil sector and the Norwegian economy).
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