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The Annual Report 2003 for the Research Department of Statistics Norway presents the main fields of research in 2003 with complete lists of publications and staff. The Research Department as presented in this report, includes the Social and Demographic Research Unit and the Statistical Methods and Standards Unit which administratively are placed in other departments in Statistics Norway. Other research activities within Statistics Norway are not included in this report.

The Research Department welcomes interest in our publications and activities in general. We are happy to provide information as well as publications to both individuals and institutions. Some of our publications, such as Discussion Papers, Economic Survey and Statistical Analyses, are available free at our website at www.ssb.no (English site: www.ssb.no/en). All paperpublications can be ordered from our Sales and subscription service or via Internet. Our website is also updated with other information about the research activities at Statistics Norway.

Oslo, March 2004

*Ådne Cappelen
Head of Research Department*

General research objectives

The general objectives of the research activities within Statistics Norway are fourfold:

Enhanced empirical knowledge

Statistics alone is an insufficient source of information for understanding social and economic development. Analysis of statistical data by means of relevant theory and analytical methods and the use of models give empirical insight and deeper understanding of the phenomena under consideration.

Analytical tools for monitoring economic and environmental development

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.

Feed-back to the statistics

Researchers in the Statistics Norway have a unique position close to the sources of data. This provides special opportunities for exploitation of the data expertise in Statistics Norway, for special organization of data material and links to other sources, and for influencing methods of collection of primary data. The analytic use gives feed-back effects to the statistical work and may improve the quality of 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 to secure that high scientific standards in the analyses have been maintained.

Per 1 January 2004

Chairman of the Board

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International Secretariat (104) Jan Byfuglien

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Development Cooperation (140)
Bjørn K. Wold

Department of Economic Statistics (200)

Olav Ljønes

Staff (201)

Office for IT (203) Kristian Lønø

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Labour Market Statistics (260)
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Elisabetta Vassenden

Sample Surveys (340)
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Per Ove Smogeli

Primary Industry Statistics (430)
Ole O. Moss

Transport and Tourism Statistics (440)
Asbjørn Wethal

Construction and Service Statistics (460)
Roger Jensen

Research Department (500)

Ådne Cappelen

Staff (501)

Units

Taxation, Inequality and Consumer Behaviour (510)
Thor Olav Thoresen

Energy and Environmental Economics (520)
Annegrete Bruvold

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Labour Market and Firm Behaviour (540)
Torbjørn Hægeland

Fiscal Sustainability (550)
Nils Martin Stølen

Local Public Finance and Regional Economics (560)
Audun Langørgen

Economic Growth and Efficiency (570)
Brita Bye

Petroleum and Environmental Economics (580)
Knut Einar Rosendahl

Department of Administrative Affairs (600)

Cecilie Wilberg

Staff (601)

Joint Services (603)
Karin Wang

Divisions

Budget and Accounting (630)
Gunhild Holta

Personnel Administration (640)
Heidi Torstensen

Department of Communication (700)

Anne Skraneffjell

Fride Eeg-Henriksen

Per Olav Løvbak

Lars Rogstad

Information

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Publication

Library and Information Centre

Department of IT and Data Collection (800)

Rune Gløersen

Staff (801)

Divisions

Data Collection Methods (810)
Gustav Haraldsen

Data Processing (820)
Dagfinn Sve

IT Development (830)
Hanne Mette Janson

IT Infrastructure (840)
Tore Eig

IT Services (850)
Torgeir Vik

The research unit is focused on micro data methods and applications. The research falls into several areas, with the following as key activities:

- 1. Developing and applying the tax-benefit model system LOTTE and other static micro simulation models*
- 2. Understanding and application of methods for consumer behaviour*
- 3. Describing distributional effects of policy interventions*

Main findings

The tax-benefit model LOTTE is extensively used by the Storting (Parliament) and the Ministry of Finance, calculating effects on revenue and income distribution from changes in the scheme for direct taxation. Recent years this service has also included simulations of effects from changes in the indirect taxes, as the VAT, through the model LOTTE-konsum. The models have been ported to new computer platform from Sun to Digital.

The research unit contributed to the preparation of a green paper that discusses reforms in the tax system, the work by the so-called Skauge-committee (NOU 2003:9). For instance has 3 appendices been delivered: on tax progressivity in the 90'ies, on trends in income inequality; and on the importance of owner-occupied housing and its impact on the distribution of income.

Members of staff were involved in the work of the committee that discussed the effects of excise taxes on commodities that are exposed to cross-border shopping, as Thoresen headed and Aasness was member of the expert group. A new model for analysing effects of indirect tax rates on revenue and consumption patterns has been developed, as part of this work. It has been applied to analyse the effects of changes in taxes on alcohol and tobacco, taking into consideration cross-border shopping, tax-free shopping, smuggling and illegal home production. The partial revenue from each indirect tax and the total revenue from all indirect taxes on consumer goods are derived as functions of all commodity prices, the tax share of each commodity, total expenditure and demographic variables using a complete demand system.

Røed Larsen completed the 2-year-long post-doc research project "Consumer Patterns, Standards of Living, and the Environment" in December 2003. The project focused attention on empirical scrutiny of consumer patterns using econometric techniques. Important insights were obtained during

2003. For example, scrutiny of standards of living uncovered that Norwegian households behaved as if costs-of-living rose faster than the consumer price index (CPI) indicates. In particular, single-person household behaved as if costs-of-living increased approximately twice as fast as the consumer price index states. This result indicates that for segments of society, the consumer price index may be biased downward in relation to costs-of-living, contrary to conventional wisdom. During 2003 results from this project were published in three articles that appeared in international, peer-reviewed journals.

In a paper that appeared in the *Econometrics Journal*, exploiting the panel feature of the Norwegian Household Expenditure Survey, we have been able to identify and estimate the distributions of preferences, measurement errors, and latent total expenditure simultaneously with an expenditure system for 28 commodity groups.

During 2003 a project on family policy issues has been completed. A micro simulation model that provides estimates of labour supply effects and distributional effects of changes in family policies is now fully established. The model has for instance been used to predict the effects of a recent reform, the so called "child care compromise".

Staff

Thoresen, Thor Olav, Head of Research Unit
 Fjærli, Erik, Research Fellow
 Hansen, Kirsten, Adviser
 Hussein, Mohamed F., Computer Scientist
 Røed Larsen, Erling, Research Fellow
 Lian, Bård, Adviser
 Nygård, Odd Erik, Economist
 Sommervoll, Dag Einar, Research Fellow, current visiting scholar at Stanford University (U.S.)
 Wangen, Knut Reidar, Research Fellow
 Aasness, Jørgen, Senior Research Fellow

The energy research group focuses on studies of the development of energy markets and how national, international and natural external conditions influence the development and use of national energy resources, the environment, the market structure and economic growth. Studies of the behaviour of firms and households and their adaptation to environmental policy is essential, as is the development of partial energy market models and integrated energy market and general equilibrium models. The domestic energy market is dominated by hydropower production with stochastic inflow, which generates separate focused studies on production and transmission capacity limits, strained markets and owner concentration issues. Interlink with thermal markets in neighbouring countries makes international trade studies an important research area.

Water inflow shortage and high electricity prices have brought up several important subjects concerning the vulnerability of the Norwegian hydropower market. Closer evaluations of the price elasticity, volatility and market power are important for the understanding of the total risk for a close to a hundred per cent hydro based power production. We analyse how the electricity market responds to varying and extreme temperatures, precipitation and inflow.

We further study the energy intensive industries' role in the hydropower market, their role in total emissions of greenhouse gases and other pollutants, interacting effects of the phasing out long-term electricity contracts, and the implementation of a permit market for greenhouse gases. The effect of technological adaptation is particularly emphasized. The project focuses on the relation between present energy policy instruments and political goals with respect to greenhouse gases, stable energy prices and balanced long-term economic growth.

Several hypotheses are launched to explain behind the inverted U-relationship between income and many environmental problems. We conduct studies of these hypotheses within a forward-looking macroeconomic model.

Main findings

In studies of productivity growth, we find that in the pulp and paper industry, the technology frontier has moved, while the average firm has increased its distance to the frontier. We also find that productivity measures including environmental factors significantly differ from traditional measures covering conventional factors only. Economists have maintained that environmental regulations hamper productivity growth. In a study where we account for emission reductions in the productivity

measure, we detect a positive relationship between regulatory stringency and productivity growth. Our results support a claim that evaluations of environmental policies based on conventional factor productivity measures disregarding environmental factors can be biased.

During the autumn and winter of 2002-2003 the inflow to the Nordic hydropower reservoirs were very low. The probability of such a low inflow to happen was only 0.5 per cent. This stressed the electricity market - prices went record high and questions were raised about the functioning of the market. In a separate study we found that optimisation of the water value in a hydropower production system based on large reservoirs actually explained the development of market prices during this period. Contrary to what was claimed, consumers adjusted relatively fast to the price changes and helped the market overcome the exerted situation. In a study of distributional effects, we found that households with many children and large dwellings, and thus high electricity consumption, experienced the highest increase in electricity expenditures. On average, the income in these households is about medium or higher. However, many low-income households also face large increases in electricity expenditures, especially as share of income. We also find that Norwegian households hedge from energy price variations by substituting between energy carriers.

A new energy policy instrument is about to be launched in most European countries. Green certificates works as a combination of taxes and subsidies in the energy market. Despite the fact that a purchaser obligation of certificates is most commonly introduced to make the certificate market work, our study on a calibrated model for the Norwegian electricity market shows that the extra cost introduced to the market is fully transferred to the producer.

We have studied of one of the hypotheses behind the inverted U-relationship between income and environmental problems, that increasing preferences for green goods in richer countries change trade patterns towards dirtier production in poorer countries. Changed preferences and hence tighter climate policy generally increase emissions abroad.

Staff

Bruvoll, Annegrete, Head of Research Unit

Bye, Torstein A., Director of Research

Halvorsen, Bente, Senior Research Fellow

Hansen, Mona Irene, Executive Officer

Hansen, Petter, Economist

Larsson, Jan, Research Fellow

Nesbakken, Runa, Research Fellow

Larsen, Bodil M., Senior Research Fellow

Lindh, Cecilie, Economist (on leave)

The unit is engaged in empirical studies of the Norwegian economy - its development and way of functioning - in a macroeconomic perspective. The research is based on Statistics Norway's short-term statistics and national accounts data, and the development and use of econometric time series methods and models. Important external users of the models are Ministry of Finance, Ministry of Labour and Administration, and Stortinget (the parliament).

Business cycle analysis

Economic surveys and forecasts are published quarterly in parallel editions in Økonomiske analyser and Economic Survey. They are also available on the Internet. The forecasts are constructed using the quarterly macroeconomic model KVARTS (see below). The Research Department is a member of AIECE (Association d'Institutes Européens de Conjuncture Economic) and the UN-based Project LINK, linking several national macro models to a global model.

Documentation: ØA 1/2003, 3/2003, 4/2003, 6/2003, ES 1/2003, 2/2003, 3/2003, 4/2003, [61], [81].

Macroeconomic models and econometric analysis

Macroeconomic research is concentrated around the development and use of the two large macroeconomic models - the quarterly model KVARTS and the annual model MODAG. Except from the difference in data frequency, the economic content in the two models is almost identical. The KVARTS model is used for forecasting and economic analysis in our business cycle reports. The model is also used to provide alternative scenarios for the Government appointed Expert Committee for Income Settlements in connection with the annual nation wide wage and income negotiations. The MODAG model is mainly used by the Ministry of Finance for forecasting and policy analysis, and by the unit itself in assisting fractions in the Standing Committee on Finance and Economic Affairs in the parliament. Both models have been central tools in various historical/counterfactual studies of the Norwegian economy.

The models comprise at the moment 28 sectors of production and 48 commodities. Although many

of the parameters in the models are econometrically estimated, several coefficients, including the input-output structure, are each year calibrated to the most recent final national accounts data. Presently, the final accounts for 2000 are used for this calibration.

For most production sectors (22) a set of factor demand equations are specified based on Cobb-Douglas production functions. The factors specified are labour, energy (nested CES-elements for electricity and fuel), other material inputs, and three components of fixed capital (machinery, transport/equipment, and structures). To each commodity, the models specify an exogenous world market price, and two endogenous prices (for exports and the domestic market), where price formation is according to the theory of monopolistic competition. The modelling of export volumes and import shares are based on the Armington approach.

Households' supply of labour is disaggregated by gender and age to take account of large differences in labour market behaviour for various groups. There are substantial "discouraged worker effects" and moderate after tax real wage effects in the aggregate labour supply. Household demand is specified using a macro-consumption function and a housing investment equation. Both depend on household real income, real wealth and after-tax real interest rate. Allocation of household demand on consumer categories is based on a dynamic version of the AIDS system.

Based on the input-output structure and the commodity classification, indirect taxes and subsidies are specified in great detail. This is also the case for direct personal taxation, where the tax rates are aggregated from a microeconomic model which links the actual tax structure to the large micro-database of recent tax forms. The

Norwegian economy is characterised by a comprehensive public transfers system and the link between labour market variables and parts of the transfers to old age pensioners are treated in a simpler way.

In 2003 both models were reestimated, based on the revised national accounts data published in 2002. As part of the reestimation, the macro consumption function and the equation for investments in housing have been significantly changed. In addition, work has been centred around the following topics: Exchange rate and financial sector modelling, the transmission mechanism of interest rates on inflation, macroeconomic effects of future drop in investments in the petroleum sector, and methodological problems related to testing trend breaks in time series.

Documentation: [32], [33], [40], [55], [56], [57], [66], [67], [68], [69], DP340, 348, 364, Reprints 236, NOT 2003/11, 2003/43, 2003/62

Main Findings

The fiscal policy rule for Norway introduced in 2001 implies an increased use of petroleum income. However, our analyses show that in the coming years this positive "spending effect" may be balanced by a negative "resource movement effect" due to an expected drop in petroleum extraction and investment.

Tests of wage equations estimated on revised national account data reject the hypothesis of a change in the wage formation in recent years. Such a change possibly explained large residuals in the equation for the manufacturing sector in 2002, based on preliminary data. In the new data set, however, producer prices in the manufacturing sec-

tor were higher. As a consequence, the model explains the actual wage growth in the manufacturing sector in 2002, just as well as in previous years.

The effects of a change in interest rates on inflation in Norway mainly work through its effects on exchange rates, and not through the effects on domestic demand. Since an inflation targeting monetary policy mainly has to work through the exchange rate it will possibly hurt the exposed sectors of the economy, as seen in 2002.

Norwegian households hold a large part of their wealth in housing, and a comparable small part in financial assets. It is often argued that the share of housing is "too large". However, our analysis shows that the actual portfolios are in line with an optimal portfolio strategy. We also find that the effect of a shock to equity prices, measured as per cent of income, almost entirely affects high-income groups, while the effect of a shock to housing prices is evenly spread across income groups.

Staff

Johansen, Per Richard, Head of Research Unit
Benedictow, Andreas, Economist
Bjørnstad, Roger, Research Fellow
Boug, Pål, Research Fellow
Drzwi, Wenche, Senior Executive Officer
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Holm, Inger, Adviser
Hungnes, Håvard, Research Fellow
Jørgensen, Jørn-Arne, Economist
Kolsrud, Dag, Research Fellow
Ouren, Jørgen, Adviser
Solheim, Haakon, Research Fellow
Walseth, Aud, Clerical Staff

The central aim of the unit is to obtain new knowledge of the functioning of the labour market and firms' behaviour through econometric analyses of Statistics Norway's microdata, and to use this knowledge in analysing economic issues. In connection with this work, the unit also contributes to the development of relevant theories, methods and databases.

Our main fields of analysis include

The relation between labour supply and business cycle conditions

Technological change and workers' retirement decisions.

The returns to and choice of education

Education and inequality: Sorting, resources and outcomes

Barriers to increasing female employment

Measurement of innovations

Effects of fiscal incentives to R&D

Efficiency, growth and firm exit

Price index methods

Econometric methods

Main findings

A new method for estimating tangible fixed assets in current prices at the firm level has been developed. Book values, which are based on historic prices, on fixed tangible assets from the accounts statistics for joint-stock companies in the Norwegian manufacturing industry are combined with investments in tangible fixed assets from the manufacturing statistics. The capital estimates in current prices are calculated using price indices for new capital goods to adjust the book values on tangible fixed assets. By summing the firm level capital data and weighting for firms not included in our sample we obtain capital estimates at the

sector level, that we believe are more credible than the estimates from national accounts using the perpetual inventory method.

Documentation: DP 365.

During 2003 work on quality-adjusted price indexes has continued. Preliminary empirical results for automobiles indicate that while the conventional index of Statistics Norway show almost no trend from 1994 to 2002, the corresponding quality adjusted index decreases rapidly (between 16 and 30 per cent, depending on the type of body).

Documentation: NOT 2003/71, Article forthcoming in Norsk Økonomisk Tidsskrift .

A survey that reviews research on the micro based labour supply conducted in the Research Department has been published in Statistics Norway. This survey discusses important methodological and empirical issues related to labour supply modelling with focus on the particular strategies that have been followed within the Research Department. The survey also presents selected empirical results.

Staff

Hægeland, Torbjørn, Senior Research Fellow, Head of Research Unit

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Frenger, Petter, Senior Research Fellow

Henningesen, Morten, Executive Officer (part time)

Kornstad, Tom, Research Fellow,

Raknerud, Arvid, Senior Research Fellow

Rybalka, Marina, Executive Officer

Rønningen, Dag, Senior Executive Officer

Skjerpen, Terje, Senior Research Fellow

The aim of the unit is to analyse the most important factors behind the development in public revenues and expenditures. Growth in tax revenues, transfers and demand for public services are strongly dependent on demographic factors, development in supply of labour, economic growth in general and its allocation. Economic consequences of long run fiscal imbalances and policies to reduce these imbalances are a natural part of the analyses.

The research activities at the unit may be grouped in two main categories:

1. The analyses of the effects on transfers to households and income distribution as a consequence of demographic development, supply of labour, and pension regulations are mainly based on development and use of a dynamic micro simulation model, MOSART. Specific micro based analyses of behavioural effects and in particular analyses of saving behaviour are currently going on.
2. The interaction between the general economic development and fiscal sustainability is subject to analyses by general equilibrium models. For the time being our most appropriate CGE-model is the MSG-model. Effects of changes in the pension system, taxation and the level of public services are central areas of research. The sustainability in public finances, effects of using petroleum revenues, excess burden of taxation and Dutch disease are also given great attention.

Main findings

Conclusions from analyses for the Norwegian Pension Commission include:

- Changes in the pension system towards higher proportionality between pension entitlements and former labour income in addition to making the yearly pension benefit dependent on the retirement age, may increase employment and reduce public expenses.
- A shift in this direction keeping average pensions unaltered, however, favours those with higher incomes and is unfavourable for women. A shift from today's pay as you go to a funded system gives no "free lunch" because this shift may introduce a double burden on the labour force in the transition period, reducing private consumption and/or leisure.

- Pension reforms which are based on a higher degree of prefunding, must be followed up by adjustments of the industry structure. In particular, increased national savings will take place through increased net exports, which warrants an expansion of the traded goods sector.

To shed new empirical light on the fiscal sustainability problems facing Norway, a detailed micro-econometric model of labour supply has been integrated with a large scale CGE model. Taking this detailed response on labour supply into account the estimated required increase in the future tax burden is reduced. Moreover, labour supply responses reduce the pressures on public finances much more significantly if the present taxation of personal income is replaced by a flat tax rate.

New micro data on household saving has made it possible to analyse Norwegian saving behaviour along three dimensions; age, period and cohort. The main findings are; 1) the propensity to save increases steadily with age, most likely due to a combination of precautionary savings and bequest behaviour, 2) there are no significant generational differences in saving behaviour, and 3) household saving over time responded to credit liberalization with a temporary decline, and responds less to revaluations of real assets than is previously assumed on the basis of macro data.

Staff

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Heide, Kim Massey, Economist
Holmøy, Erling, Senior Research Fellow
Lerskau, Lisbeth, Senior Executive Officer
Madsen, Hilde, Adviser
Solli, Ingeborg Foldøy, Economist

The research group is preoccupied with analyses that include a geographic or administrative dimension on the subnational level. The focus is on the behaviour of local governments and their priorities between different service sectors and different recipients. Local public finance is combined with analyses of distribution and efficiency. Moreover, the behaviour of individuals is studied in the setting of migration, labour market mobility and regional competition. Economic models have been developed to provide future scenarios for employment and labour force in different regions, and for local government service production by service sector.

In analysis of local government production a macro model MAKKO is used to project employment and the number of clients in local public services in Norway. MAKKO contains submodels for services provided by local governments, like kindergartens, primary and secondary education, health care and care for the elderly.

A microeconomic model KOMMODE has been developed to analyse the fiscal behaviour of local governments. A linear expenditure system has been applied to the estimation of price and income elasticities for eight service sectors. Budget deficits and expenditures in different service sectors are endogenous variables. Moreover, the model accounts for heterogeneity in local tastes and production costs. A number of projects that applies KOMMODE in analyses of income distribution, efficiency and municipality mergers are in progress. The model has also been applied to derive a classification of municipalities.

In a PhD project, fiscal competition between local governments is in focus. We have gathered a database that allows various descriptions of mobility for households and firms at a regional and local government level. In the first analyses, we include explicit measures of local mobility conditions into demand models of fiscal policy. Local government service and tax decisions are analysed dependent on mobility, together with the traditional economic, demographic and political variables. Mobility and competition can also serve to control government waste, and induce competition reform. In the next analyses we therefore introduced a link between mobility and reform, and investigated how variation in household and firm mobility were related to variation in local government competition reform.

The regional macroeconomic model REGARD is used to support the analyses and projections of the development in regional labour markets and migration. The present economic part of the model is a simple submodel to the macroeconometric models MODAG, KVARTS and MSG. A demographic model block takes care of internal migration and labour force participation. The model provides projections of labour market imbalances, illuminating the implications for regional employment, labour force and population growth of a given macroeconomic scenario and from changes in economic policy. In 2003 the model was used in the preparation of economic surveys for a Norwegian region. The model was also used in regional analyses for a Norwegian government committee ("Effektutvalget") and the Directorate of Taxes.

Two projects on labour market mobility continued in 2003. A project investigating urban and regional labour market mobility in Norway is included in the Norwegian Research Councils' programme "Urban development - driving forces and planning challenges". Another project investigating local tax policy, competition and mobility across municipalities continued as a cooperation project with NTNU in Trondheim and is included in the Norwegian Research Councils' Tax research programme. One new project on labour market mobility started up in 2003 as a Nordic co-operation project analysing "Economic Renewal and Demographic Change" in Denmark, Finland, Iceland, Norway and Sweden. The project is directed by Nordregio (Nordic Centre for Spatial Development) in Stockholm.

Main findings

The incidence of poverty in Norway is relatively high in the capital city Oslo, especially when re-

gional variation in housing prices has been taken into account.

Gross labour mobility and inter-sector mobility reflects the business cycle with highest mobility in years with strong employment growth. Inter-sector mobility contributes with almost 50% of the total gross job-entries in Norway.

Mobility seems to matter for local government spending and tax decisions. Local governments experiencing high household mobility shift spending to services important for household location decisions, that is, from care for the elderly to day care. Local governments experiencing high firm mobility tend to have lower level of infrastructure fees.

Staff

Langørgen Audun, Head of Research Unit
Langset Bjørg, Economist
Stambøl Lasse Sigbjørn, Research Fellow
Wennemo Tom, Adviser
Aaberge Rolf, Senior Research Fellow
Kalvaraskaia Maria, Economist

The purpose of the research activities in this unit is to contribute to increased understanding of long-run adaptation of the Norwegian economy to changes in policies with special attention to impacts of taxation, industrial policy, trade policy and environmental policy on macroeconomic efficiency and economic growth processes. Our main tools are general equilibrium models.

The most recent version of the numerical general equilibrium model (MSG-6) has endogenous labour supply, intertemporal consumer and producer behaviour based on perfect foresight, an integrated emissions-to-air module linked to the economic activities, a detailed description of the electricity market and a specified representation of the link between firm and industry behaviour, where heterogeneity between firms and imperfect competition are accounted for. This year work has been concentrated on re-formulating the model of public revenue and expenses, and re-estimating the elasticities of substitution in the production technology for the different industries.

Observed Environmental Kuznets Curves (EKC) indicate that growth in rich countries tend to slow-down/decrease their pollution problems. In this project we conduct studies of several hypotheses behind EKCs for Norway. One part of the project employs a forward-looking macroeconomic model to quantify the role of income growth in tightening national environmental policy so that pollution-intensive production moves abroad (emission leakages). We identify the roles of technological differences among countries as well as trade and trade composition changes. Our results indicate that income growth in Norway the next 30 years will tighten national climate policy and cause emission leakages, but that the net effects on global emissions are beneficial. Both technological and trade compositional effects contribute to the leakages.

Documentation: REP 2003/17, [9], Bruvoll, A. and T. Fæhn (2004): Inter-Jurisdictional Effects of Growth-Induced Carbon Policy, forthcoming as Discussion Paper, Statistics Norway.

Efficiency and equity effects of reforms in the indirect tax system are analysed by combining the computable general equilibrium (CGE) model with a micro simulation model. Two main reforms are studied, a) a uniform VAT rate on all goods and services and b) the non-uniform Norwegian VAT reform of 2001. The reference path is characterized by the pre-reform differentiated VAT system. The reforms are made public revenue neutral by changes in lump sum transfers. Both reforms have a negative effect on equity, and the effect is largest with the uniform VAT reform. The main source of

this reduction in equity is lower lump sum transfers. There is an efficiency gain with the uniform VAT reform and an efficiency loss with the non-uniform VAT reform. For the uniform VAT reform the positive effects on efficiency outweigh the negative effects on equity and total welfare (a weight of equity and efficiency effects) is higher. This is not the case for the non-uniform VAT reform.

Documentation: Aasness, J. and T. Åvitsland (2004): Combining CGE and micro simulation models: Effects on efficiency and equity of VAT reforms, forthcoming as Discussion Paper, Statistics Norway.

Efficiency-enhancing energy tax reforms tend to be difficult to implement due to strong political resistance from powerful industries. The major energy- and pollution-intensive industries of Norway are today exempted from paying consumer tax on electricity. This CGE study quantifies the welfare potential of equalizing the tax, and investigates the social costs of compensating for subsequent equity losses borne by the energy-intensive industries. We find that the welfare gains of equalizing the tax are positive and only falls by 15 percent, when combined with the compensation. This modest compensation cost is mainly explained by the possibility of the industries to shift part of the tax burden on to suppliers of electricity. It also hinges on the ability of the compensation scheme to stimulate entrance of new firms and products, which enhance productivity and welfare.

Documentation: Bjertnæs, G. H. and T. Fæhn (2004): Energy Taxation in a Small, Open Economy: Efficiency Gains under Political Restraints, forthcoming as Discussion Paper, Statistics Norway

Staff

Bye, Brita, Head of Research Unit
Andreassen, Leif, Research Fellow
Bjertnæs, Geir H., Economist
Fæhn, Taran, Research Fellow
Straumann, Robert, Graduate student in Economics, until September 2003.
Strøm, Birger, Adviser
Åvitsland, Turid, Economist

The aim of this research unit is to investigate how national and international policies and other conditions affect the value of Norwegian natural resources, the environmental state in Norway and internationally, and the interactions between the economy and the environment. A central part of the research work is to develop and maintain model tools that enable us to consider important natural resource and environmental issues related to economic development.

The oil market is very important for Norway, and both the demand and supply side of this market is investigated by e.g. econometric analyses. Moreover, a simulation model for the international energy markets, with special attention to the supply side of the oil market, is under development. The model will be used to analyse the effects of structural changes in the oil market, and to analyse the effects of the Kyoto Protocol.

The European gas market is also important for Norway, and the supply of Russian gas and LNG from distant sources is crucial for the future gas prices in Europe. Both these sources of gas supply are examined in separate studies, and the effects on the gas market is analysed within a simulation model for the European energy market (developed together with the Frisch centre). This model is also used to analyse the effect of liberalization in the European energy market, as well as environmental policies to deal with the Kyoto Protocol. A simulation model for the Nordic power market is also developed and used to analyse various policy scenarios and market behaviour (cf. Unit for Energy and Environmental Economics).

The Kyoto Protocol and international climate policy are also examined within a simulation model for CO₂ abatement in different regions. The effects of the protocol without the U.S. have been analysed, and the position of Russia as a big player in both the quota market and the European gas market is investigated. Moreover, the potential for CDM projects in the agricultural sector of developing countries, as well as energy projects in China, are analysed.

To achieve long-term climate targets, carbon-free energy technologies have to be further developed, and the innovation and learning processes in this respect are analysed within theoretical and numerical models. We examine the effects of innovation and abatement policies on the technological development and economic welfare. The market structure of the R&D sector is also important here, and the Porter hypothesis is examined under various assumptions.

Firms' behaviour with respect to the environment is investigated in several projects. First, we study how the risk of environmental policy and the demand for green or ethical funds affect firms' investments

decisions. This question is analysed both theoretically and empirically. We have also investigated how firms act in accordance with their pollution regulations, and how the authorities act in accordance with violations of these regulations. Consumers' behaviour is also investigated through experimental analyses, focusing on how social norms affect consumers' actions.

Main findings

The social costs and benefits of building a power transmission line between Norway and the UK or Germany have been analysed. It is found that the costs of investment and operation of such a line exceeds the social benefits in most future scenarios for the Norwegian power market. The effect of variation in precipitation, which is very important in Norway with its large hydropower production, is taken into account.

Documentation: REP 2003/11.

The Kyoto Protocol allows industrial countries to pay for CO₂ emission reductions in developing countries as a replacement for domestic emission reductions (CDM projects). In a general equilibrium analysis of the Chinese economy it is demonstrated that stimulation of coal cleaning leads to a rebound effect in the energy market, increasing the total CO₂ emissions in the country. Thus, a policy that clearly is reducing CO₂ emissions on the micro level, leads to the opposite effect on the macro level.

Documentation: DP 356.

Staff

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The general aim of methodological statistical research is to improve the quality in collection, production and analysis of statistics. The research encompasses the following areas:

- *General survey design and estimation in survey sampling*
- *Nonresponse and imputation*
- *Variance estimation*
- *Small area estimation and registers*
- *Census methodology*
- *Time series and seasonal adjustment*
- *Disclosure control*
- *Statistical standards and metadata*

Nonresponse and imputation

All sample surveys face the problem of nonresponse, resulting in incomplete data. As in many other countries, the response rates in Norway have shown a declining trend. Research is undertaken on developing model-based methods for reducing the bias due to nonresponse, mainly weighting adjustment for unit nonresponse and imputation for item nonresponse. The present imputation routines are not model-based and will therefore necessarily be unsatisfactory in many cases. The model-based imputation approach is based on stochastic models for the response mechanism, typically logistic regression, and a population model. The basic imputation method considered is random draws from the estimated distribution given nonresponse.

Documentation: DP 297 (2001), NOT 2001/50, 2003/57, 2003/58

Variance estimation

Statistics Norway is increasing its efforts in giving estimates of uncertainty in official statistics, taking into consideration sampling design, nonresponse and imputation method. The research aims at developing variance estimates and related confidence intervals, of different types, not only the usual estimated sample variance (s.v.) of the population total estimator. Other measures of uncertainty are estimated conditional s.v. for poststratified and calibrated estimators, estimated model variance and estimated method variance. The Division for Statistical Methods and Standards is participating in an EU funded three-year research project, DACSEIS (Data Quality in Complex Surveys within the New European Information Society) starting in 2001, with contributions on how nonresponse and imputation methods affect variance estimation. The project team consists of University of Tübingen, University of Southampton, Swiss Federal Institute of Technology, Johannes Kepler University Linz, and the national

statistical institutes in Finland, the Netherlands, Austria, Switzerland, Germany and Norway.

Documentation: DP 311 (2001), NOT 2003/28, 2003/46, 2003/56.

Small Area Estimation

Small area estimation has been the subject of a number of studies throughout the years. A wide range of methods has been investigated including synthetic estimation, empirical Bayes methods, model-based approach and neural network.

Current research is connected with the three-year EURAREA project under the 5th Research Framework of EU, where Statistics Norway participates together with the Office for National Statistics (UK), Statistics Finland, Istituto Nazionale de Statistica (ISAT, Italy), Statistics Sweden and Instituto Nacional de Estadística (INE, Spain). These are joined with the academic researchers at the University of Southampton (UK), Jyväskylä (Finland), and Poznań (Poland). It has four major themes, namely, use of time series data, use of geo-spatial information, survey data with complex sample design, and small area cross-classifications.

Documentation: Reprints 251

Use of Administrative Registers

Use of administrative registers often improves surveys by reducing the sampling variance, reducing the bias caused by noncoverage and nonresponse, and imposing consistency between the various sources of data. Instead of considering single surveys, recent research has focused on the effects of registers for measure of changes. The current research aims at methods beyond post-stratification and calibration, which may be more suitable and flexible for certain types of data, such as the household income and wealth. Research in this respect is closely linked to that on combining data sources and integrated statistics.

Time Series and Seasonal Adjustments

Statistics Norway uses the X-12 ARIMA seasonal adjustment program developed by the Time Series Staff of the Census Bureau's Statistical Research Division to make seasonal adjustments of economic time series. It has been necessary to make add-ons to make correct adjustments for Norwegian holidays. A program is made to simulate the revision for the seasonally adjusted value of the last observation when the value of next month is observed.

Documentation: NOT 2002/45, 2002/67.

Disclosure Control

Disclosure control is relatively new as a research topic in Statistics Norway. Work done so far has been inspired by the disclosure risks in micro-datasets released to researchers and on easily available register variables that are often linked to these datasets in particular. In 2003 the emphasis has been on confidentiality problems in frequency tables. Methods for stochastic controlled rounding have been extended to multiple two-way marginals for higher dimensional tables (unpublished). The Web StatBank Norway will pose new research challenges in this field.

Documentation: NOT 2001/28.

Statistical Standards and Metadata

General aspects

Work concerning statistical standards in Statistics Norway is decentralised so that each division is given the responsibility for classifications within their own statistical field. This concerns all aspects of the classifications unless otherwise decided by the Director General. For the purpose of coordination a Standards Committee is established. The committee acts as a catalyst and supervises statistical standards. The Division for Statistical Methods and Standards serves as the secretariat of the Standard Committee and is responsible for the central work connected to standards.

Classification database

Statistics Norway, in cooperation with Statistics Denmark, is establishing a database for standard classifications (STABAS). STABAS will also be a tool for the production of statistics. In connection with this work, Statistics Norway has participated in the Neuchâtel group (also consisting of Statistics Sweden, Statistics Denmark, Statistics Switzerland and Run-Software from Germany) where the aim has been to establish a common terminology for classification databases.

Metadata

An important part of the standardization work is connected to metadata. Work has started on developing a system where all important/central variables will be documented. This will be used as a tool for standardization of variables, and will improve accessibility to variable information for all

users inside (and eventually outside) Statistics Norway. This system is a first step in an effort to coordinate and link the different metadata systems in Statistics Norway. Statistics Norway is also developing a dissemination database for aggregate data, StatBank Norway. Structured metadata is an important part of the database. In addition, Statistics Norway participates in several metadata projects in EUs 5th framework program.

Main findings

Statistics Norway has developed methods for estimation of small area cross-classifications in the EU funded project EURAREA. The proposed methods has been tested based on the data from Sweden and Italy. Properties of the alternative approaches have been compared based on a large-scale simulation study. Outcomes of the project include documentation of the related theories, recommendation for practice and software packages for implementation.

A frequentist method of simultaneous estimation for a large number of small areas has been developed. The simultaneous estimator is the best ensemble predictor under the model. It is preferable to the area-specific estimator when the distribution of the small area parameters is of interest.

Multiple imputation for estimating variance in the presence of nonresponse has become a widely used method outside the national statistical offices (NSI). It is at present not suitable at the NSIs because it assumes a Bayesian method for imputation. A general approach for nonBayesian methods of multiple imputation has been suggested and will be studied further.

A study of the foundations of survey sampling compared the two concepts of generalized likelihood and evidential likelihood under the population-modelling framework, finding that the evidential likelihood can be regarded as the sample evidence of the generalized likelihood.

Staff

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The general objective of the division is to analyse demographic development and changes in economic and social living conditions of the population. The research activities combine micro- and macro analytic approaches to the analyses of demographic and socioeconomic processes. On-going activities are divided into four areas: (a) Population development, migration and mortality, (b) Fertility, nuptiality and changes in family structure, (c) Immigration and social change and (d) Living conditions and social participation. 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).

Demographic research

Population projections, population development, migration and mortality

National and regional population projections are made every three years, the most recent in December 2002 for the period 2002-2050. For this a new model for internal migration, based on gross flows between regions of origin and destination, was developed and implemented. On-going research includes evaluation of the new migration model and participation in an EU-funded project "Changing population of Europe: Uncertain future". This project will be finalized in 2004.

The division has a general responsibility for monitoring and analysing trends in population development, both at the national level and in a comparative context, regionally as well as internationally. The division is involved in international cooperation in a number of areas, including cooperation with the other Nordic countries on the projection of mortality in population forecasts. We represent the Ministry of Foreign Affairs in international advisory bodies on population issues (United Nations Commission for Population And Development and the Population Committee of the Council of Europe) and participate in international advisory activities.

Documentation: Reprints 246, DOC 2003/4, ØA 2/2003, 4/2003, SSP 2/2003, 3/2003, [7], [20], [44], [45], [47], [49], [50], [58].

Fertility, nuptiality and changes in family structures

In recent years a substantial part of the research has focused on structural changes in central demographic processes, in particular fertility, nuptiality (marriage and cohabitation) and family formation, including the effects of changes in female labour force participation and in family policies. Analyses of recent fertility trends are based on an extension of earlier analyses of register data for the period 1935-1990. For more complex analyses of fertility

trends and new patterns of family formation, population register information are linked to various sources containing possible explanatory variables. The doctoral project "Fertility, education and social change: Increased diversity in life strategies?" focuses on differences in fertility patterns between women with different types of educational background. The family formation process in a gender perspective is focused. We analyse the family formation of men, based on register data of registered births (recognized fatherhood) for selected male cohorts. Increased diversity in life course strategies is a key feature in the fertility as well as the nuptiality analyses of the division. Taking different kinds of diversity in family formation under consideration, we also analyse registered partnerships (same-sex couples). A large-scale postal survey on cohabitation and family formation was accomplished in 2003. The main objectives of this survey are family intentions and family patterns among young adults. The doctoral project "Cohabitation 1970-2000: a silent revolution?" focuses on the growth, types and reactions of cohabitations in the different decades.

The division participates in several collaborative networks with other research institutions, including a Nordic network on register data analyses of family formation and effects of family policies; two network use interview data to compare family formation in Sweden and Norway and in European countries, respectively. We also take part in a network on same- sex partnerships in Europe.

Documentation: Reprints 235, SSP 1/2003, 3/2003, 5/2003, [70], [79].

Social research

The activities concerning social research are increasingly focusing on more specialized analyses and research projects and less on general social reporting. Most of this research is financed as com-

missioned research, which presents special challenges. We do both cross-sectional and longitudinal analyses, based on surveys as well as administrative registers, including generational changes in the level of living over the life course, differences between various population groups, and gender differences in the outcomes of social processes. The level of living is studied both in terms of material conditions such as income and housing, in terms of social integration and isolation, and as time use patterns, often with a focus on the effects of social welfare policies on particular population groups.

Immigration and social change

The living conditions and integration process of immigrants and refugees are studied in several projects, including an analysis of changes in residential patterns of immigrants in Oslo from 1988- to 2000 and an analysis of social and economic integration of single-year cohorts of refugees settled in Norway 1987-1999. Work in 2003 includes several analyses for the Ministry of Local Government and Regional Development in connection with a white paper on "the Multicultural Norway" (scheduled for publication in 2004).

Documentation: NOT 2003/87, www.ssb.no/emner/00/01/30/innvhold/, www.ssb.no/valgaktuelt/, [48], [82], [83], [84].

Living conditions and social participation

A substantial part of the on-going research focuses on various aspects of the living conditions of parents and children, including parents' working time arrangements, as well as preferences and use of childcare arrangements and adjustments to the "cash for care" benefit. We are engaged in a project evaluating the new regulations of alimony contribution for children. In 2003 we started a project exploring the living conditions among farmers, and finalized an analysis of low household income among single parents. Recent work includes several projects on residential segregation and variation in living conditions within the "big cities urban area" of Norway, commissioned in relation to a government white paper on urban development and political challenges for large cities ("Storbymeldinga").

Documentation: REP 2003/5, 2003/9, 2003/12, NOT 2003/33, 2003/34, 2003/35, 2003/36, ØA 2/2003, 3/2003, 6/2003, ES 1/2003, SSP 2/2003, 5/2003, [41], [51], [80].

Main findings

- About half of the adult Norwegian population have lived or live in cohabitation. Three of four of the present cohabiting couples have either lived together for minimum 2 years or have children together. These couples will often, but not always, have the same rights and obligations as their married counterparts.

- Childlessness has increased considerably more for men than for women. The proportion of men living together with children (own or step-children) at age forty has decreased substantially over the last two decades. The analysis indicates a stronger selection by socio-economic resources both for registered and co-residential fatherhood for men in the younger generations.
- Analyses of single-year refugee cohorts which settled in Norway from 1987 to 1999 indicate that duration of residence is more important for the transition to ordinary employment than the business cycles at the time of settlement
- In spite of increased labour market participation and more contractual full time work, mothers with small children did not actually spend more time at work in 2001 than in 1991. Due to improved parental leave schemes an increasing proportion of mothers are temporarily absent from work.
- Norwegian parents have become more positive towards having their children in kindergartens in recent years, both for mothers with very young children and for those with children 3-5 years of age.

Staff

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Keilman, Nico, Professor **

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Kjeldstad, Randi, Senior Research Fellow

Lappegård, Trude, Research fellow

Lyngstad, Jan, Research Fellow

Lyngstad, Torkild Hovde, Sociologist

Løwe, Torkil, Sociologist

Noack, Turid, Research Fellow

Nymoen, Erik H., Geographer

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Rønsen, Marit, Research Fellow

Seierstad, Ane, Statistician ****

Texmon, Inger, Adviser

Østby, Lars, Senior Research Fellow ***

* on leave

** part time

*** Senior Research Fellow in the Department for Social Statistics, and associated with the Division for Social and Demographic Research.

**** Full time until 15 September, part time rest of 2003

Personnel and budget

The total staff in the Research Department in 2003 was 75 in total number of persons. From 2002 the Research Department is organized in 8 thematic groups.

The financial resources of the research activities stem partly from the government budget as allocated within Statistics Norway. About 40 per cent of total expenditures in 2003 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 the Environment, the Ministry of Finance, the Ministry of Petroleum and Energy, the Ministry of Local Government and Regional Development and the Ministry of Foreign Affairs.

Staff

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Skoglund, Anne, Executive Officer*
Vaagen, Otto Gerhard, Head of Administration*

*Part time

Distribution of operating costs in 2003. 1000 Nok

	Government Budget	Project	Total
Research Department	23 465	15 293	38 758
Social and Demographic Research	3 132	4 215	7 347
Statistical Methods and Standards	5 602	804	6 406

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 6 issues a year, and *Economic Survey*, in English with 4 issues a year.

Statistical Analysis (SA)

- 59 Naturressurser og miljø 2003.
- 60 *Utdanning 2003 - ressurser, rekruttering og resultater*
Aamodt, P.O. og N.M. Stølen: "Vekst i utdanningssystemet"
Bjørnstad, Roger og Terje Skjerpen: "Betydningen av teknologi og internasjonal handel for lønn og ledighet etter utdanning i Norge"
- 61 *Natural Resources and the Environment 2003. Norway*

Reports (REP)

- 2003/5 **Kitterød, Ragni Hege:** *Tid til barna? Tidsbruk og samvær med barn blant mødre med barn i kontantstøttealder*
- 2003/6 **Walle, Mari Aasgaard:** *Overholder bedriftene i Norge miljøreguleringene?*
- 2003/9 **Petterson, Silje Vatne:** *Barnefamiliers tilsynsordninger, yrkesdeltakelse og bruk av kontantstøtte våren 2002*
- 2003/11 **Aune, Finn Roar:** *Fremskrivninger for kraftmarkedet til 2020. Virkninger av utenlandskabler og fremskyndet gasskraftutbygging*
- 2003/12 **Lyngstad, Jan og Jon Epland:** *Barn av enslige forsørgere i lavinntektshusholdninger. En analyse basert på registerdata*
- 2003/13 **Fredriksen, Dennis, Kim Massey Heide, Erling Holmøy og Nils Martin Stølen:** *Makroøkonomiske virkninger av endringer i pensjonssystemet*
- 2003/17 **Straumann, Robert:** *Exporting Pollution? Calculating the embodied emissions in trade for Norway*
- 2003/19 **Bye, Torstein og Pål Marius Bergh:** *Utviklingen i energiforbruket i Norge i 2002-2003*
- 2003/20 **Halvorsen, Bente og Runa Nesbakken:** *Hvilke husholdninger rammes av høye strømpriser? En fordelingsanalyse på mikrodata*
- 2003/21 **Bye, Torstein, Petter Vegard Hansen og Finn Roar Aune:** *Utviklingen i energimarkedet i Norden i 2002-2003*

Discussion Papers (DP)

- 339 **Aaberge, Rolf and Audun Langørgen:** *Measuring the Benefits from Public Services: The Effects of Local Government Spending on the Distribution of Income in Norway*
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Reprints

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Documents (DOC)

- 2003/3 **Aasness, Jørgen, Erik Biørn and Terje Skjerpen:** *Supplement to "Distribution of Preferences and Measurement Errors in a Disaggregated Expenditure System"*
- 2003/4 **Brunborg, Helge, Svein Gåsemeyr, Gotfred Rygh and Johan-Kristian Tønder:** *Development of Registers of People, Companies and Properties in Uganda: Report from a Norwegian Mission*

- 2003/6 **Møller, Bø and Liv Belsby:** *Use of HBS-data for estimating Household Final Consumption. Final paper from the project. Paper building on the work done in the Eurostat Task Force in 2002*
- 2003/8 **Bergh, Pål Marius and Anne Sofie Abrahamsen:** *Energy consumption in the services sector. 2000*
- 2003/9 **Lindquist, Kjersti-Gro and Terje Skjerpen:** *Exploring the Change in Skill Structure of Labour Demand in Norwegian Manufacturing*

Notater (NOT)

- 2003/11 **Dyvi, Yngvar (Finansdepartementet):** *Virkningsberegninger på MODAG*
- 2003/28 **Mevik, Anna-Karin:** *Usikkerhet i konjunkturbarometeret*
- 2003/31 **Cappelen, Ådne and Lasse Sigbjørn Stambøl:** *Virkninger av å fjerne regionale forskjeller i arbeidsgiveravgiften og noen mulige tiltak*
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- 2003/36 **Andersen, Arne, Torkil Løwe og Elisabeth Rønning:** *Boforhold i storby. Utredninger til Storbymeldingen, del 4*
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