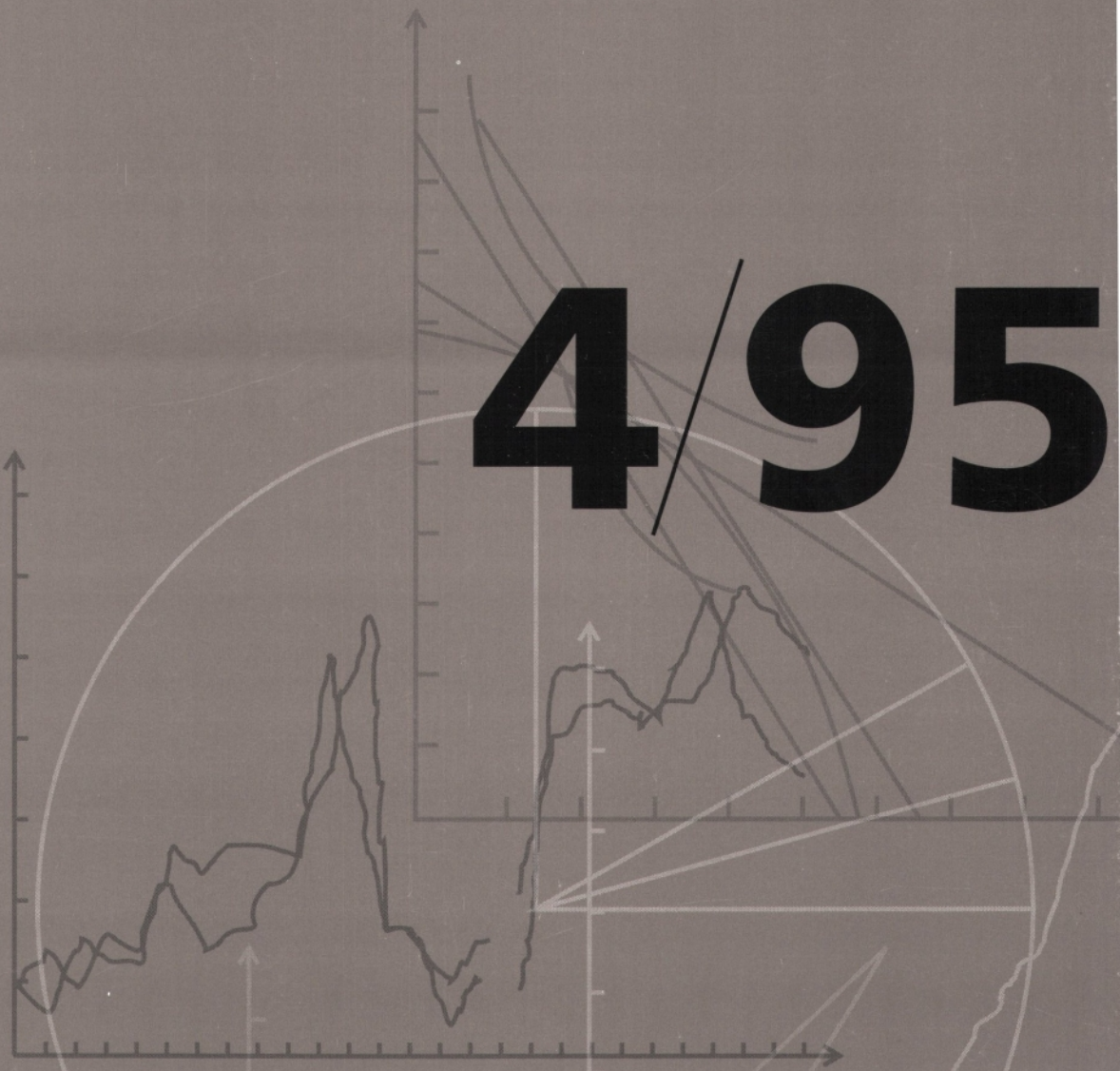
Economic Survey

Statistics Norway

Statistisk sentralbyrå

4/95



Economic trends

- National accounts for 3 quarter 1995
- Overview of international and Norwegian economic developments
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Economic Survey

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Economic Survey

is published four times a year by the Research Department of Statistics Norway. The Research Department was established in 1950. The Department has about 90-100 employees (June 1995). The Research Department is today organized in four divisions. Head of Department is *Olav Bjerkholt.*

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Symbols in Tables	Symbol
Data not available	..
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Economic trends

Developments in the Norwegian economy through the year indicate reduced growth, with both mainland output and demand set to expand at a noticeably slower pace in 1995 than last year. Mainland GDP is likely to rise at an annual rate of 3.9 per cent, nearly one percentage point lower than last year. As expected, mainland investment is now making the strongest contribution to demand growth, whereas household consumption and particularly traditional exports were the main driving force at the early stage of the recovery. Employment is still rising sharply, and in recent months at a faster pace than the labour force. As a result, unemployment measured by Statistics Norway's labour force survey (LFS) will probably fall below an average 5 per cent for the year for the first time since 1989. Despite the increase in the VAT rate from 1 January 1995, price inflation in 1995 will be 2.5 per cent, only marginally higher than the average rate of inflation among Norway's main trading partners. At the moment there are no signs of a sharp rise in wage growth. A vigorous increase in oil and gas production from 1994 to 1995 will contribute to higher surpluses on the current account and in government budgets.

Cyclical developments in Norway must be viewed in connection with the recovery in Anglo-Saxon industrial countries, which gained momentum through 1993 and into 1994. Continental Europe gradually followed suit, underpinned by the decline in German interest rates. It now appears that countries in the OECD area have passed a cyclical peak, and growth is likely to abate in Norway's main trading partner countries through 1995 and into 1996. This trend can already be detected in figures for Norway's traditional merchandise exports, which are not expected to generate any substantial growth impetus for the Norwegian economy in 1996. On the other hand, a pronounced international cyclical downturn is not expected.

Consumption growth will probably also slow from 1995 to 1996, even though interest rates may decline slightly.

Main indicators for the norwegian economy
Growth from previous year. Per cent

	1994	1995	1996
GDP	5,7	4,2	3,8
Consumption in households and non-profit organizations	4,6	3,1	2,3
Unemployment rate[1)]	5,4	4,9	4,5
Consumer price index	1,4	2,5	1,8

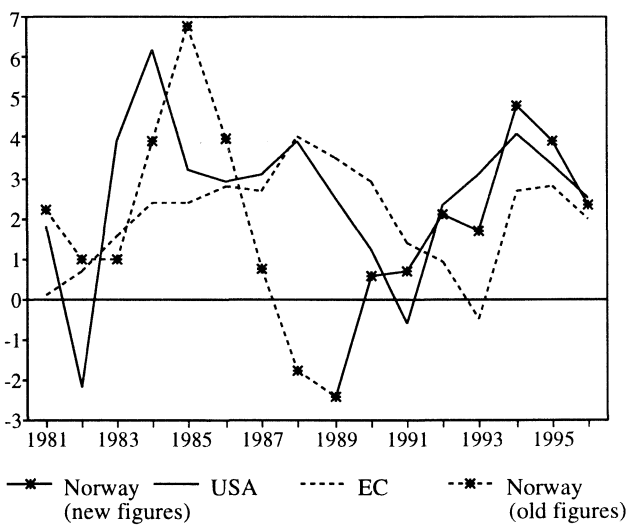
1) Level in per cent.

Growth in mainland investment may be reduced by half, but a renewed rise in oil investments will contribute to high growth in total gross fixed investment. Mainland GDP is projected to expand by 2.3 per cent next year. In spite of the cyclical slowdown and tighter fiscal policy, unemployment will probably decline further to about 4.5 per cent in 1996.

The inflationary impetus from the international economy and from the labour market is expected to remain broadly unchanged from 1995 to 1996. With unchanged VAT rates, however, price inflation is likely to decline to a little less than 2 per cent next year. Both the general government budget balance and the current-account balance will improve further.

A separate article in this Economic Survey presents a possible scenario for developments in the Norwegian economy in the years to the turn of the millennium, based on an assumption of moderate economic growth internationally, higher production of oil and gas, an approximately constant real oil price and moderate growth in public sector expenditure. The projections show a path entailing a moderate and relatively steady rise in GDP and prices, a further decline in unemployment, greater oil dependence and substantial net lending in the public sector and for Norway as a whole. This illustrates that the Norwegian economy is now moving on a path which will not necessarily result in disquieting imbalances in the medium term.

GDP growth, mainland Norway, USA and European Community (EC). Annual rates



Source: Statistics Norway, OECD and Concensus Forecasts.

International economy

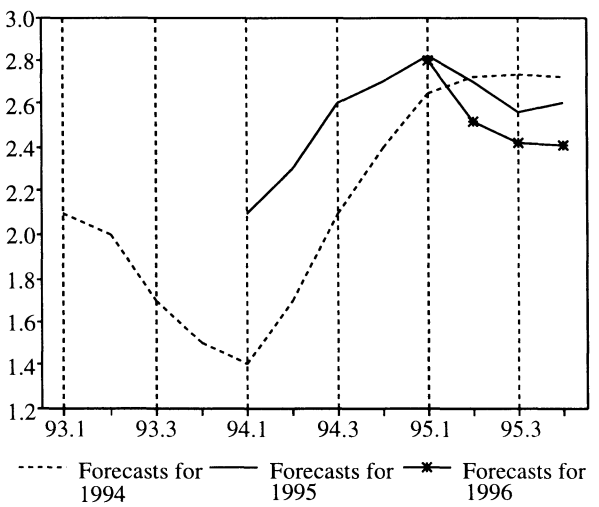
During the second half of 1995 it has become apparent that the spring slowdown in the US is in the process of spreading to Europe. For example, GDP growth in *Germany*, which has an important influence on economic developments in Europe, has slowed markedly. There are also clear signs of slower growth in the *UK* and *France*. In spite of the substantial divergence of cyclical positions, a common feature is that domestic demand impulses have not sufficiently taken over as the driving force in the economies once export effects began to wane. This must be viewed in connection with fiscal policy, which has largely been focused on reducing budget deficits and public-sector debt. Tax increases and persistently high unemployment have curbed household consumption. The rise in long-term interest rates last year probably also contributed to slower growth. Our projections now show that GDP growth among Norway's main trading partners will be about 2 3/4 per cent in 1995, drifting down to about 2 per cent next year.

In the next two years the stance of fiscal policy in EU-countries will probably play an important role for cyclical developments in the region. In the period to 1997, it will be particularly important to demonstrate that the Maastricht criteria can be satisfied, or at least that the countries are clearly moving towards a fulfilment of these requirements. Fiscal policy in many countries is therefore likely to remain restrictive, while scope for a more expansionary monetary policy is limited by an already low level of interest rates. In addition, little stimulus can be expected from the rest of the world inasmuch as growth is now slower in the US and Japan is still struggling to emerge from a prolonged period of stagnation. Growth in other Asian countries will probably be slightly weaker than in the past two years.

The *US* passed a cyclical peak last year. The period of recovery, which had a hesitant start in 1991-1992, has been broadly based, but primarily fuelled by private consumption, housing investment and particularly investment in machinery and equipment. The economic slowdown must be viewed in connection with a substantial tightening of monetary policy through 1994. The Federal Reserve's objective was to prevent an overheating of the economy with a subsequent quickening of inflation. Short-term data indicate that the strategy is succeeding. GDP will expand by about 3 1/4 per cent in 1995, edging down to 2 1/2 per cent in 1996.

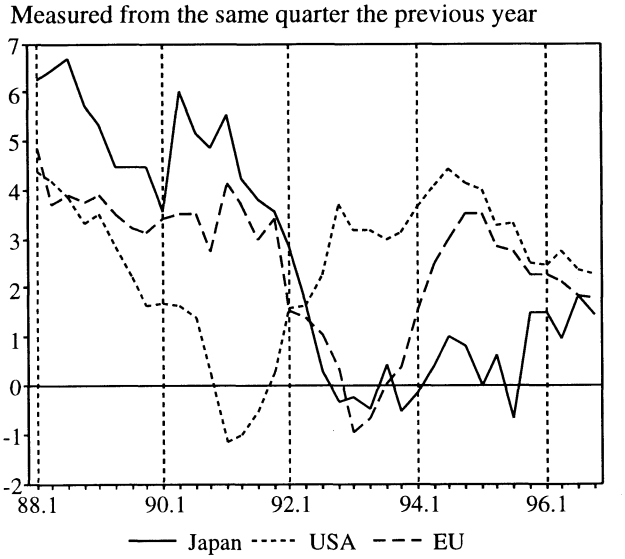
Japan is currently experiencing its most prolonged period of stagnation since the Second World War, and 1995 is the fourth consecutive year of low or negative growth. The recession must be viewed in connection with a sharp decline in private investment following several years of over-investment and inflated property and asset prices at the end of the 1980s. The Government, which has attempted to stimulate the economy on a number of occasions, introduced additional fiscal stimulus measures this past autumn, weakening the budget position for 1996 by 14 220 billion yen (equivalent to about 3 per cent of GDP). Private consumption is exhibiting a sluggish trend, partly influenced by the situation on the labour market where unemployment is at record levels by Japanese standards. Based on the fear of further deflationary pressures, the banking crisis and decline in the economy, growth is expected to be around 1/2 per cent this year. Towards the end of 1996, after the measures introduced by the authorities have had time to take effect, GDP is projected to expand by about 1 3/4 per cent for the year as a whole.

GDP-growth forecasts for Norway's main trading partners for 1994 - 1996 given on different dates



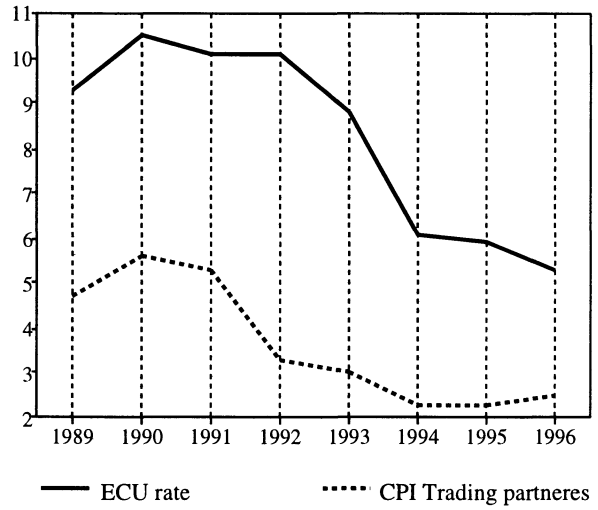
Source: Consensus Forecasts.

GDP-growth in USA, Japan and EU (per cent)
Measured from the same quarter the previous year



Source: NIESR and Statistics Norway.

3 month ECU rate and growth in consumer prices for Norway's trading partners. Per cent



Source: Statistics Norway.

The forecasts indicate that *price inflation* among Norway's main trading partners will be about 2 1/4 per cent in 1995 and slightly higher next year. So far this year consumer price inflation in Germany has eased, and while inflation is estimated at 1.8 per cent in 1995 it will probably be even lower in 1996.

In France and Sweden, indirect tax increases will result in slightly higher inflation rates next year, while higher price inflation in Italy is ascribable to increased wage pressures. During this upturn price inflation in the US has been more moderate than during cyclical upswings in the 1980s, and may be ascribable to a more open US economy in the past five years, with higher imports in relation to GDP and stronger competition in the market. The labour market is still much more flexible than in Europe and changes in health insurance have resulted in a lower rise in costs for employers. Against this background, price inflation is expected to remain moderate in the US next year. Japan is experiencing a period of falling prices, but consumer prices will probably begin to edge up in 1996.

The lack of cyclical synchronization in several of the major OECD countries is reflected in *monetary policy*. After monetary policy was tightened considerably in the US during 1994, there were indications in the spring of 1995 that economic growth had started to slow, and the Federal funds rate was therefore lowered to 5.75 per cent in July. A further decline in US short rates can be expected in the first quarter of 1996. In the UK, the central bank raised its base rate on three occasions between September 1994 and February 1995, to a level of 6.75 per cent. Since price inflation is relatively stable, and economic activity has slackened considerably this year, the base rate was recently lowered to 6.5 per cent. The German central bank has cut interest rates gradually since September 1992, most recently on 14 Desember when the discount and Lombard rates were lowered to 3.0 and 5.0 per cent respectively. This must be viewed against the background of short-term

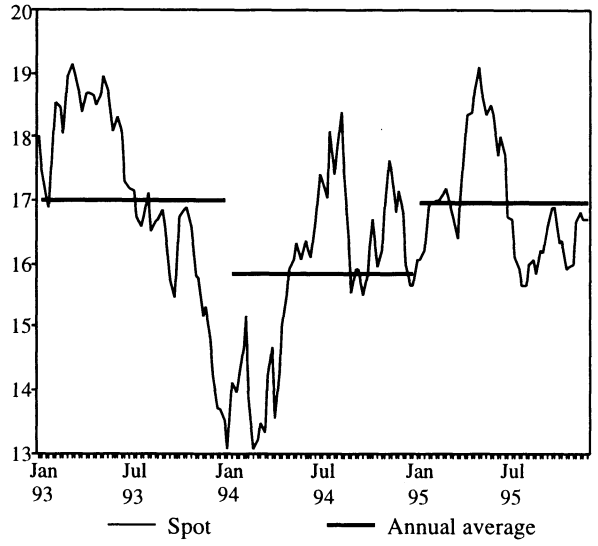
Main international economic forecasts

	1994	1995	1996
USA			
GDP[1)]	4,1	3,3	2,5
Growth in consumer prices	2,6	2,8	2,8
Short term interest rate (per cent)	4,7	5,9	5,5
Japan			
GDP[1)]	0,6	0,4	1,7
Growth in consumer prices	0,7	-0,2	0,6
Short term interest rate (per cent)	2,3	1,1	0,5
Germany			
GDP[1)]	3,1	2,3	1,7
Growth in consumer prices [2)]	2,8	1,8	1,6
Short term interest rate (per cent)	5,3	4,5	3,6
France			
GDP[1)]	2,9	2,9	1,8
Growth in consumer prices	1,7	2,0	3,1
Short term interest rate (per cent)	5,8	6,7	5,6
United Kingdom			
GDP[1)]	3,9	2,5	2,0
Growth in consumer prices [3)]	2,5	3,5	2,8
Short term interest rate (per cent)	5,5	6,7	6,1
Italy			
GDP[1)]	2,2	3,3	2,0
Growth in consumer prices [2)]	3,9	5,0	5,2
Short term interest rate (per cent)	8,4	9,1	8,7
Sweden			
GDP[1)]	2,2	3,4	1,5
Growth in consumer prices	2,2	2,6	3,1
Short term interest rate (per cent)	7,4	8,8	8,5
Denmark			
GDP[1)]	4,4	3,7	3,0
Growth in consumer prices	2,0	2,2	2,5
Short term interest rate (per cent)	..	..	..
The Netherlands			
GDP[1)]	2,5	2,8	2,8
Growth in consumer prices [2)]	2,1	1,9	1,9
Short term interest rate (per cent)	5,2	4,4	4,0
Memo			
GDP trading partners	2,7	2,7	2,1
CPI trading partners	2,3	2,3	2,5
ECU interest rate (per cent)	6,1	5,9	5,3

1) Percentage change from previous year, volume.
2) Private consumption deflator.
3) Retail price index.
Source: NIESR and Statistics Norway. National sources for Sweden and Denmark.

data, which indicated somewhat weaker economic activity in the first half of the year than expected earlier, and the slower rise in consumer prices and money supply growth. Interest rates in other continental European countries shadow German rates, with the addition of a certain risk premium. One exception to this pattern is Italy where a strong depreciation of the Italian lira prompted the authorities to conduct a contractionary monetary policy. A continued weak currency and rising consumer prices indicate that Italian interest rates will remain relatively high in the

Spot price, Brent Blend
Dollar per barrel



Source: Petroleum Intelligence Weekly

months ahead. In Japan, the economic slump over the past three years has been met with gradual reductions in the discount rate, most recently to a record-low 0.5 per cent in September this year. The central bank is expected to maintain a low discount rate until the economic recovery is firmly entrenched.

Growth in *world trade* approached 10 per cent in 1994 after rising by an average 5 per cent in the first few years of the decade. The upswing last year must be viewed in connection with the recovery in continental Europe and buoyant growth in North America. In addition, economic activity in Southeast Asia remained at a high level last year, and GDP growth in China continued at a double-digit pace. In 1995, lower demand and output in the OECD area reduced growth in world trade to an estimated 8 per cent. There are several reasons why growth remains relatively high. Imports in developing countries have risen substantially this year, partly because the sharp rise in commodity prices last year contributed to greater import capacity. East European countries have also been able to boost their imports as a result of an improvement in export markets in western Europe. Oil-producing countries, on the other hand, have not been contributing to the increase in world trade, partly due to the weak trend in oil prices. Expectations of lower GDP growth in the OECD area, particularly in the US, point to lower annual growth in world trade next year, while continued brisk growth in NICs will make a positive contribution. AIECE estimates that world trade will expand by 7 1/2 per cent in 1996.

The *price of crude oil* North Sea Brent Blend has hovered between $ 16-17 p/b the last five months after having risen to about $ 18 in late spring. Demand growth has been strong, but production in non-OPEC countries, particularly in the North Sea, has risen even faster. The forecasts indicate that the pressure on OPEC to limit production will continue in 1996 even though global demand is rising at a faster pace than in many years. In the last six months some OPEC countries have also produced more than the agreed quotas, thereby resulting in further downward pressures on oil prices. Following the appointment of a new Minister of Petroleum in Saudi Arabia, it appears that the country still prefers stability to a price war and a battle for market shares as an instrument towards non-OPEC countries. Individual episodes, such as hurricanes in the Gulf of Mexico, have an influence on the price of oil in a sensitive market, but forecasts of market balance next year indicate that higher oil prices are less probable.

After rising sharply through 1994, *commodity prices* levelled off in the first half of 1995 and prices have edged down through the autumn. According to the HWWA commodity price index, commodity prices, excluding energy raw materials, rose by 2.3 per cent in the year to November 1995. Prices of farm-based raw materials for manufacturing industry showed the sharpest rise, increasing by 10.5 per cent in the same period. The rise has been boosted by the surge in pulp prices (137 per cent since the first quarter of last year). Metal prices increased sharply last year, but the rise through 1995 has been a modest 2-3 per cent. With continued moderate economic growth in the OECD area and relatively good prospects for the car industry, AIECE sees possibilities for a marginal rise in metal prices next year. However, there is still considerable uncertainty linked to supplies from countries in the former Soviet Union. Food prices peaked in March/April 1995 and have since edged down. Price movements vary considerably, however, between different food categories. Grain and maize prices have picked up substantially since last summer, particularly as a result of poor weather conditions in the US. Grain prices are expected to rise further, both as a result of growing demand in Asia and because EU countries have cut back on the land under cultivation. The price of coffee and sugar has declined this year and the sluggish trend is expected to persist in 1996 due to expectations of a production surplus.

Norwegian economy[1]

The situation in 1995

Preliminary figures from the quarterly national accounts (QNA) through the third quarter of 1995 indicate continued growth in the Norwegian economy, but at a noticeably slower pace than through 1993 and 1994. Mainland demand rose by a seasonally adjusted 0.3 per cent from the second to third quarter of 1995, and growth has been slowing over the last four quarters. Even though mainland GDP grew by a seasonally adjusted 1.1 per cent from the second to third quarter, it appears that the expansion in production is now slackening. Mainland GDP will probably expand by a little less than 4 per cent this year, nearly one percentage point lower than in 1994. As a result of the rise in oil production, total GDP expanded at a noticeably faster pace than mainland GDP in the third quarter. The coming on stream of new fields in the North Sea will result in further growth in oil production in the fourth quarter, entailing that total GDP will rise slightly more than mainland GDP this year, but appreciably less than in 1994 when GDP grew by 5.7 per cent.

One problem when interpreting the preliminary QNA figures is the persistent increase in *inventory investment* over the past three years. As discussed in a separate box, this may indicate that QNA figures overestimate the growth in the supply of goods and services (production plus imports) or underestimate demand. Based on clear signs of slower growth in both supply and demand, the figures nonetheless indicate that the upturn in the Norwegian economy is now becoming more moderate, consistent with the situation described in our earlier economic surveys.

Production in goods-producing industries showed a clear decline in the third quarter, following a sluggish trend in the previous quarter, while the level of activity in private services continued to rise. The moderate trend in manufacturing production at the beginning of 1995 was related to a pronounced, but probably short-lived, reduction in oil investments and a decline in traditional merchandise exports. Movements in monthly indicators suggest that exports of traditional goods declined in volume through most of 1995, from a peak level in the first quarter. It is true that seasonally adjusted quarterly figures grew from the second to third quarter, but this can be ascribed to unusually low export figures for June, which sharply reduced the second quarter figures. The underlying trend in the monthly (value) index has drifted downwards in the period to end-October whereas, according to the QNA, prices have only fallen moderately this year following a sharp rise in the second half of 1994. Traditional merchandise exports are now projected to expand by 4-5 per cent from 1994 to 1995, while prices for these goods will probably increase by about 7 per cent. Most of the annual rise in both volumes

Figures on changes in inventories in the QNA

Preliminary figures from the quarterly national accounts (QNA) for the period 1993-1995 show rising growth in inventory investment (changes in inventories). In the national accounts, the figures on changes in inventories are calculated as the difference between the supply and use of each good, i.e. production and imports on the one hand, and deliveries to product inputs, exports, consumption and investment on the other. Changes in inventories thus encompass not only actual stocks but are also influenced by measurement errors in the estimates for the various supply and expenditure components. There is reason to believe that the strong growth in the QNA's figures on inventory investment over the past two years covers a little more than the actual rise in stocks. In this case the preliminary figures entail either an overestimation of supply and/or an underestimation of demand.

Because there is a considerable lag before manufacturing statistics and other extensive statistical data for a period become available, preliminary national accounts figures are largely estimated on the basis of developments in available short-term indicators such as the index of retail sales, the index of production and the investment intentions survey for manufacturing and mining. Information on investment is lacking for many service industries. Nor is there any information available on developments in intermediate consumption of goods and services in enterprises when preliminary figures are calculated. Intermediate consumption in an industry are therefore assumed to move in tandem with production in the industry. As new information becomes available, the national accounts are revised, and final figures for one year are available about two years after the end of that year.

At this time Statistics Norway has no basis for determining the reasons underlying the sharp rise in the national accounts' figures for changes in inventories in the period after 1992. Analyses of accrued VAT and investment taxes, however, may indicate that the quarterly accounts, at least for 1993, underestimate the growth in taxable expenditure components. The most uncertain components are indeed intermediate consumption and investment. It should be pointed out, however, that it is too early to draw any definitive conclusions concerning future revisions of the preliminary figures, and Statistics Norway has therefore decided to publish the figures for changes in inventories as they now appear in the accounting system.

1 The estimates for developments in 1995 and 1996 are derived from Statistics Norway's macroeconometric annual model MODAG.

Macroeconomic indicators[1)]
Growth from previous period unless otherwise noted. Per cent

			Sesonally adjusted			
	1993	1994	94.4	95.1	95.2	95.3
Demand and output						
Consumption in households and non-profit organizations	2.1	4.6	0.7	-0.6	1.7	1.5
General government consumption	1.0	1.1	-0.6	-0.3	0.2	-0.9
Gross fixed investment	6.1	9.2	-3.9	32.0	-6.6	-9.5
- mainland Norway	-3.8	12.0	4.8	7.5	-1.5	-1.8
- petroleum activities[2)]	12.6	-7.6	-10.6	-2.3	0.7	2.4
Final domestic demand from mainland Norway[3)]	0.9	4.8	1.0	0.8	0.8	0.3
Exports	2.0	8.5	7.4	-1.3	-2.8	2.7
- crude oil and natural gas	5.8	11.6	13.9	-3.3	-0.1	3.8
- traditional goods	2.9	13.3	1.7	4.1	-8.2	4.9
Imports	4.0	6.6	-0.1	1.6	3.7	-1.9
- traditional goods	0.3	15.0	-0.2	3.4	2.6	0.5
Gross domestic product	2.1	5.7	2.6	-0.8	0.7	1.7
- mainland Norway	1.7	4.8	1.5	-0.6	0.8	1.1
Labour market[4)]						
Man-hours worked	0.0	1.4	-0.0	0.4	0.2	0.0
Employed persons	0.2	1.5	0.5	0.5	0.4	0.5
Labour force	0.0	0.9	0.4	0.7	0.1	0.1
Unemployment rate, level	6.0	5.4	5.2	5.4	5.2	4.8
Prices						
Consumer price index[5)]	2.3	1.4	1.8	2.6	2.7	2.3
Export prices, traditional goods	0.4	0.8	1.4	5.7	-1.7	0.4
Import prices, traditional goods	1.6	0.5	0.6	-0.1	0.3	1.5
Balance of payment						
Current balance, bill. Nkr	25.1	21.1	6.9	10.8	5.3	7.9
Memorandum items (unadjusted, level):						
Eurokrone rate (3 month NIBOR)	7.2	5.7	6.7	5.4	5.5	5.3
Average lending rate[6)]	11.4	8.4	8.2	8.1	7.8	7.7
Crude oil price, Nkr [7)]	121.1	111.3	111.2	109.9	113	102
Importweighted krone exchange rate (1992=100)	102	103.5	102.9	101.4	101.2	100.7

1) Figures for 1993 and 1994 deviates from the ones published in ES 1/95 and 2/95 due to changes in definitions and new information.
2) Capital formation in the petroluem sector is now measured on an accruals basis in the national accounts.
3) Consumption in households and non-profit organizations + general government consumption + gross fixed capital formation in mainland Norway.
4) Based on monthly figures, seasonally adjusted.
5) Percentage change from previous year.
6) Households' borrowing rate in private financial institutions.
7) Average, Norwegian oil production.
Source: Statistics Norway.

and prices can be attributed to the upswing through 1994. The sluggish trend in traditional merchandise exports through 1995 must be viewed in connection with signs of a slowdown in the recovery in Norway's main trading partner countries. Preliminary estimates indicate demand growth of 5-6 per cent in Norway's export markets this year, against more than 10 per cent in 1994.

Activity in the construction industry also shows signs of levelling off. This is related to the downward trend in commercial building and housing starts through most of 1995, following sharp growth through 1993 and 1994. In October 1995, however, housing starts again increased considerably, to a level slightly higher than the level recorded in the same month one year earlier (measured in sq.m.). This indicates that activity in the construction industry may pick up in the fourth quarter.

The vigorous growth in production in private services in the second and third quarter must be viewed in light of the appreciable rise in consumption in households and non-profit organizations (private consumption), following a sluggish trend in the first quarter. According to preliminary QNA figures, the rise in private consumption in the second and third quarter of 1995 was slightly stronger than underlying growth through 1994. However, the index of retail sales and figures on new car registrations so far in the second half of 1995 indicate that the rise in private consumption slackened considerably after the summer. Annual growth of about 3 per cent is projected, about one and a half percentage points lower than in 1994. The recently approved changes in car taxes may contribute to some shift in car purchases from the fourth quarter of this year to the first quarter of 1996.

The slower seasonally adjusted growth in housing investment at the beginning of 1995 was reversed to a decline in the second and third quarter of this year. However, higher starts in October and substantial new orders in the refurbishing sector of the building market indicate that there may be a break in this trend in the fourth quarter. Housing investment is projected to expand by about 14 per cent at an annual rate, nearly half the level recorded last year.

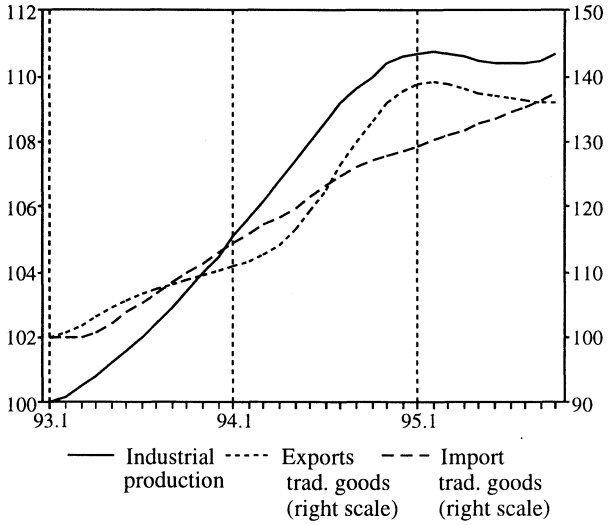
The rise in house prices over the past two years also seems to be slowing. Statistics Norway's index for the square metre price of existing dwellings in the first half of the year was in real terms about 5 per cent higher than the level in the same period one year earlier, while data from the Norwegian Realtors' Association imply a real rise in prices of existing dwellings of 4 per cent from the period January-September 1994 to the same period this year. On an annual basis, the rise in real terms may be in the area of 5-6 per cent, which is half the annual rise recorded from 1993 to 1994.

With an estimated growth in household real disposable income of a little more than 3 per cent in 1995 and 2.8 per cent in 1994, it is natural to view the slackening in private consumption and housing investment in connection with interest rate movements. Households' average borrowing rate in private financial institutions fell by nearly 5 percentage points between 1992 and 1994. The decline in interest rates, however, virtually came to a halt in the second half of 1994, and lending rates at the end of the third quarter of this year were only half a percentage point lower than at the same time one year earlier. Developments in market rates since then point to a moderate decline in financial institutions' rates from the third to fourth quarter of 1995. Households' average borrowing rate in private financial institutions is thus projected to fall by a good half a percentage point from 1994 to 1995, to 7.8 per cent. Inasmuch as the rise in prices in 1995 will be a little more than one percentage point higher than last year, however, households' real after-tax borrowing costs will decline by 1.5 percentage points, to about 3 per cent.

Preliminary national accounts figures for the general government sector may indicate slightly lower growth in general government consumption and gross fixed investment in 1995 than assumed in the Final Budget Bill. Consumption and fixed investment are thus expected to grow at an annual rate of 0.6 and a little less than 1.5 per cent respectively.

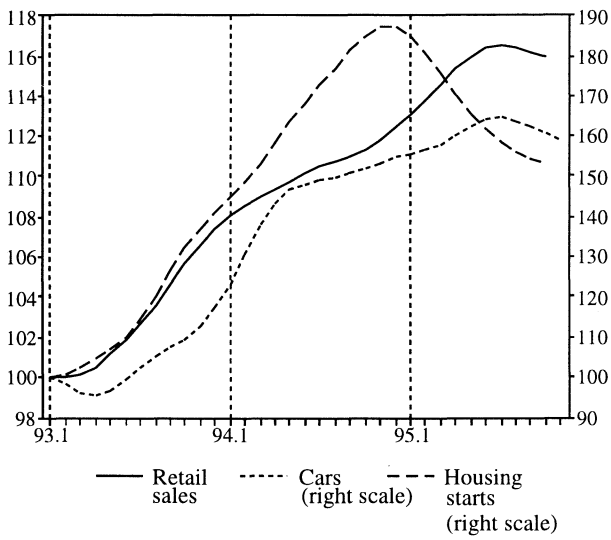
Following two and a half years of weak underlying growth, manufacturing investment expanded markedly through 1994 and in the first half of 1995. The rise in investment, however, almost came to a halt in the third quarter. Statistics Norway's investment statistics for the fourth quarter indicate that the level of manufacturing investment will show little change from the third to fourth quarter, entailing that annual growth at constant prices will be about 38 per cent.

Trend growth in some important short-term indicators
Index. January 1993=100



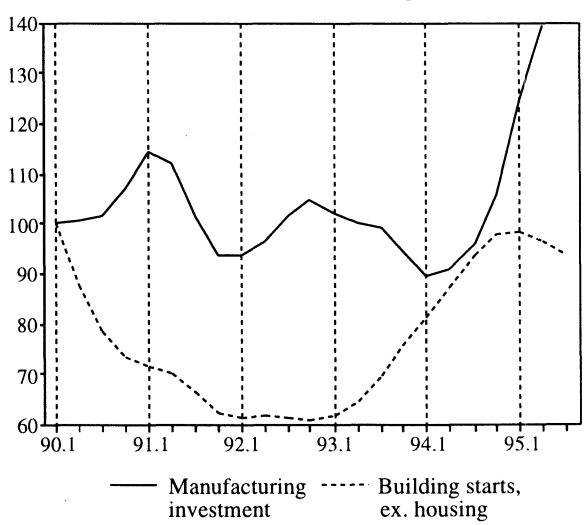
Source: Statistics Norway.

Trend growth in some important short-term indicators
Index. January 1993 = 100



Source: Statistics Norway.

Two capital formation indicators
Seasonally adjusted and smoothed. 1. quarter 1990=100



Source: Statistics Norway.

Investment in private services, excluding dwellings, has moved on a downward trend the last two quarters. Measured at an annual rate, growth is still likely to be strong as a result of the pronounced rise in investment through 1994. The level in the first quarter of 1995 was thus more than 20 per cent above the quarterly average for 1994. The construction of the new main airport and other communications-related projects are boosting annual growth. All in all, mainland fixed investment is likely to expand by a good 13 per cent in 1995, slightly more than the growth recorded from 1993 to 1994.

As noted earlier, investment in the petroleum sector will fall markedly this year. Based on Statistics Norway's investment statistics, petroleum investment is projected to decline by a good 12 per cent.

The volume of traditional merchandise imports continued to expand in the first three quarters of 1995, but at a gradually slower pace compared with the steep growth recorded in 1993 and 1994. Traditional merchandise imports are projected to rise at an annual rate of just below 8 per cent this year, after increasing by 15 per cent in 1994. However, engineering products, which in 1994 accounted for more than two-thirds of the total value of traditional merchandise imports, are likely to expand at the same high rate in 1995 as last year. It is natural to view this in connection with the strong investment upswing, while slower growth in traditional merchandise exports will contribute to lower growth in imports of raw materials and semi-manufactures in 1995 than in 1994. Prices of traditional import goods also rose through 1994, but the rise was far less pronounced than for traditional export goods. Thus far in 1995 the price deflator for traditional merchandise imports has been nearly one per cent above the level in the same period last year, and the rise on an annual basis is expected to be of the same magnitude. Compared with price movements for traditional export goods, this shows a terms-of-trade gain for this component of Norway's trade with other countries.

According to figures from Statistics Norway's labour force survey (LFS), employment grew by a seasonally adjusted 0.6 per cent from the second to third quarter of 1995, approximately on a par with the average growth over the previous four-five quarters. While labour force growth was about the same as employment growth through much of 1994 and into 1995, growth was noticeably weaker in the second and third quarter of this year. As a result, unemployment dropped by 0.6 percentage point in two quarters, and on a seasonally adjusted basis the number of jobseekers without income from employment came to about 4.8 per cent of the labour force in the third quarter of 1995, the lowest level since 1989. The Directorate of Labour's figures for the sum of registered unemployed and persons participating in labour market measures, excluding rehabilitation, have shown a clear decline since the first quarter of 1993. The figures for October and November indicate a continuation of this trend, while the number of vacancies at employment offices continued to rise.

Main economic indicators[1]
Percentage change from previous year unless otherwise noted

	Accounts 1994	1995	1996
Demand and output			
Consumption in households and non-profit organization	4.6	3.1	2.3
General government consumption	1.1	0.6	1.5
Gross fixed investment	9.2	5.0	6.4
- mainland Norway	12.0	13.7	6.8
- petroleum activities[2]	-7.6	-12.3	6.5
Demand from mainland Norway[3]	4.8	4.1	2.9
Exports	8.5	5.0	6.7
- crude oil and natural gas	11.6	9.3	15.2
- traditional goods	13.3	4.4	1.2
Imports	6.6	4.5	4.0
- traditional goods	15.0	7.6	3.8
Gross Domestic Product	5.7	4.2	3.8
- mainland Norway	4.8	3.9	2.3
Labour market			
Persons employed	1.5	2.2	1.5
Unemployed rate (level)	5.4	4.9	4.5
Prices and wages			
Wages per man-hour	3.0	3.6	3.1
Consumer price index	1.4	2.5	1.8
Export prices, traditional goods	0.8	7.2	-1.5
Import prices, traditional goods	0.5	1.3	1.1
Balance of payments			
Current balance (bill. NKr)	21.1	32.2	38.8
Current balance (per cent of GDP)	2.4	3.5	4.0
Memorandum items:			
Money market rate (level)	5.7	5.3	5.0
Average borrowing rate (level)[4]	8.4	7.8	7.4
Crude oil price NKr (level)[5]	112	108	106
International market growth	10.2	6.0	5.0
Importweighted krone exchange rate[6]	1.3	-2.5	0.4

1) The figures for 1994 deviates from the ones published in ES 1/95 and 2/95 due to changes in definitions and new information. Also the forecasts for 1995 and 1996 are influenced by the revision of the national accounts.
2) Capital formation in the petroleum sector is now measured on an accruals basis in the national accounts.
3) Consumption in households and non-profit organizations + general government consumption + gross fixed capital formation in mainland Norway.
4) Households' borrowing rate in private financial institutions.
5) Average Norwegian oil production.
6) Positive sign entails depreciation.

The consumer price index increased by 2.5 per cent from January-October 1994 to January-October this year. Measured on a year-on-year basis, price inflation was stable at 2.6 to 2.7 per cent through the first half of this year, but edged down to 2.3 per cent for the period July-October. Price inflation in the second half of the year was lower because tobacco and petrol taxes were not increased as was the case in July last year. Developments in house rents, prices of farm and fish products and in imported consumer goods facing Norwegian competition have all contributed to curbing the general rise in prices, while movements in prices of other Norwegian-produced consumer goods have pushed up the inflation rate. Consumer prices will rise at an annual rate of 2.5 per cent this year, margi-

nally higher than the inflation rate of Norway's most important trading partners, but a little less than the inflation rate in the ECU area.

The Norwegian krone strengthened against an import-weighted basket of our main trading partners' currencies through 1994 and into 1995, and this has helped to slow the rise in prices of imported goods. On an annual basis, this exchange rate indicator is likely to show an appreciation of nearly 2.5 per cent.

Developments in the wage settlements and other available information indicate that hourly earnings growth will rise from 3.1 per cent in 1994 to 3.6 per cent this year.

The current account of the balance of payments showed a surplus of a good NKr 24 billion for the period January-September, nearly NKr 10 billion more than in the same period last year. The trade surplus widened by about NKr 7.4 billion, while the deficit on the interest and transfers balance was reduced by NKr 2.6 billion. With a further rise in oil production in the fourth quarter and approximately unchanged oil prices, the current-account surplus for the year as a whole may reach around NKr 32 billion.

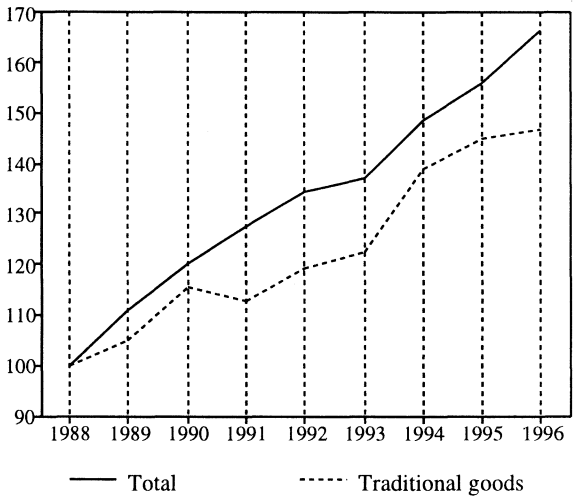
Outlook for 1996

Growth in demand and production is expected to slow further in 1996. Mainland GDP is projected to expand by 2.3 per cent and total GDP by 3.8 per cent. Growth in mainland demand will decline slightly, from 2.4 per cent in 1995 to 2.1 per cent next year, while traditional merchandise exports will only increase by 1 per cent. Even though these growth rates are appreciably lower than the results recorded in the peak year 1994, they are - with the exception of exports - relatively high compared with the average for the period 1989-1993. Price inflation will probably be slightly lower than 2 per cent next year even though unemployment will continue to decline. The current-account surplus, and probably the general government budget surplus, may be slightly higher than in 1995.

The estimates for economic developments in 1996 are largely based on assumptions concerning economic policy as presented in the National Budget for 1996. The projections are based on the assumption that average tax rates for households will remain approximately unchanged, general government expenditure will expand by 1.5 per cent and general government fixed investment will rise by a good 3 per cent. Measured at constant prices, general government expenditure will rise at a considerably lower rate than mainland GDP. This combined with continued growth in the production of oil and gas will result in a substantial rise in the general government budget surplus.

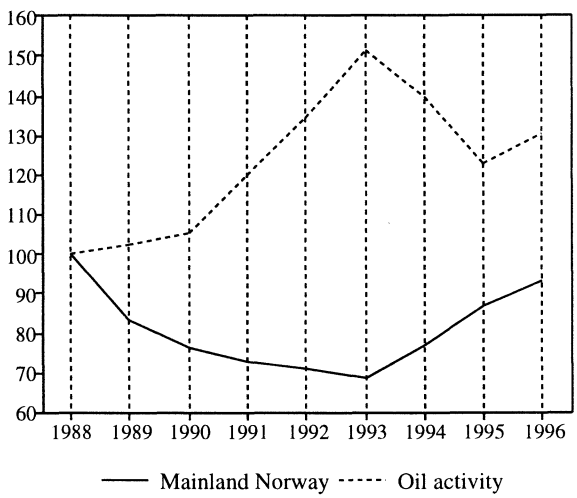
The economic upswing among Norway's main trading partners, which helped to fuel the recovery of the Norwegian economy in 1993-1994, will slacken somewhat next year. With relatively small changes in the relative price between Norwegian and foreign products, growth in traditio-

Exports
Volume indices. 1988=100



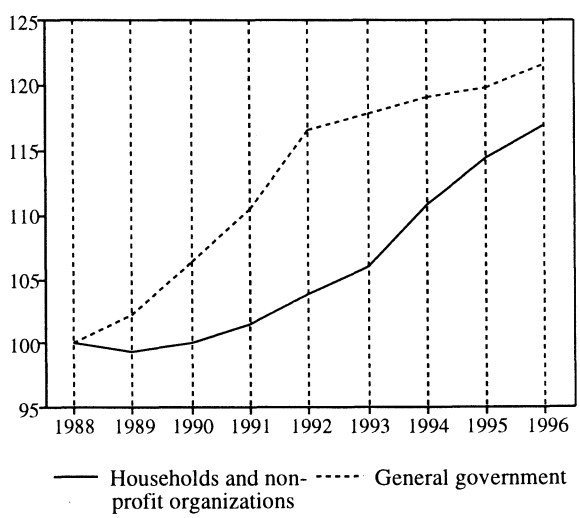
Source: Statistics Norway.

Gross fixed capital formation
Volume indices. 1988=100



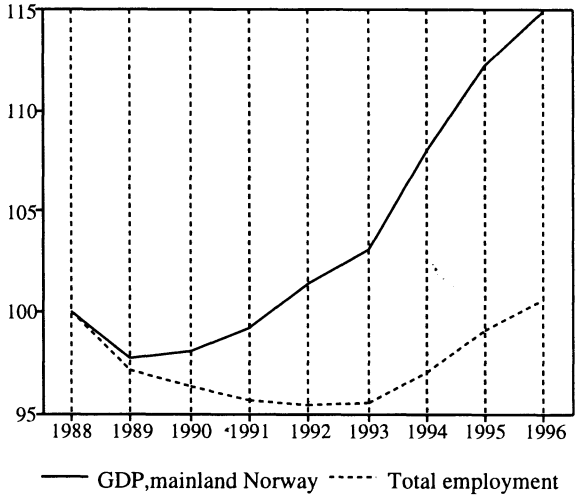
Source: Statistics Norway.

Consumption
Volume indices. 1988=100



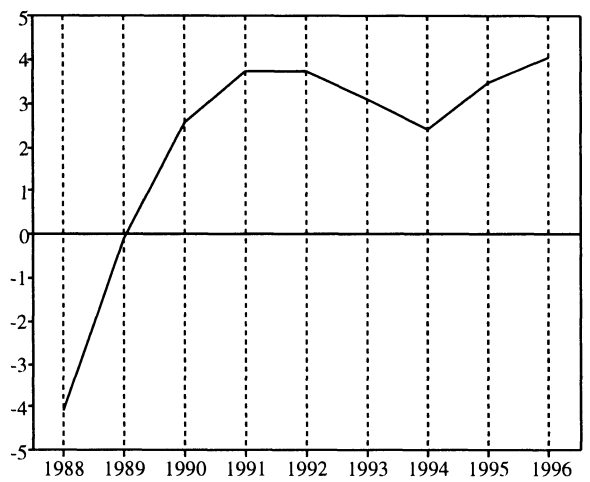
Source: Statistics Norway.

GDP and employment
Volume indices. 1988=100



Source: Statistics Norway.

Current balance in percent of GDP



Source: Statistics Norway.

nal merchandise exports may decline to about 1 per cent next year. Total exports, however, will show relatively sharp growth as a result of the steep rise in petroleum exports.

Price inflation among Norway's main trading partners is projected at about 2.5 per cent in 1996, marginally higher than this year. With an unchanged import-weighted krone exchange rate from now until the end of 1996, the foreign exchange market will not generate any noticeable inflationary impetus, and import prices will thus probably increase at about the same rate as in 1995.

Approximately unchanged inflation rates and a decline in GDP growth internationally, for example in Germany, point to a further marginal decline in short-term interest rates. The three-month ECU rate is projected to fall from about 5.9 per cent in 1995 to 5.3 per cent next year. The guidelines for interest rate policy allow Norges Bank (Central Bank of Norway) to increase foreign exchange reserves in order to maintain interest rates at the present level in an environment of a strong krone and a pronounced upturn. Given the current outlook for 1996, however, it has been assumed that Norwegian money market rates will generally shadow European rates, and the three-month money market rate is projected to fall by 0.3 percentage point to an average 5 per cent next year. A moderate decline in Norwegian market rates also points to slightly lower interest rates in financial institutions. This will have a moderate dampening effect on price inflation through house rents.

Growth in hourly wages is projected at 3.1 per cent next year, i.e. approximately the same as in 1994, but 0.5 percentage point below the expected growth in hourly pay this year. Wage growth will thus generate only a small impetus to price inflation. Moreover, indirect tax changes are not expected to boost price inflation in 1996, whereas the increase in the VAT rate from 1 January 1995 may have contributed about 0.5 percentage point to the rise in prices this year. A sharp rise in the price of electricity contributed to boosting the rate of inflation early in 1995, but a corresponding inflationary impetus is not anticipated in 1996, and consumer price inflation is now estimated at 1.8 per cent.

Household real disposable income may rise by 2.2 per cent in 1996, a decline of about one percentage point from 1995. Developments in wage income will make a positive contribution, while the contribution from net interest income is expected to be negative. With only a modest decline in financial institutions' lending rates, changes in income point to an approximately unchanged rise in the real price of existing dwellings. The saving ratio may decline moderately, but not to such an extent that it prevents private consumption growth from slowing by a little less than one percentage point, to 2.3 per cent. The upswing in housing investment will be curbed further next year. This entails that net financial investment will only decline moderately from the relatively high level this year, in spite of the reduction in the saving ratio.

Output growth, increased profitability and fall in interest rates have contributed to the vigorous growth in business fixed investment during the past two years. The development of the main airport Gardermoen has also boosted growth, and this investment will probably peak next year. According to the calculations, manufacturing investment will only rise by about 5 per cent in 1996, after increasing sharply this year. Slower growth in private consumption also implies that investment in private services, excluding dwellings, will rise at a slower pace in 1996 than in 1995. Even with slightly higher growth in general government gross fixed investment, growth in mainland investment is likely to be reduced by half from 1995 to 1996.

Oil investment, which shows a sharp decline this year, is expected to increase approximately on a par with mainland investment next year. This indicates that total fixed invest-

ment will rise at a moderately faster pace in 1996 than in 1995.

According to our estimates, mainland GDP will expand by 2.3 per cent next year, 1.6 percentage points less than in 1995 and as much as 2.5 percentage points less than in 1994. Developments in manufacturing industry and the general government sector will contribute to reducing the growth rate, while the construction industry and private services will expand at a faster rate than the mainland economy as a whole. As a result of brisk growth in oil and gas production, total GDP growth is only expected to decline moderately, from 4.2 per cent in 1995 to 3.8 per cent next year.

The rise in employment will continue through 1996, but at a weaker pace than in 1995. With the labour force growing at a slightly slower pace than employment, unemployment is projected to decline to an average 4.5 per cent for the year.

The trade surplus will rise next year as a result of vigorous growth in exports of crude oil and natural gas. Oil prices are assumed to decline from NKr 108 p/b in 1995 to NKr 106 p/b next year. The deficit on the interest and transfers balance will be further reduced as a result of a gradual rise in Norway's net foreign assets. This will contribute to a rise in the current-account surplus from a good NKr 32 billion in 1995 to nearly NKr 39 billion next year.

Norway: Trends in selected macroeconomic variables
Percentage volume changes in 1992 prices

	Billion. 1992-Nkr	Growth from the same period previous year							
	1994	1994	94.1	94.2	94.3	94.4	95.1	95.2	95.3
Consumption in households and non-profit organizations	422.1	4.6	5.6	4.9	4.2	4.0	1.8	3.1	3.7
Consumption of goods	227.5	5.3	8.1	5.5	4.3	3.8	1.9	3.6	3.9
Services	192.9	4.2	4.5	4.6	4.2	3.4	2.0	1.0	1.8
Direct purchases abroad by resident households	16.9	8.6	1.8	8.8	11.1	9.4	-3.1	3.1	4.6
- Direct purchases in Norway by non-resident households	-15.3	13.3	32.6	13.5	13.2	-4.5	2.3	-14.9	-9.7
General government consumption	176.7	1.1	1.3	1.3	0.9	1.0	-0.6	0.2	-1.4
Central government consumption	71.3	-0.6	-0.3	-0.4	-1.0	-0.8	-3.8	-1.9	-4.5
Central government consumption, civilian	51.4	-0.2	0.2	0.4	-0.8	-0.4	-0.2	1.1	-1.1
Central government consumption, defence	19.9	-1.8	-1.7	-2.3	-1.6	-1.8	-13.1	-9.8	-13.3
Local government consumption	105.4	2.3	2.4	2.5	2.2	2.2	1.5	1.7	0.6
Gross fixed capital formation	167.4	5.5	7.9	14.7	6.6	-4.5	8.7	1.0	-1.6
Oil and shipping	51.1	-7.6	-1.6	13.8	-10.9	-29.2	-17.7	-30.6	-9.9
Ships and oil platforms in progress	1.9	60.0	35.9	-213.4	-861.4	-189.9	-53.4	61.2	-240.3
Mainland Norway	114.3	12.0	12.0	9.6	12.4	13.8	24.6	18.9	8.9
Manufacturing and mining	11.7	6.5	-4.1	-3.6	7.7	20.7	42.8	50.6	30.2
Production of other goods	11.0	-4.4	-9.9	4.1	-12.9	0.6	6.3	-3.4	-3.4
General government	26.6	-0.8	-0.2	-5.4	-1.2	2.1	1.9	3.6	0.7
Dwellings	22.4	25.9	17.2	26.5	30.7	28.0	32.8	20.8	5.7
Other services	42.7	22.1	28.6	18.4	24.2	18.3	33.1	25.7	12.6
Stocks	20.5	53.2	-2.7	-775.5	-33.3	.	29.6	59.2	149.5
Gross capital formation	187.9	9.2	5.5	32.6	3.0	0.3	13.0	7.8	7.1
Final domestic use of goods and services	786.6	4.9	4.6	9.8	3.1	2.5	4.0	3.6	3.3
Demand from mainland Norway	713.1	4.8	5.3	4.6	4.6	4.9	4.5	4.8	3.3
Exports	332.2	8.5	11.4	4.2	7.8	10.7	6.4	2.7	5.3
Traditional goods	126.5	13.3	11.0	9.3	19.8	13.5	15.2	1.5	1.8
Crude oil and natural gas	114.7	11.6	18.9	10.2	8.4	9.3	3.9	4.5	14.5
Ships and oil platforms	10.9	-11.0	-13.2	-53.6	-21.0	82.4	1.1	81.3	27.6
Services	80.1	0.8	5.3	1.8	-2.5	-0.7	-2.6	-5.8	-3.1
Total use of goods and services	1118.8	5.9	6.5	8.1	4.5	4.8	4.7	3.3	3.9
Imports	272.6	6.6	7.6	11.1	4.7	3.6	4.4	3.7	3.2
Traditional goods	180.5	15.0	14.1	17.9	16.3	11.9	12.4	9.6	6.6
Crude oil	1.0	-17.8	-16.5	-6.1	-21.1	-25.0	48.5	66.8	28.0
Ships and oil platforms	12.3	-33.7	-7.8	-10.9	-56.4	-56.0	-38.4	-31.0	-1.7
Services	78.8	-0.0	-1.6	3.1	-3.0	1.8	-5.1	-3.4	-3.7
Gross deomstic product (GDP)	846.2	5.7	6.2	7.1	4.4	5.2	4.8	3.2	4.2
Mainland Norway	708.1	4.8	4.4	5.9	4.5	4.6	5.0	3.3	2.7
Oil activites and shipping	138.0	10.3	15.9	13.8	3.7	8.5	4.3	2.8	12.1
Mainland industry	639.7	4.5	3.9	5.5	4.4	4.3	4.7	3.0	2.3
Manufacturing and mining	97.2	5.6	2.8	8.0	5.7	5.9	9.4	1.4	1.4
Production of other goods	72.3	2.2	0.5	5.8	2.2	1.2	9.4	12.6	4.2
General government	131.8	1.8	1.9	1.8	2.0	1.4	1.1	1.9	1.0
Private services	338.5	5.8	5.9	6.3	5.5	5.7	3.7	2.3	2.7
Correction items	68.4	8.0	9.9	9.2	6.1	7.1	7.8	5.5	6.2

Norway: Trends in selected macroeconomic variables
Percentage volume change in 1992-prices*)

	Billion 1992-Nkr		Growth from previous quarter seasonally adjusted						
	1994	1994	94.1	94.2	94.3	94.4	95.1	95.2	95.3
Consumption in households and non-profit organizations	421.6	4.7	1.3	0.8	1.3	0.7	-0.6	1.7	1.5
Direct purchases abroad by resident households	16.7	8.2	2.2	9.2	2.4	-3.3	-8.5	12.5	4.1
- Direct purchases in Norway by non-resident households	-15.2	13.3	15.9	-3.5	-0.7	-12.7	21.3	-18.3	3.9
General government consumption	176.8	1.0	2.2	-1.2	1.0	-0.6	-0.3	0.2	-0.9
Gross fixed capital formation	167.2	5.2	-4.9	6.2	-2.7	-3.8	8.7	0.1	-5.9
Oil	51.2	-7.8	-14.6	17.4	-20.6	-10.6	-2.3	0.7	2.4
Shipping	1.9	60.0	..	..	..	..	..	..	..
Mainland Norway	114.0	11.6	-0.8	3.3	6.5	4.8	7.5	-1.5	-1.8
Manufacturing and mining	11.5	4.0	-5.8	6.3	16.9	1.9	13.8	10.3	1.6
Production of other goods	10.9	-5.3	3.1	5.6	-9.3	1.6	9.2	-3.6	-9.9
General government	26.6	-1.3	-1.7	-1.3	3.5	1.4	-0.1	-2.4	1.0
Dwellings	22.3	25.8	-1.5	10.6	8.8	7.5	3.3	-0.4	-4.2
Other services	42.8	22.3	0.5	1.4	9.1	7.0	12.1	-4.5	-1.4
Stocks	20.5	53.2	..	..	..	..	..	..	..
Gross capital formation	187.6	8.9	17.3	-3.3	-8.5	-3.9	32.0	-6.6	-9.5
Final domestic use of goods and services	786.1	4.8	5.2	-0.7	-1.2	-0.7	6.7	-0.9	-1.9
Demand from mainland Norway	712.5	4.8	1.2	0.7	2.0	1.0	0.8	0.8	0.3
Exports	331.5	8.4	2.6	0.3	-0.1	7.4	-1.3	-2.8	2.7
Traditional goods	126.4	13.4	2.7	3.2	5.0	1.7	4.1	-8.2	4.9
Crude oil and natural gas	114.7	11.6	1.6	-0.5	-5.2	13.9	-3.3	-0.1	3.8
Ships and oil platforms	10.9	-11.0	-9.0	-7.2	22.8	75.8	-49.6	66.7	-13.6
Services	79.5	0.4	5.3	-2.0	-3.0	-0.8	3.6	-5.1	0.7
Total use of goods and services	1118.8	5.9	0.2	1.9	0.6	2.0	-0.2	1.4	0.8
Imports	272.5	6.7	1.5	2.3	-0.4	-0.1	1.6	3.7	-1.9
Traditional goods	180.5	15.0	4.3	2.3	5.0	-0.2	3.4	2.6	0.5
Crude oil	1.0	-17.8	-22.6	-2.2	9.2	-9.2	53.3	9.7	-16.2
Ships and oil platforms	12.3	-33.7	-18.2	-13.9	-49.3	23.2	14.6	-3.6	-27.9
Services	78.6	-0.1	1.5	6.0	-3.2	-2.1	-5.1	7.3	-4.1
Gross domestic production (GDP)	846.4	5.7	-0.2	1.8	0.9	2.6	-0.8	0.7	1.7
Mainland Norway	708.3	4.9	-0.7	1.8	1.8	1.5	-0.6	0.8	1.1
Oil activities and shipping	138.0	10.4	2.5	1.5	-3.7	8.6	-1.6	0.0	4.5
Mainland industry	639.9	4.5	0.7	1.6	1.4	0.4	0.8	0.7	0.6
Manufacturing and mining	97.2	5.6	0.7	2.9	1.0	1.2	2.1	-1.0	-0.8
Production of other goods	72.4	2.4	-2.2	0.4	3.9	-1.6	7.0	0.7	-0.8
General government	131.9	1.8	1.2	-0.6	0.9	0.3	0.3	0.4	-0.1
Private services	338.5	5.8	1.1	2.5	1.3	0.6	-0.8	1.4	1.5
Correction items	68.4	8.0	-12.7	3.8	5.6	12.0	-12.2	1.6	6.3

*) See "Technical comments".

Norway: Price indices for selected macroeconomic variables

		Percentage change from the same periode the previous year				Growth from previous quarter seasonally adjusted. Per cent*)			
	1994	94.4	95.1	95.2	95.3	94.4	95.1	95.2	95.3
Consumption in households and non-profit organizations	1.3	1.3	2.3	2.1	1.9	0.5	0.9	0.2	0.4
General government consumption	2.2	2.3	2.9	3.0	2.9	0.6	0.9	0.8	0.6
Gross fixed capital formation	2.2	2.2	2.2	1.6	3.2	1.1	0.2	0.4	1.4
-mainland Norway	2.3	2.2	2.1	1.6	2.5	1.0	0.5	0.7	0.2
Final domestic use of goods and services	1.6	1.6	2.3	2.1	1.9	0.6	0.7	0.3	0.2
-demand from mainland Norway	1.7	1.7	2.4	2.3	2.2	0.6	0.8	0.4	0.4
Exports	-2.2	1.4	5.5	2.0	-1.3	-0.5	1.5	-0.1	-2.2
- traditional merchandise exports	0.8	4.5	10.9	7.8	5.9	1.4	5.7	-1.7	0.4
Total use of goods and services	0.4	1.5	3.2	2.1	0.9	-0.3	1.5	0.0	0.2
Imports	1.0	0.3	1.3	0.6	1.2	0.4	0.3	-0.6	2.2
- traditional merchandise imports	0.5	0.4	0.8	1.1	0.7	0.6	-0.1	0.3	1.5
Gross domestic product (GDP)	0.3	1.9	3.8	2.6	0.8	-0.6	1.9	0.2	-0.4
-mainland Norway	1.8	2.4	4.2	3.6	2.9	0.5	1.9	0.4	0.2

*) See "Technical comments".

Technical comments on the quarterly accounts figures

Statistics Norway is currently undertaking an extensive revision of the national accounts. Revised figures for the years 1988-1992 were published in Statistics Weekly no. 27 1995 (extra issue). Revised preliminary national accounts figures for the years 1993-1994 as well as figures for the first and second quarters of 1995 were presented in Economic Survey no. 3/95.

Quarterly calculations: The calculations are made on a less detailed level than the calculations for the annual national accounts, and are based on more simplified procedures.

Base year and linking the data: In the quarterly national accounts all volume measures are currently calculated at constant 1992 prices using weights from that year. The choice of base year influences the constant-price figures and thus the annual rates of change in volume (growth rates). For the sake of comparison, all tables present growth rates with 1992 as the base year (common year of recalculation). This is done by recalculating constant-price figures for the years prior to 1992 at 1992 prices. The recalculation of prices is carried out at the sectoral level of the quarterly national accounts.

At the moment the figures from the new quarterly national accounts (QNA) only go back to the first quarter of 1992, which is too short a period for seasonal adjustment. Based on the new annual figures for the period 1988-1992, provisional quarterly figures on an aggregated level have been prepared for Statistics Norway's macroeconometric model MODAG. These figures are linked backwards in time to the quarterly figures from the old national accounts, and forward in time to the new quarterly accounts from the QNA for seasonal adjustment. The new seasonally adjusted series are more aggregated than the figures in the quarterly national figures. In this issue of Economic Survey it has therefore not been possible to provide seasonally adjusted estimates for all variables as previously presented in this way. This applies, for example, to the old classification of competition within manufacturing industry and the old distribution of private consumption on goods and services.

Economic developments in Norway 1996-2000

Einar Bowitz and Ådne Cappelen

This article presents estimates for macroeconomic developments in Norway over the next five years. The projections, which are derived from the econometric model MODAG, have been adapted to the revised national accounts figures which Statistics Norway presented in the summer of 1995. Our projections are in line with earlier calculations and entail that economic growth in coming years will be far more moderate than in the last three years. Unemployment will nevertheless continue to decline to about four per cent in 1998. We expect rising surpluses on the current account and in general government budgets. The rate of inflation is expected to remain moderate.

1. Introduction

Economic Survey 1/95 presented macroeconomic projections for the Norwegian economy for the years 1995-2000. The national projections for this period are updated in this article.

The problems to be elucidated through such model-based calculations are:

- Following a vigorous cyclical upturn in the Norwegian economy in recent years, is there now a risk of pressures in the Norwegian economy with a faster rise in price and wage inflation? Even if the answer to this question is no, will a new international upturn later in the 1990s result in such a development?

- How large will the surpluses on the current account and in general government budgets be when the pace of oil production increases and automatic stabilizers in the economy take effect?

The calculations show that based on our assumptions a sharp rise in price and wage inflation is not likely in the second half of the 1990s. We thus assume that available resources, not least the supply of labour, will be sufficient to prevent this. This conclusion, however, is based on two important assumptions: That a new international upswing will not be appreciably stronger than the recent upturn and that fiscal policy is Norway is not substantially weakened.

A new international upturn is not likely to be characterized by a fall in interest rates as great as that experienced in Europe through 1993 and 1994. This implies that the projected economic expansion in the second half of the 1990s will be weaker than the upturn recorded in the first half. Growth in traditional merchandise exports will thus be more moderate. The steep rise in household demand in recent years will probably not be repeated later in the 1990s without a substantial fall in interest rates. Even though we may experience renewed growth in oil investments, this will not be sufficient to alter our projection of a moderate cyclical trend in the second half of the 1990s. With a high rate of oil production, the surpluses on the current account and in public-sector budgets will be considerable even with low oil prices. A projected moderate decline in unemployment will also contribute to an increase in budget surpluses.

Since the last medium-term projections were presented, Statistics Norway has published new national accounts figures for Norway for the period 1988-1994. The new national accounts figures are incorporated in Statistics Norway's macroeconometric model MODAG. The last medium-term projections were also derived from this model. There is, however, reason to emphasize that there is greater uncertainty linked to these calculations than what is customary because it has not yet been possible to completely reassess the model's structure on the basis of such short-term historical series as the period 1988-1994.

Notwithstanding these reservations, it should also be emphasized that the projections now being presented deviate very little from those published at the beginning of the year. This particularly applies to 1995 where the differences in growth for key macroeconomic variables are negligible. There is no difference for unemployment, consumer price inflation or for wage growth. The growth projection for mainland GDP has been raised from 3.8 to 3.9 per cent, and even for most demand components the deviations are marginal. The differences are also relatively small for developments in the period to the year 2000, with the exception of the nominal picture, which has been adjusted downwards slightly. This is primarily due to a lower estimate for international price inflation. The estimates for oil prices are also slightly lower, entailing that current-account surpluses have been reduced, but not by a substantial margin.

2. Assumptions underlying the calculations

International economy

It is now assumed that GDP growth in the OECD-countries will be half a per cent lower in 1996 than envisaged less than a year ago. No major changes have been made for subsequent years, but the cyclical path has shifted slightly

compared with earlier assumptions, with a new upturn now expected towards the end of 1997.

Estimated price inflation in 1996 and the underlying rise in prices have been reduced. The downward adjustment is most pronounced for the US where price inflation of about three per cent is now expected compared with a little less than four in our last medium-term projections.

The postponement of the next cyclical upswing one year in time along with lower estimates for price inflation have resulted in a downward revision of estimates for short-term interest rates, particularly for Germany. This downward adjustment has an important effect on our calculations of interest rates in Norway, which in turn has an influence on the rise in prices and volume in Norway. There is reason to assume that projected interest rate movements will strengthen the dollar exchange rate against European currencies in the period as a whole. As a technical assumption, we have assumed that the dollar exchange rate against the Norwegian krone will be 6.60 beginning in 1996, against 6.30 in 1995.

Our estimates for commodity prices, excluding oil and gas, have changed very little the past year. Commodity prices are expected to decline in 1996 followed by a resumed rise towards the end of 1997 in line with the projected cycle. The downward adjustment of commodity prices for 1996 influences profitability in manufacturing industry and thereby wage growth. In our last medium-term projections we assumed a slightly smaller decline in commodity prices, which resulted in higher wage growth than the current estimated level.

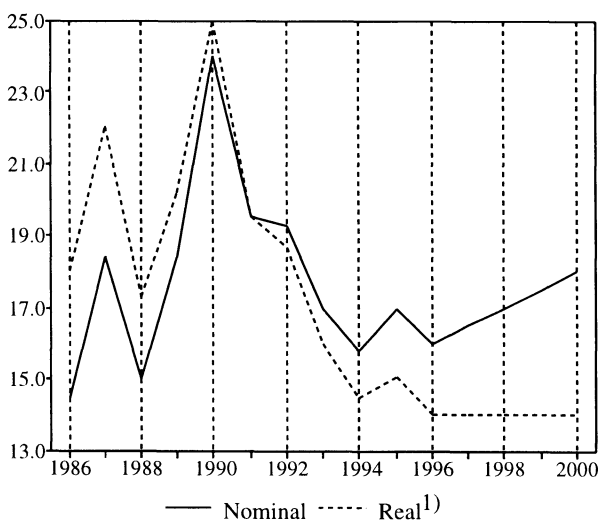
Our estimates for the price of crude oil in the years ahead has been reduced, while the estimates for 1995 are in line with those presented at the beginning of the year. The projected changes in oil prices are shown in figure 1. In our calculations in January, we assumed a nominal oil prices in the year 2000 of $ 22 p/b, while this has now been reduced to $ 18 p/b. It is now assumed that crude oil prices will fall from 1995 to 1996 followed by an unchanged real price in the years to 2000. The reasoning behind this is that technological advances make it possible to produce oil on marginal fields in the world ("North Sea") at far lower development costs than earlier; total development costs for some new fields which can make use of some of the existing infrastructure is now less than $ 10 p/b. There is reason to believe that development costs will continue to decline as new knowledge is gained. This will increase possibilities for profitable production in non-OPEC countries and will weaken OPEC's market power. Against this background, it is conceivable that our oil price estimate (unchanged real oil price) is actually too optimistic and that the price will instead remain unchanged in nominal terms.

Because the weak oil price trend is accompanied by falling development costs on the Norwegian shelf, the petroleum rent and the central government's cash flow will not be affected to any extent. Our trading partners will benefit from low commodity prices which in turn will translate into low inflation, low interest rates and higher economic growth. However, for OPEC, which will not experience the same trend in production costs as Norway, this will entail a decline in revenues. Some of these countries are already experiencing budget problems and a further decline in the real price of oil may create instability in some countries, with considerable consequences for oil prices in the short term in both directions.

Norwegian economy

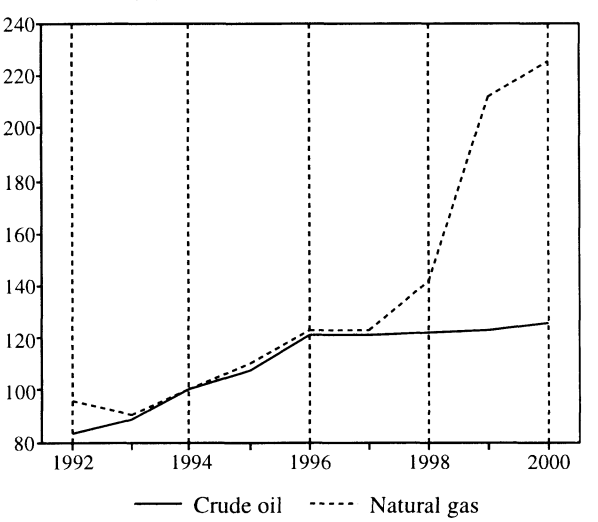
Economic policy as presented in the draft government budget and National Budget for 1996 has been incorporated in

Figure 1. Crude oil price. Brent blend USD/barrel



1) Deflated by the US consumer price index.
Source: Statistics Norway.

Figure 2. Production of crude oil and natural gas
Indices 1994=100



Source: Statistics Norway.

the calculations. On the other hand, there has not been sufficient time to incorporate the changes in the recently presented Final Budget Bill with any precision. However, Economic Survey 1995, which will be published at the beginning of February next year will take into account these changes in fiscal policy. This entails that we have not taken account of the decline in car taxes from 1 January 1996, which may result in a fall in prices for some types of cars, but a rise in prices for others. The magnitude of the decline in average car prices is therefore uncertain. Moreover, this tax reduction may be offset by an increase in other indirect taxes. According to MODAG, a fall in car prices will result in an equivalent rise in purchases the first year because the price elasticity for purchases of cars is -1.07 the first year, rising (in numerical value) to about -1.7 in the longer term.

With regard to government expenditure on goods and services, our estimates for general government consumption in the years ahead have been reduced slightly compared with our earlier calculations, while the estimates for public sector investment have been increased somewhat. This is primarily ascribable to changes in the national accounts' method of accounting for some types of military investment, which in the earlier national accounts was recorded enterily as general government consumption, but which is now partly recorded as investment. Some of the changes in defence spending as a result of the development of the main airport will therefore partly be recorded as investment, as compared with consumption in the projections presented in January of this year.

The estimates for production trends in resource-based industries have changed somewhat since the last calculations were made. The estimates for oil and gas production are shown in figure 2. Crude oil production has been increased somewhat, while gas production has been reduced in 1997 and 1998, but increased for 1999 and 2000.

The estimates for oil investment have been increased substantially since the last projections were presented. As we noted in our previous analysis, there is a tendency to underestimate investment in the petroleum sector when looking a few years ahead. While we previously assumed that investment would decline considerably in the years ahead, it now appears that investment will not fall to any great extent, but rather reach a new peak in 1998. Investment is then expected to decline substantially, but we would again emphasize the uncertainty of this estimate. The demand impetus generated by petroleum activities will consequently continue to be considerable in the years ahead. The result of the changes in these estimates is that gross fixed investment will grow at a faster pace in the years to 1998 than previously assumed, but will be weaker in subsequent years compared with our earlier projections.

3. Results of the calculations

The main results of the calculations are shown in table 1. We will first describe changes in household behaviour, and then discuss developments for enterprises, the labour market, price and wage inflation and, finally, net lending distributed on the most important institutional sectors.

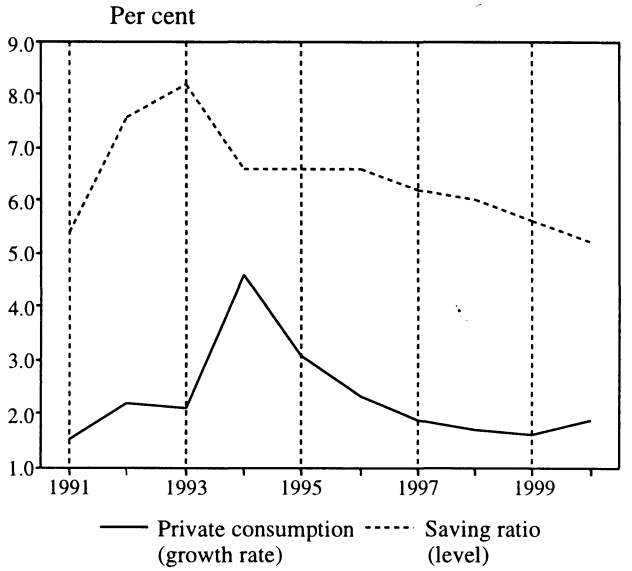
Household behaviour

Household behaviour with regard to consumption and housing capital primarily depends on developments in disposable income, but behaviour is also affected by real interest rates and wealth. Moreover, developments in prices on the

Table 1. Macroeconomic indicators
Percentage volume growth unless otherwise noted

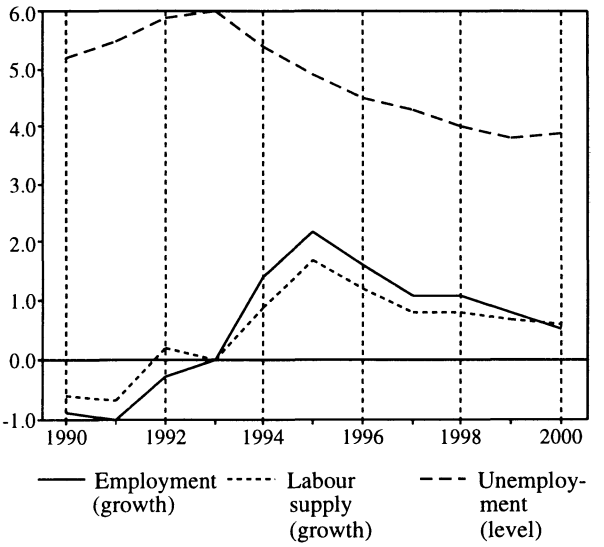
	1994	1995	1996	1997	1998	1999	2000
Consumption in households and non-profit organizations	4.6	3.1	2.3	1.9	1.7	1.6	1.9
General government consumption	1.1	0.6	1.5	1.4	1.3	1.4	0.7
Gross fixed investment	9.2	5.0	6.4	3.5	3.1	-2.0	0.4
-mainland Norway	12.0	13.7	6.8	3.3	0.8	1.1	0.4
Exports	8.5	5.0	6.7	1.7	3.3	5.5	3.3
-traditional goods	13.3	4.4	1.2	2.0	6.9	2.9	3.4
Imports	6.6	4.5	4.0	3.3	3.3	1.3	2.3
GDP	5.7	4.2	3.8	1.5	2.0	2.5	1.8
-mainland Norway	4.8	3.9	2.3	1.7	2.2	1.9	1.6
Consumer price index	1.4	2.5	1.8	2.1	2.5	2.6	2.6
Wages per man-hour	3.0	3.6	3.0	2.6	3.4	4.6	4.7
Levels							
Current balance, bill NKr	21	32	39	39	47	71	86
Short term interest rate, per cent	5.7	5.3	5.0	5.2	5.1	4.6	4.7
Unemployment rate, per cent	5.4	4.9	4.5	4.3	4.0	3.8	3.9
Import prices	0.5	1.5	1.4	1.4	2.3	1.3	1.7
Crude oil price (nominal)	112	108	106	109	112	115	119
International market growth	10.2	6.0	5.0	5.0	7.0	4.0	4.0

Figure 3. Private consumption and household saving ratio



Source: Statistics Norway.

Figure 4. Labour market. Per cent



Source: Statistics Norway.

resale home market influence both household wealth and household behaviour in the housing market.

As noted in the introduction, lower interest rates in Germany will result in lower Norwegian interest rates. This influences the calculations in two ways. First, this will in isolation imply higher housing investment than earlier. On the other hand, lower nominal interest rates (and real interest rates) result in lower income for households as households have now become substantial creditors after having increased their net assets considerably in the 1990s. In isolation this translates into lower consumption growth and housing investment. Combined with lower real wage growth compared with the projections presented in January, this has resulted in slightly lower consumption growth than projected earlier, but not very much. On the other hand, the calculations show that the household saving ratio is expected to remain at a high level (above five per cent) throughout the projection period. Here, however, it is not so easy to compare the levels with the results from the previous projections because the main revision of the national accounts has resulted in an increase in the level of household saving compared with earlier versions of the national accounts. This was discussed in Economic Survey 3/95. Changes in private consumption and the saving ratio are shown in figure 3. Since there have been few changes in our estimates for housing investment (and other investment in the household sector), a higher saving ratio results in higher net lending in these calculations. This is also largely a result of the revision of the national accounts and has its counterpart in lower net lending in enterprises.

Mainland enterprises

Following a period of high output growth, the growth rate is projected to slow down substantially in the years ahead, with production growing at an annual rate of about two per cent. This results in a slower growth in employment inasmuch as we assume that growth in 1996 will remain high

i

n the wake of the cyclical upturn and high output growth. The implicit growth in productivity for mainland enterprises is now expected to be slightly lower than in the earlier projections, a factor which influences wage growth. The most important explanation for this is probably that the service sector, according to revised national accounts figures, accounts for a greater share of the economy, and productivity growth in most of these industries is lower than in manufacturing industry given the way this is measured in the national accounts.

Manufacturing investment increased sharply from 1994 to 1995 and it now appears that investment will remain at this level again in 1996, edging down in the period to 1998. Moreover, a substantial share of current investment growth is linked to the development of the new main airport at Gardermoen. This investment will reach a maximum annual level in 1996 and 1997, followed by a decline in 1998 before reaching zero in 1999. At this point of time we have also assumed a noticeable decline in oil investment. Total investment is therefore projected to decline from 1998 to 1999.

Traditional merchandise exports generally follow international market trends inasmuch as no major changes have been estimated for price or cost competitiveness. The calculations show weak export growth for traditional goods in 1996, picking up in subsequent years, particularly in 1998 when the next cyclical upswing among our trading partners is expected to materialize.

Developments in the labour market

Unemployment, measured by Statistics Norway's labour force survey, peaked in mid-1993 and has generally been falling since that time. The seasonally adjusted rate was 4.8 per cent in the third quarter of 1995 and the underlying trend shows a continued fall. Average annual unemployment in 1995 is now projected at 4.9 per cent. While for a

time there was an unusually sharp growth in the labour force (supply of labour) in relation to demographic developments and employment growth, the figures in late 1995 point to a slightly more normal pattern in the relationship between labour force growth and employment growth. Unemployment is projected to continue to fall appreciably in 1996 after which it will show only a moderate change, cf. figure 4.

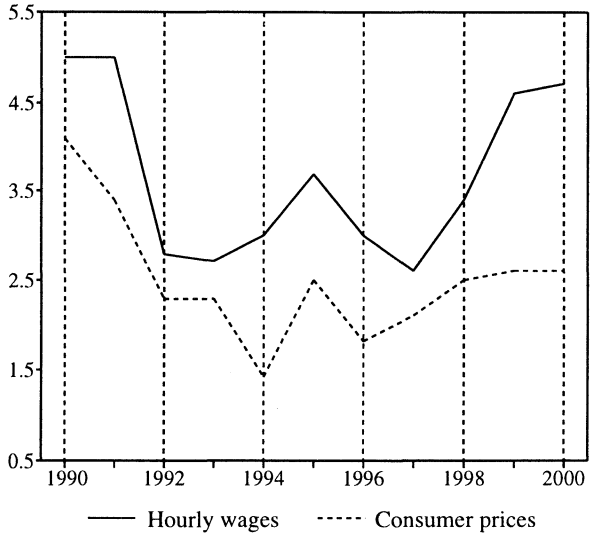
Employment growth is now likely to be greater than two per cent from 1994 to 1995 and the growth in man-hours worked as high as 1.7 per cent. Such growth rates have not been seen since 1986, but at that time growth was appreciably higher (a good 3.5 per cent in both employment and man-hours). The rise in employment from 1994 to 1995 is primarily a result of growth in the private sector. Growth in public-sector employment has been moderate in 1995 as an element in stabilization policy. We have assumed that this policy will persist when unemployment, according to the calculations, continues to decline. The fall in unemployment which occurs in the calculations up to 1998 does not, according to the model, result in significant wage pressures in the labour market. The continued fall in unemployment in spite of noticeably lower employment growth is related to far lower labour force growth. Largely based on demographic factors alone, the labour supply will increase by about 13 000 a year, i.e. 0.6 per cent. Our projection implies an increase in participation rates up to 1998 but not thereafter.

No changes in normal working hours or in the number of holidays are assumed in the projections. If the social partners agree on such changes in the near future, it is probable that this will contribute to a further slight reduction in unemployment, at least in the short run.

Prices and wages

Consumer price inflation in 1995 will probably be 2.5 per cent, on a par with the inflation rate of our trading partners following a number of years in which Norway recorded lower inflation. One important reason for the higher inflation rate from 1994 to 1995, however, was the increase in VAT with effect from 1 January this year. In the absence of this tax increase (and ceteris paribus), price inflation in 1995 would probably have been about half a per cent lower. Simply put, we can say that our inflation forecast for 1996 of a little less than two per cent is generally ascribable to the assumption that underlying price impulses will be the same as in 1995 but without any substantial increase in indirect taxes. If anything, the Government's Final Budget Bill entails a reduction in indirect taxes, although this may be offset by increases in other excise duties. The underlying price trend internationally is fairly stable. Our assumption that there will be no strong international upturn implies that there is little reason to believe that price inflation will quicken. On the contrary, it is likely that price inflation will abate somewhat. Developments in commodity markets as a whole do not point to a greater inflationary impetus. In 1995, the import-weighted effective krone exchange rate appreciated slightly, but this is not expected to occur in 1996. With a stable krone exchange rate, we thus expect only moderately stronger external inflationary impulses in 1996 compared with 1995.

Figure 5. Prices and wages - growth in per cent



Source: Statistics Norway.

Another factor which contributes to curbing the inflationary impetus in 1996 is the low level of interest rates. While in our last projections we expected nominal interest rates to rise in the years ahead, the calculations now indicate that Norwegian interest rates will remain broadly unchanged in coming years. An important factor behind this development is the assumption of lower international inflation which has entailed that we have also reduced our estimates for international interest rates. Rising current-account and general government budget surpluses will result in a wider differential between Norwegian money market rates and the ECU rate, particularly towards the end of the projection period. Lower interest rates result in lower house rents, and an inflationary impetus which existed in our previous projections has thereby been reduced. This will have an influence on developments in 1996 and helps to explain the downward adjustment in the inflation forecast, cf. figure 5.

The greatest change in these projections compared with those presented in January is the reduction in the estimates for wage growth in 1996 and 1997. This reduction is partly a result of lower inflation forecasts, inasmuch as the nominal rise in the projections has been reduced both internationally and in Norway. Second, the downward adjustment is due to a projected weaker cyclical trend internationally and a lower rise in commodity prices than assumed earlier. The prices of Norway's most important export goods are now expected to fall from 1995 to 1996, a decline which is already in evidence. Third, the manufacturing sector now plays a smaller role in the Norwegian economy than that indicated by the old national accounts figures. As noted above, this is reflected in lower productivity gains than estimated earlier. This in turn results in lower rates of growth

Tabell 2. Net lending by institutional sector. Bill. Nkr, current prices

	Households	Government	Enterprises	Norway
1991	15	1	11	27
1992	28	-14	13	27
1993	34	-13	3	24
1994	19	3	-2	20
1995	14	18	0	32
1996	13	23	2	38
1997	11	25	4	40
1998	10	29	8	47
1999	9	37	26	72
2000	8	58	21	87

in the service sector, which by virtue of its relative size, dominates the picture for total wage growth. The importance of this factor has not yet been clarified, but will become clearer when we can compare a fully re-estimated model based on new national accounts figures with earlier analyses. The estimates for growth in real wages in this projection is also lower than in January, which also explains why the estimate for growth in private consumption has been reduced slightly in these calculations.

The decline in unemployment is generally the same as in the last projection. The higher estimate for oil investment, however, results in slightly higher economic growth up to 1998 and thus slightly lower unemployment that year than estimated earlier. According to the model, however, marginal changes in the unemployment rate have little impact on the estimates for wage growth when unemployment is about four per cent.

Changes in financial balances

Table 2 shows net lending by institutional sector. The overall impression is the same as described in the last projection. The surpluses on the current account and in general government budgets are expected to be substantial, but net lending is also positive for enterprises and households. For enterprises, it is worth noting that this occurs in spite of noticeably higher fixed investment than at the beginning of the 1990s. With the exception of 1995, where the estimates for the current-account surplus and Norway's net lending have been increased compared with earlier calculations, the estimates have been lowered primarily because the estimate for oil prices has been reduced. Measured as a share of GDP at current prices, the downward adjustment is more visible because the new national accounts figures show a GDP level which is a good 10 per cent higher than the old accounts. Measured as a share of GDP at current prices, the current-account surplus in the year 2000 is estimated at 7.6 per cent, while general government net lending is equivalent to 5 per cent of GDP in the year 2000.

In the calculations, net lending for the household sector remains positive throughout the period and at a slightly higher level than in the previous projections. The revised national accounts figures show higher household saving, but the difference in levels gradually disappears as the growth in household real income is slightly lower in these calculations than in the previous projection, partly as result of lower growth in real wages. Lower wage growth is also the reason why general government net lending is higher inasmuch as spending growth is heavily influenced by nominal growth and the adjustment of pensions, etc. Furthermore, the stance of fiscal policy, measured by the growth in expenditure on goods and services, is slightly tighter than in the previous calculations.

A slightly lower estimate for oil prices and petroleum taxes point to the opposite. However, the oil sector's use of intermediate products and labour has been reduced and the level of production increased somewhat, entailing that productivity in the petroleum sector is considerably higher at the end of the period. This generally compensates for low oil prices so that the surplus surplus (and economic rent) in the petroleum sector is not reduced to any great extent.

The costs of decommissioning nuclear power stations

The Swedish example

Finn Roar Aune, Torstein Bye and Tor Arnt Johnsen

Nuclear power plants represent a substantial share of the electricity production capacity in many countries, both in Europe and in the rest of the world. With increased global attention given to environmental emissions policy, the value of existing nuclear power plants will likely increase. In Sweden, the nuclear share of electricity production capacity is approximately 40 per cent. The Swedes may well decide to shut down some or all of their nuclear plants before they have reached their respective economic lifetimes. This paper adresses the economic cost of such a nuclear shutdown policy and calculates its welfare effects. First, cost estimates have to include both demand and supply effects (i.e. changes to consumer and producer surplus). Both Sweden and several of its closely related trading partners have decided to deregulate their electricity markets and to allow third party access to the transmission grids between the countries. Therefore, costs have to be calculated within a multi country energy market model. Second, the cost of and restrictions in the supply of alternative primary energy sources, for instance world market coal prices and the supply of Norwegian gas available for electricity production, have to be considered. Third, closing down nuclear plants may reduce the risk of accidents and radiation, but at the same time it introduces increased environmental costs through greater emissions to air. In this context, future emission tax policy may also have a substantial impact on the calculation of welfare losses. Fourth, economic cost estimates of decommissioning the nuclear plants can be grately affected by uncertainty about the discount rate, gas market prices, coal prices and the decomissioning strategy that is selected. In this paper, we estimate the economic cost of Swedish nuclear plant shutdown under different alternatives. The distribution of welfare losses and gains between Sweden and the other Nordic countries: Denmark, Norway and Finland are also estimated.

I. Introduction

The issue of decommissioning Swedish nuclear power stations has been on the agenda in Sweden for a long time. In 1980 a referendum was held on the future of nuclear power stations. Based on the result of the referendum, the Riksdag (Swedish parliament) passed a resolution in the autumn of 1980 declaring that nuclear power stations that were under construction should be completed, that new nuclear power stations would not be built and that nuclear power in Sweden should be phased out by the year 2010.

In October 1995, the Swedish Government decided to deregulate the Swedish electricity market from 1 January 1996. In December 1995 the Swedish Energy Commission submitted a report on the future of Swedish nuclear power stations. Two basic questions arise in this connection: How will energy demand develop and what will then be the economic consequences of decommissioning the nuclear plants, and what will be the environmental consequences of alternative electricity production?

In the next section, we look first at the general economic costs associated with any scaling back of nuclear power[1]. The consequences can be divided into supply-side effects and demand-side effects. On the supply side, the depreciation period for existing power plants are shortened, i.e. costs increase. Besides, developing thermal power generation capacity (coal,oil or gas based) or importing electricity also increases cost. Effects on the demand side appear through changes in the price of electricity. In our paper, we concentrate on the effects in the Nordic electricity market, i.e. we exclude European integration. This is due to our focus on long term effects. In the long term, back-stop technology is assumed to be the same in all countries. Short term exchange will still occure; however this is treated through a capacity utilisation index on the established transmission lines between countries. In section III, we quantify the supply and demand welfare effects within the context of a partial equilibrium model for the Nordic energy market. The influence on welfare cost from uncertainty concerning coal prices, discount rates, gas prices, limited supply of gas and different decomissioning alternatives is presented in section IV, while in section V we draw some conclusions.

II. The electricity market in Sweden

Existing power generation

Sweden's current electricity generation is composed of hydroelectric plants, nuclear power plants, industrial back-pressure, condensate power based on coal and oil, and gas turbines based on oil/diesel, see Figure 1. For nuclear

1 Bergman (1983) and Lundgren (1985) studied some of these using national Swedish models

Figure 1. Short term supply function for electricity in Sweden

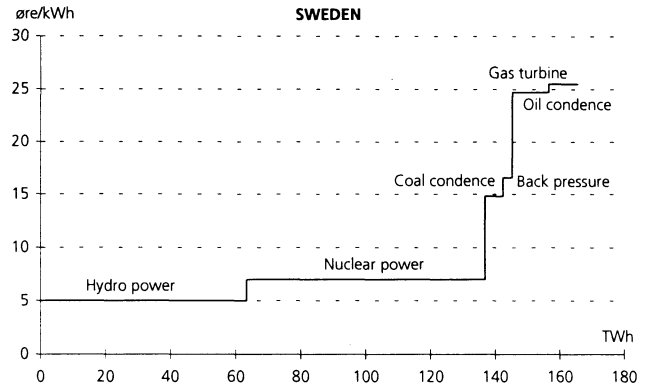


Table 1. Swedish nuclear plants

Nuclear plants	Installed capacity	Started up	Technology*
Ringhals 1	825 MW	1976	BWR
Ringhals 2	915 MW	1975	PWR
Ringhals 3	960 MW	1981	PWR
Ringhals 4	960 MW	1983	PWR
Barsebäck 1	615 MW	1975	BWR
Barsebäck 2	615 MW	1977	BWR
Forsmark 1	1006 MW	1980	BWR
Forsmark 2	1006 MW	1981	BWR
Forsmark 3	1200 MW	1985	BWR
Oskarshamn 1	465 MW	1972	BWR
Oskarshamn 2	630 MW	1974	BWR
Oskarshamn 3	1205 MW	1985	BWR

* BWR: Boiled water reactor
PWR: Preccurized water reactor

power, the variable production costs are nearly double the variable costs of hydropower generation (in øre/kWh). The variable costs of industrial back-pressure and condensate-based power generation are considerably higher than nuclear power generation cost. The costs of a future dismantling of nuclear power stations and the costs of waste handling are assumed to be included in the short-term marginal costs, cf. below.

In 1991, the electricity production in Sweden totalled 142 TWh, out of which hydro amounted to approximately 63 TWh and nuclear amounted to approximately 74 TWh.

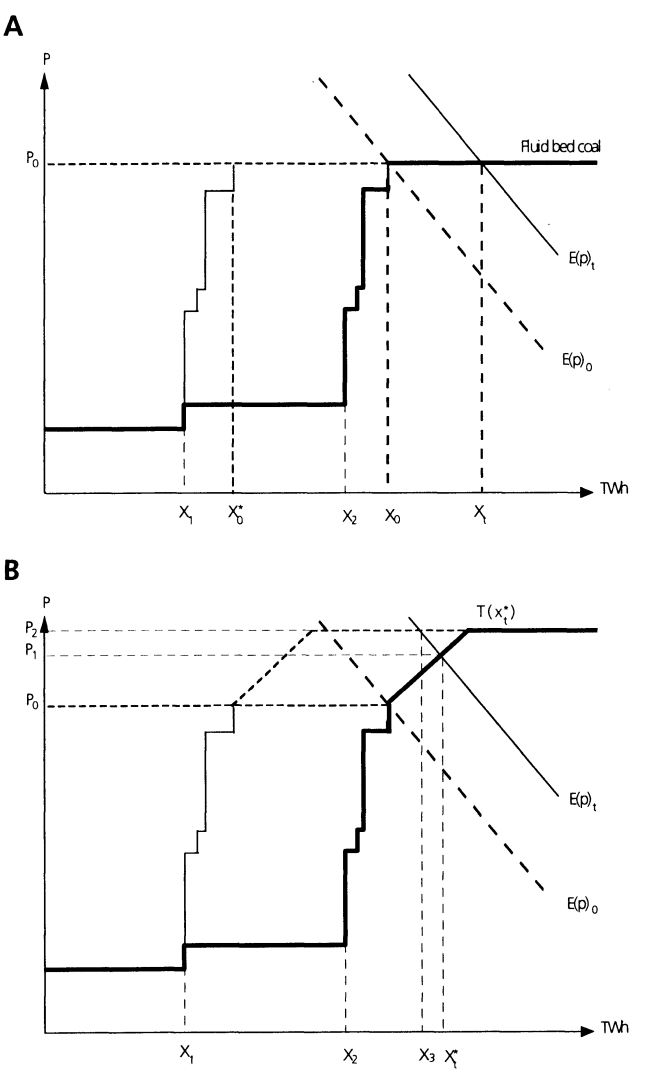
Sweden, currently has 12 nuclear power units: Ringhals 1-4, Barsebäck 1-2, Forsmark 1-3 and Oskarshamn 1-3, cf. Table 1. Nuclear power accounted for 51 per cent of total electricity production in Sweden in 1994. This share has varied between 40 and a little more than 50 per cent over the last ten years.

Alternatives to nuclear power

Let us assume that the Swedish electricity market is in perfect competition equilibrium[2]. Such a market is illustrated in Figure 2.A, where electricity generation is initially assumed to be X_0 at prices P_0. In the figure, electricity generation technologies are ranked according to rising costs. Production up to X_1 is based on hydropower, X_1 - X_2 is nuclear power and various thermal-based power technologies follow.

Assume that thermal power production based on fluid bed coal represents a back-stop technology[3], as shown by the flat section to the right of the supply curve in Figure 2.A. Let us further assume that the demand curve shifts to $E(p)_t$ some time in the future. The increase in demand is covered by electricity generation using fluid bed coal technology. With the demand curve $E(p_t)$, equilibrium in the electricity market will be characterized by prices that are the same as initial prices, i.e. P_0. The producer surplus equals

Figure 2. A Swedish power market in perfect competiton equilibrium



2 This may be a reasonable description following a deregualtion of the electricity market from 1 January 1996 assuming that the argest electricity producer, Vattenfall, is split up into two equal entities, cf. Bergman and Andersson (1995).

3 A bac,-stop technology is form of energy that is available in virtually unlimited quantities at a given price.

income, P_0X_t, minus the integral under the continuous supply curve[4] at the given production level X_t. The consumer surplus equals to the integral below the demand curve $E(p)_t$ minus the expenses P_0X_t.

Assume the nuclear power stations (X_2-X_1) are decommissioned. The supply curve shifts to the left, and consequently thermal power plants with increasing costs will be applicable at X_1. The market then encounters the price P_0 at a volume of X_0'. The total volume sold in the electricity market is, as before, X_t when the price is defined by the back-stop technology fluid bed coal. The producer surplus now equals income, P_0X_t, less the integral under the new supply curve. The decline in the producer surplus equals $(X_1 - X_2)(P_0 - c_A)$, where c_A is the *short-term marginal cost* of producing nuclear power (capital costs are sunk). In this case, the consumer surplus remains unchanged.

Figure 2.B shows a situation with an upward sloping supply curve ($T(x_t^*)$). This may imply, for example, that fluid bed coal technology is very expensive (e.g. as a result of environmental taxes), and there is a set of technologies with increasing costs and limited scope that may be alternatives to nuclear power generation. Restrictions may, for example, stem from hydropower with increasing long-term marginal costs, limited access to natural gas or gas in large quantities which must be obtained from different sources where extraction and transport costs are rising. Then the volume produced and sold, X_t^* , is less than in the case with a flat supply curve. The price, P_1 , will be higher.

Assume, then, that the nuclear power stations are decommissioned. The costs of decommissioning (including dismantling cost) them are in this case distributed between producers and consumers. The producers sustains a loss in that the volume sold declines to X_3. The initial decline in the producer surplus, however, is offset by a rise in the price of electricity to P_2. The consumer surplus falls since the price rises and consumption declines. The sum of the producer and consumer surplus, therefore, also falls.

The above scenario implies that general economic and energy demand development may influence costs estimates of decommissioning nuclear power stations. It is thus necessary to construct a model in which demand and supply conditions in the electricity market interact in order to analyze these costs. We return to this in section III.

Other consequences

New generation capacity to replace nuclear power can be located where the need for a new supply of capacity is greatest. This reduces the need for investments in new electricity network grids. New fossil fuel based power stations can be established approximately where the nuclear power stations were located, thus resulting in an unaltered need for changes in the existing grid. Imports of electricity can entail considerable grid investments. An increase in hydropower development can also require new grid investments. Where to establish new natural gas based thermal power plants depends on the grid situation and on the choice of gas pipeline routes.

The most important consequence of the new power technology choice is probably linked to its environmental effects. Sweden's goal is to limit its atmospheric emissions of pollutants (including carbon dioxide). With increased thermal power generation, such emissions increase.

Coolants in the nuclear power stations are today not used for heating purposes in Sweden. The efficiency rate of gas-based thermal power plants is higher than the efficiency rate of nuclear power stations, implying that the supply of waste heat per kWh is less. Depending on the location of the new gas-based plants, part of this heat may be utilised.

Dismantling costs

The decommissioning of nuclear power stations entails removing the actual facility and storing the fuel in such a way that it does not cause undesirable pollution. In the short-term, the marginal costs of nuclear power generation (cf. Figure 1) of 1.5-2.0 øre/kWh covers future dismantling costs. If nuclear power plants were decommissioned before their economic lifetime were over, the dismantling costs would not be covered sufficiently. However, the net estimate of cost have take into account that the quantity of waste also will decrease. Let us assume that we shift the phasing out of nuclear power stations from the period 2010-2025 to the period 1995-2010. This results in a decline in the present value (1995 prices) of dismantling costs of a good NKr 6 billion.

III. Economic costs

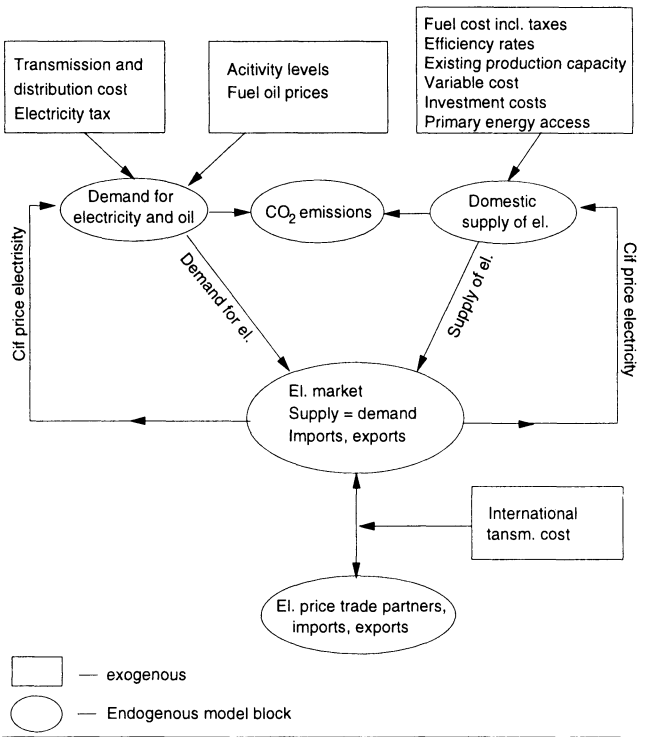
The model

Our analyses uses a *Nordic energy market model* recently developed at Statistics Norway, cf. Figure 3. The supply of electricity in each of the Nordic countries (Sweden, Norway, Finland and Denmark) is specified through both short term and long term marginal cost functions, cf. Figure 1.

Energy demand is specified through separate electricity and oil demand functions for five aggregated sectors in each of the countries. Economic activity (income and production levels) and oil and electricity prices are key factors which determine the demand for electricity. The functions are partly estimated based on country- and sector-specific time-series data and are partly calibrated. A further account of the model is provided in Bye et al. (1995).

Total producer and consumer surplus in the Nordic electricity market is maximized to find optimal electricity produc-

4 It should be noted that here we have defined the producer surplus based on shot-term costs for existing plants and long-term costs for new plants.



tion and consumption distribution. The model is partial in the sense that it does not include the link between changes in energy prices and macro economic development or possible changes in the labor and capital markets. If there are major changes in energy prices, this simplification may mean that the consequences of changes in energy markets are underestimated. This simplification is of less importance if there are only minor changes in energy prices. Such secondary effects are disregarded in this analysis.

Reference scenario

We first establish a reference scenario for the Nordic electricity market. In this scenario, which extends to the year 2030, we use official growth projections for each of the Nordic countries. Average annual economic growth in the Nordic countries is roughly set at about 2 per cent for the entire period. Economic growth varies across sectors. Future output is assumed to show a slight decline in the metals and pulp and paper sectors, while other manufacturing sectors expand by 1.5 per cent annually and service industries are assumed to record an annual growth of 2.5 per cent. Private consumption is set to rise by 2 per cent a year in each of the Nordic countries.

In the reference scenario, it is assumed that all nuclear power stations have a lifespan of 40 years[5]. This means that the first reactor (Oscarshamn I) is decommissioned in 2012. In the following years other reactors are gradually phased out so that all reactors are out of production by the year 2025, cf. Table 1.

Changes in Sweden's operating environment for nuclear power are assumed to have no impact on the world market price for oil or gas. Moreover, it is assumed that carbon dioxide taxes are maintained at the 1991 level prevailing in all the Nordic countries.

It is assumed that there is free trade in electricity between the Nordic countries[6] and that there is an unlimited supply of coal and oil from the world market. In the reference scenario, it is assumed that the fuel efficiency rate of natural gas based thermal power stations is the same in all the Nordic countries. It is hardly realistic to assume that Norway can make use of large quantities of waste heat from natural gas based power stations due to the necessary costly investments in infrastructure. One interpretation of this assumption concerning equal efficiency rates is thus that none of the warm water waste from a natural gas-based power station is used in the production of heat in any of the countries. This may be a correct assumption in a marginal analysis of the decommissioning of nuclear power. However, in an overall context it is not accurate since gas-generated power stations can also replace already existing coal- and oil-fired power stations, in which much of the production of heat is used. In this case, the location of natural gas based power stations in Sweden and Denmark is preferable to their location in Norway[7]. This may reduce our estimated decomissioning cost of nuclear power in Sweden somewhat.

In the reference scenario, it is assumed that the supply of Norwegian gas (from Troll and the Halten banks) is limited to 12 billion Sm^3 per year[8] Coal dust represents the back-stop technology and thus also the long-term alternative value for electricity produced using other technologies like, for example, nuclear power. The back-stop technology is used well before the year 2030 in the reference scenario.

In the reference scenario and all the alternative scenarios, the real price of crude oil is assumed to be around $ 18 p/b throughout the projection period. We assume that for political reasons any *new development* of nuclear power is not acceptable in any of the Nordic countries in the period to 2030. A further review of the growth estimates and other assumptions embodied in the reference scenario is provided in Aune (1995).

5 Some clain that nuclear power plants may live more than 60 years, however, this imply large reinvestments in major components in the plant.

6 Norway deregulated its electricity market in 1991, Sweden has decided to deregulate its electricity market in January 1996 and Finland and Denmark will probably follow in a few years.

7 This is discussed in Bye and Johnsen (1995a).

8 Norwegian natural gas production will more than double over the next ten years - from about 30 billion Sm3 to nearly 70 Sm3 per year. If the entire increase in Nordic electricity demand from the present time until the year 2030 were to be covered by Norwegian gas, this would entail a further increase in Norwegian gas production up to a level of 105 Sm3. An alternative to an unlimited supply of Norwegian gas is discussed in section IV.

Table 2. Changes in the producer and consumer surplus (ΔW) in Sweden and the Nordic countries as a result of decomissioning the Swedish nuclear power stations by 2010. Norwegian Kroner (NOK). Two alternative CO_2 taxes

	ΔW in Sweden Bill.NOK	ΔW Total Nordic countries. Bill.NOK
Reference scenario	-77	-76
CO_2-tax 350 NOK	-113	-84

*Present value 1995-fixed prices.

In the reference scenario electricity prices (c.i.f.) rise in all the Nordic countries, from a real level of about 15-18 øre/kWh in 1991 to about 27-31 øre/kWh in 2030. Prices in the base year were lower than the costs of new power generation capacity. In the subsequent period the prices rise to cover new capacity costs. We employ a discount rate of 7 per cent in the reference scenario[9]. Electricity consumption in the Nordic countries in 1991 amounts to 346 TWh. Consumption rises to 580 TWh in 2030, i.e. an average annual growth of about 1.3 per cent. If electricity prices exhibit a sharp rise, the feedback effects on the macroeconomy may result in slightly lower growth rates. Despite the fact that electricity prices increase by approximately 40 per cent over the period, we do not assume this implies major repercussions in our base scenario. The production capacity in most sectors is established on the basis of higher expected electricity prices than observed in the base year of the model. The low base year electricity prices were partly due to over investment in power generation under the regulated market and large water inflows to the hydro electric plant dominated Scandinavian electricity market in 1991.

In Sweden, electricity prices (c.i.f.) rise from 16 øre/kWh in 1991 to about 29 øre/kWh in 2030. The 2030 price level justify the use of coal dust as a back-stop technology[10]. Consumption rises by 120 TWh from a level of 141 TWh in 1991, i.e. at an average annual rate of about 1.6 per cent.

In the reference scenario, some of the existing power generation capacity is eliminated due to old age. The elimination of old capacity and the increase in demand are met by new supplies of hydroelectric power and gas-generated power in Norway, gas-generated power (Norwegian gas) and coal-based power production in Denmark, and gas-generated power (Russian gas) in Finland. Virtually the entire growth in Swedish power production comes from the use of coal dust-based technology. A change in the assumptions concerning relative efficiency rates for gas-generated power between countries may imply that a higher percentage of gas-generated power production takes place in Sweden and a lower share in Norway. Lower gas-generated power production in Norway will result in higher electricity prices in relation to the reference scenario and lower demand, cf. Bye and Johnsen (1995a).

Phasing out nuclear power stations by 2010

The resolution by the Swedish parliament in 1983 states that nuclear reactors shall be phased out of the Swedish power system by the year 2010. One way of modelling this is to set the lifespan of all reactors to 25 years. This implies that the first reactor, Oskarshamn 1, is taken out of production in 1997 and that the other reactors are decommissioned on a continuous basis after 25 years of production. The last reactor, Forsmark 3, is decommissioned in 2010.

The phasing out of nuclear reactors implies that available gas and other fossil fuels for power generation are used at an earlier stage than in the reference scenario. Thermal power based on coal dust technology is used as early as 2006. The transition from nuclear power to more expensive thermal power entails that electricity prices throughout the Nordic market will be slightly higher in this scenario than in the reference scenario up to the year 2010. The phasing out of nuclear reactors results in changes in energy trade flows, which leads to changes in consumer and producer surplus throughout the Nordic electricity market. These changes, however, are small when we examine the final year 2030, due to the fact that the electricity prices will be approximately equal to the prices in the reference scenario since the back-stop technology is reached in all the scenarios. In the period 2005-2015, however, the changes are more considerable.

The total consumer and producer surplus in Sweden declines by about NKr 77 billion compared with the reference scenario involving a 40-year nuclear plantlife, cf. Table 2. This is distributed as roughly NKr 59 billion less in producer surplus and about NKr 18 billion less in consumer surplus. The loss for the Nordic area as a whole is about the same, with a small positive effect for Norway and Denmark and a slight negative effect for Finland. All these countries register a positive change in the producer surplus, but a reduction in consumer surplus since electricity prices also increase in these countries. The *combined* loss of NKr 77 billion represents about 6 per cent of *one year's* GDP in Sweden.

In the phase-out period for nuclear power, Swedish electricity production falls by about 30 TWh around 2010 as compared to the reference scenario. This reduction in Swedish production will be partly offset by higher imports of electricity, particularly from Finland and Denmark, and partly balanced by an increase in electricity prices and thus lower demand.

9 This assumption is discussed in chapter IV.

10 This estimate is based on Danish calculations of coal dust-generated power costs. There is some uncertainty, however, linked to this estimate. In Sweden, it is assumed that the cost of new coal-based power stations is about 35 øre/kWh. We will return to the importance of this uncertainty in section IV.

Compared to the reference scenario, Nordic *long-term* carbon dioxide emissions will not increase when nuclear plants are decommissioned after a lifespan of 25 years, since all nuclear plants are decommissioned after 40 years anyway . In the *short and medium term*, however, emissions rise sharply. As early as 2010, CO_2 emissions increase by 50 million tons a year (approximately 40 per cent). The increase thus takes place 15 years earlier than in the case with a 40-year nuclear plant lifespan. In a greenhouse effect context (accumulation of climatic gases), this is of some significance. In 2025, the level of CO_2 emissions is the same as in the reference scenario.

Carbon dioxide taxes

In the calculations above, we assumed that the country-specific 1991 levels of taxes on carbon dioxide emissions are maintained over the simulation period. Most Nordic countries have set goals to stabilize their national emission levels in the years ahead. This objective of stabilizing national and/or Nordic emissions[11] will increase the shadow price of the environment (higher taxes) and thus also the shadow price of alternative power generation technologies. This will influence the value of future nuclear power production. In order to illustrate the importance of this, we create an alternative scenario in which we assume that all the Nordic countries in the course of the simulation period have introduced carbon dioxide taxes corresponding to the 1993 Norwegian carbon tax on petrol, i.e. NKr 350/ton CO_2. The tax is introduced in its entirety before the turn of the century.

Compared with the reference scenario, this carbon tax has two main effects in the Nordic electricity market. First, fuel prices (including taxes) for power producers rise. The increase varies for the different technologies. A number of new hydroelectric projects became profitable (the shadow price of protecting waterways increases), natural gas based thermal power becomes relatively more profitable than power generation based on other fossil fuels due to lower carbon dioxide emissions per kWh, other technologies may be used on a greater scale, etc. In our case, however, virtually all available hydroelectric power is utilized in the reference scenario and the supply of gas is limited. Substitution possibilities on the supply side are therefore limited. This would lead to higher prices for electricity and thus lower demand in the market. Second, higher taxes on CO_2 emissions will influence the direct use of fossil fuels elsewhere in the economy (by households and enterprises). On its own, this results in a desired shift from the use of oil and coal to electricity in these market segments. This helps to offset part of the decline in electricity demand through changes on the supply side.

The simulations show that prices (c.i.f.) in the Nordic electricity market may rise by about 20 øre/kWh (about 80 per cent) compared with the reference scenario. This is a result of the introduced tax unless back-stop technologies other than coal are used in this scenario. A higher supply of gas, for example, may reduce the price effect of the carbon dioxide tax. Purchaser prices for electricity show a slightly smaller percentage increase than the sum of production costs and taxes due to constant transmission charges and margins. The total consumption of electricity falls by about 10 per cent[12].

Reducing the economic lifetime of nuclear reactors from 40 years to 25 years in the case with high carbon dioxide taxes reduces the total producer and consumer surplus in Sweden by NKr 113 billion, cf. Table 2. This demonstrates clearly that an active environmental policy focused on nuclear power accompanied by a stringent carbon dioxide tax policy may result in considerably higher costs for Swedish society. Producer surplus including the emission tax increases. The consumer surplus falls sharply as a result of higher electricity prices. The combined loss in the Nordic area is estimated to be NKr 84 billion. The welfare loss for the total Nordic area is then considerably less than the welfare loss in Sweden. This is because the value of already existing power generation capacity in the other Nordic countries (measured as producer surplus) rises.

Table 3. Changes in the producer (including CO_2 taxes) and consumer surplus for Sweden and the Nordic countries as a result of decommissioning Swedish nuclear power stations by 2010. Various alternatives. Billions of 1995-NOK. Compared with corresponding alternative in the reference scenario

	Sweden	Total Nordic countries
Phased out 2010 - 7% Discount rate	-77	-76
Phased out 2010 - 7% Discount rate - 350 NOK/t CO_2	-113	-84
Phased out 2010 - 5% Discount rate	-87	-84
Phased out 2010 - 5% Discount rate- 350 NOK/t CO_2	-168	-106
Phased out 2010 - 5% Discount rate- coal 35 øre/kWh	-122	-111
Phased out 2010 - 5% Discount rate - coal 35 øre/kWh - 350 NOK/t CO_2	-182	-117
Phased out 2000 - 5% Discount rate- coal 35 øre/kWh	-164	-144
Phased out 2000 - 5% Discount rate - coal 35 øre/kWh - 350 NOK/t CO_2	-246	-150
Phased out 2000 - 5% Discount rate- coal 29 øre/kWh	-119	-112
Phased out 2000 - 5% Discount rate- unlimited supply of gas	-112	-106

Present value 1995 - fixed prices.

11 See Bye and Johnsen (1995a) for a discussion of the differences in economic consequences of these two different objectives.

12 It must be assumed that as a result of these price changes, there may be changes in other parts of the economy which are not included here. A calculation of these effects would require a macroeconomic model, and Statistics Norway is now in the process of constructing such a model.

Thus, we see that an active climate policy on the part of Sweden and the other Nordic counties increases the alternative value of Swedish nuclear power considerably.

Shadow price of gas

In the estimations above, we assumed that there was a limited supply of gas from the North Sea (8 Sm^3 from the Troll field and 4 Sm^3 from the Halten banks). In view of the large quantities of power that must be replaced if Swedish nuclear power stations are decommissioned and in view of the long time horizon, the shadow price of gas is considerable. With a larger supply of gas from the North Sea, the back-stop technology for power generation in Sweden also becomes gas-generated power at slightly lower costs than coal dust technology. This results in slightly lower market prices for electricity in the Swedish and Nordic electricity markets and thus also in smaller losses in both the producer and consumer surplus in Sweden with a decommissioning of Swedish nuclear power stations.

Some alternative calculations are meant to illustrate the importance of gas as the back-stop technology instead of coal dust. With a reduction in plant lifespan from 40 years to 25 years, the sum of the consumer and producer surplus in Sweden will falls to NKr 72 billion when gas-generated power is the back-stop technology[13] and carbon taxes are as in the reference scenario. The loss is thus NKr 5 billion less than when fluid bed coal is the back-stop technology. In the carbon tax case, a shift from a plantlife of 40 years to 25 years results in a combined estimated loss of NKr 100 billion, i.e. NKr 13 billion less than in the case where fluid bed coal is the back-stop technology. This shows that the costs of the back-stop technology are important. In the case of gas back stop technology, emissions of carbon dioxide are also lower than with coal dust technology.

IV. Uncertainty

The preceding analysis contains several elements of uncertainty. The risk of accidents or radiation from nuclear power plants is treated just as an argument for decommissioning the plants. An alternative could obviously be to treat the risk explicitly in the model for instance by an additive cost component (or a more complex variant) when calculating nuclear power net income. Another risk aspect is the future risk of global warming which will reduce the benefit from thermal power plants. This kind of risk, however, is not at the focus in this paper.

In addition to the risk of radiation and accidents in nuclear plants and the risk of global warming, other outcomes for uncertain exogenous variables in our model may influence estimated losses resulting from the decommissioning of Swedish nuclear power stations and are, therefore, discussed separately here.

Crude oil prices

The estimate for future oil prices is $ 18 p/b in constant 1991 prices. Other crude oil prices would not have a direct influence on supply side results in the electricity market since the back-stop technology is based on coal dust. The crude oil market can influence the coal market, but the effects are uncertain. Crude oil prices can also influence the electricity market through the market for oil products. Oil is a substitute for electricity, but as long as the back-stop technology is used, this effect will be modest.

Efficiency rates

The efficiency rate for thermal power stations is set here such that only electricity produced and not heated water is utilized. If a way were found to use heat production from a coal- or gas-fired thermal power station, the efficiency rate could be increased by about 10-30 per cent, depending on the percentage of heat that can be used. The welfare losses from decomissioning nuclear plants might then be lower than in our calculations.

Growth estimates

The economic growth estimates used in the reference scenario decide when the back-stop technology is applied in the Nordic power system. This, in turn, influences the size of losses which result from the decommissioning of nuclear reactors in Sweden. Lower growth would entail that the losses from a shift in plant lifespan from 40 to 25 years would be less than those estimated when a non-coal alternative with lower production costs is the back-stop. Higher growth would not result in greater losses since coal dust is already included in existing calculations.

Real interest rate

We have applied a real interest rate and discount rate of 7 per cent in the analysis. A lower real interest rate would result in lower capital costs and thus lower prices in the future. This reduces the estimated loss in producer and consumer surpluse. A lower discount rate, however, would increase the present value of future losses. A lower real interest rate could also influence the relative profitability of various technologies for power generation. The total effect is uncertain. Table 3 shows the estimated loss if the plants are decommissioned after 25 years instead of 40 years when the discount rate is 5 per cent. When carbon taxes are the same as in the reference scenario, the loss is NKr 87 billion, and when carbon taxes are coordinated and equal to NKr 350/ton, the loss is NKr 168 billion in Sweden. In the carbon tax case, the difference between Swedish and Nordic losses is considerable as a result of larger producer surpluses in the other Nordic countries.

13 Here, the price of gas is set equal to the European market price adjusted for transport costs.

Costs of new coal-generated power

In the calculations, we have used current coal-generated power prices for the entire projection period (29 øre/kWh). A lower coal price reduces the losses and higher coal prices induces larger losses. The degree to which the losses change depends in part on to what extent price changes lead to a shift in the back-stop technology. For example, higher coal-generated power costs may mean that oil-based power become the back-stop technology. Thus, higher coal-generated power costs in excess of this back-stop switching level will not result in higher losses. In order to illustrate the importance of uncertain variables in determining coal-generated power costs, we have devised a scenario with coal-generated power costs of 35 øre/kWh. Table 3 shows that the losses for Sweden in the two carbon tax cases are estimated to be NKr 122 billion and 182 billion, respectively (assuming a 5 per cent discount rate).

An alternative decommissioning strategy

In the above analysis, we assume that the lifespan of nuclear power stations is reduced from 40 to 25 years, i.e. that there is a gradual phasing out of the stations. One alternative scenario would be to decommission all the nuclear power stations from, for example, the year 2000. This would place extreme demands on the development rate of new power stations. If it is assumed that the capacity problem could be solved in the course of four years, then the costs of this decommissioning strategy are estimated to be NKr 164 billion without carbon taxes and NKr 246 billion with (assuming a 5 per cent discount rate and coal-generated power costs of initially 35 øre/kWh). There is reason to believe that this calculation seriously underestimates the adjustment costs which may be substantial in the short run. The implementation of this scenario is not at all realistic.

V. Conclusions

The economic cost of decomissioning Sweden's nuclear power plants depends on future supply and demand conditions in the entire Nordic electricity market. Possible changes from both the supply and demand sides in the Nordic electricity market must therefore be taken into account in order to estimate the potential economic losses.

Based on simulations of a Nordic energy market model, we estimate Sweden's economic losses from decommissioning nuclear reactors before their economic lifetimes have been reached to be in the order of NKr 77 billion. About 24 per cent of these losses accrue to consumers of electricity, with about 76 per cent of them accruing to producers.

The other Nordic countries are also influenced by a decommissioning of Swedish nuclear reactors. Electricity producers in the other Nordic countries will experience higher incomes through increased trade in electricity. Consumer will lose since electricity prices increase. Norway, which is an important supplier in the Nordic energy market (of both electricity and gas), will on the whole benefit from Sweden's decommissioning. Denmark will also benefit from a decommissioning of Sweden's nuclear power stations due to its increased producer surplus from existing plants but will also exhibit losses in the consumer surplus.

An active climate policy through higher taxes on Nordic carbon dioxide emissions will increase the welfare loss if Sweden's nuclear power stations are decommissioned compared with a situation in which the 1991 prevailing taxes are maintained. Based on taxes of NKr 350 per ton carbon dioxide, the social losses in Sweden may rise by almost 50 per cent in this scenario compared with the scenario where 1991 taxes are maintained.

There is uncertainty attached to our estimates. The discount rate, coal prices and the supply of North Sea gas available for power generation are all uncertain variables. With - for Sweden - the worst combination of assumptions (low interest rate, high coal-generated power price, high carbon taxes), Sweden's loss may be as high as NKr 180 billion. Based on the same assumptions and a decommissioning of all nuclear power stations as early as the year 2000, the loss is nearly NKr 250 billion.

The North Sea gas supply highly influences the cost estimates of decommissioning Swedish nuclear power stations. In a short time frame, this supply may be limited. In the long run, the shadow price of gas may exceed the development cost and make it profitable to develop more fields in the North Sea in order to cover a Swedish power generation demand. Under the worst scenario for Sweden (low interest rate, high coal-generated power price, high carbon taxes), but with unrestricted access to Norwegian gas, the Swedish welfare loss will only be about NKr 111 billion.

References

Anderson, B. and L. Bergmann (1995): Market Structure and the Price of Electricity: An Ex Ante Analysis of the Deregulated Swedish Electricity Market, *The Energy Journal* **16**, 2, 97-109.

Aune, F.R. (1995): Virkninger på de nordiske energimarkedene av en svensk utfasing av kjernekraften (Effects of phasing out Sweden's nuclear power on Nordic energy markets), Thesis at the Institute of Economics, Reports 34/95 Statistics Norway.

Bergman, L. (1983): I stället för kärnkraft. Energi etter är 2010. Kärnkraftavveckling och energipolitiska strategier. (Instead of nuclear power. Energy after the year 2010. Phasing out nuclear power and energy policy strategies). An economic analysis, Report of 1981 Energy Committee, DsI 1983:19, Ministry of Industry, Stockholm.

Bye, T. and T.A. Johnsen (1995): Prospects for a Common Deregulated Nordic Electricity Market. Discussion Paper 144, Statistics Norway.

Bye T., T.A. Johnsen and H.T. Mysen (1995): Naturgass i et nordisk kraftmarket (Natural gas in a Nordic electricity

market). *Sosialøkonomen* 1995, 2, Association of Norwegian Economists, Oslo.

Bye, T., E. Gjelsvik, T.A. Johnsen, S. Kverndokk and H.T. Mysen (1995): CO_2 utslipp og det nordiske elektrisitetsmarkedet - en modellanalyse (CO_2 emissions and the Nordic electricity market - a model-based analysis). *Tema-Nord*: 1995:539, Nordic Council of Ministers, Copenhagen.

Lundgren, S. (1985): Model Integration and the Economics of Nuclear Power. A study in Applied General Equilibrium Analysis. Doctoral thesis, Economics Research Institute, Swedish School of Economics and Business Administration, Stockholm.

Projections of waste quantities in Norway

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This article presents projections of current statistics on waste in Norway based on the general equilibrium model MSG-EE (Multi-Sectoral Growth - Energy and Environment). The projections are largely based on the same assumptions concerning economic variables as those applied in the Long-Term Programme 1994-1997 (Ministry of Finance, 1993). Generated quantities of waste are found to rise over the simulation period both in terms of per unit produced and per capita. This occurs in spite of the technological change embodied in MSG-EE, which in itself results in reduced quantities of waste per unit produced. Waste in the production sectors are generally linked to the use of tangible factor inputs, i.e. materials used in production (material inputs). During the projection period, material input is expected to become relatively cheaper than other factor inputs, thereby making it profitable to substitute materials for other factor inputs. This substitution effect in most production sectors dominates over increased efficiency due to technological progress. Therefore waste quantities rise faster than does output. The increase in quantities of waste in the period to 2010 is generally about 35-60 per cent, depending on the type of waste. The projections reflects future development, given that no waste reducing actions are taken.

1. Introduction

Large quantities of waste have considerable re-use value and represent an inefficient use of renewable and non-renewable resources. Waste disposal and incineration result in emissions of toxic pollutant gases and greenhouse gases, and seepage from waste disposal sites pollutes ground water and watercourses. The increased concentration of heavy metals and solvents in waste represents an acute risk of damage to humans, animals and vegetation. Furthermore, these hazardous substances can accumulate in the food chain and constitute a future environmental problem. Landfills also occupy large areas of land over long periods. Therefore, greater knowledge concerning potential trends in waste levels and their composition provides important background information for investigation of waste problems.

Macroeconomic models can be used to estimate changes in key economic variables which explain waste quantities. In this analysis, key variables from MSG-EE are used to describe the trends in various types of waste in the simulation period, up to 2010 (cf. Alfsen, Bye and Holmøy (1995) for a description of MSG-EE). The base year used depends upon the data available, see 2.1. The macroeconomic explanatory variables chosen are intermediate consumption of material input (except fossil fuels), production and private consumption. Intermediate consumption of materials as an explanatory factor is subject to technological change. For each type of waste and each waste-generating sector, an evaluation is made of which variable best explains the trend in waste quantities. In these projections, account is also taken of present political decisions when their consequences for future waste quantities can be estimated with some degree of certainty. Possible or probable future political actions are not considered.

Section 2 addresses the statistics underlying the projections, while section 3 summarises the main results. Section 4 discusses how the assumptions in the MSG model and the choice between production and material inputs as explanatory factors influence the projections of waste. Section 5 discusses political actions, while section 6 provides conclusions and a summary.

2. Statistical information and the waste model

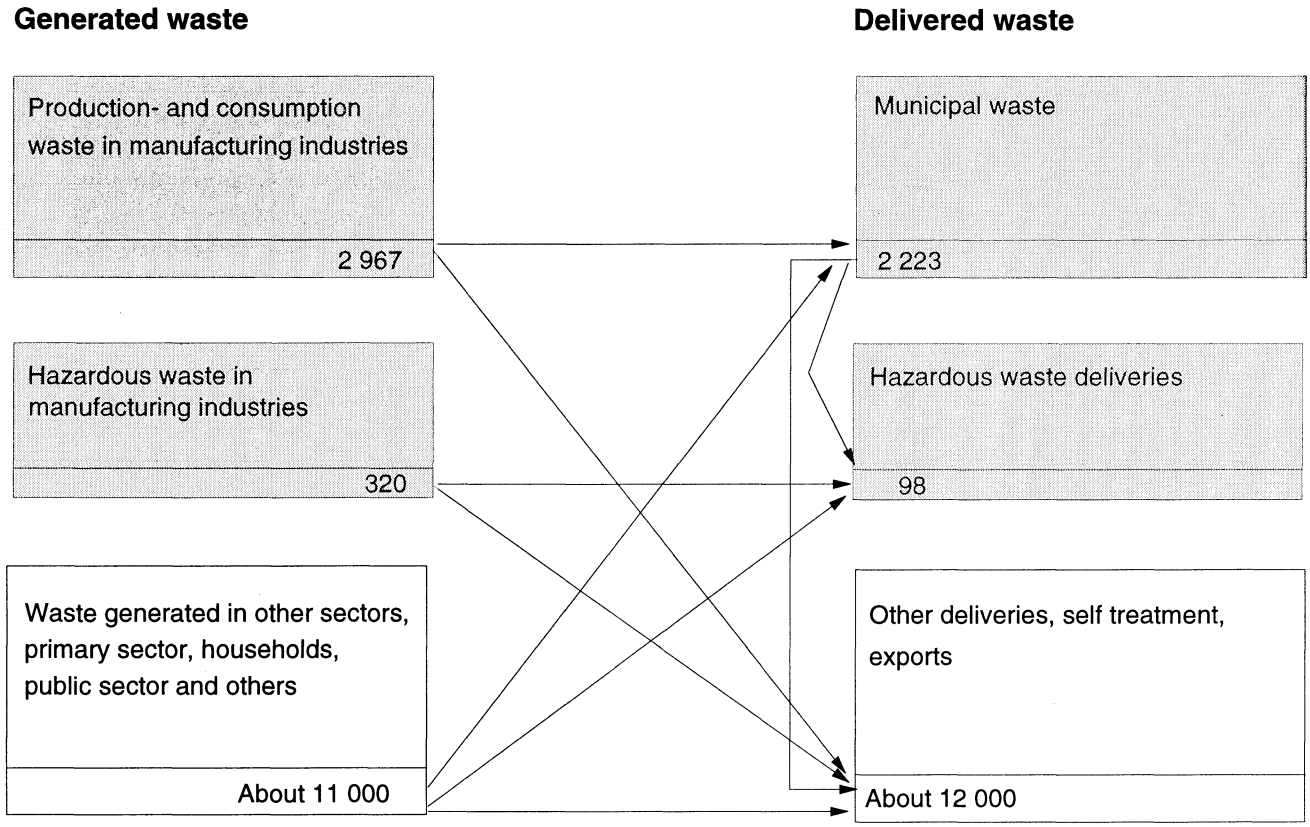
2.1 Waste statistics

When interpreting the results, it is important to be aware that the waste statistics which constitute the basis for these projections do not include all the waste which is actually generated or delivered. Current available statistics do not enable us to determine total current waste levels, and thus neither to predict them in the year 2010.

Figure 1 indicates the amount and sources of generated waste and where the waste is finally delivered in the base year. The shaded boxes represent the areas where reliable statistics are available, and which can therefore be projected. Available data indicates that about 3 million tonnes of production- and consumption-waste are generated in manufacturing industry each year. At the same time, the municipal waste collection system receives nearly 200 000 tonnes of industrial waste. However, there is considerable uncertainty linked to municipal industrial waste deliveries, and it cannot be automatically assumed that municipal industrial waste stems directly or only from generated industrial waste. Moreover, some generated industrial waste is disposed of outside the municipal sector (via recycling, energy utilisation, landfills and disposal sites).

The manufacturing industry generates a little more than 300 000 tonnes of hazardous waste, according to base year statistics. About 20 000 tonnes from the same industries are registered in Norsas' statistics on hazardous waste[1]. Sources of error in the statistics mean that it is not possible to link these waste quantities directly to each other. Some

Figure 1. Relations between generated and delivered waste used in the projections and total. Amounts in 1000 tonnes, 1993 (1992 for municipal waste)



hazardous waste is delivered to municipal disposal sites and the remainder goes to other government-authorised waste disposal facilities, is exported or ends up at unknown and unlawful disposal sites. Some of the hazardous waste delivered to municipal facilities is also sent to hazardous waste disposal sites and is thus registered in both statistics. For the economy as a whole, it is "guestimated" that about 14 million tonnes of waste are generated annually (Norwegian Pollution Control Authority, 1994). These figures are very uncertain, but indicate that in addition to the documented 3 million tonnes of waste in generated by the manufacturing industry, 11 million tonnes are generated for which no official statistics are available.

At the disposal sites, a little more than 2 million tonnes are registered as municipal waste and nearly 100 000 tonnes as hazardous waste in the base year. More than 4 million tonnes are disposed of outside the municipal system, most of which comes from manufacturing industry and the construction sector. Mining waste, which amounts to more than the other types of waste combined, adds further to these "guestimated" total delivered waste levels (Norwegian Pollution Control Authority, 1995). Based on the assumption that total generated waste amounts to 14 million tonnes, about 12 million tonnes must therefore be disposed of outside the registered municipal waste system and hazardous waste disposal sites.

Thus current reliable statistics are not available on the *total* quantity of waste. Since these projections are based on current available statistics, it will not be possible here to use the projections to indicate total future waste quantities.

Data from Statistics Norway (Statistics Norway, 1994) from 1992 are used for municipal waste figures as these statistics comprise all municipal waste collection and disposal systems (for the years 1993 and 1994 only sample data are available). Data on hazardous waste delivered to hazardous waste disposal sites in 1994 are taken from Norsas (1995)[2]. A sample-based survey from Statistics Norway for 1993, Kaurin (1995), is used for waste generated in manufacturing activities.

All waste statistics are divided into production sectors based on the ISIC standard, the UN's international standard classification. These figures are then projected on the basis of data from the MSG model, but the MSG's sectoral classification does not entirely correspond to the ISIC

1 Norsas AS, Norwegian centre for waste and recycling, is owned by the state through the Ministry of Environment, the Norwegian Association of Local Authorities and the Confederation of Norwegian Business and Industry. Anyone operating a hazardous waste disposal depot or involved in the collection or treatment of hazardous waste must have a cooperation agreement with Norsas (Norsas, 1995).

2 These statistics do not contain the quantities which firms are licensed to treat themselves or which are disposed of illegally.

standard. The ISIC classified waste quantities are therefore distributed over the MSG sectors, based on detailed historical data for material input and production from the national accounts and on more detailed statistics on delivered hazardous waste.

One drawback in the projections compared with the statistical base is that certain types of waste come from just a few industries, while the sectoral classification in MSG-EE is relatively aggregated. For these types of waste, the relationship between generated/delivered waste and the explanatory factor will be sensitive to changes in the industry-specific technology or political measures that are not sufficiently captured by MSG-EE.

For further information concerning waste statistics from Statistics Norway, see Austbø and Busengdal (1995), Busengdal (1994) and Kaurin (1995).

2.2 The waste model

The projections are based on an assumption that the relationship between the factors which are assumed to explain generated waste quantities and actual waste quantities is constant over time. The quantity of waste type j in sector i in year t, $A_{ij}(t)$ is calculated using the formula:

$$(1) \quad A_{ij}(t) = U_{ij}(t) \, {}^{*}A_{ij}(t_o) * d_{ij}(t)$$

$U_{ij}(t)$ is an index for the growth in the respective explanatory variable (production, material input, consumption) for waste type j generated in sector i from the base year t_o to year t, $U_{ij}(t_o)=1$. The parameter $d_{ij}(t)$ allows for an exogenous shift in the waste quantity, e.g. effects of various political measures which influence the generation of waste. $U_{ij}(t)$ is generated by MSG-EE model terms and $A_{ij}(t_o)$ is obtained from the statistics mentioned above. t_o is equal to 1992 for delivered municipal waste, 1993 for waste generated in manufacturing industry and 1994 for delivered hazardous waste. The explanatory variables are the value of production, the value of material input or the value of the consumption of goods, all measured at constant prices and evaluated for each type of waste. The total quantity of waste type j is equal to the sum of waste from all the sectors:

$$(2) \quad A_j(t) = \sum_i A_{ij}(t)$$

The projections are based on the assumption that the forecasts of economic variables provided in the MSG-EE model are realised and that there is covariance between the trend in waste and the selected model variables as assumed. Given current knowledge and the uncertainty linked to the above-mentioned assumptions, the existing projections provide the best possible indication of future trends in waste quantities.

3. Results

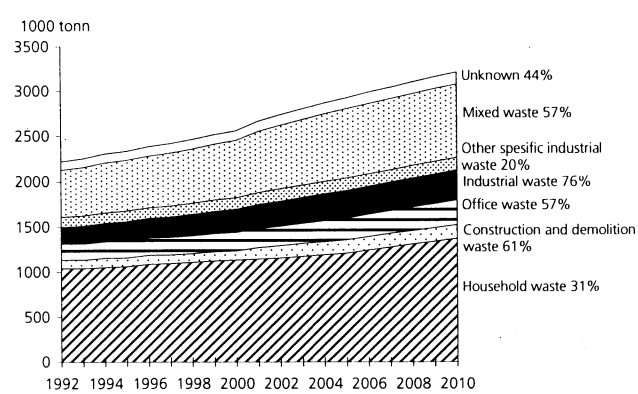
The results of the projections are summarised below. For information concerning the various types of waste within the categories, see Bruvoll and Ibenholt (1995). The increase in waste quantities from 1994 to 2010 is largely in the range 35-60 per cent. Gross domestic product in the same period shows lower growth, 29 per cent, while the growth in total material input is 52 per cent. As noted in section 4, the growth in waste quantities is boosted by the greater use of material inputs as substitutes for other input factors which become relatively more expensive.

3.1 Delivered municipal waste

Figure 2 shows the growth in and amount of various types of delivered municipal waste. According to the projections, municipal waste rises from 2.2 to 3.2 million tonnes from 1992 to 2010, an increase of 44 per cent. The growth in municipal waste over the past 15 years has been nearly 50 per cent.

Of the various categories of municipal waste, industrial waste shows the sharpest rise, 76 per cent, due to relatively strong growth in several industries[3]. Other industry-specific waste, which includes the primary sectors and mining, rises the least with 20 per cent. Growth in construction and demolition waste reflects a projected growth in activity in the construction industry following the turn of the millennium. The category of mixed waste consists of mixed and unspecified waste, and increases proportionally to the rest of industry-specific waste: industrial waste, other industry-specific waste, building and demolition waste and office waste. Household waste, which accounts for 45-50 per cent of municipal waste, is projected to increase by 31 per cent. In 1993, household waste amounts to 244 kilos per capita and by 2010 this rises to 296 kilos due to an increase in per capita consumption.

Figure 2. Growth in municipal waste. 1000 tonnes



3 Manufacturing industry comprises MSG sectors 15-50, and as will be seen in table 1, growth is predicted to be strong in a number of these sectors. At the same time, some of the fastest growing sectors generate a large share of municipal industrial waste; such as Production of intermediate inputs and capital goods.

The statistics underlying these projections comprise all waste delivered to municipal waste disposal sites and consumer waste delivered directly for recycling, i.e. waste which is included in municipal waste collection and disposal systems. In 1993, 68 per cent of this waste was placed directly in landfills, 20 per cent was incinerated, 11 per cent was sorted and recycled and 1 per cent was treated biologically (Norwegian Pollution Control Authority, 1995). The political measures are voluntary schemes primarily focused on increased recycling, and it is therefore probable that the share of recycled waste will rise compared with the share deposited on landfills.

3.2 Delivered hazardous waste

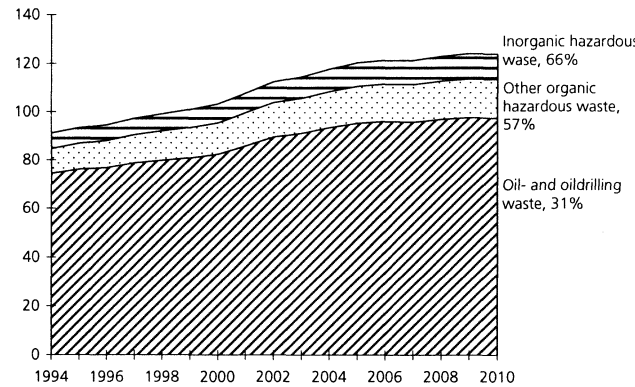
Hazardous waste is waste which cannot be treated together with consumer waste because it leads to serious pollution or is harmful to humans or animals. Establishments that have more than 1 kilo of some hazardous waste in the course of a year are obligated to deliver it to an authorised disposal site. There is considerable variation as to how dangerous the various types of hazardous waste are. Some types can result in acute damages such as poisoning and injuries caused by caustic substances, while others such as solvents can result in chronic injuries to the central nervous system. Others can have long-term effects such as cancer, foetal injuries and reduced fertility. Some types of hazardous waste border on what is considered hazardous waste; for example, some types of acid are not classified as hazardous waste if they are sufficiently diluted in water. When considering the significance of the trend in hazardous substances, the various types of waste must be examined individually.

Possible measures that can increase waste deliveries as a share of total waste generated are not included, with the exception of the reimbursement of the lubricating oil tax (see section 5).

Hazardous waste is divided into three main categories: oil-contaminated and oil drilling waste, other organic waste and inorganic waste. Organic waste can in principle be incinerated, while inorganic waste is non-combustible material. Oil-contaminated waste and waste from oil drilling is treated separately from other organic waste since it accounts for a dominant share of delivered hazardous waste, and is largely dependent on developments in the oil sector. Activity in the oil sector is expected to increase in the years to the turn of the century and is thereafter projected to fall to its 1990 level around the year 2010. There is, however, considerable uncertainty linked to developments in the oil and gas sector; for example, new discoveries in the North Sea could quickly change this scenario.

Figure 3 shows a 36 per cent growth in hazardous waste deliveries from 1994 to 2010. The growth is reduced considerably since oil sector growth is far lower than that in other sectors of the economy; oil-contaminated and oil drilling waste deliveries rises by 31 per cent over the simulation period, while the growth in other organic waste deliveries is 57 per cent, from 10 000 to 16 000 tonnes. The growth in inorganic waste deliveries is 66 per cent, from 6 000 to 11 000 tonnes. Oil-contaminated and oil drilling waste accounts for a large share of all delivered hazardous waste, but the oil sector growth over the period is generally lower than for the other sectors, implying that the share for oil-contaminated and oil drilling waste deliveries falls.

Figure 3. Growth in delivered hazardous waste. 1000 tonnes



The manufacturing industry is currently attempting to replace many of the products which today end up as hazardous waste with products that are less environmentally harmful and hazardous to health. This applies, for example, to organic solvents with halogen. The projection of these types of waste can therefore be interpreted as a projection of products that are the same in terms of use, but which in the future will not necessarily be classified as hazardous waste.

3.3 Waste generated in the manufacturing industry

Figures 4 and 5 depict the growth in waste generated by the manufacturing industry. As noted in section 2, delivered waste is not the same as generated waste.

Figure 4, hazardous waste generated by the manufacturing industry, deviates sharply both in terms of level and growth compared with figure 3, delivered hazardous waste from all industries.

Generated oil-contaminated waste shows a higher growth than delivered oil-contaminated waste since the oil sector is not included in the manufacturing sectors for which statistics on generated waste are available. All in all, generated hazardous industrial waste rises by 58 per cent; oil-contaminated waste by 68 per cent, other organic waste by 61 per cent and inorganic waste by 56 per cent.

As can be seen in figure 5, production- and consumption-waste from manufacturing activities are estimated to rise over the period from 3 to 4.9 million tonnes, or 65 per cent. The main components of this type of waste are wood waste, food, slaughterhouse and fish waste, paper and cardboard waste and slag and sludge. Together these types of

Figure 4. Growth in generated hazardous waste in manufacturing industry. 1000 tonnes

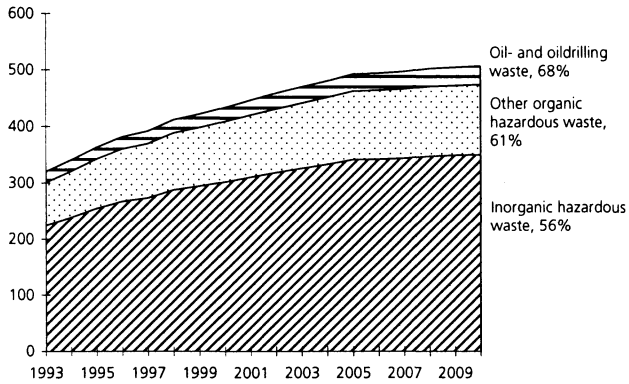
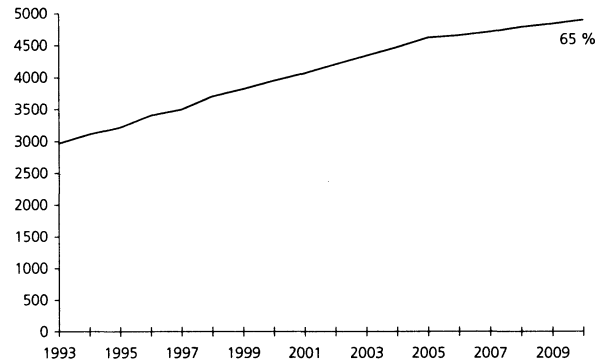


Figure 5. Growth in generated production- and consumption waste in manufacturing industry. 1000 tonnes



waste account for about 70 per cent of the total production and consumer waste in the manufacturing industry. The total figures indicate very little about environmental problems since there are considerable differences in the environmental pressure caused by the various types of waste. For example, both chemicals and gravel, which represent very different environmental pressures and treatment costs per tonne, are included in this type of waste.

The total quantity of hazardous waste and production- and consumption-waste generated in manufacturing activities rises by 64 per cent in the period 1993-2010.

4. Methodology

4.1 Explanatory variables

When projecting possible trends in generated waste quantities, choices must be made with regard to explanatory factors. Waste quantities have previously been projected based on production and consumption growth derived from MSG-EE, see Bruvoll and Spurkland (1995). For household waste, the consumption of goods is still the most obvious explanatory factor. In the case of industrial waste, the explanatory variable choice is between growth in production or in the use of material input in the various sectors. We give an example in order to illustrate the rationale behind the choice of explanatory factor:

In the printing and publishing industry, paper and chemicals (e.g. development fluids and printing inks) are important material inputs, while at the same time a considerable amount of paper waste and chemical waste is generated. Generated waste quantities are largely related to the volume of production, but production is not the only factor. Technological change in the industry may result in better printing machinery which reduces the number of misprints or makes better use of paper. This in turn may increase the number of books produced, with the quantity of paper remaining unchanged. Technological advances may also result in a better use of printing inks and photo chemicals. This reduces the quantity of chemicals used in relation to the quantity produced by the machine. It is thus reasonable to assume that waste quantities do not necessarily increase as much as does production over time, but that the ratio can be reduced through a more efficient use of material input.

A change in the prices of intermediate inputs in relation to other factor input prices, e.g. labour and real capital, can also contribute to a change in the quantity of paper and chemicals used per book produced. If the firm is to invest in a new printing machine, the price of paper is a relevant factor to take into account. If paper is expected to be a relatively expensive factor input, it may be advantageous for the firm to invest in an expensive printing machine that produces less waste paper. But if paper is cheap relative to other factor inputs, it is advantageous to rely on the cheaper printing press even though it generates more waste. If labour is relatively cheap and photo chemicals are expensive, it may be worth while to carry out frequent manual checks to ensure minimal waste of chemicals. On the other hand, if labour is more expensive in relation to photo chemicals, increased waste can be accepted from the private firm's point of view.

Relative changes in the price of factor inputs thus result in a change in the relationship between factor inputs per unit produced. Substitution between factor inputs through a change in prices can result in a change in the quantity of paper and chemical inputs, and thereby the quantity of paper and chemical waste, independent of the quantity produced.

The reasoning above indicates that there are two factors, in addition to the quantity produced, which influence the quantity of paper and chemicals used in the printing and publishing industry: technological progress and factor price substitution. The first factor has the effect, almost without exception, of reducing material input used in production per unit of output, while the second factor may work in both directions. Based on a general analysis, it is not possible to indicate whether the factors reinforce each other, have different effects, or which is strongest. However, with the help of a macroeconomic model which takes account of technological change, price substitution and the

interaction of various sectors, a probable trend can be estimated. By using MSG-EE, we assume that we have arrived at the most likely realistic trend in production and the use of factor inputs in the period to the year 2010. In general, waste is considered proportional to the material input used in production.

4.2 MSG-EE

MSG-EE is a multi-sectoral equilibrium model in which growth in total production is largely determined by technological change, growth in real capital, labour and the supply of raw materials and natural resources. The model, which is a variant of MSG-5[4] has been developed as a tool for analysing the relationship between economic activity, the use of energy and certain environmental aspects (Alfsen, Bye and Holmøy, 1995). The base year in MSG-EE is 1988, and the model is simulated for the period 1988-2030.

The model specifies 33 production sectors and 48 goods, of which 10 are non-competing imported goods and 4 are public goods. The model is a general equilibrium model, entailing among other things that demand is equal to supply in all sectors. Moreover, it requires that domestic producer price equals sectoral unit costs in most sectors, i.e. that rents do not arise.

Constant returns to scale are assumed in the model for most private service sectors, the manufacturing industry and primary industries, and the production functions can be expressed:

$$(3) \quad y_i = F_i(K_i, L_i, V_i, U_i, T_i),$$

where y_i is production in sector (manufacturing) i, K_i is the use of real capital excluding transport capital, L_i is the labour used, V_i is material input used in production, U_i is the use of energy excluding transport fuel and T_i represents transport services used. Factor input is determined in such a way that total production costs are minimised. Material input and real capital are aggregates of the model's goods. Energy is a CES aggregate of fossil fuels (excluding fuel for transport) and electricity. The factor input transport consists of three types of transport capital (cars, boats, aircraft) and transport fuel.

The demand for the various factor inputs is expressed as demand per unit produced:

$$(4) \quad zf = Z_f(EPS, PK, PL, PV, PU, PT)$$

EPS is the rate of technological change, *Pf* is the net purchaser price for factor *f*, *f*=*K,L,V,U,T*. Time series from the national accounts for the period 1962-1989 have been used for estimating these functions. All prices and volumes, except for labour and capital, are normalised to 1 in the base year (1988).

Table 1. Production and material input in selected MSG-sectors in 2010, 1993=1.00

MSG-sector	Production	Material input
15 Manufacture of consumption goods	1,62	1,65
25 Manufacture of intermediate inputs and capital goods	1,94	2,17
34 Manufacture of pulp and paper articles	1,31	1,21
37 Manufacture of industrial chemicals	2,07	1,70
40 Petroleum refining	0,98	0,98
43 Manufacture of metals	1,49	1,41
45 Manufacture of metal products, machinery and equipment	2,27	2,34
50 Building of ships and oil-platforms	0,84	0,83
64 Production and pipeline transport of oil and gas	0,96	1,42
74 Domestic transport	1,38	1,28
81 Wholesale and retail trade	1,55	1,63
83&85 Dwelling services, other private services	1,35	1,43
92S Defence	1,88	1,94
95K Other local government services	1,47	2,49
95S Other central governments services	1,47	2,70

Technological change is initially assumed to be Hicks-neutral within each sector, i.e. that the EPS parameter is the same for all factor inputs in one and the same sector. Thus it does not influence the relationship between the various factor inputs within a sector. It is, however, possible to include factor-specific technological change, for instance to reflect that material input might be used more efficiently relative to other factor inputs in the future.

The reference path used for the projection of waste is approximately the same as in the Long-Term Programme[5], but with a slightly different transport adaptation. In this path average technological change in the production sectors is about 1 per cent annually, i.e. the demand for material input per unit produced falls by 1 per cent annually - *ceteris paribus*. Price substitution between factor inputs, however, has different effects in the various sectors. Thus the total effect of technological change and price substitution varies.

The results of the projections show that the growth in waste quantities is generally higher than the growth in output. This suggest that material inputs are relatively cheaper than other factor inputs and that material input are substituted for other inputs. Table 1 shows the growth in production and material input in some MSG sectors in the simulation period.

A comparison of these growth paths allows us to derive the total effect of technological change and price substitution in the respective sectors. If production grows faster than material input used in production, then either the two

4 A more detailed examination of MSG-5 is found in Nordén (1994).
5 MSG-5 was used for the Long-Term Programme.

effects work in the same direction or technological change is stronger than price substitution. If this is not the case, price substitution works in the opposite direction of technological change and is also stronger. There is considerable variation between the different sectors, but in general it may be concluded that the effect of technological change is weaker than the price effect in most sectors. For example, production growth in the sector Production of intermediate input and capital goods, which includes the printing and publishing industry, is 94 per cent from 1993 to 2010, while material input show a growth of 117 per cent.

What is the reason that material inputs become relatively cheap? A further look at the assumptions underlying the reference path in MSG is required in order to explain these effects.

4.3 Substituting materials for other inputs

The fact that demand must equal supply in all sectors implies that all factor inputs are fully used, e.g. full employment in the labour market. With an estimated output growth of 1.7 per cent annually for the period 1988-2010 accompanied by considerably lower growth in effective man-hours, 0.3 per cent a year, the price of labour will rise. The same applies to energy; electricity prices are assumed to rise due to a common Nordic electricity market and a carbon tax on coal-based electricity production in other Nordic countries[6]. There was excess capacity in the Norwegian electricity market in the model's base year, i.e. the price of electricity was so low that expanding capacity was not profitable. A joint Nordic market is assumed to result in an increase in the demand for Norwegian hydropower, and after some time an expansion of capacity will be desired. Higher marginal costs for hydropower development and increased taxation of fossil fuels will in the long term result in higher electricity prices (Ministry of Industry and Energy, 1993).

When labour and energy become more expensive, attempts will be made to use relatively cheaper factor inputs in production. In principle, the price for transport shows the same increase in all sectors, but in some sectors it rises more than the price of material inputs and in other sectors by less. Among the factor inputs, however, the price of real capital is expected to show the smallest rise in most sectors. In relative terms this factor input becomes the cheapest. It turns out, however, that the use of material input increases faster than total real capital. This indicates that it is easier to substitute material input for input factors which are relatively more expensive than real capital. In the example above it was decided to use more paper and photo chemicals instead of investing in new machinery, which could have performed the work of employees. This may be because the machinery is too expensive in relation to the task it shall perform (due to supplementary functions not required by the firm).

On the assumption that waste is primarily related to the use of material inputs, such economic developments imply that waste rises faster than production in a number of sectors. Technological change in itself contributes to lower quantities of waste *ceteris paribus* (all other factor inputs constant). But in general, the increase in the use of material input as a result of substitution between factor inputs is greater than the reduction as a result of technological advances.

In general, waste is projected with the growth paths for material input. Production is the explaining factor when waste is a residual product of or is in some other way more closely linked to production than the use of material input. For some sectors which contain several types of firms, waste is explained by the use of material input for some of the firms and by production for the others. Based on more detailed historical national accounts figures[7], a calculation has been made of each firm's share of total production in the sector. These figures then provide the basis for determining how much sectoral waste shall be projected by using production trends and how much using growth in material inputs.

5. Political measures

An evaluation has been made of the consequences of waste-reducing political measures. Report no. 44 to the Storting (1991-92) states that the main objective is to solve waste problems in such a way that waste inflicts as little damage as possible on human beings and the natural environment, and that waste and waste management require a minimal use of society's resources. The Government's main strategy is to prevent waste from arising and reduce hazardous substances in waste, to promote re-use, recycling and energy utilisation, and to ensure an environmentally sound final disposal of residual waste (Ministry of Environment, 1995).

So far, most political measures have focused on the last points in the main strategy referred to above. There have been few measures which directly affect the quantities generated. It is difficult to comment on the long-term effects of political measures focused on treatment and how they will influence generated and delivered quantities. For example, industry-organised collection and recycling systems for packaging will increase the costs for those using the packaging, and probably result in reduced quantities of generated waste. Moreover, higher costs for the delivery of municipal waste will probably have demand effects and in turn reduce the generation of waste. This might be a result of requirements concerning cost recovery for waste collection and disposal services in the municipalities. Such effects are uncertain though, and therefore not included in the analysis. However, the present results can be adjusted later if the effects are known.

6 As a result of a common Nordic market, the equilibrium price in Nordic countries will determine the price of Norwegian electricity.
7 Average for the years 1980-1991.

No corrections have been made for municipal waste even though industry-organised collection arrangements for recycling several types of waste have been practised since 1992. This applies, for example to brown paper and car tyres which are included in the 1992 statistics but which are now no longer registered by municipal delivery sites and are thus no longer found in statistics on municipal waste. These industry-organised systems have been and will be established for other types of waste with the same consequences for municipal waste statistics.

There are three reasons why account has not been taken of such agreements in the projections: First, it has not been the intention to comment on the final disposal of waste, but rather on the quantities that are generated. Whether the final disposal of waste is handled by municipal or private companies has no direct bearing on environmental problems linked to waste quantities. Second, it is probably important in the debate concerning future final disposal and waste-generating counter-measures to know the consequences of today's policy. The analysis presented here can be interpreted as the outcome if future measures were not introduced, i.e. as a type of reference path in evaluating foreseen waste-reducing measures. Third, the projections for waste registered in municipal waste collection and disposal systems can be adjusted once experience allows us to indicate possible consequences for generated and delivered waste quantities. The projection of municipal waste shows the growth in the share of generated quantities for which municipal waste collection systems were responsible in 1992.

For delivered hazardous waste, the expected increase in deliveries of waste oil as a result of the reimbursement of the lubricating oil tax is taken into account. Reduced quantities of oil drilling waste due to new chemicals that are not classified as hazardous waste are also adjusted for. No corrections have been made in generated production and consumer waste due to political measures.

The implementation of internal controls in the firms can also result in greater awareness concerning the use of resources and waste generation. Experience has shown that this awareness reveals a potential for substantial internal cost reductions through waste-reducing measures. Higher delivery charges and more stringent controls of random disposal will probably result in waste reductions. The extent of these effects is very uncertain, but they can have a noticeable impact on the figures for all categories of waste covered by the projections.

6. Conclusions

The increase in waste quantities from 1994 to 2010 is generally in the range 35-60 per cent, depending on the type of waste. Municipal waste has risen nearly 50 per cent over the last 15 years. In the next 15 years, waste is expected to rise a further 44 per cent. The growth in waste quantities largely reflects the growth in material inputs, which is 52 per cent in the simulation period. Growth in domestic product is only 30 per cent.

Estimating an increase in waste quantities of 35-60 per cent is *not* the same as saying that waste depositions will rise by the same amount. Many of the political measures that have already been implemented or are in the making are focused on waste management. It is more likely that the quantity of deposited waste will decline in the future. However, this requires that recycling, biological treatment and incineration must rise faster than does waste (35-60 per cent).

Many of the measures will also result in higher charges for the waste delivery, which may provide an incentive for illegal disposal, but which may also contribute to greater attempts to avoid waste generation. This effect has not been taken into account here since today there is no sufficient basis for such an analysis. It is, however, possible to analyse waste-reducing taxes in the form of taxes on material input in the model. A probable result of this is slower growth in use of material input and thus in the generation of waste.

The statistics underlying the projections are not complete, and only parts of generated and delivered waste are covered by satisfactory official statistics. Waste statistics are relatively new concept, and considerable work is currently under way both nationally and internationally in this area, e.g. in the classification of waste categories and the development of a stringent system of concepts. A project has been initiated in Statistics Norway for the elaboration of waste accounts which, in principle, will cover all waste generated and delivered for final disposal. When the statistics have been improved, it will be possible to make new and better estimates of future quantities of waste.

References

Alfsen, K., T. Bye and E. Holmøy (1995): *MSG-EE: An Applied General Equilibrium Model for Energy and Environmental Analyses*, To be published in the series SES, Statistics Norway.

Austbø, T. and A.L. Busengdal (1995): *Utvalgsundersøkelse "Kommunalt avfall 1993", Dokumentasjon og resultater* (Sample survey "Municipal waste 1993". Documentation and results), Notater 95/10, Statistics Norway.

Bruvoll, A. and K. Ibenholt (1995): *Norske avfallsmengder etter årtusenskiftet* (Waste quantities in Norway after the turn of the millennium). To be published in the series Reports, Statistics Norway.

Bruvoll, A. and G. Spurkland (1995): *Avfall i Norge fram til 2010* (Waste in Norway up to 2010). Reports 95/8, Statistics Norway.

Busengdal, A.L. (1994): *Statistikk over "Kommunalt avfall 1992", Evaluering av undersøkelsen og forslag til forbed-*

ringer (Statistics on "Municipal waste 1992". Evaluation of survey and suggestions for improvements). Notater 94/20, Statistics Norway

Ministry of Finance (1993): *Langtidsprogrammet 1994-1997*, St.meld. nr. 4 (1992-93) (Report no. 4 to the Storting (1992-93): Long-Term Programme 1994-1997). (Parts of the report are available in English)

Kaurin, Å (1995): *Statistikk over avfall og gjenvinning. Utvalgsundersøkelse 1994 innen oljeutvinning, bergverksdrift, industri, bygg og anlegg* (Statistics on waste and recycling. Sample survey 1994 in oil production, mining, manufacturing and construction). Notater 95/27, Statistics Norway[8]

Ministry of Environment (1992): *Om tiltak for reduserte avfallsmengder, økt gjenvinning og forsvarlig avfallsbehandling*, St. meld nr. 44 (1991-92) (Report no. 44 to the Storting (1991-92) on measures to minimise waste, increase recycling and ensure an environmentally sound management of waste).

Ministry of Environment (1995): *Miljøvernpolitisk redegjørelse 1995* (Discussion of environmental protection policy 1995).

Nordén, G. (1994): *MSG-5. En likevektsmodell for norsk økonomi* (MSG-5. An equilibrium model for the Norwegian economy). Økonomiske analyser 1994, 3, Statistics Norway, 27-33.

Ministry of Industry and Energy (1993): *Fossile brenslers plass i det norske energimarkedet* (The role of fossil fuels in the Norwegian energy market). Report from a working group.

Norsas (1995): *Årbok for innlevert spesialavfall 1994* (Annual report on delivered hazardous waste 1994), Norsas AS.

Norwegian Pollution Control Authority (1994): *Vårt felles miljø, Avfall* (Our common environment, Waste). TA-664.

Norwegian Pollution Control Authority (1995): *Forurensning i Norge 1995* (Pollution in Norway 1995).

Statistics Norway (1994): *Avfallsstatistikk, kommunalt avfall 1992* (Waste statistics. Municipal waste 1992). Official Statistics of Norway, NOS C 145.

8 An english summary can be found in: Kaurin, Å (1995): Statistics on waste and resycling, Survey conducted in 1994 within the major divisions of industry; oil extraction, quarrying and mining, manufacturing industry and construction industry, Notater 95/37, Statistics Norway.

Economic policy calendar 1995

September

1. Aker Verdal is awarded a contract worth about Nkr 500 million by Phillips Petroleum in connection with the development of Ekofisk II.

8. The oil company Conoco must pay Aker's subsidiary Norwegian Contractors NKr 330 million as compensation for cost increases in connection with the work on the Heidrun platform. Initially, Aker demanded between NKr 500 and 800 million.

9. The US manufacturer of automotive parts A-CMI establishes a factory in Lista. The plant, which entails investments of NKr 260 million, will provide 250 new jobs. Elkem Aluminium will be co-owner and sub-contractor.

18. Oceanor signs a three-year contract worth about NKr 100 million with BPPT, the central directorate for technology and industrial development in Indonesia. The project involves the establishment of a maritime environmental monitoring system, Seawatch.

19. Statoil signs an agreement with Conoco concerning the acquisition of 257 petrol stations in Ireland. The agreement costs Statoil about NKr 500 million and will come into effect at the beginning of 1996.

20. The European Commission gives its approval to a joint venture between the food divisions of Orkla and Volvo on the condition that Orkla sells Hansa Brewery in Bergen so that the new company will not be too dominant in the Norwegian beer market.

21. Statoil awards Aker a supplementary order for more than NKr 130 million. The order with Aker Offshore Partner relates to projects in connection with the gas pipeline Norfra.

22. Selmer is awarded a contract worth NKr 221 million by Oslo Hovedflyplass, the company responsible for the new airport at Gardermoen. Selmer will be the main contractor for the airport's external facades, sun screening and security entry systems.

22. Larsen Oil & Gas in Bergen is awarded a drilling and test production contract worth NKr 140 million on the British continental shelf.

29. Following extensive leaks, Minister of Finance Sigbjørn Johnsen presents proposals for the National Budget for 1996. The budget shows a surplus of NKr 10.6 billion.

October

4. Norway Seafood/RGI sign a contract, worth at least NKr 1.4 billion, to build 16 fishing vessels for Russian shipowners. The vessels, to be built at Brattvåg shipyard, will fish on Russian quotas.

5. Alcatel Kabel Norge signs a contract worth NKr 270 million with Telenor concerning supplies of cables.

7. Brattvåg shipyard signs a contract to build five vessels for a Russian shipping company which engages in fishing on the Pacific coast. The contract is worth NKr 508 million.

17. Statoil enters the battle for the Irish oil company Aran with a bid of NKr 2 billion.

18. Kværner Pulping AB is awarded a contract worth about SKr 185 million by Stora Cell in Sweden.

19. Eeg-Henriksen Anlegg wins a contract for NKr 268 million for building 13 kilometres of the trunk road tunnel between Aurland and Lærdal.

23. Langsten Slip & Båtbyggeri in Romsdal will build a factory trawler for Norway Seafood AS. The contract is worth NKr 400 million. The hull will be built at Tangen Verft in Kragerø.

24. Esso Norge signs an agreement with Smedvig for the purchase of a special vessel SPU 380 for NKr 1.82 billion in connection with the proposed development of the Balder field.

24. Norsk Hydro concludes a long-term contract for drilling production wells for Hydro-operated fields with Odfjell Drilling and Consulting Company. The contract is expected to be worth about NKr 700 million.

31. Raufoss Technology is awarded two major contracts. One is for Canada and relates to sales of M72 for NKr 150 million. The other is a development contract, worth about NKr 75 million, for 30 mm ammunition for the Norwegian Army.

November

1. PLM Moss Glassverk AS is the first company that is denied state aid as a result of the EEA Agreement. The Swedish management evaluates closing the company after EFTA's surveillance body ESA refuses to grant an exemption from the basic tax on beverage containers.

1. A political majority in the Storting advocate a privatization of Ofotbanen. The Norwegian State Railways and Swedish State Railways will each own 24.5 per cent of the shares in the new company, Malmtrafikk AS. The remaining 51 per cent of the shares is owned by the Swedish company LKAB.

2. Veidekke AS concludes a contract, worth about NKr 210 million, for the construction of Amanda Storsenter in Haugesund.

2. Alcatel Telecom Norway wins two contracts, worth altogether NKr 185 million, with the Norwegian Defence. One contract involves the defence's digital network while the other relates to a communications control system for the Air Force.

2. The Russian and Norwegian authorities, through Eksportfinans and the Russian foreign bank Vnjesekonombank, sign an agreement on financing exports of capital goods and ships to Russia. The agreement paves the way for building Russian fishing vessels at Norwegian shipyards.

3. The Ugland Group signs an important contract concerning the transport of oil from the Hibernian oil field off the coast of Canada. The contract entails that Ugland and its Canadian partner will build a tanker reinforced against ice at Samsung in South Korea for NKr 750 million.

3. Carnival Cruise injects USD 50 million in Kloster Cruise, increasing its ownership to two thirds of the company. The capital injection saves Kloster from bankruptcy.

4. The Norwegian State Railways (NSB) is given authorization to sell assets to free up capital. NSB will sell shares in Narvesen for NKr 500 million in addition to properties worth NKr 300 million. The funds will be reinvested in new equipment.

4. Veidekke signs a contract worth NKr 170 million in connection with the construction of Norsk Bransjesenter at Skøyen in Oslo.

8. Norsk Hydro wins a contract worth about NKr 200 million for the sale of Norwegian-produced fertilizer to China. Solberg & Andersen sign a contract worth about NKr 170 million for supplies and training in connection with five drinking water plants.

10. The Government decides to extend shipyard support for several hundred million kroner into 1996 as a result of the failure to reach agreement on the OECD accord which would abolish shipyard support from 1 January.

15. The Ullstein Group is awarded a contract worth NKr 290 million from the Swiss shipping company Care Offshore for building a combined offshore vessel.

17. The Storting adopts a new Securities Trading Act which will come into force on 1 January 1996. The new Act entails changes in capital adequacy rules for securities firms and rules on short sales.

17. Russia, which took over the foreign loans of the former Soviet Union, signs an agreement with creditors after four years of negotiations concerning debt repayments.

18. Haugesund Mekaniske Verksted signs a contract with Norsk Hydro on the construction of the Visund platform. The contract is worth NKr 3.1 billion.

19. Torstein Moland resigns from his post as central bank governor after being given a penalty tax by the Oslo Tax Board due to gross negligence in the so-called Airbus case. Moland has appealed the decision to the Superior Tax Assessment Board.

21. The presidents of Bosnia, Croatia and Serbia sign an extensive peace agreement which may entail the end of a war that has lasted for nearly four years.

21. The Norwegian Competition Authority does not give its approval to the book agreement which regulates the sale of Norwegian books. The Competition Authority demands that the sale of school books and textbooks be exempt from the agreement.

21. The Storting decides to extend Norsk Hydro's electricity agreement for the aluminium plant in Årdal.

22. As expected, OPEC's ministerial council decides to extend the current production quota of 24.52 million b/d into 1996.

23. Negotiations break down between the Norwegian Fishermen's Union and the state concerning a new fisheries agreement for 1996.

24. Along with NCC, Eeg-Henriksen is awarded a contract worth NKr 510 million for internal construction and the terminal building at Gardermoen airport. Including related contracts, the project is worth about NKr 1.1 billion.

30. Odfjell Drilling signs a letter of intent for a three-year contract with Statoil for upgrading an older drilling rig. The contract is worth a good NKr 500 million.

December

1. The Government presents the Final Budget Bill. In spite of the NKr 3.5 billion increase in expenditure after the presentation of the National Budget, the surplus and transfers to the Petroleum Fund rise from NKr 10.6 billion to NKr 12.6 billion.

1. Spain's Foreign Minister Javier Solana is appointed new Secretary General of NATO.

3. Minister of Fisheries Jan Henry T. Olsen orders a halt in all feeding of salmon over two kilos to prevent further surplus production. The ban will apply until 15 January 1996.

Research publications in English

New titles

Reports

Nico Keilman and Helge Brunborg:
Household Projections for Norway, 1990-2020. Part I: Macrosimulations
Reports 95/21:-82, 1995. pp. 82.
ISBN 82-537-4178-2

This report contains projection results for the household structure of the population of Norway during the period 1990-2020. This is the first time that Statistics Norway publishes household projections. The model distinguishes individuals by age (five-year age groups), sex and 15 household positions: a person can be a dependent child, live together with a partner in a consensual union (with 0, 1, 2, or 3+ children), live with a marriage partner (with 0, 1, 2, or 3+ children), live alone, be alone parent (with 1, 2, or 3+ children), be in another position in a private household, or live in an institution for the elderly. Household dynamics are introduced by means of so-called household events, i.e. jumps from one household position to another. The household events are modelled using age- and sex-specific rates. Fertility, mortality and immigration are also included.

A sample of 10,000 households from the November 1990 Population and Housing Census was used for constructing the initial population by sex, age and household position. Special attention was given to the fact that the Census reflects the *de jure* number of private households, which is estimated to be approximately 170,000 below the *de facto* number. Rates for the formation and dissolution of consensual unions, marriages and one-parent families have been estimated on the basis of retrospective information from the 1988 Family and Occupation Survey. Parameters for fertility, mortality, and migration were derived from vital statistics.

According to the six projection variants, the *de facto* number of private households will grow from today's 1.92 million to between 2.37 and 2.62 million in 2020. The most striking result under all scenarios is the strong growth in the number of one-person households, from 740,000 in 1990 to between 1.037 and 1.369 million in 2020. The strong growth in one-person households is explained, to a large extent, by two factors: first, the ongoing general ageing process of Norway's population - particularly elderly women who often live alone - and second, divorce and the break-up of consensual unions, which leads to many middle-aged men who live on their own.

Other persisten trends, independent of the variant chosen, are the relative decline in the number of married couples with children, the growth in lone-parent families, and a strong rise in the demand for places in institutions for the elderly. Consensual unions also show a relative increase but their share in all private households will remain modest.

This report contains only macrosimulation results: the population, broken down by age, sex and household position is projected forward in time. A follow-up report (Part II) will present microsimulation results.

Leif Brubakk, Morten Aaserud, Wilma Pellekaan and Fritz von Ostvoorn:
SEEM - An Energy Demand Model for Western Europe
Reports 95/24, 1995. pp. 66.
ISBN 82-537-4185-5

This report documents an energy demand model for 13 West-European countries believed to be of particular interest for Norwegian energy exports. Each country is treated as a separate block in a demand model, i.e. we are not concerned with the supply of primary energy. Supply of thermal electric power is however modelled. In each country there are six demand sectors: Power production, Manufacturing industries and Services industries, Households, Transportation and Other sectors. All sector models can be thought of as variants of the fuel share approach, except from demand in the sector Other activities which is exogeneously given. Parameters in the model were partly calibrated, using estimates reported in the literature, and partly estimated by Statistics Norway and ECN - Policy Studies. The estimation are reported in an appendix.

Terje Skjerpen:
Seasonal Adjustment of First Time Registered New Passenger Cars in Norway by Structural Time Series Analysis
Reports 95/30, 1995. pp. 35.
ISBN 82-537-4200-2

Within the framework of structural time series models it is shown how monthly unadjusted data can be seasonally adjusted. It is assumed that a time series or the log of it is the sum of three unobserved components corresponding to trend, sesonality and irregularity. For each of these components we assume explicit stochastic processes. Utilizing the State Space Form and Kalman filter techniques the unobserved components can be estimated and the observed time series can be corrected for seasonality. With respect to the seasonal component we comment on two different stochastic specifications which coincide in the generating deterministic case.

To illustrate the application of the structural time series approach to seasonal adjustment, we utilize time series for first time registered passenger cars in Norway from 1973 to 1994. We are also seasonally adjusting this time series using X11-ARIMA, and we apply some practical criteria in order to compare the decompositions obtained from the structural time series models and X11-ARIMA.

Discussion Papers

Jørgen Aasness, Torstein Bye and Hans Terje Mysen:
Welfare Effects of Emission Taxes in Norway
DP no. 148, 1995. pp. 18.

The welfare effects of introducing taxes on emissions of carbon dioxide is analysed within an empirical general equilibrium model of the Norwegian economy. A CO_2 tax regime where we aim at stabilizing the CO_2 emissions at the 1990 emission level in 2020 is compared to a reference scenario without such taxes. In the simulations introduction of CO_2 taxes reduces gross domestic product, but increases net national real disposable income, private consumption and money metric utility. This difference in sign is due to a positive terms

of trade effect, some of the CO_2 taxes will be paid by foreigners through exports. The welfare effects differ from household to household depending on the composition of their total consumption. Poor households are less favourable affected than rich households, due to smaller budget shares for the rich households on consumer goods which imply relatively much CO_2 emissions.

Alexandra Katz and Torstein Bye:
Returns to Publicly Owned Transport Infrastructure Investment. A Cost Function/Cost Share Approach for Norway, 1971-1991
DP no. 154, 1995. pp. 37.

An issue of major concern to politicians and policy-makers around the world today is whether transport infrastructure investments, such as those in roads and airports, generate enough benefits to justify their very large price tag. Beginning in the mid 1970s, nearly all OECD countries experienced a sustained decline both in public investment and in private sector output. Since infrastructure comprises the vast majority of public capital in these countries, this led many economists to conclude that underinvestment in infrastructure was largely responsible for the low growth rates in output and productivity which were experienced by these countries. In our paper, we discuss the findings in the literature with respect to both econometric and modelling deficiencies. Based on these criticisms, we develop a cost function modelling approach which includes public transport infrastructure capital, perform an econometric analysis and discuss several of our estimates of infrastructure productivity effects. The paper concludes that, in nearly all production sectors (except oil/agriculture), the public transport infrastructure investments made in Norway over the last 20 years significantly reduced private production costs and altered demand for private inputs. However, we find such effects to be statistically insignificant at the aggregate level.

Karl Ove Aarbu:
Some Issues About the Norwegian Capital Income Imputation Model
DP no. 155, 1995. pp. 20.

This paper will focus on a particular provision in the Norwegian tax reform of 1992, the imputation of capital income for self employed and small incorporated firms with active owners. A simple user cost model is derived, and this model is used to discuss the impact on investment incentives that stems from imputation of capital income. Within this framework, we discuss potential distortions that stem from certain elements in the Norwegian tax code. The formalized approach allows us to focus more on the assumptions underlying the analysis, and we show that the user cost of capital is dependent on the discount rate. We also use our approach to calculate potential tax wedges. The calculations show that the distortions can be quite large, under realistic assumptions.

Pål Boug, Knut Anton Mork and Trond Tjemsland:
Financial Deregulation and Consumer Behavior: the Norwegian Experience
DP no. 156, 1995. pp. 22.

The present paper uses the model by Campbell and Mankiw (1991) to examine the Norwegian consumer behavior and the role of the financial deregulation during the 1980s. For quarterly data on non-durables and services, we estimate the fraction of current income consumers to be in the range of 37% and 75% before the financial deregulation. This evidence indicates a substantial departure from the rational, forward-looking behavior, and there is thus reason to believe that liquidity constraints did bind the Norwegian consumer behavior until the mid 1980s. Our results further suggest that this evidence has disappeared after the financial deregulation in that the estimated fraction of current income consumers is essentially zero after 1985. This finding is so much remarkable in that hardly any other aggregate time-series data set, from any country, conforms this closely with the forward-looking hypothesis.

Bjørn E. Naug and Ragnar Nymoen:
Import Price Formation and Pricing to Market: A Test on Norwegian Data
DP no. 157, 1995. pp. 23.

This paper investigates the determinants of Norwegian import prices of manufactures over the period 1970(1) - 1991(4). Multivariate cointegration analysis establishes a long-run relationship between import prices, foreign prices, the exchange rate and domestic unit labour costs. Normalized on import prices, the long-run elasticities are 0.63 (foreign prices and the exchange rate) and 0.37 (domestic costs). Deviations from this relationship are highly significant in a structural import price equation, which also contains positive effects of growth in domestic demand and inflation, as well as a negative effect from the Norwegian unemployment rate. The estimated parameters appear reasonably stable within the sample.

Rolf Aaberge:
Choosing Measures of Inequality for Empirical Applications
DP no. 158, 1995. pp. 23.

This paper is concerned with the distribution of income and the problem of choosing summary measures of inequality for empirical applications. By introducing a simple transformation of the Lorenz curve one is led to three measures of inequality, which jointly prove to represent a fairly good approximation of the inequality in a distribution function and also yield essential information about the shape of the income distribution. The paper also demonstrates that this type of inequality measures have an explicit normative foundation as well as an attractive statistical/geometrical interpretation. Furthermore, it is shown that the measures' sensitivity to transfers depend on the shape of the income distribution.

Documents

Knut H. Alfsen, Torstein Bye, Solveig Glomsrød and Henrik Wiig:
Integrated Assessment of Soil Degradation and Economic Growth in Ghana
Documents 95/8, 1995. pp. 44.

Olav Bjerkholt:
Ragnar Frisch and the Foundation of the Econometric Society and Econometrica
Documents 95/9, 1995. pp. 34.

Petter Jakob Bjerve:
The Influence of Ragnar Frisch on Macroeconomic Planning and Policy in Norway
Documents 95/10, 1995. pp. 39.

Reprints

Olav Bjerkholt:
Introduction: Ragnar Frisch, the originator of Econometrics
Reprints no. 78, 1995. pp. 48.
ISBN 1-85278-840-2

Reprint from O. Bjerkholt (ed.): Foundations of Modern Econometrics. The Selected Essays of Ragnar Frisch, Volume I. Aldershot, UK: Edward Elgar, pp. xiii-lii, 1995.

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