Economic Survey 4/91

Economic Trends in Norway

New developments in the perspectives for natural gas trade in Europe

Economic trends in the Nordic countries

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Economic Survey

is published four times a year by the Research Department of the Central Bureau of Statistics of Norway. The issues contain comments and analysis of economic trends in Norway, based on the latest quarterly national accounts data.

The publication regularly presents main figures from the annual national accounts. Other articles are selected from the outcome of various projects in the Research Department.

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was established i 1950.

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The present issue of Economic Survey contains a review of current economic trends in Norway and an outlook for 1991 and 1992. The main source of information is the quarterly national account system, which is based on less detailed information than the annual national accounts. The cut-off date for information used in this publication was 4 December 1991.

Economic Trends in Norway has been prepared by the Research Department in the Central Bureau of Statistics. Inquiries should be directed to Knut Moum or Øystein Olsen.

In addition, the present issue includes a discussion of the future market for naturial gas in Europe, and an overview of the current economic situation in the Nordic countries.

Summary

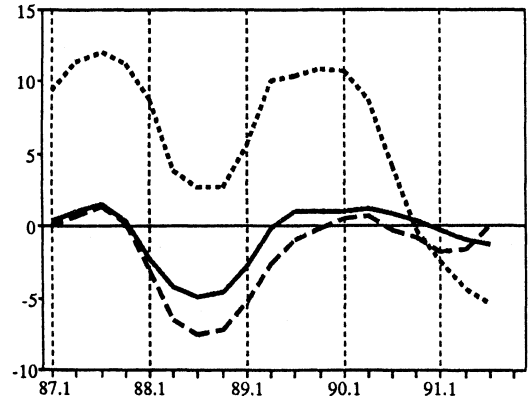
Provisional figures from the quarterly national accounts indicate that demand from mainland Norway is picking up. Private consumption increased by nearly 2 percent from the second to third quarter. Investment demand, on the other hand, remains weak, partly as a result of a continued strong decline in investment in dwellings and other buildings. Manufacturing investment is likely to show a noticeable growth from 1990 to 1991. Investment in manufacturing industry, however, showed a decline in the second and third quarters of this year, and we now expect a weaker trend in the period ahead than previously envisaged.

While production of crude oil reached a record level in the third quarter of this year, traditional merchandise exports continued to fall. This development is related to the weak international economic situation where countries which represent important Norwegian export markets are experiencing sluggish and, in part, negative growth. The forecasts for next year point to stronger economic growth for our trading partners. The picture, however, seems somewhat more uncertain than a few months ago, partly because the projected economic recovery in the US has failed to materialize.

Price inflation in Norway, measured by the Consumer Price Index, has abated considerably thus far in 1991, and will probably be down to less than 3 1/2 per cent for the year as a whole. This is noticeably lower than the rate of price increase for our trading partners. The rate of inflation in other OECD countries, however, is also easing. The growth in wages in Norway is likely to be about 5 per cent in 1991, which is approximately on a par with the previous year.

Projections based on the Central Bureau of Statistics macroeconomic model KVARTS indicate that the mainland economy will grow faster next year than in 1991. Both private consumption and investment in mainland Norway are expected to pick up. According to the calculations, however, this upturn in domestic demand will result in only a modest growth in employment.

CYCLICAL DEVELOPMENT
(Per cent growth from previous quarter.
Seasonally adjusted and smoothed. Annual rates.)



1) Excl. oil and ocean transport.

MAIN TRENDS IN ECONOMIC DEVELOPMENTS
Growth from previous quarter, seasonally adjusted.
Per cent[1)]

	90.4	91.1	91.2	91.3
Demand and output volume indicators				
Final domestic use of goods and services	4.0	-2.1	0.5	-2.8
- Demand from mainland Norway	1.5	-1.5	-1.5	1.5
- Private consumption	-0.4	-0.1	-1.4	1.9
- Government consumption	3.8	-1.9	0.5	1.2
- Gross fixed capital formation, mainland Norway	5.0	-5.2	-4.8	0.2
Eksport	2.6	-0.9	5.3	-1.6
- Traditional goods	-2.9	1.4	-1.1	-2.7
Imports	8.4	-5.5	6.6	-6.0
- Traditional goods	3.7	-5.3	5.9	-4.4
GDP	1.7	-0.3	0.4	-1.0
- Mainland Norway	0.3	-0.4	-0.0	-0.7
Labour market				
Man-hours worked	-0.5	-1.5	0.3	-0.4
Employed persons	-0.2	-1.4	-0.6	2.1
Unemployment rate[2)]	4.9	5.3	5.3	5.6
Prices				
Consumer Price Index[3)]	4.5	3.8	3.7	3.5
Income				
Current balance, NOK bn[4)]	13.1	6.5	10.0	12.7

1) See "Technical comment".
2) Seasonally adjusted levels in per cent.
3) Growth from same period previous year.
4) Unadjusted levels in NOK bn.

International economy: Economic recovery fails to materialize

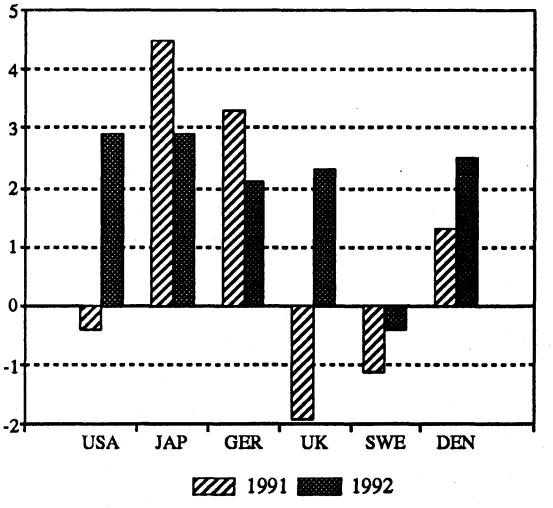
The international economic situation is marked by greater uncertainty concerning the projected economic recovery in the US. After the end of the Gulf war most observers were of the view that conditions were suitable for rising economic growth in the US in the second half of this year and later in 1992 (cf. Economic Survey 3/91). In recent months, however, several economic indicators have shown a weaker than expected trend. It is particularly private consumption that has shown signs of weakening. The background for this seems to be a feature which recurs in the description of the situation in many OECD countries: After a number of years of debt accumulation, households now have a need for financial consolidation and have increased their saving faster than assumed earlier. To stimulate economic activity the Federal Reserve in the US has at various times lowered interest rates on its loans to banks, and the Federal Funds rate is now down to 4 3/4 per cent. Monetary policy, however, has so far not had a visible stimulatory effect on demand.

Reduced expectations concerning the growth potential in the US economy contributed to the sharp drop in share prices on the New York Stock Exchange (and on bourses in most other countries) in mid-November. However, there is reason to assume that this represented an adjustment of expectations concerning the timing and the strenght of the recovery many have waited for. The forecasts still point to an economic upturn in the US towards the end of this year and later in 1992, but there is reason to assume that this may be substantially weaker than earlier recoveries.

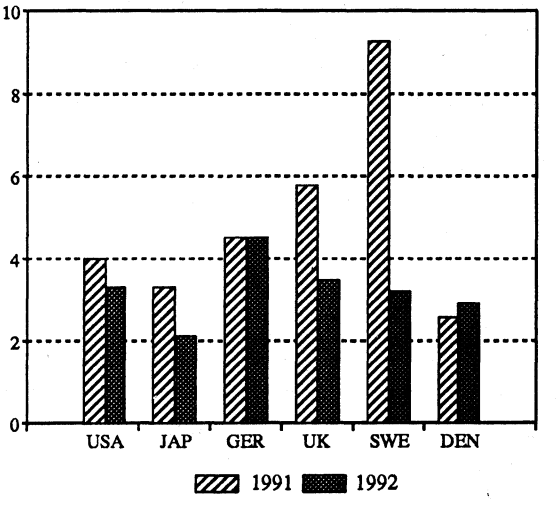
In both Japan and Germany (West) there has been a market slowdown in the rate of growth in production and demand through 1991. In Japan, it is particularly investment demand which is recording a noticeably weaker trend than has been the case in recent years. Private consumption as well is probably now growing at a slower pace than earlier, while exports continued to make a positive contribution to the total production performance.

The nature of the economic situation in Germany is in the process of changing. GNP growth in the West has been reduced, while the East, which has experienced a dramatic loss of production, will probably register positive growth next year. Tax increases were carried out in Germany (West) in July this year to finance transfers and economic measures in the East. Along with rising price inflation and a higher interest rate level, this has contributed to slowing private consumption. Exports to other countries have also exhibited a sluggish trend the past year, while the expansionary policy has contributed to a brisk growth in imports. Hence, for

GNP/GDP GROWTH FOR SELECTED COUNTRIES
Per cent



GROWTH IN CONSUMER PRICES
Per cent



a combined Germany, a current account surplus of DEM 64.5 billion in 1990 will be reversed to a sizeable deficit in 1991 (DEM 32 billion in the first three quarters). Combined with a rise in wages and prices that has been stronger than usual in Germany the last few years, public budget deficits have resulted in renewed upward pressures on the interest rate level. This may counteract a further decline in interest rates in other OECD countries.

In the UK, GDP is projected to fall by some 2 per cent in 1991. The cyclical downturn has resulted in a sharp increase in the number of unemployed; the rise from 1990 to 1991 will be about 600 000. The rate of increase in consumer prices, on the other hand, has been sharply reduced, and the interest rate level has fallen through 1991, from some 15 per cent to about 10 1/2 per cent. Against this background and based on an assumption of a general eco-

nomic upturn internationally, most forecasts expect positive GDP growth next year. There is, however, considerable uncertainty linked to these estimates. Both a delayed turnaround in the US economy and a continued trend towards higher saving in households may entail that the recovery in the UK will be very moderate.

In Sweden, GDP is likely to fall by about 1.5 per cent this year, and a weak trend is expected again in 1992. The cyclical downturn has resulted in a strong rise in unemployment, and the unemployment rate will probably reach 5 per cent next year. As a result of previously sharp increases in prices and wages and reduced competitiveness, Swedish industry has lost market shares. The rise in prices and wages, however, has now been reduced considerably, and in 1992 consumer price inflation may be down to 3-3 1/2 per cent.

Total output and demand are rising in Denmark, but unemployment has nevertheless increased through 1991. The strongest impetus to growth stems from exports, stimulated in part by increased demand from Germany. Due to a low rise in prices and wages over a longer period, there are prospects of a continued positive export performance in the period ahead.

Forecasts for world trade point to a growth in volume of 5-6 per cent in 1992. Norway's export markets will expand more slowly than this, 3-4 per cent, as a result of a particularly sluggish growth in several countries representing important Norwegian export markets. Early in the autumn of this year the price of crude oil showed relatively small variations, with fluctuations between USD 18 and 20 a barrel. Following a steep rise in October, to USD 22.50 a barrel, crude oil prices have now dropped back to less than USD 20 a barrel. At their meeting in November the OPEC countries failed to reach agreement on any new quota limitations, and this may entail slight downward pressures on prices in the next few months. On other commodity markets the situation in 1991 has been marked by low and falling prices. In addition to the international recession, higher exports from the Soviet Union and Eastern Europe have contributed to the weak price performance.

Sluggish trend in exports

The weak international economic situation has resulted in a noticeable deterioration in Norway's traditional merchandise exports in 1991. Exports of traditional goods fell by 2.7 per cent (seasonally adjusted) from the second to third quarter of this year, to a level about 4.8 per cent lower than in the third quarter of last year. More than half of the decline in traditional merchandise exports in the third quarter can be traced to special supply-side conditions. Reduced output as a result of maintenance work at the Mongstad refinery contributed to a decline of 18 per cent in exports of refined petroleum products in the third quarter. Reduced exports of electric power due to lower reservoir levels earlier this year also contributed to the fall in exports.

In spite of difficult market conditions total exports of metals remained virtually unchanged in volume from the second to third quarter, following a decline in the previous quarter. Average prices, however, fell by 2.5 per cent. Exports of export-oriented goods, excluding metals and refined petroleum products, increased slightly.

Exports of import-competing goods were reduced by 1.7 per cent, partly as a result of a decline in exports of engineering products.

Exports of services rose by some 4 per cent from the second to third quarter of this year, partly due to a higher freight volume in the shipping sector. Direct purchases by nonresidents also contributed to the growth. Exports of ships and oil platforms in the third quarter remained at about the same high level as in the previous quarter. Crude oil and natural gas exports fell by 5 per cent after showing a sizeable growth through the previous four quarters. The sluggish trend in petroleum exports in the third quarter is a consequense of extensive maintenance work on the Norwegian shelf in August.

The special supply-side factors noted above will only to a limited extent contribute to a further fall in traditional merchandise exports in the fourth quarter. For 1991 as a whole, it is thus likely that exports of traditional goods will show a decline of some 1 per cent from the previous year.

Signs of growth in private consumption

Demand from mainland Norway picked up slightly from the second to third quarter of this year, following a noticeable decline through the first half of 1991. Private consumption expanded by 1.9 per cent (seasonally adjusted) after having shown negative growth through the previous three quarters. Spending on goods grew by 2.1 per cent, while spending on services, excluding housing services, increased by 1.4 per cent.

In spite of a market increase in household saving in 1990, to a level corresponding to 2 per cent of disposable income, the household sector's net financial wealth is still considerably lower than in the period up through 1984. Along with a continued high real after-tax interest rate level, this indicates a further rise in the savings ratio and a low level of housing investment in the period ahead. A certain liquidity effect from the release of funds accumulated in special savings accounts allowing tax credits (SMS scheme) in September of this year may nevertheless contribute to continued growth in pri-

vate consumption in the fourth quarter, entailing that the growth in consumption for the year as a whole will be close to zero. With a growth in household real disposable income of about 4 per cent, the savings ratio is likely to show a sharp increase in 1991, to a level of about 6 per cent.

Through the first three quarters of this year public consumption was 2.4 per cent above the level in the same period a year earlier. The Government's policy aims at a growth of 2.8 per cent in public consumption from 1990 to 1991.

Private sector hesitant about new investment

The decline in gross fixed investment in mainland Norway came to a halt in the third quarter as a result of a pronounced rise in investment in the public sector and in the power supply sector. The increase in public fixed investment is in line with the revision of policy announced in the Revised National Budget for 1991, but this investment must increase further in the fourth quarter if the estimates for the year as a whole are to be achieved.

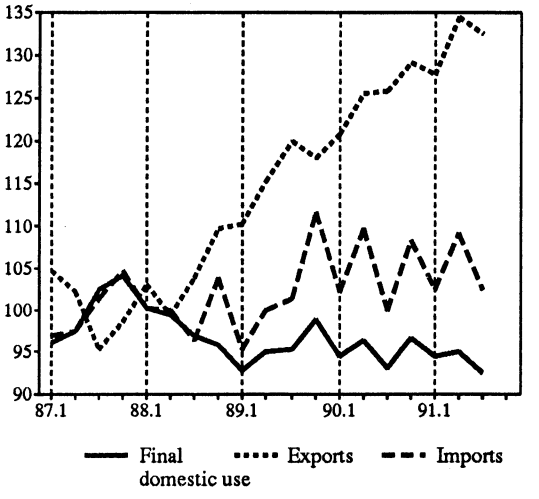
A marked growth in manufacturing investment through the fourth quarter of last year and the first quarter of 1991 was replaced by a decline of almost equal magnitude in the second quarter, and the decline persisted at a slightly slower pace in the third quarter. The Central Bureau of Statistics' investment intention survey for manufacturing and mining in the third quarter indicates that manufacturing investment will expand by about 7 per cent from 1990 to 1991. The growth in manufacturing investment from last year to this year can primarily be ascribed to a steep increase in investment in pulp and paper, and this industry is expected to record a continued growth in investment later in 1992. The decline in housing investment continues with undiminished strength, and investment in 1991 may be reduced to less than 3 per cent of mainland GDP, or half the level recorded in 1987. As a whole, gross fixed investment in mainland Norway is likely to decline by some 6 per cent this year.

According to the investment intention survey for oil activities in the third quarter, accrued investment costs will rise by more than NOK 14 billion at current prices from 1990 to 1991. This growth approximately corresponds to the level of total manufacturing investment in Norway in 1990, and represents a direct demand stimulus equivalent to about 2 per cent of mainland GDP on an annual basis.

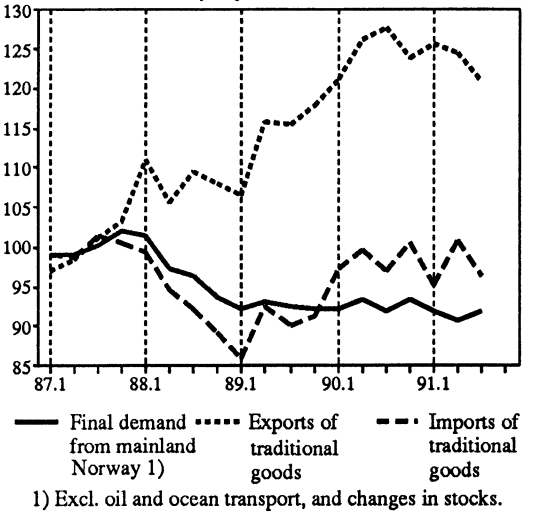
Continued little change in imports

Adjusted for normal seasonal variations, traditional merchandise imports fell by 4.4 per cent in the third quarter following a slightly stronger increase in the

TOTAL EXPORTS, IMPORTS AND FINAL DOMESTIC USE
1987 = 100. Seasonally adjusted

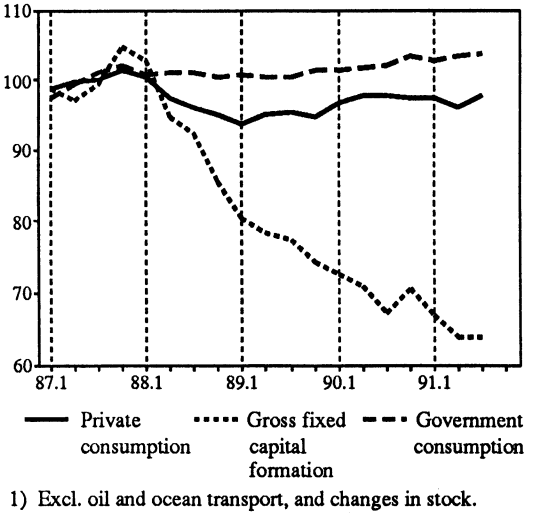


EXPORTS, IMPORTS AND DOMESTIC DEMAND, MAINLAND NORWAY
1987 = 100. Seasonally adjusted



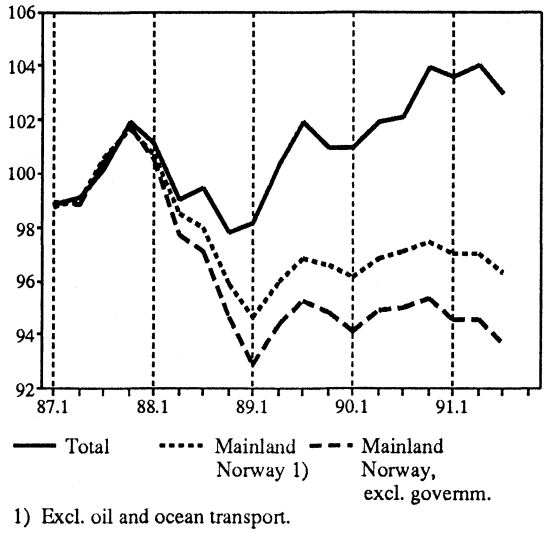
1) Excl. oil and ocean transport, and changes in stocks.

CONSUMPTION AND FIXED CAPITAL FORMATION, MAINLAND NORWAY 1)
1987 = 100. Seasonally adjusted



1) Excl. oil and ocean transport, and changes in stock.

GROSS DOMESTIC PRODUCT
1987 = 100. Seasonally adjusted



1) Excl. oil and ocean transport.

previous quarter. Major purchases of aircraft and submarines have contributed to sizeable fluctuations in imports of traditional goods the past two years, and will also contribute to a seasonally-adjusted growth in imports in the fourth quarter of this year. For the year as a whole, traditional merchandise imports will remain approximately unchanged from last year.

Decline in activity in goods-producing industries

Mainland GDP fell by 0.7 per cent in the third quarter of 1991, after declining slightly the first six months of the year. Manufacturing output fell by 4 per cent following a growth of some 3 per cent in the third quarter. The reduction in output was most significant in import-competing manufacturing sectors in spite of some growth in domestic demand. Production in the power supply sector fell further in the third quarter. The reduction in power production in 1991 must, however, be viewed in light of unusually high production in 1990 as a result of considerable precipitation.

Continued growth in private and public consumption in the fourth quarter and a flattening out of exports will contribute to a slight growth in mainland GDP towards the end of the year (seasonally adjusted). Output growth in mainland Norway for the year as a whole may thus be about the same as last year (0.7 per cent), or slightly lower.

Weak trend on the labour market

According to the Central Bureau of Statistics' Labour Market Survey (LMS), there was a decline in the number of man-weeks worked from the second to third quarter, while the number employed increased markedly. Due to special conditions linked to the implementation of the LMS in the second and third quarters of this year, however, there is reason to assume that the number employed may be underestimated in the second quarter and overestimated in the third quarter.

According to the LMS, the labour force has generally moved in tandem with employment. In the third quarter, however, there was a tendency towards an increase in the number of people unemployed (seasonally adjusted), in spite of the reported growth in employment. A trend towards higher unemployment through 1991 can also be seen from the labour market authorities' observations for the total number of registered unemployed and people participating in labour market measures (excluding rehabilitation). Based on developments through the first three quarter of this year, it may be concluded that LMS unemployment on an annual basis will be slightly higher in 1991 than in 1990.

Slower rise in consumer prices contributing to growth in real wages

The year-on-year increase in consumer prices fell from 4 per cent at the beginning of 1991 to 2.5 per cent in October. The very low rise in prices in the 12-month period to October 1991 is primarily due to the effect of the Gulf crisis on oil prices last year. The underlying rise in prices, however, is also low as a result of a sluggish trend in domestic demand, a moderate growth in costs and a low rise in import prices. On average, consumer prices will probably rise by a little less than 3.5 per cent from 1990 to 1991, representing the lowest rate of price inflation in Norway since 1969.

Viewed as a whole, the carry-over from 1990 and the pay increases granted in connection with this year's wage settlements will contribute 3.1 percentage points to the annual growth in wages for groups covered by the Norwegian Federation of Trade Unions and the Norwegian Confederation of Business and Industry. The wage indices for manufacturing and building and construction for the second quarter indicate a growth in hourly wages from the same quarter one year earlier, of 8.1 and 5.4 per cent, respectively. The sharp rise in wages in the second quarter is related to the fact that the pay settlement this year, as usual, had an effect on wages in the second quarter, while last year retrospective payments were made in the third quarter. The growth in wages will therefore slow in the second half of this year. For the economy as a whole, average wages will rise by nearly 5 per cent from 1990 to 1991. This will result in a growth of about 1.5 per cent in real wages before taxes.

Oil and gas exports contribute to sizeable current account surpluses

Provisional figures for the balance of payments show a current account surplus of some NOK 29 billion for the first three quarters of 1991, almost NOK 20 billion more than in the same period last year. The sizeable increase in the current account surplus thus far this year may primarily be ascribed to a considerable growth in the value of crude oil and natural gas exports. Net exports of services have also increased in value, and a decline in the value of traditional merchandise imports is contributing to reducing the deficit on the balance of trade for such goods by nearly NOK 2 billion. The decline in both the price of crude oil and the dollar exchange rate from the third to fourth quarter, combined with a slight rise in imports of traditional goods, will result in a lower current account surplus in the fourth quarter. For the year as a whole the surplus can now be estimated at some NOK 35 billion, NOK 13 billion higher than in 1990.

Stronger growth in Norwegian economy in 1992, but continued high unemployment

This issue of Economic Survey also contains a model-based projection of macroeconomic developments in Norway for the period to end-1992. GDP growth for mainland Norway in 1992 is now projected at 1.5 per cent. It is estimated that such a development will only generate a marginal growth in employment and a slight increase in unemployment. The most important reason for the downward revision in growth prospects compared with earlier forecasts is a weaker than expected trend for traditional merchandise exports.

The decline in oil price and the dollar exchange rate in addition to lower traditional exports entail that the forecasts for Norway's current balance have been revised downwards. Due to a record production of crude oil, however, it is still likely that Norway's current account will show a surplus of more than NOK 30 billion in both 1991 and 1992.

It is assumed that the decline in mainland fixed investment will come to a halt in 1992, partly as a result of a vigorous growth in public sector investment and a levelling off of the decline in housing investment.

In the new projections it is still assumed that private consumption will show an upturn in the second half of 1991 and in 1992, entailing that the annual growth for 1992 will be 3 per cent. Due to a continued need for financial consolidation in the household sector, however, the uncertainty concerning household saving behaviour is particularly large. We have therefore made an alternative calculation in the model in which we have analysed the effects of a further 1 1/2 percentage point increase in the household savings ratio in 1992 compared with the original model path. The most important effects of this tightening in the household sector is a halving of the growth rate for mainland GDP and an improvement in the current balance as a result of lower imports. Employment declines by about 5 000 people compared with the original path. The effect on the rise in prices and wages is negligible in 1992.

DEVELOPMENT TRENDS IN SELECTED MACROECONOMIC VARIABLES

Percentage change in volume in 1989 prices [1)]

	NOK billion	Growth from same period previous year				Growth from previous quarter seasonally adjusted			
	1990	90.4	91.1	91.2	91.3	90.4	91.1	91.2	91.3
Private consumption	320.2	2.4	0.3	-1.6	0.1	-0.4	-0.1	-1.4	1.9
Goods	201.6	2.3	-0.0	-2.1	-0.2	-1.5	-0.1	-1.0	2.1
Services	107.9	2.8	2.5	2.6	3.9	1.5	1.4	-0.5	1.0
Norwegian consumption abroad	20.4	-0.1	-16.7	-16.7	-6.9	-0.0	-13.2	-0.1	7.5
- Non-residents' consumption	9.8	-0.9	-14.5	4.4	14.9	1.2	-9.2	20.3	4.2
Government consumption	134.2	3.7	3.2	0.6	3.5	3.8	-1.9	0.5	1.2
Central government	53.8	5.6	6.5	-0.8	6.8	7.5	-3.5	0.2	2.7
Civilian	32.8	5.4	5.5	1.2	10.3	6.7	-0.6	-0.2	3.9
Military	21.0	5.8	8.4	-3.8	0.5	8.8	-8.0	0.9	0.7
Local government	80.4	2.2	1.4	1.6	1.5	1.4	-0.8	0.6	0.3
Gross fixed capital formation	122.3	-29.5	-7.3	1.9	3.6	15.3	-6.8	5.0	-17.0
Oil and shipping	25.9	-61.0	8.4	37.2	41.3	30.3	4.4	-21.1	-2.0
Mainland Norway	96.3	-6.9	-11.0	-8.9	-5.0	5.0	-5.2	-4.8	0.2
Manufacturing and mining	13.4	14.6	14.8	11.1	6.4	11.6	9.4	-9.3	-5.2
Production of other goods	13.3	-14.9	-15.6	-3.2	7.9	0.6	-3.9	4.8	6.8
Other services	69.6	-9.3	-14.2	-13.9	-9.9	4.5	-8.5	-5.6	0.0
Stocks (contribution to GDP growth)	16.2	(4.1)	(-0.5)	(-0.2)	(-2.0)	(0.1)	(-2.0)	(2.0)	(-1.7)
Ships and oil platforms in progress (contribution to GDP growth)	11.7	(2.1)	(-0.3)	(-1.4)	(-1.1)	(-0.7)	(-1.2)	(1.4)	(-0.5)
Other stocks[3)] (contribution to GDP growth)[4)]	4.4	(2.0)	(-0.2)	(1.2)	(-0.9)	(0.8)	(-0.8)	(0.6)	(-1.2)
Final domestic use of goods and services	592.8	-2.8	-1.1	-0.6	-0.6	4.0	-2.1	0.5	-2.8
- gross capital formation in oil and shipping (incl. stocks)[2)]	37.7	-47.5	0.4	5.5	4.5	..	..	..	..
- demand from mainland Norway	550.7	0.9	-1.0	-2.3	0.0	1.5	-1.5	-1.5	1.5
Exports	281.8	8.6	4.2	8.1	6.1	2.6	-0.9	5.3	-1.6
Traditional goods	119.6	4.1	0.5	0.4	-4.8	-2.9	1.4	-1.1	-2.7
Crude oil and natural gas	74.8	11.9	17.6	24.6	16.1	11.2	2.5	6.3	-5.0
Ships and oil platforms	10.8	69.2	-15.6	13.7	62.1	2.8	-25.0	113.4	-1.4
Services	76.7	7.3	-0.7	4.0	6.3	3.2	-5.0	3.5	4.1
Total use of goods and services	874.6	0.6	0.6	2.3	1.5	3.5	-1.7	2.1	-2.4
Imports	240.7	-3.4	-1.7	0.8	3.0	8.4	-5.5	6.6	-6.0
Traditional goods	150.1	9.3	-4.6	2.7	-0.1	3.7	-5.3	5.9	-4.4
Crude oil	1.4	129.3	0.3	5.1	-47.5	2.5	-30.4	176.3	-73.4
Ships and oil platforms	18.7	-51.9	7.8	-24.2	-7.9	99.0	-23.1	7.0	-44.2
Services	70.5	1.6	2.5	5.1	11.1	3.6	-0.0	5.8	2.6
Gross domestic product (GDP)	633.9	2.2	1.4	2.9	1.0	1.7	-0.3	0.4	-1.0
- Mainland Norway	533.6	0.1	-0.5	1.1	-0.5	0.3	-0.4	-0.0	-0.7
Oil activities and shipping	100.3	14.1	11.6	12.7	10.2	9.6	0.2	2.6	-2.2
Mainland industry	493.5	-0.2	-0.4	1.2	-0.7	0.2	-0.2	-0.1	-0.9
Manufacturing and mining	92.4	-0.3	-3.0	3.2	-2.7	-0.1	-1.9	3.4	-4.0
Production of other goods	71.3	-7.1	-2.3	-8.4	-7.6	-3.1	1.1	-5.0	-2.0
Other services	329.8	1.5	0.8	2.4	1.7	1.0	0.1	-0.0	0.2
Correction items[5)] (contribution to GDP growth)[4)]	40.1	(0.2)	(-0.1)	(-0.1)	0.1	2.0	-3.3	0.9	1.6

[1)] Notes, see "Technical comment".

PRICE INDICES FOR SELECTED MACROECONOMIC VARIABLES

	Percentage change from the same period the year before				Growth from previous quarter, seasonally adjusted. Per cent			
	90.4	91.1	91.2	91.3	90.4	91.1	91.2	91.3
Private consumption	4.7	4.4	4.0	3.6	1.2	0.9	0.6	0.8
Government consumption	4.7	5.4	4.5	3.8	1.9	0.8	0.0	1.0
Gross fixed captial formation	2.3	2.9	3.7	4.8	1.0	0.7	3.1	2.2
- mainland Norway	2.0	1.4	2.1	2.1	0.8	-0.9	0.8	1.3
Final domestic use of goods and services	4.4	4.4	4.3	4.1	1.3	0.8	1.0	1.1
- demand from mainland Norway	4.2	4.2	3.8	3.5	1.3	0.6	0.5	0.9
Exports	14.2	2.7	9.2	2.2	13.3	-10.9	1.6	-0.2
- traditional merchandise exports	2.8	0.7	3.1	0.9	6.8	-4.4	0.5	-1.8
Total use of goods and services	7.6	3.8	5.8	3.4	5.1	-3.2	1.2	0.7
Imports	0.2	-1.3	0.6	3.2	1.1	-1.6	1.8	1.7
- traditional merchandise imports	-0.4	-3.0	-0.2	0.9	0.2	-2.4	2.5	0.6
Gross domestic product (GDP)	10.4	5.7	7.8	3.5	6.7	-3.9	1.1	0.2
- mainland Norway	3.9	5.5	4.3	3.8	2.4	1.5	-0.2	0.5

TECHNICAL COMMENT ON THE QUARTERLY ACCOUNTS FIGURES

Footnotes: 2) Including ships, oil platforms and platform modules in progress. 3) Excluding ships, oil platforms and platform modules in progress. 4). Contributions to GDP growth are calculated as the difference between corresponding figures calculated as a percentage of GDP. 5). Corrected for free bank services and certain excises.

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. The quarterly national accounts figures for the years up to and including 1989 have been reconciled against the most recently published annual accounts figures.

Gross fixed capital formation: Total gross fixed capital formation is heavily influenced by significant fluctuations in investment in oil activities. These fluctuations are inter alia due to the fact that platforms that have been under construction for several years are counted as investment in the quarter and with the capital value they have at the time they are towed out to the field.

Seasonally-adjusted figures: The quarterly national accounts are not seasonally-adjusted, as these accounts are attempts to register the actual transactions that have taken place in each quarter. Many of the statistical series thus show clear seasonal variations. These are therefore seasonally adjusted on the detailed accounts level and then added together with the other statistical series to obtain the figures presented in the tables and charts of this volume. Seasonal adjustments for the public sector's purchase of goods and services are based on estimates, as there is not enough information available yet to map out the seasonal pattern.

Underlying trend: The Norwegian economy is so small that random or single important occurrences can give wide variations in the figures. The seasonally adjusted figures are therefore smoothed so that it is possible to find the underlying trend for each series. Smoothing is an attempt to distinguish between random and systematic variations in the series.

REVISIONS OF UNDERLYING TREND

Per cent growth from previous quarter. Seasonally adjusted and smoothed. Annual rates

Publ.	87.4	88.1	88.2	88.3	88.4	89.1	89.2	89.3	89.4	90.1	90.2	90.3	90.4	91.1	91.2	91.3
						GDP mainland Norway										
Sept.-88	0	-1	-1													
Dec.- 88	1	0	-1	-2												
Feb.- 89	1	0	-1	-1	-2											
June -89	2	0	-2	-3	-4	-3										
Sept.-89	2	-1	-2	-4	-4	-2	1									
Dec.- 89	2	0	-2	-4	-4	-2	1	3								
Feb.- 90	2	0	-2	-3	-3	-1	2	3	2							
June -90	-1	-3	-4	-4	-3	-1	1	1	0	-2						
Sept.-90	-1	-3	-4	-4	-3	-2	1	1	1	1	3					
Dec.- 90	-1	-3	-4	-4	-3	-2	1	1	1	2	3	3				
Feb.- 91	-1	-3	-4	-4	-3	-1	1	2	1	1	2	2	2			
June -91	-1	-2	-4	-5	-5	-3	0	1	1	1	1	1	0	-1		
Sept.-91	-1	-2	-4	-5	-5	-3	0	1	1	1	1	1	0	0	-1	
Dec.-91	-1	-2	-4	-5	-5	-3	0	1	1	1	1	1	0	0	-1	-1
						Final demand from mainland Norway										
Sept.-88	0	-2	-4													
Dec.- 88	0	-2	-4	-4												
Feb.- 89	0	-3	-5	-4	-3											
June -89	0	-3	-5	-5	-4	-3										
Sept.-89	0	-3	-6	-7	-6	-4	0									
Dec.- 89	0	-3	-5	-6	-6	-5	-2	0								
Feb.- 90	0	-3	-5	-6	-6	-4	-2	0	1							
June -90	0	-3	-6	-7	-7	-4	-2	-1	-1	-1						
Sept.-90	0	-3	-6	-7	-7	-5	-2	0	1	2	3					
Dec.- 90	0	-3	-6	-7	-7	-5	-2	-1	0	1	2	2				
Feb.- 91	0	-3	-6	-7	-7	-5	-2	0	1	1	2	2	2			
June -91	0	-3	-6	-8	-7	-5	-3	-1	0	1	1	0	0	-2		
Sept.-91	0	-3	-6	-8	-7	-5	-3	-1	0	1	1	0	-1	-2	-3	
Dec.-91	0	-3	-6	-8	-7	-5	-3	-1	0	1	1	0	-1	-2	-2	0

COMMENTS ON THE REVISIONS

Revisions can either be due to new/revised quarterly figures for the current year, new/revised annual national accounts figures for previous years, or a change to a new base year for prices. Because the growth rates following the change-over to an annual rate are rounded off to the nearest whole per cent, a 1 percentage point change in the growth rate can be due to different rounding.

Published:	Price basis:	New annual accounts:	Other comments:
Sept.-88	1986	1985-87	
Dec.- 88	"		
Feb.- 89	"		
June -89	1987	1986-87	
Sept.-89	"		Revised seasonal adjustment programme
Dec.- 89	"		
Feb.- 90	"		
June -90	1988	1987-88	
Sept.-90	"		
Dec.- 90	"		
Feb.- 91	"		
June -91	1989	1988-89	
Sept.-91	"		
Dec.- 91	"		

Outlook for 1991 and 1992

Projections of macroeconomic developments in Norway for 1991 and 1992 are presented in this section. The calculations have been made by running the Central Bureau of Statistics' macroeconomic quarterly model, KVARTS. The main results from the calculations are presented in the table below, which also includes projections from other institutions. For some key variables the results from the KVARTS calculations are also shown in diagrams as seasonally adjusted levels or as seasonally adjusted and smoothed growth from the previous quarter.

The forecasts are based on the following main assumptions:

- Rising growth in demand for Norway's main trading partners in 1992.
- Relief in direct taxes in 1992 for households amounting to about NOK 5 billion.
- The release of funds accumulated in special savings accounts (SMS scheme) will generate a stimulus to consumption totalling about NOK 2 billion. We have assumed that about one fourth of this stimulus will appear in 1991 and the remainder in 1992.

In the calculations, output growth in mainland Norway is estimated at 0.6 per cent in 1991, or about the same as the previous year, and 1.5 per cent in 1992. A growth in public consumption and in investment activity in the oil and gas sector will make a positive contribution to growth in the Norwegian economy in 1991. In 1992, an upturn in private consumption as well as higher demand in our trading partner countries will also generate a positive impetus to output growth.

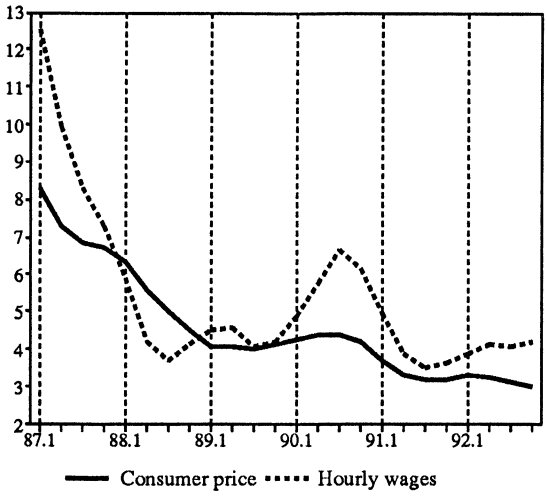
The most important change in the forecast for 1991 compared with projections presented in Eco-

THE DEVELOPMENT OF MAIN ECONOMIC INDICATORS
Percentage change in volume from previous year unless otherwise noted[1)]

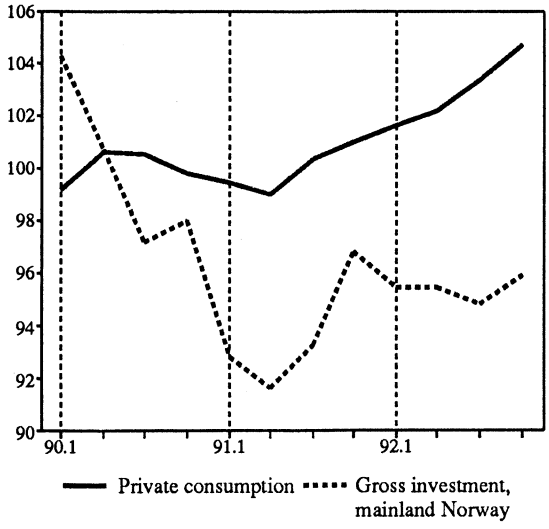
	1990	1991				1992			
	Accounts	CBS	MoF	NB	BF	CBS	MoF	NB	BF
Private consumption	2.6	-0.1	0.5	-1/4	0.4	3.0	3.0	21/2	1.3
Public consumption	2.3	2.7	2.8	23/4	3.0	1.4	1.2	11/4	2.2
Gross fixed capital formation[2)]	-28.5	-0.7	3.4	-31/2	1.5	28.1	7.6	9	8.2
- mainland Norway	-9.8	-6.1	-3.6	-61/2	-6.2	1.8	3.5	31/4	-1.6
Exports	7.8	4.0	5.9	61/4	4.5	2.0	1.1	21/4	4.9
- traditional exports	8.7	-1.2	1.0	-3/4	-1.5	2.1	2.6	41/2	3.0
Imports	2.6	0.8	-0.6	-21/2	-0.6	3.8	2.1	3	2.7
- traditional imports	9.1	0.1	1.0	-1/4	0.5	3.6	4.5	31/2	4.7
Gross Domestic Product (GDP)	1.8	1.6	2.8	21/2	1.7	2.2	2.6	2	3.2
- mainland Norway	0.7	0.6	0.8	1/4	0.4	1.5	2.6	2	1.4
Man-hours worked, employees	-0.5	-0.9	-1	-13/4	-1	0.2	3/4	0	0
Unemployment rate (level)	5.2	5.5	-	-	5.4	5.6	-	-	5.7
Rise in wages per man-hour	5.0	4.9	41/2-5	5	-	3.9	31/2-4	31/2	-
Consumer Price Index	4.1	3.4	31/2	31/2	3.5	3.2	33/4	31/2	3.3
Current account (level, bill. NOK)	22.6	35.5	36.7	44	37.8	30.3	34.8	41	46.7

1) CBS: Forecast according to Central Bureau of Statistics, Economic Survey no. 9/91.
MoF: Forecast according to Ministry of Finance, National Budget Proposal 1992.
NB: Forecast according to Bank of Norway, Economic Bulletin. 1991/4.
BF: Forecast according to Norwegian Bankers Association, Report no. 2/91.
2) Includes oil platforms. In the National Account these are measured as "investments" at the time they are installed offshore. As a consequence, the growth rates may show significant fluctuations.

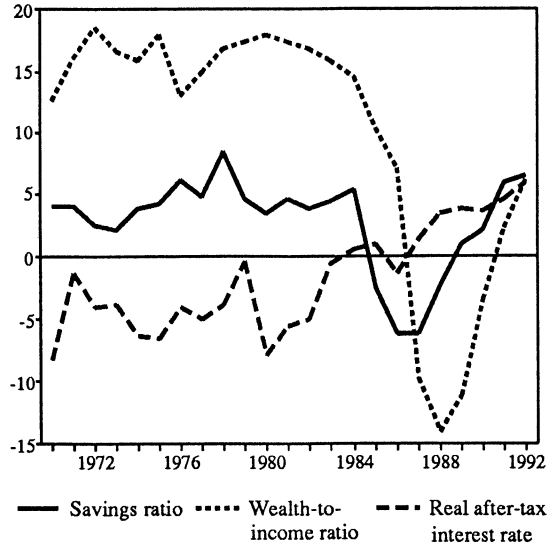
GROWTH IN PRICES AND WAGES
From previous quarter, annual rate



CONSUMPTION AND INVESTMENT
1990 = 100. Seasonally adjusted



SAVINGS, FINANCIAL WEALTH AND INTEREST RATE



nomic Survey 3/91 relates to the growth in traditional merchandise exports. While we in September estimated the growth in traditional merchandise exports at 1 per cent, a decline of 1.2 per cent is now likely. The downward revision is partly due to developments in the third quarter, which are now known, and partly to lower projections for international economic growth the rest of this year. For 1992 as well we now expect a weaker growth in Norway's export markets, about 4 per cent, than previously assumed. The estimates for mainland fixed investment in 1992 have also been revised downwards. This particularly applies to manufacturing industry which, according to the latest investment intention survey, expects an approximately unchanged investment volume from 1991 to 1992. Private consumption is still expected to show a pronounced rise in 1992, with a growth of about 3 per cent from the previous year. Along with a continued real growth in the public sector's expenditure on goods and services, this will contribute to an upturn in mainland Norway's total production and demand from 1991 to 1992. Output growth, however, is not sufficiently strong to boost employment, and unemployment will rise slightly in both 1991 and in 1992.

Higher international growth in 1992

The projections are based on the assumption that the market growth for Norwegian export industries will pick up in 1992. The international economic recovery, however, will be weaker and come considerably later than forecast earlier.

The upswing in the international economy is expected to result in a market growth of slightly more than 4 per cent for Norway's traditional merchandise exports from 1991 to 1992. This represents a sizeable downward revision in market prospects compared with earlier estimates.

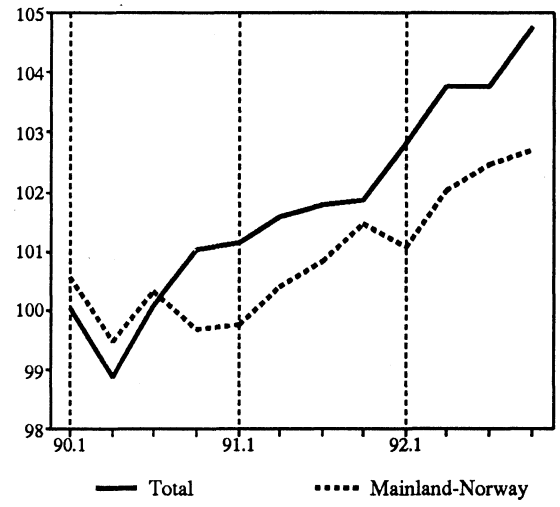
The prices for traditional exports are projected to increase by a little more than 1 per cent in both 1991 and 1992. After a slower rise in prices through 1991, the rise in export prices will increase again through 1992 as a result of the projected international upturn.

The rise in import prices will also pick up through 1992, and on an annual basis the increase is estimated at about 2 per cent.

The calculations are based on an average oil price of USD 20.30 and 20 a barrel in 1991 and 1992, respectively, and a dollar exchange rate which remains around NOK 6.30 in 1992. Both the price of oil and the dollar exchange rate have been revised downwards considerably compared with earlier forecasts. As a result of these factors, the surplus on current account for 1992 is about NOK 17 billion lower in this projection than in the forecast presented in Economic Survey 3/91.

EXPORTS AND IMPORTS OF TRADITIONAL MERCHANDISE. 1990 = 100. Seasonally adjusted

GROSS DOMESTIC PRODUCT 1990 = 100. Seasonally adjusted



Strong growth in public investment

The estimates for developments in employment, intermediate consumption and capital spending in the public sector for 1991 and 1992 are primarily based on the Government's economic programme as presented in the National Budget for 1992. Total public consumption is projected to rise by 2.7 per cent in 1991 and by 1.4 per cent in 1992. Gross fixed investment is expected to rise in volume by about 20 per cent in the central government sector and by 3.2 per cent in the local government sector in 1991, while in 1992 the rates of growth in volume for investment in the central government and local government sectors are 7.5 and 4 per cent, respectively.

For the household sector, a tax relief of about NOK 5 billion has been included for personal taxes in 1992 compared with the tax level based on unchanged average taxes from 1991. The level of indirect taxes is projected to increase in 1992 in line with the Government's budget proposal.

Slower rise in prices and wages

According to the calculations, the growth in wages will remain at 5 per cent in 1991 and taper off to about 4 per cent in 1992. The upturn in domestic demand is expected to be accompanied by a continued rise in productivity, inter alia in wholesale and retail trade and other service industries. Along with a lower growth in wages, this will contribute to keeping consumer price inflation low in 1992.

Turnaround in private consumption

The upturn in private consumption which was registered in the third quarter of this year will, according to the calculations, continue in the fourth quarter and later in 1992. The average growth in consumption from 1991 to 1992 is estimated at 3 per cent, representing a small downward revision compared with our last forecast. Housing investment has fallen significantly every year sice 1987. The calculations indicate that the decline will level off during 1992. As noted in Economic Survey 3/91, the development in private consumption and housing investment must be viewed in connection with the low level of households' net wealth. A continued increase in the real after-tax interest rate in 1992 will contribute to higher saving, and this combined with a lower expected return on housing entails that households will probably want to keep a higher percentage of their wealth in financial assets and reduce the proportion of their wealth in the form of housing capital. In the calculations, the savings ratio in 1991 is estimated at about 6 per cent, increasing slightly in 1992.

The tax relief for households in 1992 and the release of funds in the SMS scheme will make a significant contribution to consumption through 1992. It is assumed that the winding up of the SMS scheme will contribute somewhat less than NOK 1 billion to consumption in 1991 and a little less than NOK 2 billion to consumption in 1992. According to the calculations, the household sector's net claims on financial institutions at the end of 1992 will return to the level recorded in 1986.

Decline in investment comes to a halt

Fixed investment in mainland Norway has been falling since the end of 1987. According to the projections, the decline will come to a halt at the beginning of next year and be replaced by a weak rise in 1992. Following a decline of about 6 per cent

in 1991, mainland investment will rise at an annual rate of 1.8 per cent in 1992. A growth in general government investment along with a levelling off in the fall in housing investment in 1992 are important factors in this picture. Manufacturing investment showed clear signs of a weaker trend in the second and third quarters of 1991. Due to a previously strong growth, this investment will nevertheless rise by 7 per cent from 1990 to 1991. The level of investment is estimated to remain approximately unchanged from 1991 to 1992.

Few bright spots on the labour market

The output growth in the last part of 1991 and later in 1992 is not sufficient to boost employment to any great extent; the calculations indicate a decline in the number of man-hours worked in 1991 and only a modest rise in 1992. Unemployment in 1991 will be somewhat higher than the level in 1990, and is projected to increase slightly again next year, with some improvement towards the end of the year.

New developments in the perspectives for natural gas trade in Europe

by
Olav Bjerkholt and Eystein Gjelsvik

Introduction

Natural gas has over a period of 25 years developed from a largely local and marginal source of energy supply in Europe to a major source transported over vast distances from its points of origin. The overall share of energy use in Europe has increased from somewhat above 3 percent in 1966 to nearly 20 percent in 1990. The potential for natural gas in Europe is far from fully exploited. As an exhaustible source of energy it is eventually bound to decline, but in the future may be a long period with natural gas as a pillar in European energy supply.

Various factors have hampered the development of natural gas in Europe, such as national protection of domestic energy sources, monopolistic practices in transmission and distribution, misperception of the natural gas situation in Europe, and a number of institutional constraints.

With regard to the long-term perspectives for natural gas in Europe there are now elements in the picture that did not figure, at least not as prominently, some years ago. First, the definition of the European gas market has changed to include the former CMEA countries of Eastern Europe. The need for a transformation of the energy systems in those countries may be no less than for the economic systems in general. Secondly, the environmental concerns as accentuated by the wide political support of the ICCP findings may generate long-term energy policies that will give preference to natural gas among fossil fuels, but also encourage reduction in fossil fuel use and promotion of alternatives. Thirdly, the economic integration process in Europe may imply the removal of many constraints on the development of an integrated energy market, while there is still guesswork how far this process will advance in the intermediate future. Fourthly, the East-West détente and the need for economic reforms in the former Soviet Union may affect the future European willingness to rely upon the vast natural gas resources of western Siberia.

In the following we present an analytic approach towards assessing the future gas supplies and prices as the outcome of a battle for market shares between the major suppliers. The situation in Europe is changing fast and the analysis is not completely updated with regard to impact on the supply and demand situation of the changes in Eastern Europe and the former republics of the Soviet Union. The demand region under consideration is delimited to continental Western Europe. The outside supply of natural gas to this region comes from Algeria, the Norwegian Continental Shelf and western Sibiria. We refer to these sources as Algeria, Norway and USSR, although the latter term is perhaps outdated.

The battle over market shares is depicted here in game theoretical terms by means of a *dynamic oligopoly model.* Each supplying country is represented as having a number of *strategic options* with regard to developing additional supplies. Reliable cost estimates for these developments are hard to come by. On the other hand without such estimates we would only be playing with numbers. We document in some detail the basis for the estimates we use, recognizing that some of them are rather rough estimates. By means of the model - called *DYNOPOLY* - and the strategic development options with cost estimates we derive simulation results in the form of future market equilibria. The model pays no direct attention to the market power exerted by the continental transmission companies, apart from including the transmission companies margin. Hence, the interpretation of the results is the outcome of supply competition in a market deregulated according to *common carrier* principles.

By way of introduction we first take a brief look at the development of gas trade in Europe in the late 1980s and then discuss the common carrier principle in theoretical terms and with regard to what seems to be coming up in the implementation of this principle in Europe in the 1990s.

Current trends in the expansion of gas trade in Western Europe

The discoveries of significant indigenous gas reserves, first in the Netherlands and other continental countries and later on in the North Sea, along with large supplies made available by the USSR and Algeria, have allowed a gradual evolution in gas consumption in Western Europe.

On the supply side, some of the gas consuming countries have significant domestic gas resources of their own, but with the Netherlands as the only net exporter. Three main producing areas supply the region from its fringes, namely the USSR, Norway and Algeria. The USSR has close to 40% of the total reserves of natural gas in the world. Algeria's exports consist partly of piped gas to Italy, and partly of LNG deliveries to several countries on the Continent. Norway's offshore production of natural gas increased rapidly in the 1970s and all its production is exported to the UK and the European continent through pipelines.

Table 1A and 1B give the status of international trade in natural gas in Western Europe in 1985 and 1989, respectively. Total consumption (net of losses) increased from 216 bcm in 1985 to 233 bcm in 1989, i.e. 7.9% p.a. Indigenous supply has a downward trend and as a share of total Western European consumption was reduced from 52% to 42%. Dutch export of natural gas has stagnated and its market share was reduced from 17% to 15%. The Norwegian and Algerian shares increased moderately both in absolute and relative terms, but little compared with the Soviet Union. The increase in supplies from the USSR from 1985 to 1989 was 23 bcm, more than the overall increase in consumption. The market share increased from 15% to 22%. The DYNOPOLY region which is covered by the model, comprises Western Europe except for the

Table 1A. Natural gas trade, consumption in Western Europe, 1985. Bcm

	Exporters							
Importers	Algeria	Netherlands	Norway	USSR	Other	Indigenous sypply	Losses	Consumption
Belgium	2	5	2	-	-	-	0	9
France	8	8	3	7	-	5	4	26
Italy	8	5	-	6	0	14	2	31
The Netherlands	-	-	2	-	-	72	3	37
United Kingdom	0	-	13	-	-	42	0	54
Germany (West)	-	16	7	12	0	14	3	46
Other W. Europe	2	1	1	5	1	5	1	12
Total W. Europe	19	35	26	31	2	151	13	216
DYNOPOLY Region	19	35	14	30	0	106	12	158
Market share	9	17	7	15	0	52	-	100

Source: BP Review of World Gas, 1990.

Table 1B. Natural gas trade, consumption in Western Europe, 1989. Bcm

	Exporters							
Importers	Algeria	Netherlands	Norway	USSR	Other	Indigenous sypply	Losses	Consumption
Belgium	4	4	2	-	-	-	-1	10
France	9	4	6	8	-	3	3	27
Italy	11	6	-	11	0	17	4	42
The Netherlands	-	-	2	-	-	59	-7	35
United Kingdom	0	-	11	-	-	43	3	50
Germany (West)	-	19	8	21	0	15	13	50
Other W. Europe	3	1	0	9	3	6	4	18
Total W. Europe	27	34	29	54	4	144	20	233
DYNOPOLY Region	27	34	18	49	2	96	18	174
Market share	12	15	8	22	1	42	-	100

Source: BP Review of World Gas, 1990.

United Kingdom, Ireland, Turkey, Norway, Sweden, Finland and Iceland, and we refer to it as continental Western Europe.

Altogether, the supply situation for the European natural gas market seems abundant. The consuming countries are connected to four large supply regions: Groningen in the Netherlands, the Algerian Sahara, Uringoi in western Sibiria and the North Sea. The gas reserves included in these fields represent potential for several decades with total consumption at a considerable higher level than today's. Moreover, most of the major countries in Europe are interconnected in a central transmission system.

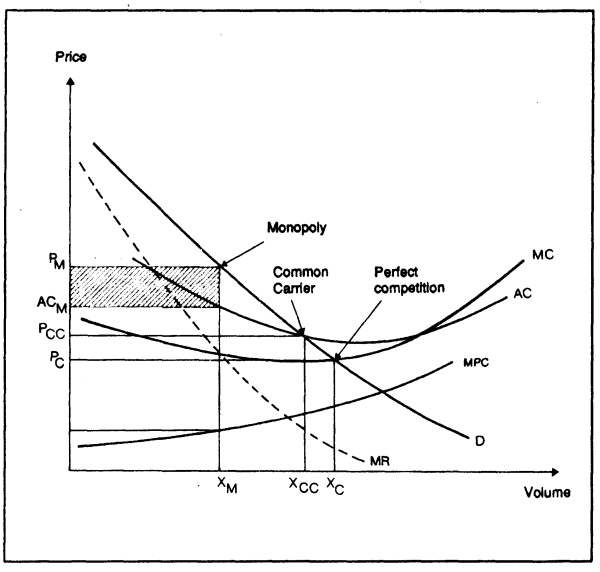
The conventional view among analysts about the future growth in gas consumption in Europe has changed considerably in the last few years from a very moderate assessment (the projections ranged from a decline to a modest increase in total consumption, see *Bjerkholt, Gjelsvik and Olsen, 1990),* to the current view of a sellers' market.

The Common Carrier principle in European gas trade

In a competitive market of an ordinary good the equilibrium price is defined by the intersection of a downward-sloping demand curve representing the aggregate marginal utility schedule of many small consumers and an upward-sloping supply curve representing the aggregate marginal cost-of-production schedule of many small producers. This textbook commonplace provides a natural starting point for discussing the peculiarities relative to the textbook paradigm of the European gas market. First, due to the resource scarcity in the supply of natural gas different producers will have differing marginal costs, not only as a transient phenomenon, but as a permanent feature. Intramarginal profit will thus not be eliminated by competition. Secondly, increased production and transmission to the market over existing capacitites will typically be made available by large-scale investments in development of new fields and pipelines or LNG facilities. And thirdly, as the number of producers is relatively small, this opens for *imperfect competition,* i.e. the producers' ability to capture more than the fair share - as defined by perfect competition - of the total value of the gas produced.

The transportation and retailing of natural gas are again very different from ordinary goods and are better described as a *natural monopoly,* i.e. with downward-sloping average cost curves. Increasing returns in distribution may come as a result of underutilization of capacity because of indivisibility, by lumpiness of investments as new projects are large relative to the size of the market. The increasing returns in distribution could even outweigh decreasing returns in production. The existence of increasing returns to scale is clearly of importance of the present state of the market. The end users are in practice constrained to purchasing from only one company with no way of counteracting price discrimination between end users.

Figure 1. Monopoly and Common Carrier Equilibrium in the Gas Market



The specific features of the gas market lead to various kinds of rent. Resource rent originates from the exhaustible nature of gas resources. The small number of agents producing and trading gas together with the elements of increasing returns may lead to monopoly rent. Finally, the lack of arbitrage possibilities of end users allows rent from price discrimination which amounts to capturing a share of the consumers' surplus.

We illustrate the equilibrium in the gas market in a static stylized setting with a transmission monopoly. In figure 1 the MC curve represents total marginal cost and the MPC curve marginal production cost. Marginal transmission cost (not drawn) is hence represented by the difference between the two curves. MPC is everywhere increasing. The curve AC is the sum of MPC and the average cost of transmission. The vertical distance between AC and MPC diminishes, which means increasing returns to scale in transmission of gas. The demand curve is D, while the corresponding marginal revenue is given by the curve MR. The optimal sales volume from an overall efficiency point of view is at the intersection of the MC curve and the demand curve ('C'). The monopoly solution with no price discrimination (flat rates across consumers) is given by the intersection of the MC curve and the MR curve ('M').

The common carrier principle in this highly simplified scheme can be interpreted to mean access to

the transmission pipeline at current average costs. Starting from the monopoly volume producers and end users unhampered by a transmission monopoly would then have a margin of mutually beneficial trade. This would increase the volume, and market forces could then be relied upon to bringing the end-user price down until it equals AC. This is the common carrier equilibrium ('CC'). This is still a higher price and lower volume than the (unobtainable) competitive equilibrium. The main point is, however, that the move from the monopoly solution to the common carrier equilibrium reduces transmission costs. The transmission companies' surplus vanishes, and the transport tariff is reduced to average transmission costs. We shall not deal with the incentive problems from such a rate of return regulation, only note that forcing the transmission monopoly to set its rate on a traditional public utility cost-of-service basis, may imply a bias of a too capital intensive transmission system. Special measures may be needed to speed up adjustment in a market in transition from transmission monopoly control to common carrier principles. The concept of common carriage may cover somewhat different ways of removing the monopoly surplus in transmission, but we are not looking further into this here.

EC energy policy after 1992

The need for major structural changes in institutions and contractual arrangements is a repeated issue in discussions about the European gas market. The energy sector and energy policy is an important area in the context of increased economic integration in Europe. The *European Economic Area* (EEA) negotiations between the EC and the EFTA countries which have been going on since 1989, were completed in October 1991, but the agreement has still not been signed and the text has not been published at the time of writing (Dec. 1991). The negotiations have in principle included energy trade, but it is still unknown to what extent energy will be covered by the agreement, e.g. by clauses preparing for future coordination of energy policy. (As the political process has not been completed, it isd, of course, also somewhat uncertain what the final outcome will be.)

Most likely the EEA Agreement will not contain any new element with regard to energy policy directly, but it may be part of the agreement that the transportation, distribution and trade in energy within the EEA region shall be organized according to the general principles of the inner market. This would i.a. include common carrier principles of direct natural gas transaction between producers and consumers of energy with the use of existing infrastructure in the transportation. A first step in this direction has been taken already by a directive awarding transmission companies the right to use each other's transmission facilities (see below).

Energy has within EC until now to a large extent been an exception with regard to the general principles of the Rome Treaty. Imports and exports of energy have generally been quite regulated and restricted as part of the national energy policy of the respective member countries. It is wellknown, however, that the EC Commission circles has argued in favour of getting rid of the exceptional status of energy as a commodity within the Community to the extent that the inner market would also become an "inner energy market". Earlier this year the EC Commission announced e.g. that nine member countries will have to answer to the EC Court unless the import and export monopolies and electricity are abolished and three countries (Belgium, Denmark and France) for the same with regard to natural gas. The Commission seems determined to battle the exploitation of vertical control of the trade in natural gas as well as in electricity. Various directives adopted by the EC already are steps towards restricting the discretion of national energy policy, e.g. by requiring that distributors of natural gas have to report prices, tariffs, and other contractual terms to the EC Commission at regular intervals. So far, the directives are not really imposing strong regulations. All EC countries except one already reports according to the directive.

With regard to the transit of natural gas and electricity through third countries directives have already been adopted indicating the principle to be pursued, namely the right to transit. The directives adopted limit this right to transmission companies. This means for natural gas that the large transmission companies within the Community are granted the right to use available capacity in other companies transmission lines. Again, the directive is not strong enough to imply important consequences. The parties have the right to appeal to EC authorities if an agreement is not reached within a certain time. Through its control of the network, the transmission company may set terms that are not acceptable for the seller, but cannot really be proven unreasonable by the authority. The transmission directive does not specify any sanctions if an agreement is not reached.

However, it is clearly indicated, e.g. by Lord Brittan *(Norwegian Oil Review, No. 5, 1991)*, that this will be followed by further measures aiming at implementation within the Community of the common carrier principle or third party access to the use of existing infrastructure. This goes along with transparency, competitive pricing of energy and limitations with regard to energy subsidies. On the other hand these measures are bound to meet with

opposition from some countries. Ruhrgas and Gasunie have argued against common carriage and may have the support in this by their respective governments. The arguments applied, that common carriage or other forms of deregulation will risk the energy security of the Community countries, have probably become less convincing over time.

The implementation of common carriage is, however, not at all clear. It might or might not be extended to include the right to use Community transmission facilities in contracts between outside sellers and inside buyers. If there is an EEA Agreement, Norway as an EFTA country will most likely be defined as an inside seller of energy. This might give Norway an advantage over the USSR and Algeria. On the other hand Norway would have to adhere to Community rules by dissolving the monopoly in electricity production, import and exports, and will also have to accept non-discrimination in the awarding of oil and gas concessions. Monopolistic practices in the negotiation of Norwegian gas sales (in casu the Gas Negotiation Board) may also have to change.

Environmental policy within the framework of the Rome Treaty is another issue awaiting political resolution. Within the Commission the preparation of a carbon tax proposal is under way. This will affect the relative competitive position of natural gas in any of its uses, as demonstrated in the DYNOPOLY simulations.

Simulation of gas trade in a deregulated EC market

The purpose of our attempt at simulating the development of the Western European gas market is to try to catch in a realistic model two key factors, the effect of deregulation of the natural gas market and the suppliers' battle over market shares. The issues are, of course, related: deregulation opens for more fierce competition and fewer constraints on the moves of the three large outside suppliers.

Investigations of the pricing in the European gas market show that end-user prices have not come down to competitive levels, see *Bjerkholt, Gjelsvik and Olsen (1990)*. This is not surprising in view of the dominating role of the transmission companies. More open competition should increase volumes and reduce prices, at least, that is what the textbook reasoning predicts.

Our model focuses on the key factors, but like any other model will have shortcomings with regard to the descriptive realism of the very complext phenomena it tries to deal with. In addition there are severe difficulties connected with establishing reasonably reliable data, as set out below.

A dynamic oligopoly model

For this purpose we have simulated the development of the European gas market by means of a dynamic oligopoly model - *DYNOPOLY* - developed in the Central Bureau of Statistics. The game depicted by the model is essentially an investment game between suppliers facing a deregulated market with no intermediate barrier between suppliers and end users. Hence, the producers compete directly for market shares. The three players in the model are Norway, Algeria and the USSR. The demand region is continental Western Europe. The UK is thus kept out of the game; this should not be unreasonable in view of the separation until now of the UK and the continental gas market. The three contestants in the game play on an excess demand function (total demand less indigenous supply). Dutch production is included in indigenous supply. The elimination in this way of the Netherlands which reduces the number of players and simplifies the game, we defend on the ground that the Netherlands have already made most of their heavy investments.

Each player possesses a bundle of *strategic investment options*. In the beginning of each 5-year period they can make use of one or more of the remaining options, or none. The moves are made simultaneously, only previous investments are known. The investments are operative in the next period. The players maximize discounted cash flows over the remaining horizon. They have full information of demand, options and costs and can predict the other players' best moves. The players choose their best strategies on the basis of this information, hence, a *Nash equilibrium*.

A model solution consists of a complete plan of how to act in all future periods. The plans (strategies) consist of a set of actions, contingent on previous outcomes. Thus, the solution also shows the alternative optimal strategies whenever another player deviates from the optimal strategy by, say, postponing an investment.

The model is solved by dynamic programming, and the solutions are perfect Nash equilibria[1]. The solutions of this investment game are dependent on the solutions of the short-run game for given investments. Here our assumption is the Bertrand price game, which implies full capacity utilization and lower prices compared to a short-run Cournot game.

To grasp the basic implications of the existence of large and irreversible investment options in the gas market, a model based on *dynamic game theory* is required. In such a game the players are perfectly aware that their current actions have important im-

1) In some cases the Nash solution is not unique, i.e. there are two or more Nash equilibria. Rationality in such situations is not easy to define. We assume the minimax solution will be chosen in this case.

plications in future periods. If Norway decides on a large investment at a certain point in time, this will not only increase total supply and decrease market prices, but also decrease profits on the competitors' future investments. In such a dynamic game, the states and the strategies at various points in time will depend on previous actions and outcomes in the market (feedback strategies). In equilibrium, the players will balance the profits from discouraging other supplies by making an investment, against the profits from restricting supply by postponing the investment.

Norwegian development options and cost

The Norwegian development options considered are represented by the Troll/Sleipner fields with reserves amounting to 1339 bcm and the Haltenbanken region comprising several fields among which the Midgard field with estimated reserves around 80 bcm is the most important one. Both the Troll field and the Haltenbanken region are represented as two different options. The Troll options are sequential, however, as one (Troll/Sleipner) has to be used before the other (Troll II). The Haltenbanken options are two alternatives which differ with regard to the production intensity. An important aspect of the Norwegian development options is that attention has to be paid to the already developed fields in the North Sea region with regard to the use of existing transport facilities.

Reliable data for the future options we are interested in are hard to get by, especially for the Haltenbanken region and the transport costs. We explain our assumptions based on econometric estimates, rumoured cost data and own calculations at some length below.

By way of introduction we distinguish four components of total production (upstream) cost of natural gas and oil. First, the cost of acquiring property rights (licence), locating a field and estimate its economic potential can be lumped into *finding costs*.Second, the costs of building a platform with the necessary facilities, *development costs*. These are both defined as investment costs. The expenses for operating and maintaining the platform, insurance etc. are included in *operating costs*. In the operating phase, further investment in drilling, development of satellite fields which can be exploited from existing platforms, and other measures to exploit the resources more intensely, will usually pay off. These are lumped into *drilling investments* (investment in operating fields).

Central Bureau of Statistics (1990) reports data on these cost components on a macro level. We shall not bother about finding costs here, as they are sunk whenever a development is considered. As argued by *Adelman and Lynch (1986)*, annual operating costs can be treated as a constant fraction of development costs, and we estimate this to be 4.5% in Norway. We apply this fraction whenever operating costs are not known. Drilling costs are harder to estimate. For example, huge investments have been undertaken in the Ekofisk area. Lifting the platform, extended drilling and water injection have added a lot to recoverable reserves. We apply this cost component whenever the R/P ratio of the initial reserves does not support sustained production of the horizons considered.

Troll

Although the Troll and Sleipner developments are separate investments and by no means technically linked, they are tied to the 1986 Troll/Sleipner contract, and will be considered as one in this paper. The production is set at 24 bcm/year. The costs are well known, and have changed little, despite the decision to move processing facilities onshore. It has been reported that this will not change investment costs, but will save operating costs. Also, progress has been achieved in the prospects of extracting the oil layer in Troll. To what extent this will require additional costs, we do not know, and we have chosen to make no adjustments for the "associated"oil.

The huge Troll reserves can support a higher production than allowed by the Troll phase I project. A platform of similar type is expected in the Troll West region. It has been reported that there is an agreement that total Troll capacity cannot extend beyond 40 bcm/year.[2)] We thus set Troll

Table 2. Troll gas, capacities and costs. 1989 prices

Options	Reserves bcm	Production bcm	Investment B$	Operating cost B$/year	Operating cost $/m^3
Troll/Sleipner	1339	24	3.64	0.24	0.24
Troll II		16	2.55	0.10	0.007

2) This might have something to do with the R/P-ratio, 40 bcm/year imply 32 years of production and the contract period is 30 years.

phase II to 16 bcm/year. Unit costs have been reported to be 0.17 Nkr/m^3. Using this figure we calculate backwards assuming annual operating costs amount to 4,3% of total costs and a lifetime of 30 years, gives an investment estimate of 22 bill. Nkr. Compared to the 25.7 bill. Nkr for the 24 bcm Troll/Sleipner this seems high, but we have chosen to stay with this estimate in our simulations.

The two strategic investment options based on Troll gas are set out in table 2.

Haltenbanken

For the cost of gas from the Haltenbanken region, there is less to rely on. We have estimated tentative Haltenbanken costs as explained below.

We use available information from Norwegian North Sea fields to provide preliminary estimates for investments costs of the six Haltenbanken fields. *Oil Directorate (1990)* and *Central Bureau of Statistics (1990)* report data on development costs for individual oil and gas fields in the Norwegian sector. By 1990, 14 fields were under production and investments completed[3], and 7 fields were under development. We have thus 14 ex post observations and 7 ex ante estimates. In addition to investment cost data, water depth, year of completion (first year of production) and reserves of oil, natural gas and NGL are reported.

More information could be exploited to improve cost estimates. The number of (appraisal) wells drilled could serve as an indicator of reservoir complexity, a factor which tends to increase costs. For fields that are not licensed, these data are just not available. The hypothesis we try to apply is that investment costs (C) are increasing in total reserves (R) and depth (D) and decreasing in time (year of completion). While the first two assumptions should be obvious, time is here a proxy for learning-by-doing effects. For the functional forms tried the parameters of time turned out not to be significant or yield unreasonable results such as negative investment cost by waiting long enough. Other specifications of the learning trend turned out not satisfactory. The specification surviving the test was (standard errors given in parentheses):

$$(1)\quad C = \underset{}{-2.65} + \underset{(0.009)}{0.185\,R} + \underset{(0.012)}{0.0346\,D} + \underset{(0.000008)}{-0.000130\,R^2}$$
$$\qquad\qquad (1.91)$$

One observation, Gullfaks, was deleted because of its huge cost overruns due to reservoir problems. Equation (1) gave a good fit, low residuals and significant parameter estimates[4]. For the Haltenbanken fields we hence get the investment cost estimates of table 3.

Compared to estimates of Heidrun costs given in the licence application, 19 billion Nkr, the estimated development cost of 29 billion Nkr seems high. *Norwegian Oil Review (No. 11, 1990, pp 24-27)* quoting sources in operator company Saga, claim a Midgard cost of 9-10 billion Nkr, also way off our estimate. (Technical progress is ignored by us and could be part of the explanation of the difference.) We use this apparent disparity for two fields to scale down our own estimates for the whole Haltenbanken region (see below).

In estimating the cost of producing gas from the Haltenbanken region we also have to pay attention to the fact that some fields are mainly gas fields and some are mainly oil fields. We have kept matters simple by including the development cost and gas production of those fields that are mainly gas fields, and excluded others. This is done to avoid the cumbersome task of splitting costs between the three petroleum products. The error from this shortcut is probably not large, the associated gas we in this way exclude is balanced off against associated oil and NGL we include. Estimates of annual production from the gas fields are derived by comparison with the average plateau production for

Table 3. Estimated investment cost for Haltenbanken fields (unadjusted). Billion Nkr

Heidrun	29.2
Njord	16.2
Smørbukk	22.8
Smørbukk S	16.8
Tyrihans	15.3
Midgard	22.7

Table 4. Haltenbanken gas fields, reserves and estimated annual production

Field	Gas reserves bcm	Production bcm/year
Smørbukk	75	6.65
Smørbukk S	30	2.66
Tyrihans	29	2.57
Midgard	80	7.10
Total[1]	270	19.0

1) Includes associated gas from other fields.

3) Oseberg was not completed as the C-platform was still under development.

4) The estimated parametres imply negative derivative of investment to reserves for large values of R, which is nonsense, but since eq. (1) is used for small fields only, we have ignored this.

North Sea fields and are given in table 4 together with reserves for each field.

Midgard is the key to gas development of the Haltenbanken region. With a processing unit and a pipe link to the North Sea, gas can be transported to UK and the Continent. Then other fields can be developed and associated gas utilized. The pipeline and Midgard development is really the strategic option, and other Haltenbanken gas is included in the option as specified in the DYNOPOLY model.

The total cost figure for Haltenbanken gas is estimated as an adjusted sum of the estimates for the four fields. The adjustment is simply a scaling down according to the apparent cost disparity of the Heidrun (high estimate) and Midgard field (low estimate), respectively (table 5).

Needless to say, the cost estimates are uncertain. It might seem unduly optimistic to assume the low cost estimate, implying more than halving the estimate of the regression equation which is as close as we can get to historical costs. Cost sharing between fields may, however, be possible.

Some of the Haltenbanken fields are close to each other, and if one field can use the platform of another, costs can be reduced, making the low estimate more probable. Joint development of the Smørbukk fields means e.g. according to our equation total investment cost of 31.5 billion Nkr, while separate development costs 39.6 billion Nkr.

We assume in the following the low cost estimate and reformulate this as two alternatives, both based on the same development cost.[5] One has annual production of 19 bcm/year, sustained by additional drilling investments of 68 million dollar/year (Haltenbanken A). The other one has an annual production of 12 bcm/year, sustained without drilling investment (Haltenbanken B). Drilling investment is the usual way of exploiting reservoirs more intensively. The estimate of drilling investments needed applied above is computed as the average of average drilling investment per unit of reserves and average drilling investment per capital unit in the Norwegian sector. Haltenbanken A has a unit cost of 41 dollar/1000 m^3, while it for Haltenbanken B is 52 dollar/1000 m^3. The alternatives will be fed into DYNOPOLY model to decide which is the better alternative

Table 5. Total costs of Haltenbanken gas, high and low estimate

	Investment costs	Operation costs	
	Bill $	Bill $/year	$/m^3$
High estimate	5.80	0.25	0.013
Low estimate	3.97	0.17	0.009

Transport projects and costs

The transport system linking the producing wells in the North Sea to the Emden port in Germany comprises Statpipe and Norpipe. Statpipe links Statfjord and Gullfaks gas in a 30" wet gas line to the processing facility onshore at Kårstø and the dry gas line continues to the platform 16/1, connects to the line from Heimdal, and ends up at Ekofisk. The capacity of this line is different from segment to segment, and can be extended through additional investment. We assume that an additional cost of 0.5 bill. dollar can extend throughput to 20 bcm/year.

The Norpipe line from Ekofisk to Emden has a capacity of close to 20 bcm/year, and cannot be extended. Thus, for the Troll/Sleipner gas another pipeline, Zeepipe, from Troll via Sleipner to Zeebrugge in Belgium will be built. The pipelaying work on the 806 km Zeepipe line started earlier this year. We shall assume that, in general, full cost tariffs based on a normal rate of return (7%) will be charged for all gas using existing pipelines. This assumption ignores that pipeline investments are sunk cost with no alternative value. Tariffs for the Norpipe and Statpipe system have been based on

Table 6. Haltenbanken gas, capacities and costs. 1989 prices

Options	Reserves bcm	Production bcm	Investment B$	Operating cost B$/year	Operating cost $/m^3$	Drilling B$/year	Var. cost $/m^3$
Haltenb. A	270	19	3.97	0.17	0.009	0.068	0.013
Haltenb. B		12	3.97	0.17	0.009	-	0.014

5) The development licence application from the Haltenbanken fields is expected in 1991. Operating company Saga seems to be positioning for the UK market, as the Norwegian Frigg pipeline will have 12 bcm/year idle capacity when the Frigg fields have expired. Thus transport to UK port less of variable costs is free. It is very likely that the exports to UK will be continued, but the Haltenbanken gas will have to compete with other fields for this option. Saga thus seems to scale the transport capacity from Haltenbanken to 8-12 bcm/year. This scale cannot, however, justify the high total investment estimate.

such a principle, and it ensures that no pipeline goes bankrupt[6]. The tariffs are based on full capacity utilization, which is always ensured in DYNOPOLY model.

The construction of the The Zeepipe costs is computed from data in *Oil Directorate (1990)*. At plateau production, Troll produces 24 bcm/year, and 4 bcm is allocated through the Statpipe-Norpipe link. When Troll II is on stream, another pipeline to the continent will be needed, otherwise Troll gas would crowd out gas from other North Sea gas. Recently, a third pipeline, Europipe, has been proposed[7]. At initial capacity 12 bcm/year, the cost is set at 10.2 billion Nkr. We assume that at an additional cost of 4 billion Nkr the capacity can be extended to 20 bcm/year by compressor facilities. We have lumped this in one project in the Troll II line in the table. The Europipe line will run from the riser platform on Statpipe the the Emden terminal, and pipelaying might start in 1993 *(Petroleum Economist, May 1991)*. It is not, however, perfectly clear from which point the costs of Europipe is calculated. Assuming it is from the Troll area[8], flows from other North Sea fields can hook up along the line, and should pay no extra transmission cost to this point.

There will thus be three links from the Northern North Sea to the continent, Statpipe/Norpipe, Zeepipe and Europipe, each of about 20 bcm/year capacity. While the unit cost of the first is about 1.12 $/mill btu, the others are about 0.4-0.5 $/mill btu. There are historical and specific reasons for these differences, mostly learning-by-doing effects. In a free market, however, nobody would like to pay a tariff over the "marginal" cost. We shall therefore in the model base the tariff for gas exported from Northern North Sea and beyond, at a tariff equal to the Zeepipe unit cost.

Table 7. Transport costs for Norwegian gas, investments, tariffs and capacity. 1989$

Option	Investment B$	Tariff $/mill btu	$/m^3	Capacity bcm
Other North Sea	0.0	1.12	0.028	19.77
Troll/Sleipner	2.17	0.14	0.004	20
Troll II	1.65	0.13	0.003	20
Haltenbanken A	2.39	1.38	0.035	19
Haltenbanken B	0.61	1.38	0.035	12

The Haltenbanken gas is charged full cost tariff through the Statpipe and Norpipe system, 1.12 $/mill btu, plus the operating cost of the new line from Midgard to Statfjord, the hookup node to the Statpipe system. The Haltenbanken gas will also have to cover the strategic investment cost of 2.39 bill dollar.

It has been reported that the Midgard-Frigg line unit cost is only 0.08 Nkr/m^3 at a flow of 8 bcm/year. This implies an investment of 5.3 bill Nkr (0.61B$) with 30 years lifetime and 7% discount rate. This implies about 7.5 mill Nkr/km, significantly lower than any other North Sea line, where Norpipe has been the cheapest at 10.3 mill Nkr/km, and the Zeepipe has a cost of 17.2 mill Nkr/km. The transport cost estimate of Haltenbanken A in the table is based on the average cost per km of Norwegian lines of similar size. For Haltenbanken B we use the estimate of 0.08 Nkr/m^3, although this is based on a somewhat smaller throughput. In our baseline run, however, we limit the Norwegian options to Troll/Sleipner, Troll II and Haltenbanken A.

Other North Sea Gas

Other North Sea gas comprises the flow of remaining gas from developed fields, and new fields located close to existing pipelines, including oil fields with associated gas. These are relatively small developments, and do not qualify as strategic investments. They are thus lumped together. Furthermore, we shall assume that some of this gas will be allocated for the UK market, implying that the Norwegian part of the Frigg pipeline, after a period of slowdown as the Frigg field expires, will be fully utilized from year 2000.

It is hardly a contested issue that this export will pay at least the same netback to the wellhead as exports to the DYNOPOLY region, and thus preferred. The oil companies have already started their maneuvering for the "premium" market. Saga argues that "their" Midgard gas will make a profit when exported to UK, and thus should be developed by 2000, while Statoil and Hydro want to develop Sleipner West and Visund, respectively. The coordination through the Gas Negotiation Board and the Ministry for Oil and Energy will not be easy, as in this game, the contenders have incentives to underestimate costs and even start a bidding game for politically preferred projects (i.e. employment in

6) Because of the low capacity utilisation of the Statpipe system, this has lead to high tariffs, and after the price plummet of 1986, some gas have sold to a negative netback at the wellhead. Those companies that rejected the offer of being partners in Statpipe have been the loosers. This illustrates that the full cost tariff principle is by no means undisputed.

7) *Financial Times, May 1991*, "Outlook couldn't be better".

8) This assumption is reasonable, since Europipe is tied to the Troll/Sleipner options, and the unit cost is slightly below Zeepipe, also reasonable as the distance is shorter.

remote areas). A rush of applications for development is expected in the coming year.

The residual gas after deduction for UK exports we take as exogenous in DYNOPOLY. This residual flow has been computed in the following way:

Forecast for the flow from developed fields are made from contracts and normal depletion rates. The main fields are the Ekofisk area, Statfjord, Heimdal and Gullfaks. Only Heimdal is a gas field, the others have associated gas. These fields, which produce under the Ekofisk and Statfjord contracts, had a total production of about 20 bcm in 1990. This level will be sustained through 1995[9], and then follow a normal decline.

The Norwegian gas companies have presented scenarios for development of other new North Sea gas[10] that shows the potential flow from fields to be developed. These are Sleipner West, Oseberg, Visund and Gullfaks South. The total flow depends upon the capital investment and the priority management, i.e. when development licences will be awarded, approved by the Storting. Under the so called M1 path, which is one of many possible ones, total flow peaks around 2005 at about 23-24 bcm/year.

Deducting exports to UK from the sum of new and "old" gas gives exports to the DYNOPOLY region. For all years until 2010, this production is more than sufficient to fill the Statpipe-Norpipe system to capacity. It is therefore assumed that the model exogenous gas flow from Norway is constant at 20 bcm/year through 2010, then declines at a 10 % rate.

Soviet development options and costs

The Soviet Union has been a reliable supplier of gas to Western Europe since the controversial establishment of the pipeline from the vast Siberian gas fields to the West German border in 1982. The capacity of the pipeline was initially much larger than the sales, and only recently the pipeline has been used to capacity with a total sale of 53.8 bcm to Western Europe in 1989 (see table 1B). With the world's largest reserve base, the question of further expansion is not about resource constraints, but rather about production and transmission costs, and the ability to finance and organize large and expensive investments. And if these potential projects are implemented, can stable supplies be relied upon? Again, this question may hamper Soviet exports as it did in the early 1980s, but for the opposite reason! To buy gas from the Brezhnev regime was seen as exposure to risk because of Soviet power, now to trade with the Gorbachew regime may seem an exposure because of its lack of power! Thus, in the contest for new contracts, the market may claim a rebate for Soviet gas (insurance premium).

Nobody knows for certain in which direction the USSR will move as a gas exporter in the years to came. The buyers might have to deal with a redefined union or with the Russian republic. Even a private company selling Russian gas cannot be ruled out. We shall not speculate further on this, but simply assume that the buyers will face a monopolist seller of gas from what we now call the Soviet Union, and that this seller maximize discounted cash flow. We shall also, with a little regret, ignore any insurance premium.

In the assessment of Soviet costs, two methods have been applied. One is trying to measure the costs in rubles based on Soviet information, and then apply a rather arbitrary conversion to dollars. The other is to measure sizes and lengths of pipes, investigate physical conditions and terms, use standard dollar costs per well and per km, and sum up. *Adelman and Lynch (1986)* do both, but prefers the latter as a model estimate. Even though this method does not reflect internal opportunity costs in Soviet, the uncertainty of applying the first method seems less attractive. We have computed our costs in general by using weighted average cost surveyed from the literature in *Dahl and Gjelsvik (1991)*, using personal judgement on the weights relying more on the latter method. As the trend is using western companies in joint ventures in the oil and gas upstream and downstream to modernize and expand Soviet export, the latter method becomes more relevant.

Soviet gas production comes from a number of fields, and most of the production is for domestic consumption. Only 6% of total production was exported to continental Western Europe in 1988. Gas for exports can be achieved from new investments or by substitution or by diverting gas from domestic use or from exports to the other "internal market" of CMEA countries. It is widely assumed that both internal markets have been subsidized, while there is some rent on exports. Because of these subsidies, substantial quantities could be made available for exports through more optimal pricing. This is already taking place for exports to former CMEA countries, while internal price reforms still are unsettled. The costs of strikes and internal turmoil may hold price changes back.

There is no obvious way to estimating the shadow price of Soviet gas, and we will simply use operating production cost as the benchmark for

9) Our information is not clear on which fields are counted under the Ekofisk contract. If it includes the Ekofisk area only, which is assumed in table 7, the declining path will start later than if it includes more fields.

10) See *Norwegian Oil Review, Nos. 11 and 12, 1990.*

exports through the existing pipeline. Futhermore, the production possibilities are obviously not discrete, and the strategic decisions are linked to export pipelines. We shall assume that all exports pay transport costs from western Siberia, because most of the reserves and production are located there, and most consumption is on a line to the west.

Table 8 shows the computed investment cost of Soviet pipelines based on average US costs per km for pipelines in similar conditions (Alaska). For a 55 bcm/year pipeline Urengoi-Germany this turns out almost equal to the one used as model input, which is simply the average computed from Dahl and Gjelsvik (1991). For a smaller line the computed cost based on cost per km is lower than the one used as model input. The reason is that the cost per km should be decreasing to scale, but we have only one estimate, which is assumed to be an unspecified average, and we assume that the computed cost is underestimated for the 30 bcm scale.

In table 9 two different sets of strategic investments are included. One is duplicating the existing line. The other is a series of new lines of 30 bcm/year capacity. While having a somewhat higher unit cost, the latter is more flexible. In our baseline run we assume that the Soviet options are to build additional 30 bcm/year pipelines.

We have included estimates of operating, capital and total unit costs. Operating costs are model exogenous, while the latter two are not used in the model. For exports through the existing pipeline, total operating costs include operating production and transport costs and a tariff from the German border to the market central point.[11] For new gas, also capital production costs are included in total operating costs. The player can be thought of as a pipeline manager (transmission company) that buys gas on a free market in long term equilibrium. Recall that the production decision is not considered strategic, but continuous.

Table 8. New pipeline from Urengoi to the German border, costs and capacities

	Total 88$/MMbtu	Investment Bill 88$
30 bcm		9.4
40 bcm	42.6	12.3
55 bcm		17.2

Algerian development options and costs

Like the USSR, Algeria has large undeveloped reserves of natural gas, which would last for over 100 years at the going rate of depletion. Algeria has made large investments in LNG facilities and in the Transmed pipeline crossing from the Algerian coast to Sicily and Italy. Most of their reported LNG capacity have remained idle, because Algeria has insisted on premium prices, i.e. at a crude oil parity. Also, the Transmed line had idle capacity for years, but as of 1989, was close to the assumed capacity of 12.5 bcm, no more than 15 bcm of a once claimed LNG capacity of 30 bcm was operative.

Again, state company Sonatrac is issuing large expansion plans. *Quinland (1990)* reports that plans for restoration of the 30 bcm/year LNG-capacity. Also Algeria is pushing for more exports through the Transmed line, "which could be raised by some 10 bcm" by installation of compressors. Italian ENEL has signed a letter of intent to buy 4 bcm/year from 1994, and an option to increase its offtake to 6 bcm/year, see *Petroleum Economist, Oct 1990.* Furthermore, gas company SNAM is negotiating to increasing its offtake by 5-7 bcm/year from current 11 bcm/year. *Petroleum Economist (Sept. 1990, p34)* reports on an Algerian export forecast of 45 bcm LNG in 1995. Recently, plans for a new pipeline to Spain has been launched.

So far, these are plans with no commitment. European customers will probably not forget endless disputes over previous LNG[12] contracts. They may also fear heavy dependence on a country of strong Islamic fundamentalism. This fear may be

Table 9. Production and transportation cost for Soviet gas to a central point. 1988 prices

	Operating $/toe	Capital $/toe	Total $/toe	Investment Bill $
Current pipe (55 bcm)	22.5		66.3	-
New pipe (55 bcm)	40.8	33.1	73.9	17.2
Stepwise expansion (30 bcm)	40.8	42.4	83.2	12.0

11) Recall that the players compete on a common demand curve, and full cost to a point of gravity for the DYNOPOLY market are included for all players.

12) According to *World Gas Intelligence, sept 1990 p 2* Italy's ENEL has signed a letter of intent with Statoil for purchases of 2,5-5 bcm of LNG from Arctic Norway.

Table 10. Algerian options and cost

Options	Operating unit costs $/toe	Operating unit costs $/mill btu	Capacity bcm/year	Investment Bill $
Current production	58.2	1.47	34	-
Compressors	54.4	1.37	10	0.5
New pipe	58.5	1.48	18	1.5
New LNG facilities	58.3	1.49	8	1.5

mirrored in the Italian willingness to buy Norwegian LNG, which by no means can compete with Algerian costs. But it remains a fact that Algerian gas is competitive, especially in the Mediterranean countries. Using similar sources and methods as described with regard to Soviet gas we have arrived at the following costs and capacities og Algerian gas exported to the DYNOPOLY region (table 10).

Demand

"Prospects couldn,t be better" and "Gas tastes freedom - set for rapid growth" are recent headlines in the trade press and literature expressing the optimistic outlook for gas demand at present. Not long ago, the attitude was different, and when the Troll-Sleipner contract was signed in 1986-7, it was considered risky (for the producers). *IEA (1989)* forecasted almost zero growth in European gas demand for the 90's. The reasons for this turnaround is mainly two, which are interlinked. First, natural gas thermal power has a technological advantage over coal and oil, and gas can compete with coal even if its price doubles that of coal. Second, environmental restrictions and taxes favour gas at the expense of oil and coal as the cleanest fossil fuel.

The impact on gas demand of environmental taxes or regulations is, however, ambiguous. Gas is a pollutant, although to a lesser extent than oil and coal, and the end user price will rise. Since gas in many markets have a lower absolute price in terms of energy equivalents than oil products, the price increase from a carbon tax may in percent be no less for gas than for oil. Then no interfuel substitution will take place, but as aggregate energy prices increase, there will be a substitution of other inputs for fossil energy. It is conceivable that the overall result for gas demand would be negative. *ECON (1990)* applied a fuel share type of energy demand model, and got this of results.

DYNOPOLY uses a single aggregate logarithmic-linear demand function for gas. There are no substitution possibilities versus other inputs than coal and oil products, and gas demand is driven by income and fossil fuel prices. The demand function is calibrated for 1985 as a base year, and the elasticities are calculated from runs on a multisector energy demand model for the continental Western Europe under development in the Central Bureau of Statistics, see *Aaserud et al. (1991)*. The demand side of this model is an econometric multisector fuel share model incorporating the effects mentioned above. Although the model is not completed and results still have to be tested, we have used the implicit elasticities calculated from this model of a 1% shift in various exogenous variables (*Aaserud et al. 1991*).

The players in DYNOPOLY maximize cash flow, which is a function of the price at the central point (p_c). The demand is a function of end user prices, which equal the sum of p_c, distribution cost, profits and taxes. Prices, margins and costs are measured in $/toe.

The difference between the end user price and the import price is the gross margin. Deducting transmission costs to the central point, and distribu-

Table 11. Gross and net margins, Lerner index for selected countries. $/toe. 1985 and 1989

	Gross margin		Net margin		Rent		Lerner index	
	Industry	Household	Industry	Household	Industry	Household	Industry	Household
1985:								
France	42	283	22	230	22	157	0.10	0.34
Germany	43	180	23	127	23	83	0.10	0.23
Italy	6	235	-14	182	-14	118	-0.06	0.25
1989:								
France	35	275	15	221	15	166	0.14	0.47
Germany	55	187	35	134	22	91	0.20	0.37

tion costs to industry and households gives the net margin. The margins for selected countries are set out in table 11.

Note that distribution cost to small scale consumers cost more than to large scale users (industry and power). It can be seen that the margins and rents to the transmission companies did not change much from 1985 to 1989, the Lerner index[13] increased. This means that the transmission companies passed on the fall in import prices after 1985, but did not reduce their margins. At end user level, real gas prices has fallen to about 70% of 1985, much in line with oil and coal prices[14]. Thus gas has not lost competetiveness, due to the much larger fall in gas import prices.

Table 12 shows CIF import prices in current $, and in 1985 PPI (i.e. current dollar prices recalculated in 1985 PPI value). Due to the fall in the dollar value, the gas import cost has fallen to less than a third in current prices in Germany from 1985 to 1989! Since the gross margins (end user price minus import price) per unit seems fairly stable, we keep these margins constant in the simulations[15].

The weighted end user prices for fossil fuels were as follows (table 13):

Table 12. Import prices (CIF) for natural gas to Western Europe, selected countries. $/toe. 1985 and 1989

	Pipeline		LNG	
	1985	1989	1985	1989
Current $				
France	145	87	173	96
Germany	149	76	-	-
Italy	160	na		
EC	152	84		
1985 PPI:				
France	179	77	213	84
Germany	177	58	-	-
Italy	235			
EC	198	69		

Simulation results

We show simulation results only for the baseline run and for the effects of carbon taxes. The base year of the simulation is 1985. In the baseline run GDP for the demand area is assumed to grow by 2% p.a. The oil price increases by 1.95% p.a. until 2000, while the coal price decreases by 1% p.a. in the same period. After 2000 both prices are held approximately constant. Constant taxes and margins are assumed, and the discount rate is 10%.

In the baseline run each player has three options. For Norway these are Troll/Sleipner, Troll II and Haltenbanken A (numbered in the table as 1, 2 and 3). The three Algerian options are compressor facilitities in the existing pipeline to Italy (1), a new pipeline to Italy (2) and new LNG facilities (3). For the USSR the three options are identical, each representing a new pipeline from Sibiria with a capacity of 30 bcm. The baseline results are given in a standard format in table 14 below, showing the gas market equilibrium period by period.

As can be seen from the table only Algeria invests in 1985. Algeria moves ahead with the next two projects in 1990. Norway executes the first two options in 1990, the third in 2005. The new Soviet pipelines come in one after another after the Norwegian and Algerian options have been used. The Soviet market share will, as a result, increase to 38 %. The results from the model show that under dynamic oligopoly the supply options are not always entered across countries according to increasing costs.

Consumption increases steadily by a growth rate of about 1% p.a. The amount of imports increases somewhat unevenly with an average rate of growth

Table 13. Weighted end user prices for gas, light fuel oil and steam coal, 1985

	85$/toe		89$/toe	
	1985 PPI	1989 exch.r.	1985 PPI	1989 exch.r.
Gas, weighted consumer price	300	347	344	398
Gas, weighted industry price	222	258	254	296
Light fuel oil, industry	408	470	468	539
Steam coal	154	190	177	217

13) The marginal rent fraction of price, here estimated as rent fraction of price.

14) *IEA (1989)*, table 4-7. The oil product prices is around 90%, but the rise in gasoline prices, which does not compete in the interfuel markets, are pulling this index up.

15) The components of the gross margin vary by country and segment and cannot be directly decomposed on macro level. Carbon taxes will be simulated as additions to the gross margin.

Table 14. Simulation results, baseline run

Period	Status			Capacity bcm			Consumption bcm	Imports bcm	Import price $/toe	Market share %		
	Nor	Alg	Sov	Nor	Alg	Sov				Nor	Alg	Sov
1985	0	0	0	13.0	19.4	30.2	204	62	198	6	9	15
1990	2	1	0	20.0	36.5	55.0	251	112	112	8	14	22
1995	2	3	0	60.0	62.5	55.0	314	178	73	19	20	17
2000	2	3	0	60.0	62.5	55.0	312	178	100	19	20	18
2005	3	3	0	60.0	62.5	55.0	310	178	129	19	20	18
2010	3	3	0	79.0	62.5	55.0	326	196	140	24	19	17
2015	3	3	1	77.0	62.5	55.0	322	194	176	24	19	17
2020	3	3	1	75.2	62.5	85.0	348	223	179	22	18	24
2025	3	3	2	73.6	62.5	85.0	344	221	219	21	18	25
2030	3	3	2	72.1	62.5	115.0	370	250	224	19	17	31
2035	3	3	3	70.8	62.5	115.0	367	248	269	19	17	31
2040	3	3	3	69.6	62.5	144.6	393	277	277	18	16	37
2045	3	3	3	68.6	62.5	144.6	390	276	328	18	16	37
2050	3	3	3	67.6	62.5	144.6	387	275	384	17	16	37
2055	3	3	3	66.8	62.5	144.6	384	274	446	17	16	38
2060	3	3	3	66.0	62.5	144.6	381	273	516	17	16	38
2065	3	3	3	65.3	62.5	144.6	378	273	594	17	16	38

of 2.8% p.a from 1985 until 2040 when import levels off. The gas import price falls to 112 $/toe in 1990 as idle capacity and Algerian compressor capacity enter the market, and further to 73 $/toe, less than half of base year level, in 1995 due to the heavy 1990 investments. For a comparison the CIF price was 84 $/toe in 1989, 116 $/toe in 3rd quarter 1990, and about 130 $/toe in june 1991. The base price is set in terms of 1985 purchasing power parities (table 12) and the corresponding 1989 price was 69. The difference is due to the fall in dollar value which has caused the real price in European currencies to fall more than current dollar prices show.

The floating exchange rates complicate a comparison, but it seems clear that the model gives higher import prices than observed in 1990. There are a number of reasons for this, among the important ones is that we operate with long term elasticities, and do not adjust for short term disturbances like warm winters etc. Also, the demand function is calibrated to fit the 1985 observations, which is convenient, but a source of error. A downward calibration of the demand function would, for given investments, yield even lower prices. The model price path follows an increasing trajectory after the strategic investments are done, driven by economic growth and high income elasticity, but does not reach the present level until 2025. At that time the imports of gas to continental Western Europe is more than three times higher than today.

Examination of the simulations show that the third Algerian option (LNG facilities) is a strategic move to block the first additional Soviet pipeline, which thereby is postponed for 20 years until 2015. On the other hand if the first Soviet pipeline had been let in, it would have blocked the third Algerian option for 20 years.

Carbon taxes

In a Government commissioned study the Central Bureau of Statistics has estimated energy taxes to stabilize climate effects, see *Central Bureau of Statistics (1991)*. We use the simulation model to study the impact of the proposed energy fossil fuel taxes. The tax increases from $10/tonne CO_2 in 1995 to $200 in 2025. The relative taxes on fossil fuels are (with the tax on natural gas equal to 1.00), 1.31 for oil products and 1.63 for coal.[16] The proposed tax rates are given in table 15.

The increasing tax trajectory leads to taxes at 1.5 times the base price of oil products in 2025, and 5 times the coal price. The increased taxes on oil and coal imply, via relatively low cross price elasticities, about 50% increase in gas demand. The gas tax amounts to 1.1 times the price without tax. The negative effect of this price increase dominates the positive substitution effect. shift from the cross prices. For the given set of taxes, crossprice elasticities and a gas price of 280 $/tonne a direct gas

16) There is international disagreement on these numbers, *Manne and Richels (1991)* have used 1.4 and 1.73 respectively, and *Ogawa (1991)* uses 3.05 for coal.

Table 15. Proposed carbon dioxide taxes 1995-2025. 1987$

	CO_2 $/tonne	Oil $/toe	Gas $/toe	Coal $/toe
1995	10	32	24	39
2000	42	131	100	164
2005	73	231	177	289
2010	105	331	253	413
2015	137	431	329	538
2020	168	530	405	663
2025	200	630	482	787

price elasticity of about -.5 would have given neutral demand effect.

The simulation based on these proposed carbon taxes results in different capacities and market development. Compared to the baseline run the negative demand shift caused by carbon taxes causes the Algerian pipe and LNG-options to be postponed by 25 and 35 years respectively, Norway's Haltenbanken option is postponed 25 years, and the first Soviet pipe 15 years. This simulation contains no strategic investments. The postponement of the capacity development leads to a higher import price! Norway is the player losing the least compared to the base run.

Sensitivity tests

As mentioned above, the preliminary demand model gave a set of elasticities that are likely to be revised. Especially the industry and the electricity generation sectors these elasticities implied considerable aggregate price elasticity on the upper level of the fuel share relations (often referred to as the income effect of a price change), and very little substition effect on the lower level. We therefore ran the model with a modified base run reducing the price elasticity to -0.5. In agreement with a priori expectations, this lead to postponement of investments and less strategic play. Again, Algeria was most hurt by the change. The price trajectory did not change much in the first years, but shifted up after 2010.

Another run was made to check sensitivity of the income elasticity set at 0.5, which can be regarded as improved energy efficiency or neutral technological change exceeding historical trends. This reduced investments, most for Algeria and the Soviet Union. Also prices shifted down. A run with both adjustments reduced investments even more. In this case, the first Soviet pipe enters in 2045.

We combined the lower price elasticity with taxes. The tax makes it optimal for Norway to put in the second and third options 5 and 15 years earlier, respectively. The other players did not change plans. Combining both adjustments with taxes, made both Norwegian investments strategic, preventing Algerian and Soviet investments for several periods. Even though this drives import prices way below operative costs for a short period, this is optimal for Norway just for this strategic reason. Waiting would postpone Troll II 40 years in this extreme case, and lead to even lower prices as a result of competing strategic investments.

Concluding remarks

The simulations demonstrate that the model is very sensitive to exogenous changes. This makes simulating interesting, but also weakens the model as a planning tool. The solutions depend on a number of exogenous variables and parameters of which our knowledge is limited and uncertain. Even though a lot of this uncertainty can be reduced through research, they cannot be eliminated. Also, the players themselves are presumably better informed than the authors, at least on the cost estimates. But equilibrium paths depend on that all prises and parameters are common knowledge. This assumption is courageous in any business, but even more so in the gas business. The results in this paper should be regarded as illustrative. Relative to the baseline run, carbon taxes will not benefit the gas exporters. Algeria and Soviet stand to lose more than Norway, as their options are more sensitive to the negative demand shift.

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Economic trends in the Nordic countries

by
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This article comments on the economic situation and prospects for four Nordic countries, namely Denmark, Finland, Norway and Sweden.[1] Although the Nordic countries are frequently treated as one region, the economic structure differ widely with respect to a number of factors. The endowments of natural resources vary considerably, with Norway having vast oil and gas reserves in addition to large capacities of hydro power. The latter also plays and important role in Swedish energy supply. Regarding industry structure, Denmark is the only country in the region with a significant agricultural sector, benefiting in this area also from an easy access to the European markets through its EC-membership (so far the only Nordic country). Sweden has traditionally had the most advanced manufacturing sector among the four countries, although Finland has had great success in this sector and experienced strong economic growth during the last decade. An important special feature in the Finish economy has been the bilateral trade with Soviet Union.

During the last ten years the Nordic countries have all been through a period of economic stagnation, with weak growth in domestic demand and production, declining price inflation and increasing unemployment. By and large, these problems are similar to those that most other countries in the OECD area experienced in the late 1970s and in the first half of the 1980s, even though both Sweden, Finland and Norway have kept unemployment rates at a lower level than Denmark and most other EC-countries. However, partly due to the differences in economic structure pointed out above, there are interesting time lags in the cyclical development between the various Nordic nations. Like many other industrialized countries, *Denmark* was hit badly by the oil price hikes in the 1970s and struggled throughout the 1980s with huge deficits on the current balance and high unemployment. Several years with low inflation rates, has, however, improved competitiveness and Denmark has recently experienced a somewhat more positive economic development, in particular in foreign trade but unemployment remains very high. In the period of stagflation in the 1970s and in the early 1980s, *Norway* was rescued by rapid growth in the incomes from the oil and gas activities. Economic policy was designed to cut through the period of economic stagnation by using both realized and expected petroleum incomes. This policy was successful until the oil price deep-dived in 1986, enforcing a much more restrictive economic policy. The downturn that followed and the necessary adjustment of savings and fiscal balances in the economy are still restraining demand and production in mainland Norway. However, due to a further strong rise in the production of oil and gas and prices around 20$ per barrel, Norway now run with significant surpluses on the current account. A rapid consolidation of financial balances by households and firms also indicate prospects of a more positive development in mainland Norway in the coming year. In *Sweden* and *Finland* economic growth was rather stable during a large part of the 1980s. Recently, however, both these countries have entered a period of recession; GDP growth has become negative, domestic demand is weak and unemployment is rising. In Finland the drop in trade with Soviet Union has increased the problems created by a general slack in the international economy and the Finish currency was recently devalued by 12 per cent. In Sweden the central bank interest rate was recently raised from 11.5 to 17.5 percent in order to stop the outflow of capital.

This article presents economic trends in the four Nordic countries. Forecasts for main economic aggregates are also presented. Most of the estimates for 1991 and 1992 are based on a recent report from AIECE - The Association of European Economic Forecasting Institutes. Some figures from OECD and various domestic sources are, however, also utilized. The forecasts for 1992 are based upon certain assumptions regarding an overall economic upturn in the OECD area. In particular, a central assumption is that an upswing in the US economy will start this year and continue in 1992. Most analysts still regard this as a likely scenario, al-

1) With the term "the Nordic countries" one would normally also include Iceland. This country is excluded from this comparison due both to problems of providing relevant data and because this country's special dependence on fisheries.

though there seems to be increased uncertainty regarding the strength and durability of the US cyclical upturn as well as when it will start.

Sluggish economic growth

While most OECD countries in the latter part of the 1980s showed strong economic performance, the growth in the Nordic countries as a whole steadily levelled off. The international downturn which started in 1989/90 enlarged the problems for all countries. However, although common features may be noted, there are important differences both in historical developments and in present trends between the various Nordic countries. In the current situation, both Finland and Sweden are rapidly heading into a recession, while Norway and Denmark probably are on the way upwards.

In Norway and Denmark, a period of strong growth in the period 1984-1986 was followed by a tightening of economic policy and a strong decline in GDP growth in the ensuing years (see figure 1). After sluggish economic development in 1988-1990, the recent forecasts point at a recovery in 1992 with GDP growth reaching 2.2 percent and 3.0 percent respectively (up from 1.6 and 1.0 percent in 1991). For Norway this development is partly explained by a continued increase of oil- and gas production levels, but even the mainland economy is expected to show growth figures approaching 1.5 percent. For Denmark, the brighter prospects are to a large extent based on increased exports. Strong export performance has already been observed, and in particular the strong expansion of the German market has stimulated Danish exports. As mentioned, with an upswing in international economic growth, Denmark should gain from an improved competitive position.

In Sweden the economy showed stable economic growth almost throughout the whole 1980s. The labour market remained tight. This however, contributed to persistently higher growth rates for prices and wages than the OECD average. Towards the end of the decade the traditionally successful Swedish industry lost significant market shares, and it became clear that this development was not sustainable. In 1990, economic policy became tighter, contributing to a much weaker development in domestic demand and production. Actually, negative GDP growth is expected both in 1991 (-1.5) and in 1992 (-0.9).

Among the Nordic countries, Finland showed the strongest economic progress during the 1980s, and the growth accelerated towards the end of the decade. As in the other countries, this period of strong expansion caused pressure in the economy and drove up wages and production costs. The reaction to this development has just been seen, in terms of an almost dramatic fall in the activity level during 1991. Recent estimates point at a 5 percent drop in GDP from 1990. The breakdown of the eastern trade has of course added to these problems, and as a result total exports are expected to be reduced by 10 percent from 1990 to 1991. For 1992, the economic picture will remain weak, with GDP growth close to zero.

Industrial production is commonly regarded as a leading indicator when analyzing business cycles. As is demonstrated by figure 2, the development of industrial output in the Nordic countries underlines the picture of an economic recession in these countries in the late 1980s. Except for strong growth in Finland in 1987 and 1988 and the development in Norway, the downward trend is more pronounced than for total production in all countries. However, regarding the recent trends, the picture is more or

FIGURE 1. GDP
Real annual growth rates

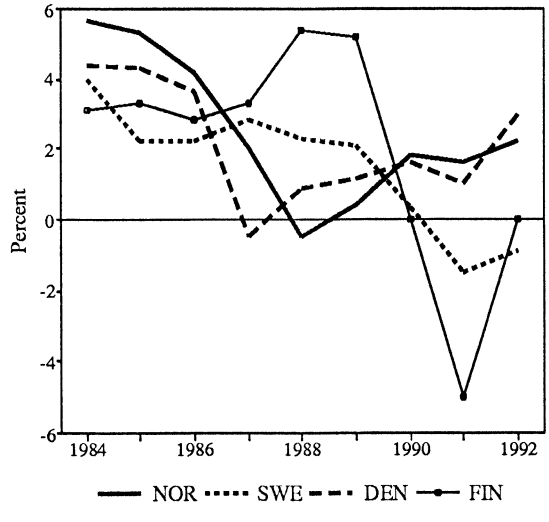
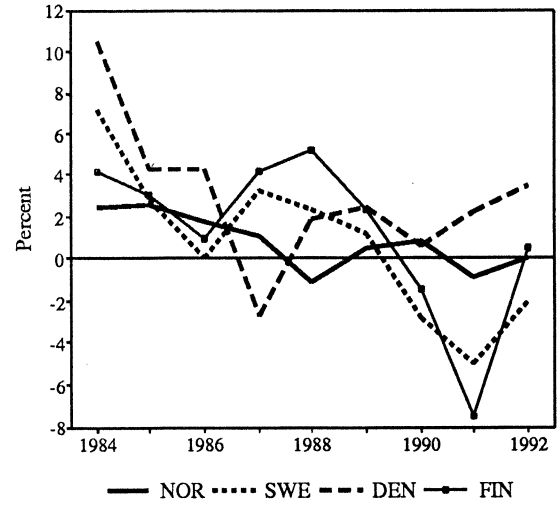


FIGURE 2. GDP, MANUFACTURING
Real annual growth rates



less the same as for GDP: output levels have picked up in Denmark and Norway, while the industry sector in Sweden and Finland will remain in a recession both this year and the next.

Credit liberalization and fluctuating savings

Despite differences in economic structure, the period of recession in the Nordic countries has much in common. Compared to many other countries in the OECD area, more weight has traditionally been put on employment issues, and less on problems created by high inflation. Over the years, this has contributed to reduced competitiveness and problems in export and import competing industries. An important factor in explaining the domestic development in the Nordic countries since the mid-1980s, is the gradual liberalization of credit markets that has taken place.

Both in Finland, Sweden and Norway the credit market was deregulated in the first part of the 1980s. In Denmark, market regulations were not as strict as in the other countries, but the proposed transformation to fixed exchange-rate policy in 1982, created a downward pressure on interest rates. At the same time, inflation rates in all countries were still high and the tax system allowed for significant deductions of interest expenses, implying low and even negative after tax real interest rates. Naturally, with "free access to cheap loans", total credit volumes increased markedly and put strong pressures on domestic demand. The impacts were particularly strong in housing and property markets, where prices increased rapidly. Housing investments rose to higher levels (see figure 3), and prices both in new constructions and in the second hand markets accelerated. In this period, "myopic" expectations held by households' probably added to these tendencies, as housing investments clearly

FIGURE 3. HOUSING INVESTMENTS
Real annual growth rates

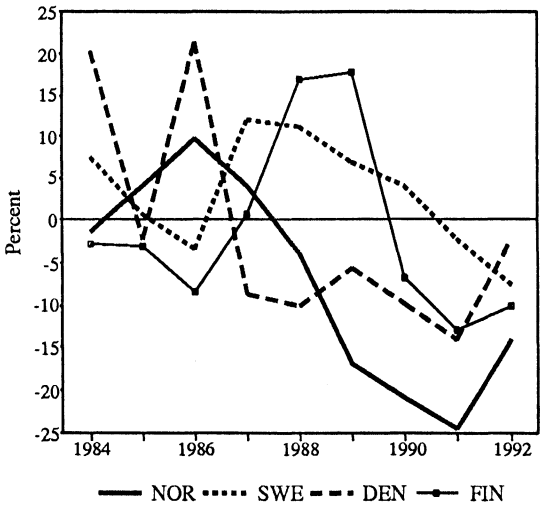
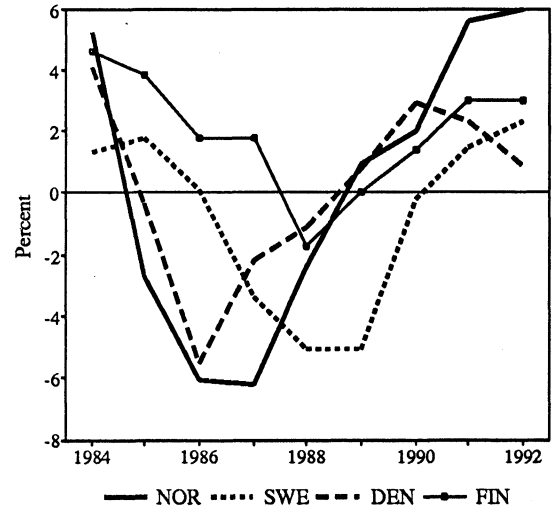


FIGURE 4. SAVINGS RATIO, HOUSEHOLDS



seemed far more profitable than financial investments. In Norway and Denmark, a dramatic drop in households saving ratio started as early as 1984 (see figure 4). A somewhat more modest fall in the saving ratio could be observed in Sweden from 1986 and onwards, and Finland entered a similar development some years later. Both in Sweden and in Norway, where the credit market had until then been firmly regulated, saving ratios started from rather positive levels and quickly became negative.

The period of credit liberalization and expansion of domestic demand was followed by both tighter fiscal policy and a necessary adjustment of households' saving. Lower inflation and significant changes in the tax systems (with reduced effects of interest deductions), contributed to raise the real rate of interest. This increased the debt burden of many households, and this in turn enforced private financial consolidation. In Norway, the speed of this consolidation has been quite remarkable. Due to strong growth in private incomes and negative to moderate increases in consumption in the late 1980s, the saving ratio turned positive again in 1989 for the first time since 1984. In spite of continued strong growth in households' disposable income, a close to zero increase in consumption is expected this year. The saving ratio is thus expected to return to its "historical level" of around 5 percent in 1991. As households have been rebuilding their financial position the last two years, private expenditure is expected to show considerable growth next year. Continued growth in real household incomes and significant tax reductions contribute to this development.

A similar, but more modest recovery may be seen for Sweden. Despite a strong increase in households disposable income, private consumption will not increase at all this year, and the forecast for 1992 points at very low consumption growth. In Den-

mark, domestic demand declined from 1987-90 by about 1 percent a year due to reduced public support for residential construction and a contraction of government demand. Private consumption was also weak and the saving rate gradually picked up. Increased private consumption is however expected both in 1991 and in 1992. Residential investment is still falling but is supposed to pick up again in 1992 as the private housing market recover.

In Finland private consumption declined in 1990, reflecting high interest rates and heavy indebtedness of households. In 1991, the increase in unemployment and tight fiscal policy will reduce household income, resulting in a decline in private consumption of 2.5 percent. For durable goods the estimated fall is close to 20 percent. Together with an expected fall in business investments (see below) and rapid contraction of residential construction, this may imply a reduction of total domestic demand of above 6 percent from 1990 to 1991, the largest fall in the after-war period. Private consumption will probably continue to fall in 1992.

Investments: some positive signs

Private investments started to decline in Sweden and Finland in 1989, and has since then pointed downwards (see figure 5, note that the figures are *total investments*, i.e. including housing investments). This mirrored a similar development in Denmark and (mainland) Norway starting a couple of years earlier.[2] In the latter two countries business investments have started to pick up again although very moderately, and this development is assumed to continue in 1992 (the growth estimates are in the interval of 3-5 percent). For Norway, the high and increasing investments in the oil sector give strong impulses to the rest of the economy. Investments in the oil and gas sector is estimated to about NOK 40-45 billion both in 1991 and in 1992. As a comparison, total investments in the manufacturing sector in Norway amount to only one third of this (1991-figures). In Sweden and Finland on the other hand, negative growth in investments is expected also next year. In Sweden, industry investments are, however, assumed to pick up gradually during 1992.

Severe problems in the labour market

As mentioned above, the unemployment rate in Denmark has for many years been very high, while for the other countries, unemployment figures approaching the OECD average is a more recent problem. Lower economic growth during the last part of the 1980s increased unemployment in all Nordic countries. In both Denmark and Norway, unemployment rates were reduced in 1986-87 due to the expansion of the economies, but the turnaround of economic policy and the setback of domestic demand induced increased unemployment. The slightly positive growth of production in these two countries has so far not been sufficient to bring down unemployment rates. Actually, employment both in Denmark and in Norway are about to fall in 1991, and the stabilization of unemployment is due

FIGURE 5. INVESTMENTS
Real annual growth rates

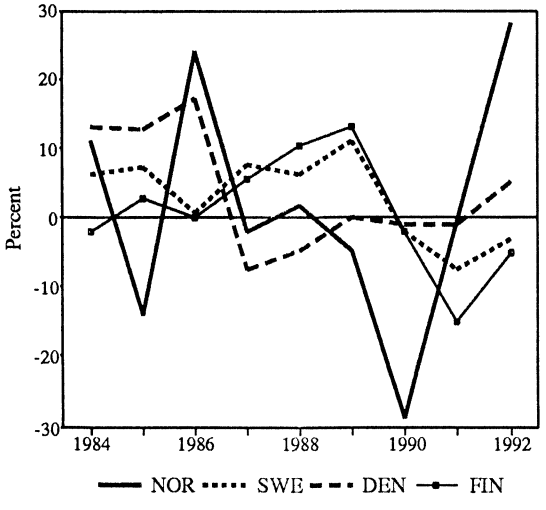
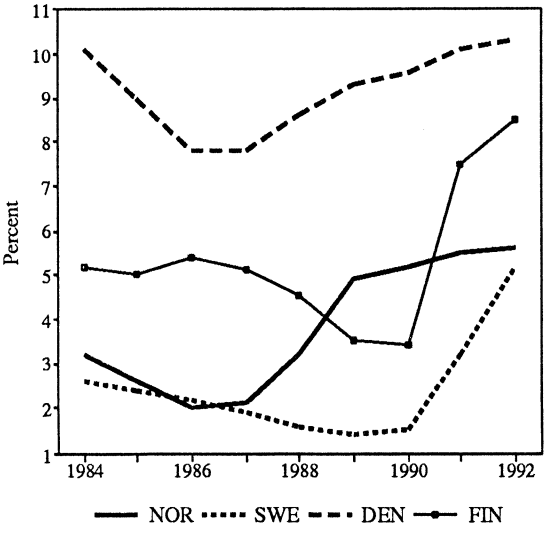


FIGURE 6. UNEMPLOYMENT RATES



2) The strong fluctuating investment figures for Norway stem from investments in the petroleum sector. In the National Accounts oil platforms and other installations are treated as investments at the time these are in place in the North Sea and stock building during construction.

to a parallel fall in labour supply. The unemployment rates are expected to decrease somewhat in both countries in 1992 (figure 6).

In Sweden and Finland, a rapid increase in unemployment, which started in 1990, has continued in 1991. In both countries the number of unemployed has doubled from the previous year. In Finland, the reduction has been most apparent in construction and manufacturing industries. For the total economy, the unemployment rate will jump from 3 1/2 percent in 1990 to over 6 percent in 1991, and for 1992 it may exceed 8 percent. In Sweden, the fall in employment has been most rapid in manufacturing industries. However, during 1991 other sectors have also been severely affected. Reduced labour supply and labour market measures will probably limit the average unemployment rate for 1991 to 3.1 percent, but the rate is expected to rise to 5.5 percent in 1992 according to most forecasts.

Reduced inflation rates - finally

Productivity growth in the Nordic countries has during the last ten years been much in line with other western countries. Prices and wages have, however, increased more rapidly than in other OECD-countries, implying loss of competitiveness. However, during the 1980 inflation rates gradually approached the OECD average. Denmark and Finland reached inflation rates of 4-5 percent in the mid-1980s, while Norway followed at the end of the decade. For 1991, the inflation rate in Denmark is estimated to 2.5 percent, in Norway 3.5 percent, and in Finland 4 percent, all at or below the average inflation rates of the countries' trading partners. In Sweden, the tax reform which increased indirect taxes, induced a preliminary increase in prices. The underlying growth in prices is now declining and the inflation rate is expected to approximate 3 percent in 1992 (figure 7). The recent Finish devaluation will however lead to an increase in inflation in 1992.

Labour costs in Sweden have grown rapidly during recent years, and the wage increase was even in 1990 as high as 10 percent, while productivity fell. However, a wage settlement agreement has limited the rise in wages to around 5.5 percent for both 1991 and 1992. Denmark, which lost competitiveness in 1990 due to appreciation of the Danish krone, expects a wage increase of 4 percent in 1991 and 3.5 percent in 1992. Along with continued growth in labour productivity (expected to improve by 2-3 percent per year in 1991 and 1992), this implies a more favourable development in labour costs in Denmark than most trading partners. In Finland, strong wage drift since 1990 has further deteriorated a rather weak competitive position of Finish industries. The wage increase is, however, supposed to fall from 9 percent in 1990 to 7 percent in 1991. In Norway, a wage regulation act reduced increases in wages in 1988 and in 1989. This contributed to improve the competitiveness of the export industries. For 1991, wage settlements resulted in a moderate increase and on average wages are estimated to rise with 5 percent. The forecast for 1992 is 4 percent.

Current account balances: mixed picture

As mentioned above, Denmark has undergone a long period with huge deficits on the current account (figure 8). Since 1986, however, the foreign trade balance has improved steadily, and in 1990 the current balance was positive for the first time since 1963. Danish export, which has been the main force of the Danish upswing over the last years,

FIGURE 7. CONSUMER PRICES
Annual growth rates

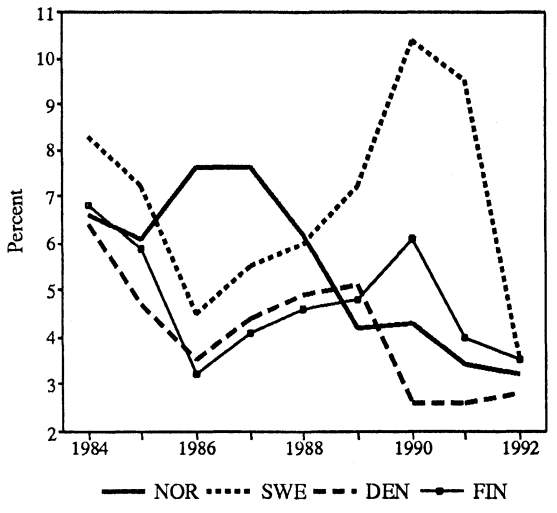
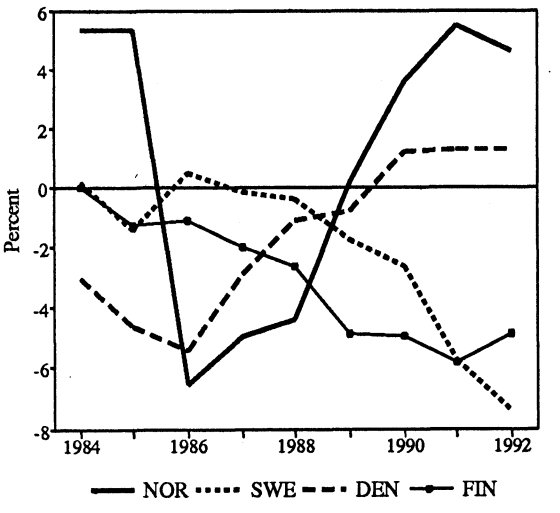


FIGURE 8. CURRENT BALANCE
Percentage of GDP



increased by 30 percent in the period 1987-90. After somewhat lower growth in 1990, annual increases of 5-6 percent is expected in 1991 and 1992 due in particular to strong growth in exports to the unified Germany. Together with more moderate growth in imports in the forecasting period, this will give a surplus on the trade balance of over 6 percent of GDP in 1992. However, Denmark still has a large foreign debt and interest payments will continue to burden the current balance in the years to come.

Norway was severely hit by the drop in oil prices in 1986, turning the current balance negative. The picture has, however, improved remarkably since then, due to the sluggish domestic demand, significant increases in petroleum production and also strong growth in traditional exports. In 1990 Norway thus had a current account surplus of NOK 20 billion, and this will exceed NOK 30 billion this year. Given that oil prices remain at present levels, Norway may expect even higher surpluses in the years to come due to further strong buildup of production capacities in oil and gas activities. In such a scenario, the total net foreign debt of about NOK 85 billion will be eliminated somewhat during 1993.

In both Sweden and Finland, the picture is the opposite: The current account deficits have steadily been growing during the last years, and the balance is expected to worsen in 1991 and 1992 as well. The breakdown in Finish exports to the Soviet Union is the main cause of an expected decline of 8-10 percent in exports this year, but the recessions in Sweden, U.K and U.S have also contributed considerably to the downswing of exports. On the other hand, imports have also decreased over the last years due to reduction in domestic demand. For Sweden, the trade balance improved from 1990 to 1991 due in particular to lower imports of goods. Weak demand internationally for investment goods and intermediate goods is an important factor behind the expected reduction in Swedish exports of 2.6 percent in 1991, since these commodities contribute to around 70 percent of total Swedish exports. A worsening of the balance of interest payments and transfers has counteracted the improvements of the trade balance.

Government financial balances

Denmark has by far the largest public debt among the Nordic countries (figure 9). The public sector deficit in 1990 constitutes 2.2 percent of GDP and is expected to increase somewhat in 1991 due to increased unemployment (figure 10). According to the 1991 budget, the central government deficit will increase somewhat, but this is expected to be offset by increased surpluses in the social security system and in local authority finances.

FIGURE 9. NET PUBLIC DEBT. 1990
Percentage og GNP/GDP

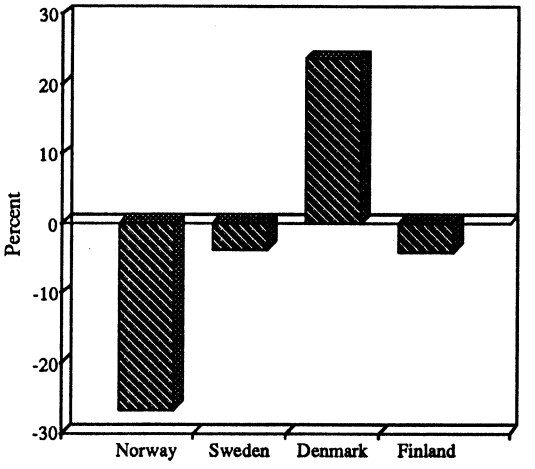
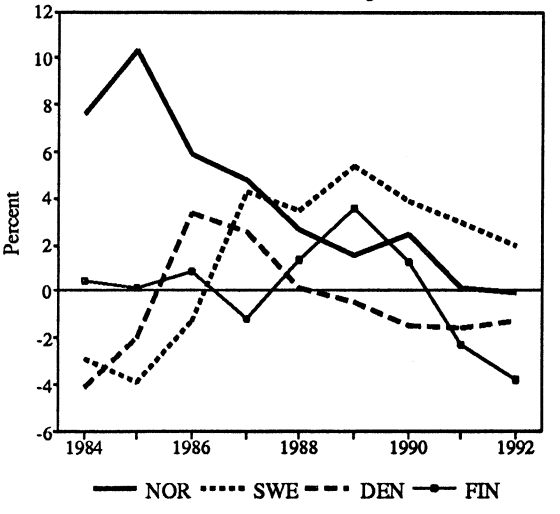


FIGURE 10. GENERAL GOVERNM. FINANCIAL BALANCES. Percentage of GDP



Central government income in Finland is assumed to remain constant in 1991, but a revision of sales taxes will reduce tax incomes by one percent. Expenditures will probably grow rapidly due to the rise in unemployment, and increase the deficit to 3.3 percent of GDP. For 1992, the main policy goal is to limit the increase in real government expenditures. However, even if this policy succeed, the net public debt is expected to reach 22 percent of GDP, a dramatic increase from 1990.

The 1991/92 budget in Sweden implies a modest tightening of the fiscal policy in 1991. Over the last years, public sectors financial balances have worsened and public savings have fallen from 4 percent of GDP in 1990 to 0.5 percent this year. This is mainly due to lower tax income and increased labour market measures. The public sector financial

surplus (as percentage of GDP) is expected to reach 3 percent in 1991 and 2 percent in 1992.

In Norway, fiscal policy has been very expansionary over the last years in an attempt to cope with increasing unemployment. In the 1992 budget the central government deficit is estimated to 2.9 percent and 3.3 percent of GDP respectively. However, surpluses in other government sectors and funds outweigh the central government deficit, so that net financial investments of the whole public sector will be positive in 1991. Moreover, the Norwegian government sector still has significant positive net assets (see figure 9). The 1992 tax-reform implies a reduction in tax payments of NOK 5 billion and the maximum marginal income-tax-rate is reduced from 58 percent in 1991 to 49 percent in 1992.

The bank crises

Large households indebtedness and bankruptcies have created severe bank sector losses, in particular in Norway and Sweden. Recently, the Norwegian bank Kreditkassen was suspended from the stock market. In Norway, the government has therefore established a public fund aimed at supporting private banks with loans. In addition, another fund is established to strengthen the equity situation of the private banks. The two funds has so far been supplied with an amount of about NOK 15 billion. The Norwegian authorities have decided that banks should increase the capital-adequacy ratio to 8 percent, matching the international BIS minimum. Presently, this requirement is far from being met, and as a start the ratio should be increased to 5.6 by the 1 January 1992. By its intervention, the Government has clearly demonstrated that it will see that this goal is achieved.

In Sweden, the recession has led to losses in the financial sector of around SKR 20 billion in 1991. However, the financial situation for Swedish banks is better than in Norway, with an average capital-adequacy ratio close to 8 percent (equal to the international BIS-requirement). The fall in housing prices has also so far been less dramatic than in Norway. However, recent re-evaluations of property values have brought down the ratio in some saving banks.

Denmark has so far avoided a similar crises in the banking sector. This is reflected in the Danish capital-adequacy ratio, which is about 10 percent. Moreover, the Danish banks are not involved in the property market in the same way as in Norway and Sweden.

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