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Economic commentaries

Effects of higher oil prices on the Norwegian economy

Haakon Solheim, Senior adviser, Norges Bank Monetary Policy

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Oil prices have risen markedly in recent years. An oil price increase affects the Norwegian economy through various different channels. Some sectors will experience increased demand, while others will be affected mainly through higher costs. Given limited idle resources in the economy, increased activity in one sector will divert resources away from other sectors. Although higher oil prices will boost Norway's national wealth, it is therefore not a given that the net effect will be an increase in mainland GDP in the short term. It is conceivable that activity will fall even if wealth rises. In practice, however, we find a positive relationship for Norway.

The following channels may contribute to increased domestic demand:

- Higher oil prices increase not only Norway's oil revenues today but also the expected value of her remaining petroleum reserves. Much of the increase in revenue falls to the government. In the short term, this will have a limited effect for as long as fiscal policy is subject to the "fiscal rule", which limits government spending of oil revenue to the 4% expected real return on the Government Pension Fund – Global. In the longer term, however, greater wealth means that freedom to manoeuvre within the fiscal rule increases, and therefore that the non-oil budget deficit can grow.
- Oil investment rises. This affects activity in the mainland economy to the extent that it results in an increase in the supply of goods and services from mainland enterprises to the oil industry.
- Wages rise due to greater demand for labour in the oil industry and industries supplying the oil industry.
- Higher oil prices may result in expectations of increased activity and revenues in the future. The higher value of oil and gas will also help to increase the value of petroleum-related companies listed on the Oslo Stock Exchange. Changes in expectations may lead to increased investment and private consumption, and to reduced saving

(see box "Household saving" in *Monetary Policy Report 3/07*).

Other channels may put a damper on growth in the mainland economy:

- Higher energy costs for enterprises result in decreased profitability and/or higher prices. This leads to lower investment and reduced activity in industries where oil is an important input.
- Higher energy prices, in isolation, lead to a drop in real household income, which reduces household demand.
- Effects on the growth path. Higher oil prices shorten the life of real capital, causing lower productivity growth.
- Activity among our trading partners falls due to higher costs and lower real income, which reduces exports.
- The real exchange rate rises, undermining Norwegian competitiveness and thereby reducing activity.

Higher oil prices divert activity away from internationally exposed enterprises that are not oil industry suppliers in favour of enterprises that either supply the oil industry or are in a sheltered sector. How quickly this happens is affected by how quickly public authorities phase oil revenues into the economy, the impact of increased demand from the oil industry on mainland enterprises and the impact on household expectations. The net effect will also depend on how monetary policy reacts. With an inflation-targeting regime, interest rate setting will depend on an assessment of the effects on inflation.

Higher oil prices have increased mainland GDP

There are various ways of analysing how an oil price shock affects activity in the mainland economy and different areas of domestic demand. One is to use a large macroeconomic model.² Another is to use small econometric systems to analyse the effect of multiple variables simultaneously, such as vector autoregressive (VAR) systems.³ We have looked at the effect of oil

1 I have received important input from Kåre Hagelund, Bjørn Naug and Ingvild Svendsen. The results from Norges Bank's Regional Network were summarised by Marianne Isaachsen. I am also grateful for constructive comments from Hilde C. Bjørnland and Pål Winje.

2 Elkdag, Lalonde, Laxton, Muir and Pesenti (2007) and Cappelen, Eika and Olsen (2006) are two examples of this approach.

3 Blanchard and Gali (2007), Jiménez-Rodríguez and Sánchez (2004) and Bjørnland (2000) are examples of the use of VAR analyses to assess the effect of oil price shocks. The latter two studies also use Norwegian data.

prices by estimating VAR systems with two and two variables, where one is the price of oil. In this system, we explain changes in the two variables with changes in the same variables in earlier periods. Our contribution is to demonstrate the effects on consumption and investments in more detail than in previous studies using this approach.

In the analysis, we have used annual data from the national accounts published in February 2007 and oil prices measured in 2007 kroner.⁴ We look at the percentage change in the different variables. An oil price shock is defined as a one-off oil price increase of approximately 25%.⁵ The price of oil is then assumed to hold at this level.

We have concentrated on the period from 1987 to 2007, as events of the 1970s were affected by the oil industry still being under development in Norway.⁶ The analysis spans several different monetary policy regimes. The period of inflation-targeting is too short for us to be able to compare effects before and after the change in monetary policy regime.

Our results reveal both positive and negative effects on activity in the mainland economy from an oil price increase. Overall, however, there is a net positive effect on mainland GDP growth (see Chart 1).⁷ The analysis suggests that mainland GDP growth increases by 0.6

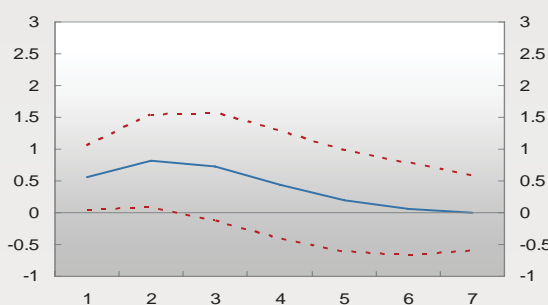
4 We deflate the price of oil by the GDP deflator for mainland Norway. The equations are estimated with two lags.

5 This corresponds to a one-standard-deviation change in oil price.

6 Thus we begin our analysis after the sharp drop in oil prices in the mid-1980s.

7 This is in line with the findings of other studies looking at Norway, such as Jiménez-Rodríguez and Sánchez (2004) and Bjørnland (2000). Cappelen, Eika and Olsen (2006), on the other hand, find that an oil price increase results in lower activity in the Norwegian economy. This conclusion is based on the effect on expectations being weak or insignificant, oil investment not being affected particularly by the higher price of oil, and the oil price increase leading to higher interest rates. Mohn (2008) believes that the net effect on activity is positive. He refers partly to oil investment – especially in exploration and recovery rates – being sensitive to changes in oil prices.

Chart 1 Change in volume growth in mainland GDP as a result of a positive oil price shock. Years 1 to 7 after the shock.¹⁾ In per cent

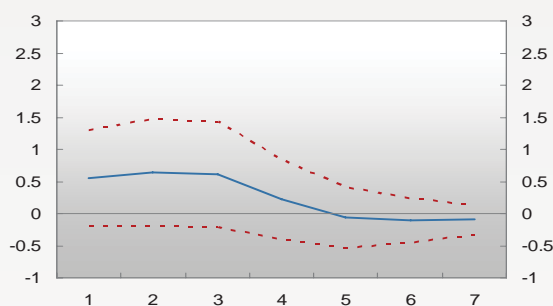


¹⁾ The oil price increases by 25 per cent in year 1, and is then stable. Estimated on data from 1987 to 2007. Broken lines indicate +/- 2 standard errors. Source: Norges Bank

percentage point in the first year and 0.8 percentage point in the second year, after which the effect gradually subsides.

In the short term, it is the effect through household consumption that contributes most to the positive effect on mainland GDP (see Chart 2). This suggests that the positive effects in the form of higher expectations are stronger than the contractionary effects resulting from higher costs and lower real income. The change in consumption can explain more than half of the change in mainland GDP in the first year, but this share decreases over time. At the same time, we find that

Chart 2 Change in volume growth in private consumption as a result of a positive oil price shock. Years 1 to 7 after the shock.¹⁾ In per cent



¹⁾ The oil price increases by 25 per cent in year 1, and is then stable. Estimated on data from 1987 to 2007. Broken lines indicate +/- 2 standard errors. Source: Norges Bank

Table 1. Effect of a positive oil price shock on annual volume growth in mainland GDP and other demand components in the national accounts. Years 1 to 4 following the shock.¹⁾ Per cent

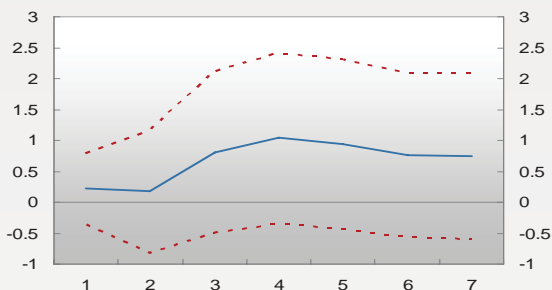
Year	GDP Mainland Norway	Private consumption	Public consumption	Private investment	Oil investment	Exploration and drilling	Platforms and modules
1	0,6	0,6	0,2	-0,2	2,5	-1,8	
2	0,8	0,6	0,2	3,5	9,7	-1,7	
3	0,7	0,6	0,8	2,9	-1,3	8,7	
4	0,4	0,2	1,0	1,6	-1,9	2,0	

¹⁾ Oil price measured in 2007 kroner. The shock corresponds to an increase in the price of oil of 25% in year 1, after which it is stable. Estimated on data from 1987 to 2007.

higher oil prices have a negative effect on the saving ratio. This lends support to higher oil prices having a relatively rapid impact on the economy by affecting expectations.

We find that higher oil prices have little effect on public consumption in the first year after an oil price increase. Public consumption does increase as a result of higher oil prices, but this effect comes only after about two years (see Chart 3). This must be seen in the light of the fiscal policy rule. The increase in the Government Pension Fund – Global as a result of higher oil prices allows the public sector to increase the size of the structural non-oil budget deficit gradually without departing from the fiscal rule.

Chart 3 Change in volume growth in public consumption as a result of a positive oil price shock. Years 1 to 7 after the shock.¹⁾ In per cent



¹⁾ The oil price increases by 25 per cent in year 1, and is then stable. Estimated on data from 1987 to 2007. Broken lines indicate +/-2 standard errors. Source: Norges Bank

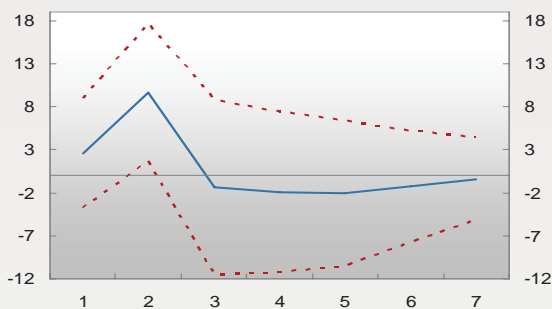
Oil prices also influence investment. Higher consumption growth leads to increased activity in the mainland economy, which contributes to higher investment activity. In addition, higher oil prices may result in increased oil investment. To the extent that this leads to increased activity in the mainland economy, growth in business sector investment will increase further. However, oil investment is also affected by other factors besides oil prices. To isolate these effects from one another, we have estimated a system of equations where oil prices, oil investment and private investment in the mainland economy are all included.

We have distinguished between oil investment in drilling, exploration and pipelines, and oil investment in platforms and modules.⁸ We find that the effect of higher oil prices on investment in drilling and exploration occurs in the first year, and that investment expands markedly in the second year (see Chart 4). The impulse to investment growth is strong, although the estimate

⁸ The analysis of investment has been performed in a system with four variables: percentage change in oil price, and volume growth in oil investment in exploration, drilling and pipe-laying, oil investment in platforms and modules, and private investment in the mainland economy.

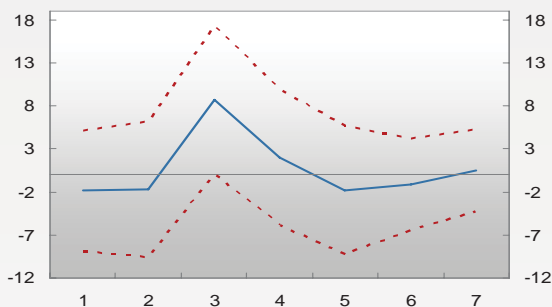
is associated with considerable uncertainty. The effect of higher oil prices on investment in platforms and modules comes into evidence somewhat later (see Chart 5). This seems to reflect a reasonable profile for investment activity.

Chart 4 Change in volume growth in oil investment in exploration, drilling and pipelines as a result of a positive oil price shock. Years 1 to 7 after the shock.¹⁾ In per cent



¹⁾ The oil price increases by 25 per cent in year 1, and is then stable. Estimated on data from 1987 to 2007. Broken lines indicate +/-2 standard errors. Source: Norges Bank

Chart 5 Change in volume growth in oil investment in platforms and modules as a result of a positive oil price shock. Years 1 to 7 after the shock.¹⁾ In per cent

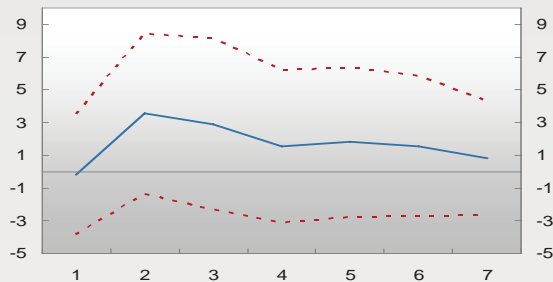


¹⁾ The oil price increases by 25 per cent in year 1, and is then stable. Estimated on data from 1987 to 2007. Broken lines indicate +/-2 standard errors. Source: Norges Bank

Higher oil prices have a positive and lasting effect on growth in private investment in the mainland economy (see Chart 6). However, the effect is visible only after one to two years. We find that the growth in private investment is mainly concentrated in business-oriented industries. We find no direct effect on investment in the mainland economy from investment in exploration and drilling, but we do find a positive effect on investment in the mainland economy from an increase in oil investment in platforms and modules (see Chart 7). In particular, we see a strong relationship between investment in platforms and modules and investment in manufacturing industries that supply this part of the oil industry, such as engineering, shipbuilding and platforms.

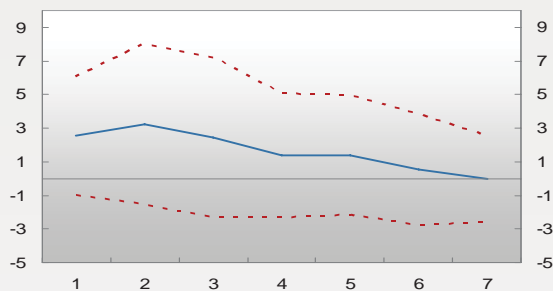
We find a negative relationship between higher oil prices and exports of traditional goods. This may be

Chart 6 Change in volume growth in private investment in mainland Norway as a result of a positive oil price shock. Years 1 to 7 after the shock.¹⁾ In per cent



¹⁾ The oil price increases by 25 per cent in year 1, and is then stable. Estimated on data from 1987 to 2007. Broken lines indicate +/-2 standard errors. Source: Norges Bank

Chart 7 Change in private investment in mainland Norway as a result of a positive shock in oil investment in platforms and modules. Years 1 to 7 after the shock.¹⁾



¹⁾ The oil price increases by 25 per cent in year 1, and is then stable. Estimated on data from 1987 to 2007. Broken lines indicate +/-2 standard errors. Source: Norges Bank

due to a stronger real exchange rate, lower external demand and domestic resources being diverted towards the public sector and sectors supplying the oil industry. This is also reflected in the signs we find of distortion between different parts of the manufacturing sector as a result of the oil price shock. There is a positive effect on industries that typically supply the oil industry, such as engineering, shipbuilding and platforms, but we find a negative effect on, for example, the production of metals. In recent years, exports of traditional goods have grown markedly despite high oil prices. This needs to be seen in the light of strong growth in the global economy. It may also be a reflection of foreign petroleum activities accounting for a growing share of Norwegian exports.

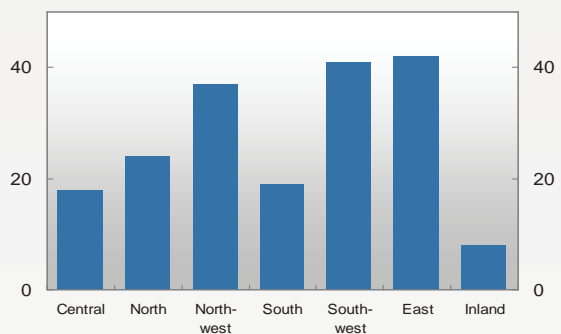
A stronger real exchange rate can translate into higher inflation and/or a stronger nominal exchange rate. The analysis shows a moderate pass-through from higher oil prices to consumer prices measured by the CPI. We find that higher oil prices strengthen the nominal exchange rate. We also find a positive effect from an oil price shock on real hourly wages. There is reason to believe that this is due to increased activity in the economy (see below). Most of this effect comes into evidence two-three years ahead. Over time, higher wage growth will push up domestic cost levels.

What do Norwegian enterprises think about the importance of the oil industry for their own demand?

In spring 2008, Norges Bank's regional network conducted a survey of oil dependence at Norwegian enterprises. The survey asked about the importance of the oil industry as a customer for Norwegian enterprises⁹ and how the oil industry affects competition in the Norwegian labour market.

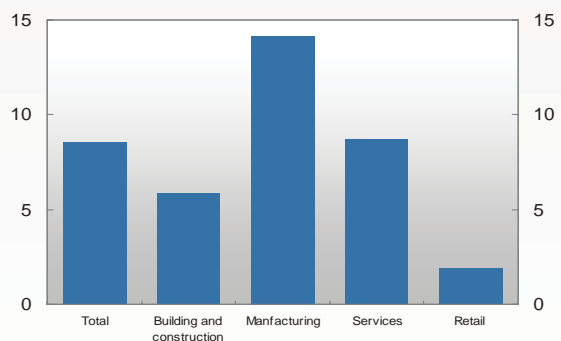
A total of 27% of the enterprises surveyed responded that they supply the oil industry. The proportion supplying the oil industry is highest in southeastern Norway, closely followed by the southwest of the country. The proportion is lowest in eastern and central parts of Norway (see Chart 8). Around 14% of income in the manufacturing sector is affected by developments in the oil industry, and around 9% in the service sector (see Chart 9). Most enterprises supply enterprises that supply the oil industry. Around a third of the supply activity is related to operation and maintenance, a third to offshore exploration and development and the remainder mainly to onshore activities.

Chart 8 Share of business that are affected by the oil sector through delivery of goods and services. By region. In per cent.



Source: Norges Bank's regional network

Chart 9 Share of total turnover related to the oil-producing sector. Per cent. 2008



Source: Norges Bank's regional network

⁹ Both goods and services supplied directly and goods and services supplied to enterprises that supply the oil industry.

Demand from the oil industry accounts for about 10% of revenue at the enterprises surveyed. They estimate that a drop in oil prices back to the levels seen before 2003 (USD 20 per barrel) could reduce their revenue by around 3%. They believe that around half of the lost revenue could be made up relatively quickly by gearing production towards other markets. Even so, this underlines Norwegian enterprises' vulnerability to large changes in oil prices.

The proportion of enterprises experiencing competition from the oil industry in the labour market is higher than the proportion supplying goods and services to the oil industry. The market for engineers, skilled manufacturing workers and project managers in particular is affected by the need for labour in the oil industry. Increased competition is noticed first and foremost by companies in the southwest of the country (see Chart 10). Norwegian enterprises see this competition particularly through higher wage demands (see Chart 11). A total of 36% report that they have experienced increased competition from the oil industry in the last year, and 27% that they have noticed this through higher wage demands. This is in line with the empirical analysis, which shows a positive relationship between oil prices and wage growth. Another channel is increased

employee turnover, with 16% of enterprises reporting that this is important.

The increase in oil prices has probably been an important driver behind the recent economic upswing. Consumption growth has been high for several years, and there has been strong growth in manufacturing industries that supply the oil industry. At the same time, global growth has been high. This suggests that oil prices have been driven largely by increased demand, not by restrictions on the supply side as was the case in the 1970s. It has also been argued that higher oil prices may have a less pronounced effect on the global economy in recent years than previously. This is a reflection of less energy-intensive production and enhanced monetary policy credibility (see, for example, Blanchard and Gali (2007) and the box "Effects of high oil prices on the world economy" in *Inflation Report* 3/05). The global outlook is now marked by greater uncertainty and lower growth prospect. This may curb the expansionary effects associated with higher oil prices ahead.

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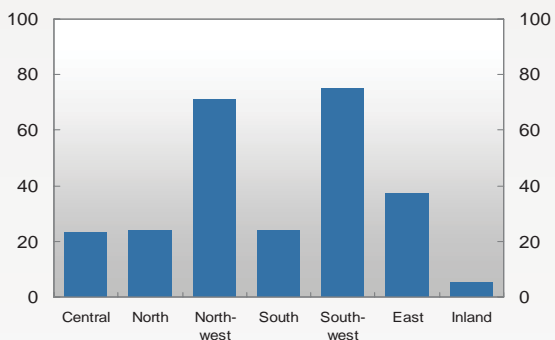
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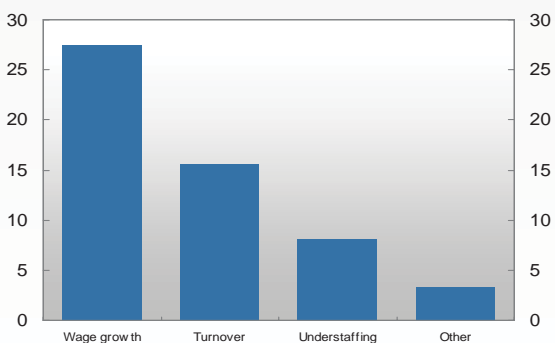
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Chart 10 Share of businesses that are affected by the activity in the oil sector through the labour market. By region. In per cent



Source: Norges Bank's regional network

Chart 11 How has demand for labour in the oil sector affected your business during the last year? Per cent. 2008



Source: Norges Bank's regional network