Economic commentaries

Monetary Policy

The effect of a fall in oil prices on the turnover of Norwegian enterprises

An analysis based on Norges Bank's regional network

By Anna Sandvig Brander, Henriette Brekke and Bjørn E. Naug*



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Norwegian enterprises have increased their sales to the oil and gas industry markedly in recent years. In this article, we take a closer look at the petroleum-related turnover of Norwegian enterprises and the effect of a fall in oil prices on turnover. The analysis is based on a survey of enterprises in Norges Bank's regional network. The responses indicate that a share of sales will be affected if oil prices fall below USD 90 and that a drop to USD 70 or lower will have a severe adverse impact on petroleum-related sales in the Norwegian economy. Overall, the enterprises estimate that they can only compensate for lost petroleum-related sales to a limited extent by increasing sales in other markets in the first one to two years after a fall in oil prices.

Introduction

Oil prices have quadrupled since 2002, driven by increased demand from Asia and an increase in production costs in non-OPEC countries. The rise in prices has led to a surge in activity in the petroleum sector in Norway and abroad. Since the degree of concentration among Norwegian enterprises in the petroleum sector is considerably higher than among enterprises in other countries, the impetus to production and employment in Norway has been particularly strong. As a result, Norwegian enterprises have increased their deliveries to the petroleum industry – both on the continental shelf and abroad – markedly in recent years. Increased deliveries have in turn had considerable spillover effects on the wider Norwegian economy.

This development may have made Norwegian enterprises more vulnerable to a drop in oil prices. There is considerable uncertainty attached to future oil prices. The effect of a fall in oil prices on Norwegian enterprises will depend on the amplitude of the fall, the scale of enterprises' petroleum-related sales, the sensitivity of sales to a price drop, and to what extent enterprises can compensate for lower petroleum-related sales by increasing sales in other markets.

The analysis in this commentary is based on a survey of 563 enterprises, excluding oil companies and public entities, in Norges Bank's regional network. The enterprises were asked about the scale of their petroleum-related sales and the drivers of these sales. They were also asked about how their petroleum-related sales would be affected by a fall in oil prices, and to what extent they could replace lost sales by increasing sales in other markets. The survey was conducted in the second half of 2012, and is described in greater detail in Annexes 1 to 2.

¹ We would like to thank Kjetil Olsen, Marianne Sturød, Per Espen Lilleås and Gisle James Natvik for their helpful suggestions and comments. We are also grateful to Mari Brekke Holden for her assistance in preparing the charts.

How dependent are Norwegian enterprises on petroleum?

A large number of Norwegian enterprises make petroleum-related sales. These sales can be categorised according to the types of products the enterprises supply and according to the drivers of the sales (see separate box for further discussion). The petroleum-related deliveries largely depend on investment and production inputs on the Norwegian continental shelf. Investment and production inputs in the *production of crude oil and natural gas* and *pipeline transportation* sectors have increased as oil prices have risen over the past 10 years (see Chart 1). The two demand components accounted for 11 percent of GDP for mainland Norway in 2012, indicating that demand from oil companies on the Norwegian continental shelf is important for the turnover of Norwegian enterprises. However, some investment and production inputs are import-based. In addition, Norwegian oil suppliers make substantial sales of goods and services to foreign oil suppliers and foreign petroleum industries. Accordingly, a more detailed picture of petroleum sales by Norwegian enterprises can be obtained by surveying the enterprises than by looking at figures for investment and production inputs on the Norwegian continental shelf.

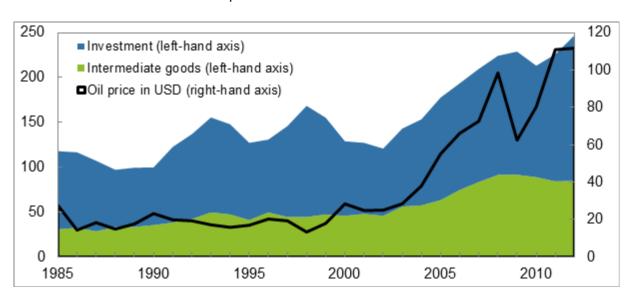


Chart 1 Oil price and demand from the Norwegian petroleum sector¹⁾ Demand measured at constant2010 prices. In NOK billions

Source: Statistics Norway

Around 40 percent of the enterprises in the survey make petroleum-related sales. The majority of the enterprises with petroleum-related sales reported that such sales account for up to 25 percent of total turnover. Only a small proportion of the enterprises stated that more than 75 percent of their sales are petroleum-related.

The enterprises in the sample that fall into the *industrial* and *service provision* sectors have a higher proportion of petroleum-related sales than the enterprises in the *trade in goods* and *building and construction* sectors (see Chart 2). More than half of the enterprises in the *service provision* sector

¹⁾ Production and pipeline transport

² Several analyses may indicate that 30 to 40 percent of production is exported; see Jacobsen et al. (2010), Rystad Energy (2012), Sasson and Blomgren (2011) and *Norsk Industri* (Federation of Norwegian Industries) (2013).

make petroleum-related sales. The proportion of enterprises making such sales is one-third in the *industrial* sector and one-quarter in the *building and construction* sector. Only one-tenth of the enterprises in the *trade in goods* sector make petroleum-related sales. Most of these enterprises stated that their petroleum-related sales accounted for less than 25 percent of their total sales.

Details of petroleum-related sales by Norwegian enterprises

Oil prices can affect the sales of Norwegian enterprises in different ways, depending on the types of products delivered and the relevant sales drivers. Such sales can be categorised by product/sector as follows:

- 1) Production of crude oil and natural gas and pipeline transportation. In total, enterprises in these sectors accounted for over 20 percent of GDP and almost 30 percent of investment in Norway in 2012. They also purchase a substantial volume of goods and services in connection with operation and maintenance (production inputs) (see Chart 1). Employment in these sectors accounted for 1 percent of total employment in 2012.
- 2) Services linked to production of crude oil and natural gas. This separate sector in the national accounts covers exploration and production drilling and other services that relate directly to the production of crude oil and natural gas. The sector is designed to cover service provision on the continental shelf, and is therefore not included under Mainland Norway in the national accounts. The enterprises in this sector accounted for 2 percent of GDP and ¼ percent of investment in 2012. Employment and production inputs among these enterprises are almost as high as among enterprises in category 1).
- 3) Other products that are specially adapted to the needs of the petroleum industry. Many enterprises in Mainland Norway supply such products. These enterprises are spread across multiple industries in the national accounts. Foreign shipping also includes such deliveries.
- 4) Non-petroleum-specific goods and services supplied to the petroleum industry. These may include, for example, banking services, ICT services, audit services, transportation services and hotel and restaurant services.

The enterprises in categories 2) and 3) are often referred to as "oil suppliers". The boundary between the two categories is fluid, since a number of enterprises in category 2) also engage in considerable petroleum-industry-focused industrial activity in Mainland Norway; see *Norsk Industri* (Federation of Norwegian Industries) (2013). The enterprises in the category *services linked to production of crude oil and natural gas* are partly classified as "industry" and partly as "service provision" in our survey.

We have considered the effect of lower oil prices on deliveries by enterprises in categories 2), 3) and 4) to enterprises in categories 1), 2) and 3), in Norway and abroad. These sales are driven by several types of demand:

- Exploratory activity (seismology, exploratory drilling, etc.)
- Development and construction of offshore installations, onshore facilities, rigs, offshore vessels, etc.
- Modification of offshore installations, onshore facilities, rigs, offshore vessels, etc.

- Operation and maintenance
- Shutdown and decommissioning of offshore installations

The first three demand categories are defined as investments, while operation and maintenance are treated as production inputs. Shutdown and decommissioning are treated partly as production inputs in the production and pipeline transport sector and partly as sales of fixed assets used in the production and pipeline transport sector to enterprises that perform shutdown and decommissioning.

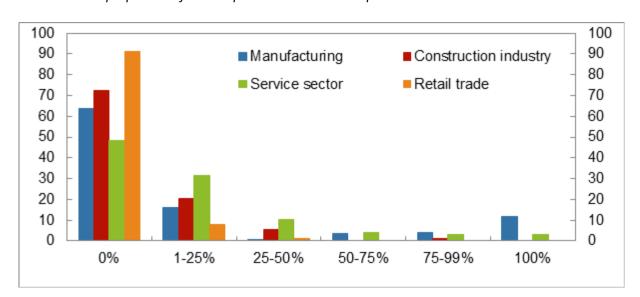
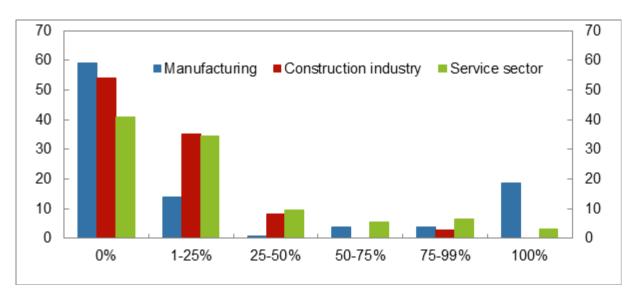


Chart 2. What proportion of sales is petroleum-related? In percent

Source: Norges Bank's regional network

Chart 2 may give the impression that Norwegian enterprises make relatively modest deliveries to the petroleum industry or (other) oil suppliers. However, the enterprises that stated that more than 75 percent of their sales are petroleum-related employ many people. Generally speaking, large enterprises specified a higher proportion of petroleum-related sales than small enterprises in the same industry (see Charts 2 and 3). One-fifth of industrial enterprises with more than 100 employees reported that all of their sales are petroleum-related.

Chart 3. What proportion of sales is petroleum-related? In percent. Companies with more than 100 employees



Source: Norges Bank's regional network

A drop in oil prices may affect enterprises differently, depending on what drives their petroleum-related sales. The enterprises were therefore asked to identify the most important drivers of their petroleum-related sales. The possible responses were based on the five types of demand described in the box above, although *operation and maintenance* was split into purchases of petroleum-specific and non-petroleum-specific products. Overall, the industrial enterprises stated that *development and construction, modification* and the purchase of petroleum-specific products for *operation and maintenance* are the most important drivers of their petroleum-related sales (see Chart 4). These drivers are also important for deliveries by other industries, albeit less so than for this industry. Only a small proportion of the industrial enterprises reported that demand for non-petroleum-specific goods and services linked to *operation and maintenance* is important for petroleum-related sales. However, this is the most important driver for enterprises in other industries. Only a small number of enterprises reported that *shutdown and decommissioning* is important for their petroleum-related sales. This reflects the fact that shutdown and decommissioning expenses are modest compared to the other expenditure categories in Chart 4.³

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³ Closure and dismantlement expenses have totalled NOK 3 to 4 billion in recent years; see *Oljedirektoratet* (Norwegian Petroleum Directorate) (2010, 2011) and *Norsk olje og gass* (Norwegian Oil and Gas Association) (2012).

80 80 ■Manufacturing ■ Construction industry ■ Service sector and retail trade 70 70 60 60 50 50 40 40 30 30 20 20 10 10 0 General operation Exploration 1) Design and Modification 2) Operation and Shutdown and decommissioning construction 2) maintenance 2) 3) 4) Seismology, exploratory drilling, etc. 2) Of offshore installations, onshore facilities, rigs, offshore vessels etc. Non-petroleum-specific products and services 4) Of offshore installations

Chart 4. What are the most important drivers of petroleum-relates sales? In percent

Source: Norges Bank's regional network

How low can oil prices fall before petroleum-related sales are adversely affected?

In this section, we examine the effects of a drop in oil prices on petroleum-related sales. If oil prices fall, expected future oil prices will normally also drop. This will reduce the expected profitability of oil exploration and the expected profitability of current investment projects. This may result in lower investment in Norwegian and foreign petroleum activities, which in turn will shrink operational, maintenance and modification expenditure. Lower oil prices may also cause oil companies to reduce some of their operational costs to mitigate the decline in profits. If oil prices fall below marginal production costs, fields may be shut down. However, production costs in the petroleum industry are relatively low.

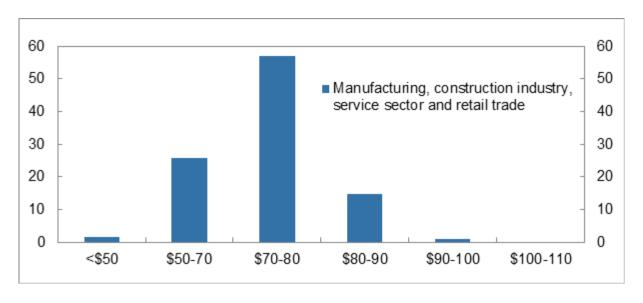
The enterprises that make petroleum-related sales were asked (i) how far oil prices could drop before the decline would have a severe adverse impact on their petroleum-related sales, and (ii) how many quarters it would take for lower oil prices to result in lower sales. In other words, we have taken account of the fact that a fall in oil prices may affect sales differently depending on the magnitude of the drop. If prices fall to a level at which current petroleum-related investment projects remain profitable enough to be completed, the decline in prices may have a minor effect on the activity levels among Norwegian enterprises. On the other hand, if the price drop causes a significant number of investments to be postponed or cancelled, it may trigger a substantial decline in petroleum-related sales.

Charts 5 and 6 illustrate the responses to questions (i) and (ii) above. The replies have been weighted using estimates of the enterprises' petroleum-related employment. ⁴ The charts thus show estimates

⁴ We began by calculating petroleum-related employment by each enterprise as total employment by the enterprise multiplied by the median of the range of the proportion of sales that are petroleum-related. We then calculated the proportion of petroleum-related employment (by the enterprises that replied to the questions on the effect of lower oil prices), associated with each alternative answer regarding the effect of lower oil prices.

of the proportion of petroleum-related sales that will be materially affected when oil prices are at different levels.

Chart 5. How low can oil prices fall before having major negative consequences for petroleum-related sales?¹⁾ In percent



¹⁾ Responses weighted using employment and the proportion of petroleum-related sales by the enterprises.

Source: Norges Bank's regional network

Overall, the enterprises reported that a drop in oil prices would not have a severe adverse impact on their petroleum-related sales as long as oil prices stayed above USD 100. Some enterprises in the sample stated that their petroleum-related sales would decline sharply if oil prices fell to around USD 90. However, these enterprises have little petroleum-related employment, and have therefore been given little weight in Chart 5. Around 15 percent of the enterprises (weighted using estimated petroleum-related employment), stated that oil prices could fall to USD 80–90 before the drop would have a severe adverse impact on their petroleum-related sales. Almost 60 percent of the enterprises reported that oil prices could fall to USD 70 to USD 80 before their petroleum-related sales would be materially affected. The replies therefore indicate that sales will be affected to some degree if oil prices drop below USD 90, and that a decline to USD 70 or lower would have a severe adverse impact on petroleum-related sales in the Norwegian economy. However, a considerable number of enterprises reported that oil prices could fall to USD 50–70 before a drop would have a strong negative impact on their petroleum-related sales. Several of these enterprises supply products required for operation and maintenance while fields are in production. Such sales are more robust in the face of declining oil prices than sales focused on investment.

In isolation, Chart 5 may suggest that petroleum-related sales in the Norwegian economy will be largely unaffected by a drop in oil prices if prices remain above USD 90. However, the results must be interpreted in light of the fact that the enterprises have specified how low oil prices could fall before there are *severe* adverse consequences for their petroleum-related sales. Some enterprises may suffer reduced sales at higher oil prices than they have reported as the "critical price" in the survey. It is therefore reasonable to assume that a drop in oil prices will affect petroleum-related sales in the

Norwegian economy at somewhat higher price levels than those shown in Chart 5. This is also supported by the fact that investment costs have increased since the survey was conducted in the autumn of 2012, as a result of both tax changes and general cost inflation.

In respect of the majority of petroleum-related sales, lower oil prices were estimated to take effect after three to four quarters (see Chart 6). However, almost a quarter of enterprises also stated that it would take around two years, or even longer, for lower oil prices to affect their petroleum-related sales. Only a small proportion of sales were expected to be affected within one to two quarters. On average, enterprises with a high proportion of petroleum-related sales stated that their sales would be affected more slowly than enterprises that make relatively few sales to the petroleum industry. This may be because enterprises with a high proportion of petroleum-related sales make a larger proportion of deliveries in connection with investment projects than the other enterprises, and because ongoing projects are seldom shelved even when oil prices fall considerably.

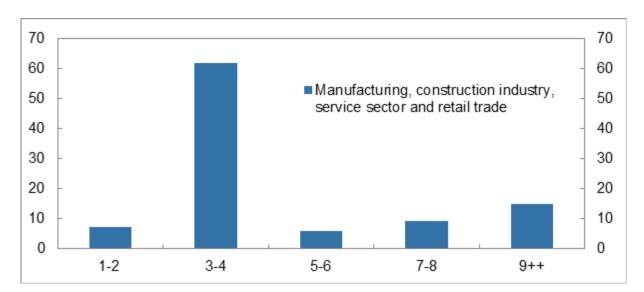


Chart 6. How many quarters will it take for lower oil prices to result in lower sales?¹⁾ In percent

Source: Norges Bank's regional network

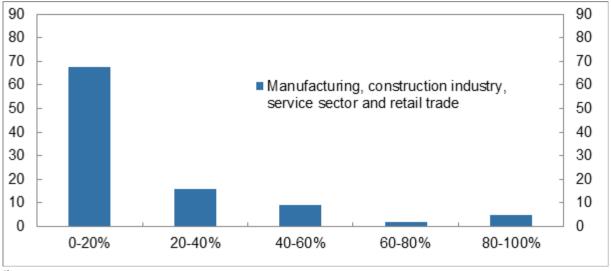
Can enterprises compensate for the loss of petroleum-related sales by increasing their sales in other markets?

Norwegian businesses have focused an increasing proportion of their activities on the petroleum industry in recent years. This suggests that the economy has become more vulnerable than previously to a drop in oil prices. This vulnerability is determined by the extent to which enterprises will be able to shift their activities to non-petroleum-related markets if petroleum-related sales decline. This adaptability will in turn depend on the degree of petroleum-related specialisation among the enterprises. In particular, it seems likely that enterprises that supply specially adapted products are less adaptable than enterprises that supply non-petroleum-specific goods and services. The ability to compensate for lost petroleum-related sales will also depend on demand and competition conditions in alternative markets.

¹⁾ Responses weighted using employment and the proportion of petroleum-related sales by the enterprises.

We examined the adaptability of the enterprises by asking them about the extent to which they can compensate for the loss of petroleum-related sales by increasing sales in non-petroleum-related markets within one to two years. The replies were weighted using estimated petroleum-related employment by the enterprises.

Chart 7. If petroleum-related sales should fall, what proportion of the shortfall could be made up for in non-petroleum-related markets within one to two years? 1) In percent



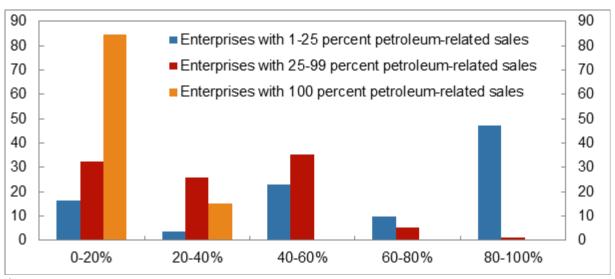
¹⁾ Responses weighted using employment and the proportion of petroleum-related sales by the enterprises.

Source: Norges Bank's regional network

Overall, the enterprises estimated that they could only replace lost petroleum-related sales by increasing sales in other markets within one to two years to a limited degree. Two-thirds of the enterprises reported that they could only cover up to 20 percent of the shortfall by boosting sales in non-petroleum-related markets (see Chart 7). Only five percent of the enterprises stated that they could replace more than 80 percent of their lost sales by increasing sales in other markets within one to two years.

Chart 7 largely reflects that pure oil suppliers account for a considerable proportion of petroleum-related employment, that they are highly specialised in petroleum-related activities, and that they therefore have limited opportunities to refocus on other markets in the short term. Some 85 percent of pure oil suppliers stated that they could only cover up to 20 percent of lost petroleum-related sales by increasing sales in other markets within one to two years (see Chart 8). The rest stated that they could replace 20 to 40 percent.

Chart 8. If petroleum-related sales should fall, what proportion of the shortfall could be made up for in non-petroleum-related markets within one to two years? 1) In percent



¹⁾ Responses weighted using employment and the proportion of petroleum-related sales by the enterprises.

Source: Norges Bank's regional network

The enterprises that reported that between 25 and 99 percent of their sales are petroleum-related are already present in alternative markets. Moreover, several enterprises in this group supply non-petroleum-specific products to the petroleum industry. Accordingly, these enterprises are able to refocus their activities onto other markets to a much greater degree than pure oil suppliers. Around 40 percent of the enterprises in the 25–99 percent category reported that they could cover around 50 percent, or more, of lost petroleum-related sales through higher sales in other markets. A further 25 percent of the enterprises stated that they could cover 20 to 40 percent.

Almost half of the enterprises that reported that up to 25 percent of their sales are petroleum-related stated that they could replace more than 80 percent of lost petroleum-related sales by increasing sales in other markets within one to two years. One-third of the enterprises reported that they could replace 40 to 80 percent of lost sales by ramping up sales in other markets. Industrial enterprises in the 1–25 percent category were less able to refocus their activities than enterprises making corresponding petroleum-related sales in the other industries. This reflects the fact that the industrial enterprises primarily supply specially adapted products, while the enterprises that make between one and 25 percent of their petroleum-related sales in other industries primarily supply non-petroleum-specific goods and services for operation and maintenance (see Chart 4). In addition, the industry has experienced weaker alternative markets than other industries in recent years.

⁵ Only one-sixth of industrial enterprises in the 1-25 percent category stated that general operations (i.e. the purchase of non-petroleum-specific goods and services for operation and maintenance), are an important driver of these sales. All of the enterprises in the 1-25 percent category that are active in other industries stated that general operations were an important driver. Only one-tenth of these enterprises reported other important drivers than general operations.

Conclusion

In this commentary, we have taken a closer look at the petroleum-related sales of Norwegian enterprises and how they would be affected by a fall in oil prices. The results of our survey show that a considerable proportion of Norwegian enterprises make petroleum-related sales. This means that they too may be vulnerable to a decline in oil prices. We found that some sales will be lost if oil prices drop below USD 90, while a fall to USD 70 or lower will have a severe negative impact on petroleum-relates sales in the Norwegian economy⁶. Overall, the enterprises estimate that they can only compensate for lost petroleum-related sales to a limited extent by increasing sales in other markets in the first one to two years after a fall in oil prices.

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⁶ The actual scale of the effects of a fall in oil prices on the Norwegian economy will depend on many factors not covered by the survey. These will include effects through real exchange rates, economic policy and household demand, and whether gas prices also fall.

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Annex 1: Details of the survey

The questions in the survey were posed to enterprises that participated in rounds 3-2012 and 4-2012 of the regional network. The survey was conducted in the periods 3 to 28 September and 5 to 30 November 2012. The questionnaire is reproduced in Annex 2.

The enterprises in the network are distributed across the sectors industry, trade in goods, service provision, building and construction and public enterprises (hospitals, municipalities and other public bodies). The analysis in this article is based on replies from 563 enterprises (excluding public enterprises but including foundations and state-owned limited companies).

The enterprises include local units, businesses and groups. Some enterprises are included both through a local unit and through a business or group. We have not corrected the results for such duplication.

⁷ The regional network is described and discussed in Brekke and Halvorsen (2009).

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Modification of offshore installations ² , onshore facilities, rigs, offshore vessels, etc.			General operation of petroleum-related companies' organisations (non-petroleum-specific products and services, such as consulting, auditing, ICT, freight transport, passenger transport, hotels, restaurants, etc.).						
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¹ Deliveries to the petroleum sector from operations in Norway. Here the petroleum sector is defined as oil companies and (other) oil services companies in Norway and abroad.

² Including wells and subsea installations.