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Global markets – local competence? Internationalisation of the Norwegian petroleum industry.

by

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1. Background

In 1967 the Norwegian sector of the North Sea opened for oil and gas surveying and exploration drilling. This followed the discovery of massive gas resources off the Netherlands and some smaller fields in and off the southern part of England. Before any licence to explore was given in Norway, all the North Sea States reached a mutual agreement on the offshore territories of each state and the situation of the exact borders. In this infant period a new law also passed the Norwegian Parliament stating that all resources under the sea level were state property.

On this foundation the Norwegian government had the legal right to regulate the commercial activities offshore and to licence exploration and production rights to whoever it wanted. An early white paper also formulated a petroleum policy inspired by the common industrial policy of the sixties. The most important goal was to use the petroleum resources in the development of a new basic industry where national interests such as industrial and regional development and national control were in the forefront of the policy (Royal Ministry of Petroleum and Energy 1973).

Through this policy the government could control:

- which part of the territory should be explored or developed at any time;
- which companies were given licences;
- the structure of the consortia set up to develop a field and the shares given to each partner;
- the location of onshore facilities including offices and supply bases for the offshore activities as well as landing of crude oil or gas – as a general rule all activities had to operate out of Norwegian territory;
- the technology used to develop a field including safety regulations, working conditions and industrial relations.

This regime of regulation influenced the development of the Norwegian industry in many ways:

- by *establishing national, Norwegian oil and gas expertise*: 1) through the founding of a state owned enterprise (SOE) - Statoil, which was given a special preferential position, 2) by giving a license to a Norwegian semi-public energy/chemical company (Norsk Hydro), and 3) by promoting the incorporation of a new privately owned oil company (Saga) in Norway. All of these national enterprises were given large shares (15-20 %, Statoil more) in promising fields and should create some form of national competition. After a period as "trainees" in or under the supervision of a foreign oil company, the Norwegian newcomers were also licensed to act as project managers of field exploration and development projects and later as operators of production;
- Foreign oil companies acting as project managers, were 'forced', through the licensing agreement, to integrate Norwegian partners into the development organisation and *transfer specific knowledge* from the experienced to the less experienced partner. This also included the foreign engineering consultants used in project development. This "infant school" arrangement was important in developing Norwegian expertise both in operation and in engineering of petroleum fields;[1]
- Many of the activities in the Norwegian sector had (and still have) the status as frontier technology due to deep water, long distance from the shoreline, rough weather, etc.. As a consequence new knowledge, new ideas and designs had to be developed more or less continuously, in the early period by foreign operators, which were 'forced' by the licensing, "goodwill" or "technology" agreements, to *develop their R&D in Norway* using Norwegian research institutions and companies;
- by *choosing designs (e.g. integrated concrete platforms) that favoured construction in Norway* and the expertise of Norwegian companies, but at the same time also had a good economic and environmental reasoning. This opened the national market for Norwegian firms based on their technological and locational advantages;

[1] E.g. Mobil (oil company) was a training ground for Statoil employees, Brown & Root (engineering company) for Norwegian engineers in Aker Engineering.

- by *regulating the labour market* in a way that foreign companies operating in the Norwegian territory had to use Norwegian safety, salary and income tax regulations. This took away the possibility for foreign firms to operate offshore with cheaper labour costs from for example England or any tax heavens;
- by demanding *all logistic support to the platforms to be provided from a Norwegian harbour*. This gave some advantages to Norwegian marine construction and supply companies.

As a *compensation for these regulations*, foreign (and Norwegian) oil companies do not pay for the license (e.g. using auction) to explore for or produce petroleum in the Norwegian sector. Further, the high windfall tax in the end makes the State pay most of the bill for whatever the extra cost would be incurred in using national companies as suppliers.

As a result of the above mentioned policies, different barriers of entry were established, giving Norwegian enterprises preferences and protection to establish an expertise in offshore oil and gas exploration, construction and production. During this period of 'soft' protection (ending in the early 1990's), Norwegian companies conquered a 60 % share of the Norwegian investment market and still hold this share under fully fledge competition. The same national dominance holds for the UK sector, but there 'British' construction companies often are subsidiary of US engineering companies (Cumbers 2000).

As a consequence of this policy Norway has today developed:

- two Norwegian fully integrated and internationalised oil companies (Statoil and Norsk Hydro) [2] ;
- three internationally operating engineering and construction companies (Kvaerner, Aker Maritine and the oil and gas division of Swedish/Swiss ABB);
- several leading seismic surveying and drilling companies;

[2] Norsk Hydro bought Saga in 1999 and integrated the majority of Saga's activities into their own organisation.

- as well as many small and medium sized producers of petro/offshore/subsea-related equipment and services successfully operating internationally.

This success is believed to have its root in three different aspects of the Norwegian industrial environment:

- first, the above mentioned *protectionist policy in the "seed bed" phase* of oil and gas development;
- second, the fact that the North Sea region opened a *technological frontier* of deep water exploration, drilling and production, requiring development of new and innovative approaches to find and extract petroleum. These approaches demanded a *merger of petroleum and marine knowledge* and competence. Many of the established foreign companies in the petro-supply market had disadvantages in delearning in this early period where they were partly reproducing onshore technology offshore. This situation opened a *window of opportunity for newcomers*;
- third, Norway, already at that time, had a *strong technological and commercial position in marine operation*; shipping, ship design and construction. At that time Norway controlled the fourth largest merchant marine in the world, was large in ship building, ship design and ship equipment and had a good track record in developing innovative niches in the shipping market; e.g. gas and chemical product carriers, car carriers, cruise ship, specialised fishing vessels etc.

For the last couple of years the magnitude of investments in new capacity and modification of old, has been running near 5-8 billion US$ a year. As the production has developed, Norway is now the second/third largest exporter of petroleum in the world (after Saudi Arabia and Russia) and the fifth largest producer. Related to the size of the nation (4.5 million inhabitants) and the capacity of its industry, the growth and magnitude of this market has been very large. In 1999 15 % of GNP could be related to this sector and 36 % of the national exports consisted of petroleum products. At the peak 90.000 people have been employed in activities related to the sector (Royal Ministry of Petroleum and Energy 1999). As a result the national

economy has problems to absorb the revenues, and the capacity of the national industry has been more or less fully utilised in a booming home market.

Investments in exploration and drilling are very sensitive to changes in oil prices. In many respects this also holds for investments in construction of new production capacity. The investment market in the petroleum sector is therefore cyclic. Petroleum is an extracted and not renewable resource that in the end will be fully exploited.[3] The investment boom of the late 1990's is therefore not expected to return. All forecasts suggest that the investment market for new capacity in the Norwegian and UK sector will be reduced by half. On the other hand, the smaller segment of the market related to operations and maintenance will increase. This creates a situation where national companies are 'forced' to restructure; either go for markets abroad, restructure to compete in the maintenance/operation market or direct their activities towards non-petro related markets or as the last solution downscale the operation of the enterprise.

In this paper our interest is to follow the internationalisation option and analyse if the preferential position these firms have developed in the Norwegian setting also holds in truly international competition.

2. Internationalisation and competitive advantages

We know that the international petroleum industry is operating globally, but still much controlled by a few oil companies of American, British/Dutch or French origin allied with their nationally based support companies in exploration, engineering, construction and transportation technology (Odell 1986). In centrally planned economies like China and former Soviet Union, a separate national production system has developed with few links to western technology and markets.[4] Likewise, many governments in developing countries controlling petroleum resources have tried to use this control to develop a domestic petro-related industry.[5] *Transfer of technology*

[3] To date one forecast that gas will flow for another 100 years, but the oil resources will be very limited 35 years from now.
[4] Both Russia and China are now opening up for Western technology and western companies
[5] Iran, Saudi Arabia, Brazil, Mexico or Indonesia as examples

through joint ventures, trainees and licensing has been part of this policy in Norway, as well as in many developing countries. Even so, the most significant transfer of petroleum technology to the Norwegian industry has taken place as normal *trade* in producer services, particularly in engineering or in project based employment of foreign-trained engineers (Nordås 2000). As many Norwegian companies initially experienced this kind of knowledge transfers, they should have a first hand understanding of such a policy and thereby some potential advantages in collaborating with domestic partners and government officials in other, new petroleum regions.

In the more sophisticated parts of the offshore exploration and construction market, new technologies or products have to be developed. Few countries, particularly in the developing world, contain the infrastructure in skilled labour and engineers, in construction capacity and capability or in R&D facilities, to take part in the frontier of offshore petroleum technology. This is needed, as many of the new fields found in Asia, Africa or South America, are located offshore in very deep waters.

In most cases development of new technology in this industry takes place inside strong user-producer relations where oil companies, engineering companies, construction firms and suppliers of equipment and services share knowledge and jointly develop new, *experience based* solutions (Lundvall 1992). On the other hand, technological development in this area also uses new knowledge in microelectronics or telecommunication, in new materials or biotechnology, emphasising strong connections to *science-based* knowledge and R&D institutions (Heum & Vatne 1999). The more sophisticated part of this market is therefore based on tacit knowledge and the combination of tacit and codified knowledge. Innovative activity of this kind is more difficult to imitate and therefore easier to protect than straightforward transfer of standard technological knowledge, even though skills in *collaboration and networking* also seem to be important.

As a suggestion we could expect this kind of firm to have reached a level of skills and competence forming a *technological advantage* in the market. This is based on the

firms ‘core skills’ in Porter’s terminology or ‘owner specific advantage’ using Dunning’s conceptualisation (Porter 1985, Dunning 1988). Normally, such advantages are developed over time, and dependence on both tacit and codified knowledge inside and outside own organisation. Construction of networks towards users and suppliers, utilising untraded interdependencies and technological spillovers seem to be part of the competitive advantage created (Storper 1996, Eliasson 1996).

The data we shall use will not allow us to investigate the underlying processes creating technological advantages. On the other hand, firms mastering a specific and tacit form of sophisticated technology are an important group developed out of the Norwegian experience as described above. Given that they have developed real technological advantages, one could expect that this is the type of firms that first of all should be able to succeed in foreign markets.

On the other side, many domestic companies have built their competitive force in the home market based on proximity to physical operations offshore. A location near the field is regarded as an important advantage for the construction of enormous platforms or large modules that are difficult to transport. The regulations on location of offshore operations and the national employment policy in this sector have also created an advantage for local/national firms and a disadvantage for firms operating out of foreign territories. This is particularly a reality in labour-intensive operations. Such *location advantages* are the reason why large foreign service firms like Schlumberger or Racal have located their operations for the Norwegian market in close proximity to the onshore supply bases and/or in easy access to the operational offices of their Norwegian customers.[6] If a foreign company wants to attack the Norwegian market where locational advantage is important, they have to move their operation to that territory. The same reasoning would apply to Norwegian firms penetrating markets in other countries.

[6] A supply base functions as an onshore logistic link to the offshore platforms, covering many functions like warehouse, repair workshops, offices for daily routine operations, harbour etc

In line with Dunning's eclectic paradigm of international production we could suggest that firms competing in the international petroleum market should either possess firm specific technological advantages or/and develop locational advantages as part of their competitive strategy.

3. Segmenting the market

The market for offshore petroleum activities (here the oil companies are the customer –the market and are not included) can be grouped into eight different activity categories as shown in table 1 below. These are directed toward separate segments of the investment market in the offshore petroleum business. In table 1 we have grouped them in a rising order from market niches basically believed to be dependent on locational advantages, to segments based on technological advantages as their prime competitive advantage[7].

Table 1 Competitive advantages in segments of the offshore petroleum exploration and construction market

A. Process and maintenance	Locational advantages
B. Trading/service on technical equipment	
C. Fabrication of larger modules or platforms	
D. Drilling and well services	
E. Engineering	Mix of locational and
F. Marine operations and equipment services	technological advantages
G. Seismic and surveying	
H. Development, production and installation of technical equipment or systems	Technological advantages

In the first case mobilisation of labour and proximity to customer seem to be the most important aspects of their operations. On the other hand, 1) innovative solutions to

[7] This typology is based on qualitative indicators checked by a panel of business managers

solve new problems and/or 2) control over expensive and highly specialised equipment or idiosyncratic assets, seem to give other companies technological advantages in their market. As many of the activities in this market relate to operations on or near the specific field, a location near (relatively speaking) the natural resources often has to be combined with technological advantages. If a company under such conditions (combining technological advantages with proximity) want to internationalise, they must move part of their operations to new sites and involve themselves in direct investments instead of exporting. As many of the operations are offshore, some of these services are placed on board floating constructions and are therefore fairly easy to move around.

The segments include the following characteristics:

- *Process and maintenance services* are basically work that has to be done on the platform or in proximity to a supply base. It is often based on highly trained labour, routinely executed and often at regular intervals. This is an area where outsourcing from the oil companies and long contracts are normal. Labour is an important input. In many cases it is necessary to mobilise and demobilise workers over a short period. A location near the operation is therefore an advantage.
- *Trading and service of technical equipment* is a segment where promotion, sale and service are an integrated part of the activity. Agents, wholesalers, joint ventures or wholly owned sales offices will normally take care of these functions. Proximity to customers is very important, particularly if the traded item is complex and in need of training to operate, continuous service or continuous supplies of material or parts. Often the products are produced abroad, but sales and service take place in a regional market under a specific licence to serve for example just the Norwegian market.
- *Fabrication of larger modules and integrated platforms,* particularly the mega-platforms used in the North Sea, have to be transported as an integrated, floating processing factory from the fabrication yard to the offshore petroleum field. This is a risky and costly operation. Analyses of these costs have concluded that the assembly of the topside and the steel or concrete legs, production of large and heavy parts like the topside, jackets, large modules, etc. would most likely take

place near the field. Fabrication yards therefore gain a locational advantage if they are located near (relatively speaking) the field in question. (New types of production platforms like floating platforms, production-ships or sub-sea systems will change this advantage over time).

- *Drilling and well services* are by nature in need of proximity to the natural resource. Exploration drilling is often dependent on a floating platform and can operate flexibly in broad provinces like the North Sea, the Mexican Gulf or the South China Sea, but not between provinces due to the cost of moving these platforms over long distances. Up to now production drilling often takes place from the permanent platform offshore. Most of the well services will also take place in the production phase. Production drilling and service will therefore be dependent on a permanent workforce, warehouses and offices in proximity to the field and the drilling/well specialist of the oil companies. At the same time, unique expertise, and control over costly and very specialised equipment, will be necessary to win contracts. The same could be said about a good track record and reputation. All drilling activities are in need of an efficient onshore feeding system of standard material like mud or pipes. A mix of locational and technological advantages is therefore in operation in this segment.
- *Engineering* is partly dependent on deep expertise in platform or pipeline construction, long experience and often the ability to mobilise large capacity over a short period. Engineering of new platforms is normally done through a specific project team temporary mobilised for a specific platform, factory or field. Collaboration and face to face contact with the engineering department in the oil company and the construction yard are important. This type of project organisation is mobile, but proximity to fabrication is crucial. An integration of engineering and fabrication has developed lately, where the fabricators have developed sophisticated engineering capacity or vice-versa. Engineering in connection with modification of existing installations is a more permanent activity, done in near collaboration with the operator of the installation. Here a smaller organisation is in need of proximity to the office of the operator, the installation itself and the service contractor. Again a mix of locational advantages

and technological advantages will lead to a situation where lot of the work has to be done in the market in question.

- *Marine operations and equipment services* include activities like supply shipping, diving, offshore pipe-laying, offshore crane or construction ships, etc. Here the technological systems are highly sophisticated, specialised and based on large, idiosyncratic investments. The systems are normally installed on a floating structure with a dedicated crew, living onboard. Many of these activities operate on a world-wide market and are operating fairly autonomous, but of course in near collaboration with their customer under the short or long period their contract demands. Supply shipping is a daily service more dependent on long term contracts and proximity to the field. Pipe laying is a seldom-performed activity taking place over a short period. For the supply fleet a locational advantage is an important part of their competitive strength. For the technological advances services technological advantage will be the prime competitive strength.
- The same could be said about *seismic and surveying services*. These services are even less dependent on links to an onshore logistic connection or proximity to a specific part of the organisation of the oil companies. Processing of data takes place on board or via online connections by a few processing centres around the world. These activities will basically compete on technological advantages, given the cost structure, but for standard 2-D seismic, price will be more important.
- Lastly, *system developers and producers* should be dependent on their engineering and production skills and control over specific technological know-how developed through long experience and innovative thinking. In this segment we are dealing with smaller integrated technical constructions that can be transported world wide at reasonable costs. A drilling unit, a fire protection system, a subsea wellhead production system, pumps or measuring instruments of water in the oil stream or corrosion on pipes are examples. In this segment the most important competitive advantage should be the systems' technological superiority and operational efficiency. This should make it possible to export equipment to foreign markets from Norway, even if there is a need for a sale and support staff in the foreign market. We expect to see a high degree of export in this segment.

One weakness of this typology is of course the problem that firms in some segments basically are competing on price, not on technological sophistication. The oil companies have a reputation for being conservative in introducing new systems, materials and even suppliers, and rather stick to the well proven. In that respect, sophisticated but expensive new solutions developed by smaller firms for extreme environments in the North Sea are not always easy to export, even if the product is regarded as technological advanced.

Based on these arguments and the suggested typology a simple research question could be raised:

The more a "Norwegian"[8] firm is involved in locationally specific operations without technological advantages, the less we expect this firm to internationalise. On the other hand, the more technologically sophisticated, the more we expect that the firm will operate internationally. In other words, we expect to see an increasing internationalisation of the firm as the main activity of the firm moves from category A to category H in table 1.

4. Data

The data used in this paper comes from a questionnaire send to approximately 600 petroleum related enterprises in Norway. This is suggested to be the whole population of firms of the offshore service and construction industry established in Norway (Heum, Kristiansen & Vatne 2000). Many of these firms also delivered parts of their product to other markets, but regard the petro-market as one of their most important. 51 % or 300 of the companies returned a useful set of data. Control of this sub-set did not detect any serious deviation from the total population, only a small overrepresentation of larger firms.

165 of these firms only operated on the Norwegian scene, 52 of these because they only had the right to operate in this territory (licensing, subsidiaries of foreign firms,

[8] By Norwegian we define all enterprises operating in/from Norway as an autonomous organisation, independent of foreign or national ownership

etc.). 135 firms (Norwegian or foreign owned) delivered petroleum-related products or services to foreign markets for almost 14 billion NOK (≈ 1.75 billion €) in 1999. Totally these firms had a turnover in 1999 of 83 billion NOK (≈ 10.4 billion €) of which 70 % was related to the petro-market. The mean value of the petro-related turnover was smallest for the home market firms -100 million NOK (12.5 million €), 130 million NOK (16.25 million €) for the 'restricted'[9] firms, and 304 million NOK (38 million €) for the internationalised firms. Likewise the average number of employed in all firms was 215; the restricted firm the smallest, closely followed by home market firms. Internationalised firms were more than twice as large as the other two groups.

5. Analysis

5.1 Differences between groups

In the following we shall leave the descriptive data and concentrate on analysing the relations between internationalisation and resources in the firm. The set of data used here gives us limited access to information. First we grouped the firms into three different categories:

- *home market firms* (no foreign sales of petro-relates equipment – 155 firms),
- *experimental exporters* (1-20 % of petro-sales on foreign markets – 77 firms) and
- *internationalised firms* (> 20% of petro-sales abroad – 59 firms).

Most of foreign sales could be regarded as export, even if the most internationalised firms tended, relatively speaking, to be more involved in direct investments abroad than the experimental group. Firms in the experimental group tended to be more involved in sales of merchandise.

[9] Restricted in the sense that they, as part of a multinational corporation, were only allowed to operate in the Norwegian market

The data available restrict ability to measure the resources of the firm. Here we have used turnover and employment as a proxy for economic resources and a measure of R&D intensity of the firm as a proxy for intellectual capabilities. Table 2 gives the overall impression that the most internationalised firms also are the most resource rich measured by turn over, employment and R&D intensity.

We also find that the petro-related activities of these firms are more R&D dependent than other non-petro related activities of the firm. The petro-market makes up 75 % of the total turnover on average for the home based firms, 78 % for the experimental exporters and 86 % for the internationalised. This tells us that the internationalised firms also are more dedicated to this specialised market.

Table 2 Differences between groups of firms regarding resources.

RESOURCES	GROUP	MEAN	SIGN
	Home	159	
Total turnover - mill. NOK	Experimental	358	***
	International	416	
	Home	107	
Total sale petro - mill. NOK	Experimental	318	**
	International	300	
	Home	185	
Total number employed	Experimental	250	
	International	273	
	Home	2,37	
Petro-related R&D - scale1-5	Experimental	3,27	***
	International	3,46	

Note: In this analysis we have measured the use of *R&D* along a scale from 1 to 5, **1** = 0 % of turnover used in R&D, **2** = 0,1-2,0%, **3** = 2,1-5,0%, **4** = 5,1-10& and **5** = >10. For group 2, experimental exporter, extreme outlayer influences the mean value of total and petro-related turnover, reducing the mean value for this group if deleted.

5.2 Internationalised firms

The data allow us to analyse the scoring of different firms on arguments explaining why internationalised firms go abroad, respectively why the home based firms stay at

home. These arguments are used as indicators of the strategic positioning of the firm. Let us first take a look at the exporting firms.

As we can be see from table 3, the mean value tells us that the most important argument for firms internationalising operations is to utilise the technological competence developed in the firm and the prospect for faster growth. The responding firms also strongly argue that diversification of risk is important, as well as the economies of scale they can achieve through growth. Building relations and developing trust and reputation is important in this industry (Stabell 2001). From there it also follows that the firms regard their customers as important and want to follow their customers in oil and engineering companies where ever they operate globally.

Table 3 Arguments for international activities correlated with per cent sale in foreign markets. Mean value. Correlated with the firm's total petro-sale in foreign markets. Firms with international operations only.

Argument	Mean value	Correlation	Sig.	N
Shrinking market in Norway	2,57	-,025	,792	115
Diversify risk	**3,06**	,185	**,048**	115
Increasing volume to advance economies of scale	**2,91**	,271	**,003**	116
Profit on specific technological knowledge	**3,34**	,070	,459	114
Follow customers abroad	**2,94**	-,152	,103	116
Accessing new knowledge and possibility for learning	2,55	-,037	,697	111
No/low profitability in Norwegian sector	1,92	-,065	,499	109
Accessing cheaper inputs	1,84	,113	,244	108
Greater possibilities for growth abroad	**3,23**	,260	**,005**	115
First mover advantage in a new oil province	2,19	,220	**,022**	108
Meet their competitors in Norway on their home markets	2,16	,018	,852	109

Note: Measured as a 1-4 scale, 1=not important ..... 4=very important

From the table we also can read that there is a significant correlation between the degree of international operations achieved and in which degree firms argue that it is important to utilise scale economies, utilise a larger market for growth, to be a first mover in new regions and to diversify risk. On the other hand a strategy to follow oil companies out (often Norwegians) seems to have a reverse (but not significant) relation, the less the firm exports the more important this argument is. Obvious this could be the main argument for the laggards in international operations – wait until someone helps you out into foreign markets.

Table 4 Factor analysis of internationalised firms. Varimax rotation. N=101. Firms with international operations only.

Argument	**Factor**			
	1	**2**	**3**	**4**
Shrinking market in Norway	,497	**,598**	,000	,000
Diversify risk	**,651**	,207	-,216	-,290
Increasing volume to advance economies of scale	**,631**	,000	,000	**-,552**
Profit on specific technological knowledge	**,621**	-,370	,005	-,374
Follow customers abroad	,385	-,357	**,662**	,277
Accessing new knowledge and possibility to learn	**,631**	-,171	,417	,253
No/low profitability in Norwegian sector	,493	**,646**	,000	,003
Accessing cheaper inputs	,463	,450	,142	,203
Greater possibilities for growth abroad	**,739**	-,348	-,315	,002
First mover advantage in a new oil province	,397	,000	**-,568**	**,558**
Meet their competitors in Norway on their home markets	,476	-,301	-,177	,255

There is of course a lot of intercorrelation between these arguments. Factor analysis helps us identify four different factors as shown in table 4. The first factor explained 31% of the variance, the second 14 %, the third, 10 % and the fourth 10 %. All

together these four factors explained 65 % of the variance in the data analysed (eigenvalue 1).[10]

Factors have to fit with a theoretical explanation to be of any value. As can be seen from table 4, firms in line with the first factor seem to go for a *proactive internationalisation.* They are working consciously to internationalise their operations and to achieve specific scale and technological advantages, through growth and innovative activities. The second factor could be said to include firms with a *defensive or reactive internationalisation* strategy. They basically respond on problems in their home market and seem to be 'forced' to internationalise to keep their business going. The third group includes firms that do not internationalise their activities as a strategic decision, but seem to be *dependent follower*s of their main customer's internationalisation. The last group seems to include smaller, innovative firms controlling a specific technology developed in the North Sea, customised to perform very specific functions. In this niche market, scale economies are not important, but it is important to be the first mover and to define standards, build relations of trust and develop reputation before others. We could call them *flexible customisers*.

We shall use the factor scores for each firm as a measure of their strategic attitude towards internationalisation and include these measures in the next regression model. In these models we try to predict sales in foreign markets, respectively the share of total turnover that is related to the petro-market for the home-based firms.

Let us start with the internationalised firms. We have nine variables available that we believe are related to success in foreign markets. First we use the size of the total turnover in the petro-market as an indicator of the magnitude of the specific petro-related resources in the firm; second the total resources used in R&D (as per cent of total turnover); third and fourth the profitability of the firms' petro-operation in

10 Here we are using orthogonal rotation (Varimax) to reduce the number of data for later use in regression analysis. In this way every factor is independent of the other which is unrealistic but acceptable. The use of oblique rotation is a more realistic procedure. Using this procedure only identified weak values on correlation between the factors.

Norway and abroad as an indicator of success in this market and control over financial resources to attack foreign markets. The next variable, called *loc-tech index*, is based on data from table 1. Each industry is given a value from 1 to 8 according to the ranking in table 1, indicating an increasing dependence on technological based competence versus simple locational advantages as their main competitive force.[11] The four last variables are summary variables of the strategic arguments used to explain reasons behind internationalisation. Here we use the factor score for the four factors as a way of reducing data. We expect that factor 1, 3 and 4 will be related to larger shares in foreign markets, but not the reactive strategy identified in factor 2.

Table 5 Regression analysis. Internationally operating firms. Dependent variable: per cent sale in foreign petro market. Standardised coefficients. N=101

Independent variables	**Stand. Beta**	**Sig.**
Total turnover	,149	,134
% petro of total turnover	,091	,361
Resources used for R&D - % of turnover	-,108	,914
Profitability in Norway - % of turnover	,088	,484
Profitability abroad - % of turnover	,104	,372
Loch-tech index	**,257**	**,013**
Strategy: proactive international (factor score 1)	**,187**	**,079**
Strategy: reactive international (factor score 2)	,074	,469
Strategy: dependent follower (factor score 3)	**,188**	**,066**
Strategy: flexible customiser (factor score 4)	**-,255**	**,012**
R2	,299	
Adjusted R2	,208	
P	,001	

From table 5 we can read that it is basically the market segment in which the firm operates and the firm's choice of strategy, reflected in the factor scores, that are able to predict the degree of international sale of the firm. The size of the firm, if it is an R&D intensive firm or not, the degree of specialisation or it's profitability, does not predict the size of the firm's foreign sale in this model. On the other hand it seems

[11] This variable is not well developed and measured and must be critically viewed as experimental/ speculative. As measurement level we have here used interval level. This is highly questionable. Alternatively dummies for the different industries could have been used.

(not surprisingly) to be a relation between a proactive internationalisation strategy and success in foreign markets. The same is true for companies using a 'follow the customer' strategy. The "flexible customisation" strategy predicts the reverse relationship - that the more the firm trusts their "customised" technology and first mover advantage the less they export. All together this model explained 21 per cent (using the adjusted value for R square) of the variance which is acceptable given the crudeness of the data available, the size of the sample and the complex set of factors probably explaining the real situation. Compacted information, using as we do the factor scores, also reduces the R square. Running the model with the 'full package' indicates that it is basically an aggressive growth strategy and the segments in question which explain internationalisation. On the other hand a strong "follow your customer" strategy and a reactive strategy to attack your competitors in their home market seems to have the reverse effect on internationalisation.

Table 6. Suggested ranking of internationalisation for different industries and the real, mean value of international activities in different industry. N=300

Market segment	Predicted Ranking	Real ranking	Per cent foreign sales
A. Process and maintenance	8	8	3,5
B. Trading and service of technical equipment	7	7	6,6
C. Fabrication of large modules/platforms	6	5	10,5
D. Drilling and well service	5	6	8
E. Engineering	4	4	13
F. marine operations and equipment	3	2	32
G. seismic and surveying	2	1	42
H. Develop, produce, install technical systems	1	3	18

As analysed before, the specific market segment that a firm operates in seems indeed to affect its possibility to operate in international markets. An inspection of table 6 suggests that the typology developed in table 1 is correct with one exception. Group H, development and production of technological systems, said to be dependent on technological advantage as their main competitive strength, did not compete well in foreign markets. On reason could be the heterogeneity of this group and that the

typology is not suited for this industry. Another is that Norwegian firms in this segment of high expectations have not been clever enough, or willing to attack foreign markets. Many factors could explain this, but they are not discussed here.

5.3 Home base firms

Table 7 shows arguments why firms have not internationalised their operations. The eleven arguments are the most commonly reported. From these figures, we see that the importance of the arguments against internationalisation is generally weaker than arguments for internationalisation. The most commonly used argument for staying at home is that the home market fully utilises the capacity of the firm. Another restriction is the plain fact that the firm has built their presence in the North Sea on a foreign technology and only has a licence to operate in the Norwegian sector. Thereafter comes a bunch of arguments related to the lack of competence or capacity in the firm. The firm lacks knowledge of international marketing, their management does not have the capability to find the right niches abroad or to build relationships to specific customers, and lastly many regard the risk as being too high.

The score for each firm on these arguments can be correlated with the size of their sales in the Norwegian petroleum-sector. As can be seen from table 7, there is a significant negative correlation between lack of knowledge about markets, how to export, management capacity and the ability to take risks, and the size of the firm's turnover. In other words, the smaller the turnover in the domestic petro-market, the higher scores on these variables. Attributes like these are regarded as general weaknesses for smaller firms. These resource squeezes block, at least temporarily, their growth and the internationalisation of their activities. Small firms normally do not have the right experience, financial strength and networks to attack new markets. This is one reason why the internationalisation of smaller firms often can be seen as an experimental situation and gradual adaptation process (Eskelinen and Vatne 2000).

Restriction on exports through licensing seems not to be related to the size of the firm's turnover in the Norwegian sector. This does not come as any surprise. Several

of the largest service firms in Norway are branches of multinationals only serving the Norwegian sector At the same time many smaller firms serve as representatives for component suppliers with a relatively small turnover in Norway.

Table 7 Arguments for concentrating on the national market measured as a 1-4 scale, 1=not important, 4=very important. Mean value. Correlated with the firm's total turnover in the petro-market. None-exporting firms only.

Arguments	**Mean value**	**Correlation**	**Sig.**	**N**
Coincidental variation in demand this year	1,58	-,011	,913	97
Just licence to operate in Norway	**2,29**	,031	,747	112
Have not the right products	1,66	,032	,749	102
Lack capacity to produce	1,99	,010	,918	104
High enough activity/profitability in Norway	**2,74**	-,033	,735	109
Lack of knowledge how to find the right markets internationally	**2,28**	-,256	**,009**	104
Lack knowledge how to export	2,03	-,219	**,028**	100
Not enough managing capacity	2,06	-,225	**,023**	102
Lack of financial resources	1,91	-,166	,094	104
Have not the right connections/ relations	**2,27**	,227	**,019**	107
Too tough competition internationally	1,90	-,139	,159	104
The economic risk too high	**2,21**	-,207	**,033**	106

On the other hand, the table shows that problems developing the right relations (which often means a specific engineer in a specific department of an oil or engineering company) will be of increased importance as the size of the domestic petro-sale increase. An explanation for this could be that the larger the firm the more sophisticated and system integrated product and by that an increased need to communicate face to face the advantages of this solution compared to competing products.

As we did for the internationally related firms, we have also tried to group firms with the same characteristics using factor analysis. The result of this exercise identified

three different groups. Factor 1 explained 48 per cent of the variance, factor 2 explained 10 per cent and factor 3 explained 8 per cent. As a sum 66 per cent of total variance in this material was explained (eigenvalue set to 1).

Table 8 Factor analysis of none-exporting firms. Varimax rotation. N=89

Arguments	**Factor**		
	1	**2**	**3**
Coincidental variation in demand this year	,000	-,004	**,853**
Just the right to operate in Norway	-,294	-,311	**,546**
Have not the right products	,187	**,732**	-,131
Lack capacity to produce	,156	**,775**	,327
High enough activity/profitability in Norway	,388	**,573**	,176
Lack of knowledge how to find the right markets internationally	**,872**	,226	-,020
Lack knowledge how to export	**,800**	,325	,000
Not enough managing capacity	**,777**	,183	,027
Lack of financial resources	**,723**	,000	,294
Have not the right connections/relations	**,782**	,233	,281
Too tough competition internationally	**,598**	,274	,356
The economic risk too high	**,809**	,167	,191

Factor 1 seems to identify firms (and basically smaller firms) that believe they have something to market abroad, but at the same time are constrained by restricted resources, knowledge and relations. We could call these firms *laggards*. The second factor identifies a group of firms with no ambitions for internationalisation due to lack of products and capacity and a general satisfaction with their market situation at home. We could call this group the *dedicated home based firms* with no ambitions to sell abroad. The third group seems to be related to firms, which for some reason did not export at the time of the survey, but regarded this as quite possible. This group of firms also has a strong relation to licensing, restricting them in exporting their services even though they have the capability. We could call this group *temporary*

home-based firms. These firms do not see many restrictions in their capacity or knowledge, but other reasons keep them at home. This grouping seems to makes sense and can be explained theoretically.

The next step is to take a look at the home based firms and see in what sense our data are able to predict their total domestic petro-sales in Norway. This time we use seven independent variables as predictor variables. First the degree of specialisation towards the petro-market measured as the petro-share of the total turnover of the firm. Second the use of resources on R&D as per cent of turnover, third the profitability of the firm in petro-related activities in Norway and the firms' score on the locational/technological advantage scale. The last three variables are the factor score of the factors already discussed, here used as a summary variable.

Table 9 Regression analysis. None-exporting firms only. Dependent variable: petro related sale in Norway - NOK. Standardised coefficients. N=89

Independent variables	**Stand. Beta**	**Sig.**
% of total sale in the petroleum market	**,220**	**,044**
Resources used for R&D - % of turnover	**,184**	**,094**
Profitability in Norwegian market - % of turnover	-,040	,692
Loc-tech index	-,125	,250
Strategy: laggards (factor score 1)	**-,353**	**,002**
Strategy: dedicated home based (factor score 2)	,121	,241
Strategy: temporary home based (factor score 3)	,038	,716
R2	,217	
Adjusted R2	,150	
P	,005	

From table 9 we can read that it is the degree of specialisation and maybe the investment in R&D together with a position as laggard that best predict the volume of turnover in the domestic petro-market. In other words, the more specialised and focused on R&D, the higher petro-turnover in Norway. And at the same time, the more the firm lacks of human and financial resources and international contacts, the smaller the turnover in the Norwegian sector. As these attributes are related to small

size , this relationship is not surprising. Profitability on the other hand does not seems to be related , nor is the loc-tech index. Firms with specific locational advantages did not win larger contracts in Norway than firms in more technologically sophisticated segments. Again the explanatory strength of this model is weak, explaining 15 % of the variance.

6. Conclusion

Let us first state that the samples are small and the quality of the data not as good as could be wished. For this reason we should be reluctant to draw any major generalisations from this exercise. Still, the data allows us to speculate a little why Norwegian firms seem to be slow to internationalise their operations.

This analysis suggests that successful internationalisation in the petroleum related offshore, construction and service businesses, seems first of all to be related to the market segment the firm is operating in, and a proactive strategy for internationalisation. This strategic positioning seems to come out of a situation where firms either have *developed unique products/equipment/technological systems and related organisations* in technologically sophisticated, but not R&D intensive segments. Or they have *developed relational links* to important customers operating internationally.

We have seen from table 6 that Norwegian firms particularly involved in marine construction and seismic and surveying have been the most successful in international markets. These two segments are based on capital intensive, very mobile, floating constructions where much of the capital and management comes from the *shipping sector* in Norway. This sector has always been used to operating in international and highly competitive markets. Their core skills seem to be their technological, financial and organisational assets mixed with long lasting relations with international oil companies.

In the ongoing restructuring of the petroleum business, a wave of mergers of oil companies has been seen. As a reaction, the supply side - the construction and service

industry, is also integrating through mergers and acquisitions, and is forming larger global construction groups operating world-wide. In this process several Norwegian firms have been acquired and integrated into French or US controlled groups. Integration into global corporations could be a base for further expansion and internationalisation as long as the key assets of the Norwegian enterprise are localised in Norway. But, as many of the assets in these segments are highly mobile, there is also a good change that most of the growth will not come in Norway, but in a few foreign world centres of the multinational corporations, and in decentralised units near the market. We could therefore challenge the conclusion that this segment will be leading the internationalisation of the Norwegian based petro-related service industry in the future.

Relational assets also seem to be important in internationalisation. In this market reputation and trust is important. The consequence of a technical failure is so great in the offshore and processing environment that safety, regularity and well-proven technical solutions are at the forefront when suppliers are selected. If a firm proves to be reliable, flexible and even innovative, strong ties will be developed in a stable customer – supplier relation. If this happens, oil companies will bring new technical solutions from the Norwegian sector and introduce them, together with the supplier, in other similar projects in foreign markets. Over time these relations could lower transaction costs and develop dynamic untraded interdependencies or worse, static inertia. If so, these relational assets seem to be important in the internationalisation process.

The phrase “similar projects” is important. Much of the technology developed in the Norwegian sector is customised for the technological and political demands in this particular setting. In other markets safety regulations could be weaker and the natural environment not so challenging. As a result, simpler, less innovative, mass-produced and cheaper technical solutions will compete with expensive “high tech” and customised solutions from Norway. To convince a foreign customer that the “life time profitability” is stronger even if the initial investment is larger, needs a reference installation in operation and clever promotion and marketing over a long time.

Table 6 also illustrates that the traditional engineering and construction industry has not succeeded in foreign markets in the same way as the shipping based industry. One reason could be that these firms, generally speaking, have been developed from a base of traditional Norwegian shipbuilding, ship-equipment firms normally very strongly linked to Norwegian shipping firms as their customers, and have therefore gained little experience in operating in international markets. At the same time, many of these firms operate in labour intensive and immobile segments where export seems to be difficult. Internationalisation in these segments where locational advantages are strong, demands involvement in joint-venture, acquisition or green field development of fabrication facilities in foreign markets, not export from a Norwegian registered firm.

In this group of firms we will find enterprises controlling larger shares of the Norwegian market. The analysis in table 9 suggests that these firms (not exporting, but large in the Norwegian segment) had reached this position partly through specialisation and maybe, more use of formal R&D in developing their technological basis. We know that several of the large and specialised actors in the Norwegian sector are subsidiaries of large multinational service firms like Halliburton or Baker Hughes operating in segments where "owner specific advantages" are strong. Normally, their Norwegian subsidiary only serves the Norwegian sector. A British sister company serves the UK sector. On the other hand other large Norwegian owned actors seems to be either dedicated to serving the Norwegian sector only or follow their customer out. These are firms in maintenance, fabrication as well as drilling. Turnover in the Norwegian sector does not seem to be related to any specific segment of the market, be it locational or technology dependent. A few combine a strong position in the Norwegian market with a proactive strategy to internationalise their operations. Some of these firms are the first to be expected to be bought and integrated into large multinationals.

A fairly large group of home based companies has been classified as laggards. These are generally speaking smaller firms, wholly Norwegian owned, often controlled by

the entrepreneur and use more resources on R&D then normal. For this reason several of them are knowledge based firms controlling intellectual property in a consulting or laboratory setting or a specific product in a manufacturing firm. The data also indicate worse profitability for this group then other groups of firms only operating in Norway. Because of their size and poor profitability, they have focused on a small segment in the Norwegian sector and use most of their energy to survive here. Very few of these firms have the potential to grow and expand internationally.

There is a better chance that firms classified as *dedicated home based* or as *potential exporters* could become able to expand their operations abroad. Some of these are among the large service and construction firms in the Norwegian sector and have a strong technological base. As the North Sea market matures and the growth prospect changes from huge integrated platforms towards floating or sub-sea structures, there should be a potential for export in some of these firms.

Time will show.

References:

Cumbers, A., 2000, Globalization, Local Economic Development and the Branch Plant Region: The Case of the Aberdeen Oil Complex. *Regional Studies*, Vol. 34, pp. 371-383.

Dunning, J.H., 1988, The eclectic paradigm of international production - a restatement and some possible extensions source. *Journal of international business studies*, Vol. 19, pp. 1-31

Eliasson, G., 1996, Spillovers, integrated production and the theory of the firm. *Journal of Evolutionary Economics*, Vol. 6, pp. 125-140

Eskelinen, H. & Vatne, E., 2000, Explaining Internationalisation of SMEs: The Importance of Internal and Local Resources. In Vatne, E. Taylor, M.: *The Networked Firm in a Global World. Small firms in new environments.* Ashgate, Aldershot.

Heum, P. & Vatne, E. (1999), *Hjemlandseffekter av direkte utenlandsinvesteringer i norsk oljeindustri*. SNF report 25/99, SNF, Bergen.

Heum, P., Kristiansen, F. & Vatne, E. (2000*), Internasjonalisering av norsk petrorettet næringsliv*. SNF report 32/00, SNF, Bergen
Journal of evolutionary economics, Vol. 6, pp. 125-140

Lundvall, B:Å: (1988), Product innovation and user-producer relations. In Dosi, G. Et al (eds), *Technical change and economic theory*. Pinter Publishers, London.

Nordås, H.K., 2000, *Gullfaks - the first Norwegian oil field developed and operated by Norwegian companies*. Working paper 2000:13, Christian Michelsen Institute, Bergen

Odell, P.R. (1986), *Oil and world power*. Penguin Books, London.

Porter, M., 1985, *The competitive advantage*, Free Press, New York

Royal Ministry of Petroleum and Energy, 1973, Om petroleumsvirksomhetens plass i det norske samfunn. *St.meld. nr. 25 1973-74*

Royal Ministry of Petroleum and Energy, 1999, Olje og gassvirksomheten. *St.meld. nr. 39 (1999-2000).*

Stabell, C. 2001, *New Models for Value Creation and Competitive Advantage in the Petroleum Industry*. Research report 1/2001. Oslo Business School, Oslo.

Storper, M., 1997, *The Regional World. Territorial Development in a Global Economy.* The Guildford Press, New York.