

The impact of vertical integration on performance

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The impact of vertical integration (VI) on performance is an often-addressed topic in both management and economic studies. The contradicting conclusions based on different theoretical perspectives regarding this impact cause need for empirical studies. Empirical work, however, has lagged behind. In fact, few studies have in a convincing way demonstrated how VI affects performance. The barriers in conducting empirical studies of VI are multiple. The main purpose of this paper is to demonstrate ways of overcoming the difficulties facing empirical studies of VI. The empirical setting chosen for the study is the Norwegian fish processing industry. We examine to what extent VI is implemented in this industry, mainly upstream, towards the fishing fleet. The economic effect of VI is addressed.

Keywords: Vertical integration, performance, fish processing industry.

1. INTRODUCTION

The barriers in conducting empirical studies of VI are multiple. For example, in parts of the literature VI is looked upon as a dichotomous variable, while other focus on VI as a continuous variable. Need-less to say, industry specific measures need to be elaborated. As the competitive environment may influence the effect of VI and change as well, data reflecting the competitive environment over time are needed. Additionally empirical studies must relate observations from one firm to other firms in the actual industry studied. In sum, empirical studies of VI face challenges at both the conceptual and empirical level, including the development of adequate measurements in addition to specific sampling and design requirements.

The main purpose of this paper is to demonstrate ways of overcoming the difficulties facing empirical studies of VI. The empirical setting chosen for the study is the Norwegian fish processing industry. We examine to what extent VI is implemented in this industry, mainly upstream, towards the fishing fleet. The economic effect of VI is addressed and various motives for integrating vertically in the Norwegian fish processing industry are investigated.

The paper is organised as follows. In section 2 a literature review of VI is carried out. Focus in the review is on theoretical perspectives and empirical findings concerning VI. The paper then continues by presenting the design of the study, the setting chosen and the data applied. The results of the analyses are then presented. The paper ends by outlining some concluding remarks.

2. THEORY AND EMPIRICAL FINDINGS

The literature concerning VI is extensive. We have chosen to present theoretical perspectives that focus on the impact of VI on the firm's performance. In addition we will pay attention to recommendations on how to measure VI and empirical findings regarding the impact on performance.

2.1 Vertical integration and theory

In the conceptual part of the literature VI has received considerable attention, mainly because it is a frequently implemented strategy in many firms and industries. Secondly, economic models, based on assumptions of perfect competition, have proven unsuitable in explaining existence of VI. Chatterjee *et al* (1992) put it this way;

“In a world characterised by perfectly competitive input and output markets, there are no sustainable advantages from being vertical integrated (...) Any management action that by chance causes a positive deviation from the expected normal level of return will soon be eroded by competition's counterattack. ... In this neo-classical view of the world VI has little relevance in explaining the relative performance of the firm.”(p.140).

In the real world, however, product markets contain varying degrees of imperfections or failures. As a result VI exists, and is more common in some industries than others. In analysing VI three perspectives dominate; transaction cost economics, industrial organisation and strategic management.

The transactions cost approach developed by Coase (1937) and Williamson (1971, 1975, 1985) provides a

coherent framework for investigating the determinants of VI over different industries. Arrow (1969) defined transaction costs as being “*the cost of organising the economic system*”. The choice of alternative depends on minimising the costs that arise in the presence of transaction specific investments and uncertainty. In this perspective transactions are classified according whether they take place in the firm or across markets. Market alternatives become hazardous in recurring exchanges involving transaction specific capital and efficient information processing. The firm provides a suitable alternative because the common ownership of physical capital discourages opportunism between owners, and it is the basis of efficient information transfer and long-term ties between the firm and its employees. In terms of vertically related production processes, the firm will integrate when the costs of transacting over markets outweigh internal costs of management (Levy, 1985).

The industrial organisation (IO) perspective, as put forward by Porter among others, argues the opposite way. Based on this view, VI is a valuable instrument for the firm in creating competitive advantage by taking advantages in imperfect markets. In discussing different strategic motives for VI, Porter (1980) argues that the strategic purpose of VI is to utilise different forms of economies (i.e. cost savings) like;

- ✓ Economies of combined operations
- ✓ Economies of internal control and co-ordination
- ✓ Economies of information
- ✓ Economies of avoiding the market
- ✓ Economies of stable relationship

Porter argues, in the same way as for instance Pfeffer and Salancik (1978), that VI is an important instrument for reducing external uncertainty and securing supply of critical input.

The resource-based view of the firm has received much attention for its explanation of the existence of sustained competitive advantage (Penrose, 1959; Wernerfelt, 1984; Barney, 1991; Peteraf, 1993). VI has been studied rooted in the resource-based view of the firm (Wernerfelt, 1984, Ramanujam and Varadarajan, 1989, Miller and Shamsie, 1996). Based on this view VI is often looked upon as a differentiation issue. Figure 1 sums up how the resource-based view of the firm explains the existence of sustained competitive advantage.

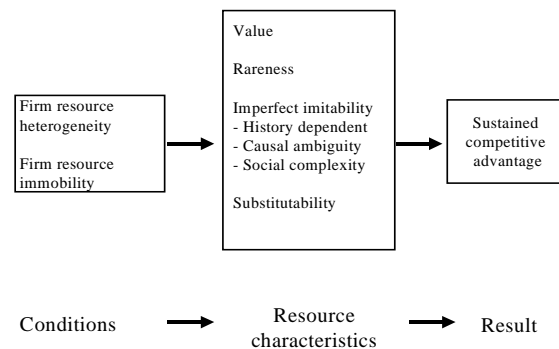


Figure 1 The relationship between resource heterogeneity and immobility, value, rareness, imperfect imitability and substitutability and sustained competitive advantage (Barney, 1991)

The model is based on the assumptions that some of the firm resources are heterogeneous and immobile. To have the potential of sustained competitive advantage a firm resource must have four attributes (Barney, 1991):

- ✓ It must be valuable
- ✓ It must be rare
- ✓ It must be imperfectly mobile
- ✓ It must be non-substitutable

The three perspectives presented have different focuses. The transaction cost perspective emphasises that vertical integrated firms will have lower cost than firms that buy in an open market. The IO perspective emphasises VI as a strategy in order to achieve competitive advantage. This perspective also connects the impact of VI on performance to the industry specific competitive environment. The resource based view focus on VI as a complex and costly strategy. Although the perspectives presented are the three major conceptual approaches for analysing VI, the predictions concerning the impact of VI on performance are rather ambiguous. And so are the empirical findings.

2.2 The definition issue

Until recently the debate on how to measure VI has been almost absent in the literature. VI has been considered mainly an issue concerning ownership. Intermediate products are either processed within the company or the transaction takes place across markets.

As early as the late thirties Coase focused on why firms exist and their boundaries. He emphasised the importance of analysing the firm as an organisation that attempt to minimise transaction costs. Williamson, following this path, developed the transaction cost theory. This

perspective has proven applicable in analysing the existence of VI. Within this tradition classical economic models are applied, but there seems to be little concern on how to define VI.

In the eighties, however, industrial organisation and strategic management focused on VI as a strategic instrument in creating competitive advantage. Porter (1980), being a major exponent for this tradition defined VI as follows:

“Vertical integration is the combination of technologically distinct production, distribution, selling and/or other economic processes within the confines of a single firm.” (p. 300)

Porter views VI as a strategic tool for achieving competitive advantage. Applying this perspective Buzzell (1983) concluded that VI essential is a strategic management question concerning “make or buy” and “use or sell”.

At the end of the eighties focus was to a greater extent put on conditions within the firm in order to understand the effects of VI. Joskow (1988), for instance, points out the wide range of transactions – from merely spot market to only internal transactions. He stated:

“Vertical integration is simply a means of coordinating the different stages of an industry chain when bilateral trading is not beneficial” (p. 71).

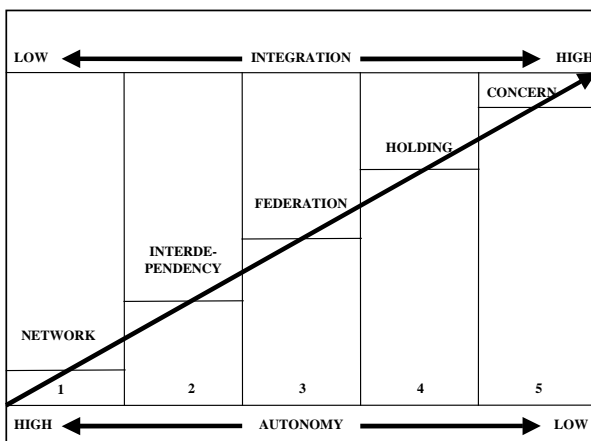


Figure 2 Levels and images of integration (de Koning, 1994)

de Koning (1994) argues that the traditional definition of VI has some weaknesses, and propose to look upon VI as a continuous variable. He also emphasises the negative

correlation between degree of VI and autonomy as illustrated in figure 1.

The approach chosen by de Koning indicates that the content of VI is complex and multidimensional. This recognition leads to the need for measurements that incorporate such complexity in empirical work.

2.3 Empirical findings

The literature review indicates that most of the work concerning VI is in the conceptual field, and there are rather few examples of empirical studies. The empirical work based on the transaction cost perspective tend to confirm that factors like the internal costs of management, transaction-specific investments, flow-economics, small numbers bargaining problems and conditions of uncertainty have impact on the degree and effect of VI within an industry (Levy, 1985).

Based on the contingency view the empirical studies have mainly focused on when to integrate and when not to integrate. Although the competitive environment is well suited for reducing cost and uncertainty, VI has proven to be a rather costly and difficult strategy to implement. Another observation is that some firms succeed while other fail in implementing VI within the same competitive setting. Stuckey and White (1993) reported that VI is a risky strategy - it is complex, expensive, and hard to reverse. According to them VI will have positive impact on performance when (p. 72):

- ✓ The market is too risky and unreliable – it “fails”.
- ✓ Companies in adjacent stages of the industry chain have more market power than companies in your stages of the industry chain.
- ✓ Integration would create or exploit market power by raising barriers to entry or allowing price discrimination across customer segments.
- ✓ The market is young and the company must forward integrate to develop a market, or the market is declining and the independents are pulling out of adjacent stages.

The main conclusion from this study is not to vertically integrate unless it is absolutely necessary. Although the negative experiences, VI is a popular strategy because, according Stuckey and White, the decision is often based on spurious reasons and managers that fail in estimating the cost of investments and management. The spurious reasons they listed are:

- ✓ Reducing cyclicity or volatility in earnings
- ✓ Assuring supply outlets
- ✓ Capturing more value

As a result of empirical findings, the focus in the 1990s has been put on internal resources within the firm and the costs of implementing VI. The main reason for VI seems to be the firm's struggle for improving its competitive position and maximising its profit. The empirical findings indicate that the resource-based view is important for a better understanding of the impact of VI on performance and the spread of VI. Another conclusion is the need for developing new measurements that incorporate the complexity of VI and accounts for specificity both regarding production and competitive setting.

2.4 Theoretical approach

Our study is based upon a combination of the transaction cost view, the contingency view, and the resource based view. The transaction cost view is an important part of understanding the economic benefits of VI and the contingency view is important for understanding the way the competitive setting makes VI valuable. It is also important in elaborating measurements of VI that fit the industry studied. The resource-based view is important in understanding what internal resources that are needed for implementing VI, and the way the complexity and internal barriers make VI a costly strategy.

We assume that, due to heterogeneous firm resources and imperfect resource mobility, we have heterogeneous firms within an industry. The firms have developed different capabilities, which applied in a specific setting, will end in different performances among firms. In an industry with strong competition, the firms that succeed in developing the essential capabilities will be the survivors.

According to the transaction cost view and contingency theory we have chosen to test the impact of VI on performance in a setting with vast fluctuations in supply of a critical input. The firms within this setting are heterogeneous regarding both VI and performance. Based on industry specific measurements of VI that are continuous, we will, according to the resource-based view, test if the firms that achieve competitive advantage, to a greater extent are vertically integrated than those who do not succeed in this industry.

3. DESIGN

The need for long and detailed time series on firm level is obvious an important barrier for the design chosen. Most of the studies based on the resource-based view are case studies, while critics of such analysis recommend a design based on a comparison between firms that over years have demonstrated superior performance to other firms within the same industry (Reed and Defillipi, 1990). Two

considerations have had a major impact on the design chosen for this study. First we have chosen a design that makes it possible to measure VI as a continuous variable rather than a dichotomous variable. Secondly we have wanted to analyse the relationship between VI and performance among firms within the same industry.

The design chosen in this study is basically a result of the literature review and the reported problems on measuring VI and performance. In a two-group study we compare a sample of 35 companies that went bankrupt ("failures") in the period from 1977 to 1995, with companies who had the highest profitability in the population in the same period ("survivors"). In this part survival is chosen to measure performance, and the focus in the study is to analyse if the degree of VI is different in the two groups of firm.

Additionally to the survival study we have chosen a classical economic approach by making use of performance measures and analysing the correlation between them and the degree of VI. This part of the study is extended by continuous measurements of the degree of VI based on actual supply of raw material from vessel owned by the processing company.

4. SETTING

In order to find a suitable population for the purpose of this study, three major demands must be met. First, the population must be exposed to a competitive setting that brings about the need for VI according to IO and the contingency view. Secondly the industry studied has to consist of firms that are heterogeneous as far as VI are concerned. And thirdly detailed data on the firm level must be available in order to measure relative performance and degree of VI over a sufficient period of time. A population that accommodates to these needs is the Norwegian fish processing industry.

A mapping of the supply of raw material to this industry shows that volumes and quality of raw material fluctuates highly due to problems managing commercial fish stocks and biological variations (Dreyer, 1998). As a result of these fluctuations we predict that firms performing well in this industry are in need of securing the supply of raw material. According to management literature this is a setting where the firms are facing the "make or buy"-situation. The Norwegian fish processing industry are heterogeneous with regard to degree VI, i.e. ownership in fishing vessel. Some firms, due to exclusionary provisions, are allowed to own vessels. Though, the majority of fish processing firms are not. This institutional barrier has created a competitive setting well suited for analysing the impact of VI on performance within a single industry.

5. DATA

One of the features when studying the nature of VI is the extended need for relevant data. Earlier attempts to reveal the effect of VI on economic performance in certain industries have outlined the need for a high aggregation on firm level, (MacDonald, 1985; Caves and Bradburd, 1988; Bolton and Whinston, 1993). We have to a certain degree met these demands, and for this purpose, two sets of data have been employed.

The literature review, the purpose of the study and the chosen design make several demands on the data to be employed. Due to measurement problems, both of VI and performance, the firms to be studied have to be in the same industry. The industry studied has to be in a situation with uncertainty in supply of input and within the industry there must be variation in the degree of VI. On the firm level there must be detailed longitudinal information that makes it possible to develop relevant measures of VI and the firms' relative performance. This information must be available for a sufficient number of firms for securing the statistical validity.

Based on these demands we have chosen to use data from fish processing companies in Norway in our study. The data used in the study originates from "Driftsundersøkelsen i Fiskeindustrien", a yearly, ongoing survey of fish processing plants in Norway (Bendiksen, 1999). Being the same cross-section of companies each year, the data is a so-called "panel data" set. From the panel data we have extracted a sub-set of data used particularly for this study.

The industry is heterogeneous regarding size, products and performance and the firms are exposed to huge fluctuations in supply of raw material. Within this industry the firms have developed different degree of VI. We study the population from 1977 until 1998, and the data consists of internal accounting and production statistics. The data it is well suited for developing continuous measurements on degree of VI. Having performance measures on every firm in this population it is also possible to map the firms' competitive position every year in the period studied.

5.1 The annual profitability survey

The primary data source is the annual profitability survey amongst the Norwegian fish processing establishments, performed by our institute since 1977, (e.g. Bendiksen, 1999). The survey is based on official accounts reported to the authorities by the firms¹ and gives a presentation of

¹ Before 1993, data was collected from a representative sample of establishment in the shrimp and groundfish sector. All public limited corporations are included from 1993 on, about 470 firms.

the main accounting figures for the whole, or sectors of the industry, together with comparisons between the different groups of processors. The main figures used to measure the economic performance of the firms have been return on total capital and operating profit margin.

A problem arises however, because of the points of distinctions in how the profitability survey is executed in the two periods of time, (e.g. before and after 1993). Whilst the first periods surveys exhibit detailed production, cost and income data for the firms, the latter is less detailed, and gives basically the accounting figures as stated in the annual reports. This makes comparisons over time, between the two populations, difficult.

5.2 Interviews with managers

The second data source was a survey based on telephone interviews with the general managers of the 75 biggest fish processing companies² within the institutional limits of the biggest sales organisation; Norges Råfisklag³. This survey was conducted to complete the former. This was especially performed to get a situation description on VI at a given point of time - namely at the end of 1997.

The combination of the two data sets has given a unique opportunity to compare the hard facts presented by the annual accounts, with the data that were obtained orally. It gives us the possibility to analyse the development over time and the situations on different points of time, and is unique compared with earlier studies performed in this sector and in comparable studies from other industries.

Our purpose of this paper was to analyse the impact of VI on economic performance, and in particular; if VI have some positive impact on economic performance in the Norwegian fish processing sector. Contributions from the theory are, as indicated in the literature review, ambiguous. The causality could also go the opposite way; prosperous economic performance gives the firm the opportunity to integrate vertically. This however has not been examined thoroughly, but the interviews could lead to this conclusion. A total of 85 per cent of the managers replied that acquisition of ownership in fishing vessels were considered in 1998, perhaps the best economic year in the 1990s for the ground fish sector of this industry (op cit.).

² Based upon total purchase of fish. In 1997 the 75 companies received close to 70 percent of the total landings within Norges Råfisklag.

³ The geographical limits of Norges Råfisklag's first hand sales monopoly extend from the northern parts of Møre and Romsdal, including the five northernmost counties. It is the largest sales organisation in Norway and attended in 1997 to about ¾ of the total landings of groundfish in Norway, foreign vessels' landings included.

6. RESULTS

The analysis was performed in two distinct separate ways. First, a dynamic approach was conducted, where the detailed branch data from the former profitability survey was applied. Again, the alteration of the survey from 1993 on limited the time horizon of the analysis. Thereafter, information from the interviews on the 1997 situation in the industry was combined with the account figures from the 1997-survey, to examine the effect on economic performance from (up-stream) VI. The design of the two separate analyses was different and is accounted for under.

6.1 Dynamic approach

The old design of the profitability study is of a much more detailed level than the new one. Among other variables, trawlers share of total landings of fish to the firm, was one variable that was collected from the enterprises until 1992. By the means of this variable we have operationalised an own variable that we find “capturing” the phenomena up-stream VI in the fish processing industry very well, as accounted for under section 3. A fallacy that could be pointed out is that the measurement does not distinguish between autonomous trawlers and those controlled by the industry. However, the vast majority of trawl fish landed to the ground fish sector stems from wet fish trawlers that are controlled by the processing industry, or trawlers that through their licence are imposed delivery terms to specific plants or geographic areas.

From this data two variables are constructed, **V1** and **V2**⁴, measuring the extent of trawler landings to the total purchase of fish the individual firm does within a period of 5 consecutive years. By doing a comparison between firms that have “survived” and operated continuously since 1977 until 1997 and firms that went bankrupt in the same period (“failures”), one gets an impression of the influence of VI on performance, as shown in Table 1.

⁴ **V1** is the sum of trawler landings over five consecutive years, divided by total landings in the same period. **V2** is the average annual share the trawler landings constitute over a period of five consecutive years.

$$V1 = \frac{\sum_{i=1}^5 r_i}{\sum_{i=1}^5 R_i}$$

where r_i = annual trawler landings
 R_i = total annual landings

$$V2 = \frac{\sum_{i=1}^5 \left(\frac{r_i}{R_i} \right)}{5}$$

Table 1 Differences in vertical integration between “survivors” and “failures”. N=35 in both groups

	Survivors		Failures		t-value*
	Mean	Average	Mean	Average	
V1	0.08	0.2	0.17	0.32	-1.39
V2	0.08	0.2	0.13	0.22	-0.96

* At a 1% significance level, the t-value must be greater than 2.

Table 1 shows that there is no significant difference between the two groups on neither of the measures. The “survivor”- firms have on average less raw materials from trawlers, and there are large variations in degree of VI both among “survivors” and “failures”. One can however conclude that the quantities the firms receive from trawlers are relatively small, for both groups.

Another test performed on the same sample with the same measures, was whether the degree of VI influenced the relative profitability of the firms (RES); the strength of the economic performance for the individual firm, measured by return on total capital, relative to performance of the whole sample⁵. The results are given beneath in Table 2.

Table 2 Correlation matrix on the relation between vertical integration and relative profitability

	All firms	Only freezers
V1	0.1685	0.012
V2	0.1641	- 0.016

The results indicate a positive correlation between VI and relative profitability, i.e. a negative relation between profitability in the processing industry and the extent of trawler landings. However, the correlation is weak and, by controlling only for the fish freezing plants, which are those who generally are integrated with vessels, we find no correlation between the two measures. The correlation coefficients are close to zero, and have different signs.

A central motive to integrate vertically towards vessels is to assure the supply of the most important raw material, fish. Previous analyses have shown that the volume of raw material to firms in this industry that go bankrupt, fluctuate less than with firms who achieve sustainable competitive advantage, (Dreyer, 1998). This points out that stable supply of raw material is not vital for the profitability in this industry.

In addition to the former, an equal analysis on annual basis for all the years in the “old” profitability study is

⁵ This was operationalised by dividing the sample in 4, depending on quartiles and median of the return on total capital of the sample. Then, an average value for five years was found, reaching from 1 to 4; 1 being best and 4 the poorest, identical with the quartiles, stating the firms relative profitability to the rest of the industry.

carried out. Note that the variable for vertical integration used here is synonymous with VI, with only one year instead of five⁶. Profitability is measured with the actual return on total capital the given year, and not placed in its appurtenant quartiles. The results are given in Table 3 below.

Table 3 Correlation coefficient between vertical integration (VI) and profitability in the fish-processing sector, 1977-1992

Year	All firms	Only freezers
1977	-0.1211	0.1794
1978	-0.2458	0.0123
1979	-0.2437	-0.0410
1980	-0.2210	-0.1590
1981	-0.2959*	-0.4283*
1982	-0.0773	-0.0186
1983	-0.1137	-0.2920
1984	-0.1655	-0.1457
1985	-0.2382	-0.1640
1986	-0.0224	0.0437
1987	0.0359	0.1152
1988	-0.2086	-0.1647
1989	-0.0721	0.0427
1990	-0.1695	-0.1318
1991	-0.1812	-0.2726
1992	-0.2079	-0.2627

* Indicates significant at a 1% significance level.

Again, the result coincides with the previous. For the total sample we see that every year, except one, there is a negative connection between profitability and VI, by our measures. This applies for the freezers as well, in most years. For those firms the correlation coefficient demonstrates the biggest problems around 1990 when the cod quota is at its lowest. This can, among other factors, be due to the “trawl ladder”⁷ and high capacity costs at both vessel and processing level.

The conclusion that can be drawn from these three exercises is that firms with a high share of trawler landings have had relatively lower economic performance than the rest of the fish processing industry. The correlation is however not significant, but the conclusion is strengthened as all three analyses from the profitability study points in the same direction. Another problem is that our measurements of VI are not precise, including only the traditional concept between wet fish trawlers and frozen fillet producers.

⁶ The corresponding variable is therefore:

$$VI = \frac{I_t}{R_t}$$

Notation is given in footnote 4.

⁷ Merely an allocation rule between trawlers and the coastal fleet, agreed upon by the Norwegian Fishermen’s Association, stating that in periods with high cod quotas, trawlers get relatively more, and opposite in periods with low quotas.

6.2 Static approach

The fish processing industry has shown to be very dynamic and changes take place quickly at both firm and industry level. In order to capture alterations after 1992 and in order to operationalise VI in a better manner, an interview with the managers in the biggest establishments in the north of Norway was done. One of the questions was on the share of the raw material basis that was acquired from vessels where the firm had proprietary interests. This gave a continuous variable on VI, and by the mean of this, three groups of fish processing firms, as shown beneath in Table 4.

Table 4 Profitability of firms. Groups depending on share of landings from own vessels.

Share from own vessels	Variable*	Average
Nothing	OPM	2.0%
	RTC	12.4%
0 - 20 %	OPM	2.2%
	RTC	14.2%
More than 20 %	OPM	2.7%
	RTC	10.9%

*RTC = Return on total capital, OPM = Operating profit margin. The first measuring the yield of the total capital, independent of funding, while the latter states how much is left to profit from total sales.

As shown, the results are dubious depending on variable chosen. Whilst “operating profit margin” suggests that firms that receive a great share from own vessels are more profitable than other, the proposal from the variable “return on total capital” is different. Namely, that the most integrated firms have the worst outcome in this respect. This suggests that the most integrated firms in 1997 had the highest operating margin, though not high enough to compensate for the additional capital tied up by ownership in vessel(s).

Contemplating the dispersion around the average, uncover a vast over all variety in the sample. The plot diagrams in Figure 3 under emphasise the dispersion on return on total capital and operating margin respectively, for the situation in 1997.

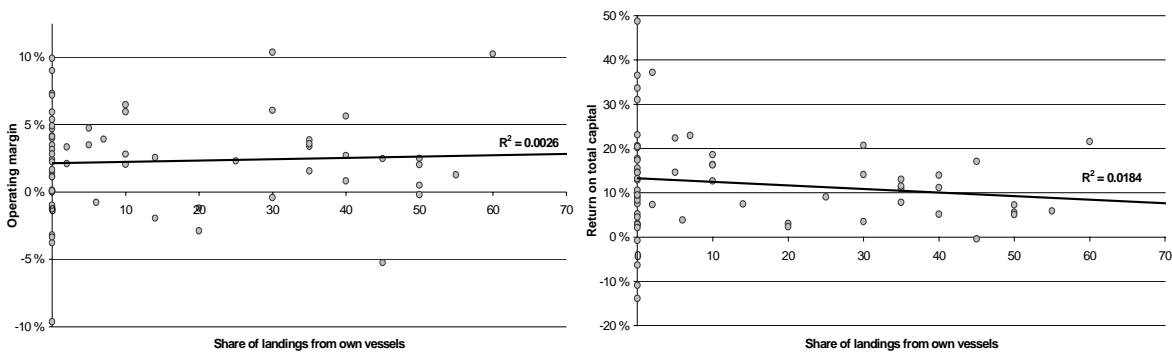


Figure 3 Plot diagrams on profitability and degree of vertical integration in the Norwegian fish processing industry in 1997

The plots exhibit near to no correlation between profitability in the fish processing sector and VI towards the fishing fleet, as the regressions have very little explanatory force on variation, as seen by the correlation coefficient. This is however for a specific year, but similar tests for 1995 and 1996, under the assumption that the same share of total landings came from own vessel as in 1997, demonstrated the same, absent effect.

The results from these practises points out that *it is not possible to explain the diversification in economic performance in the Norwegian fish processing industry, merely by means of vertical integration towards the fishing industry.* Our analyses give in that respect no indication of positive correlation between degree of integration towards the fleet and profitability amongst the processors.

7. CONCLUDING REMARKS

The industry studied is exposed to an imperfect raw material market that motivates for VI. The imperfection is generated by different factors like biological fluctuations, climate and institutional barriers. Due to these imperfections the processing companies have to adapt to large fluctuations in supply of raw material. Our findings indicate that the managers in this industry intend to increase their ownership in fishing vessels in order to increase their control of input. The managers seem to prefer this strategy, although it has proven to have little impact on performance.

Miller and Shamsie (1996) developed a model based on the resource-based view that predicts that knowledge-based resources will be the source for sustained competitive advantage in a turbulent setting. Property-based resources, like in VI concepts, will be sources for sustained competitive advantage in stable and predictable

settings. This prediction is supported by our findings. According to other studies of this industry, high degree of flexibility seems to characterise the firms in the economic frontline. Our results seem to support the prediction of de Koning (1994), who predicts a negative correlation between degree of VI and autonomy.

According to Stuckey and White (1993) the motives for VI among the managers are spurious, and the investments and management challenges seem to be underestimated and the positive impact on performance exaggerated. They recommended managers to take a closer look at other strategies in order to reduce uncertainty before implementing VI. Our findings support this recommendation.

In addition, our findings did not indicate that in order to achieve sustain competitive advantage, a company in this specific industry have to be vertically integrated. Most of the firms in the competitive frontline do not own vessels. But some of the integrated firms are performing well, and an interesting question for further research will be to explain this observation. One path to follow may be to study closer the internal pricing regime chosen in those companies compared to those who fail.

One shortcoming in our study is that we have not included on-board processing companies. This limitation is made because law prohibits such adaptation and makes it less relevant in the Norwegian setting than in other institutional settings. This weakness in our study illustrates the need for developing measures of VI that are relevant for the setting studied in order to secure the internal validity of an empirical study. Such a priority will obviously lead to less external validity. On the other hand, this dilemma may also be the reason for the contradicting conclusion both in conceptual and empirical studies concerning the impact of VI on performance.

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