

The art of vertical integration – Profitability considerations

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ABSTRACT

Predictions regarding the impact of VI on performance, based on the different theoretical perspectives are ambiguous, and so are the empirical findings.

The barriers in conducting empirical studies of vertical integration (VI) are multiple. The main purpose of this paper is to demonstrate ways of overcoming the difficulties facing empirical studies on the impact of VI on performance. The empirical setting chosen for this 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 results from our study show that VI can hardly be said to explain the variation in economic performance among the Norwegian fish processing plants.

Key Words: Vertical integration, performance, fish processing industry

1. INTRODUCTION

The main purpose of this paper is to demonstrate ways of overcoming difficulties in conducting empirical studies focusing on the impact of vertical integration (VI) on performance. 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 we briefly review past research of VI. 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. VERTICAL INTEGRATION: THEORY, FINDINGS AND APPROACH

The literature concerning VI is extensive. Here 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 how VI is measured and empirical findings regarding the impact of VI on performance.

2.1. Theory

In the theoretical literature VI has received considerable attention, mainly because VI is a frequently implemented strategy by firms in multiple industries. It is an accepted "truth" that in the world of perfect competition VI has no place. 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 vertically 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, perfectly competitive markets hardly exist. Markets vary with regards to degree of imperfections, VI both exists, and is more common in some industries than others.

Three perspectives dominate the analysis of VI; transaction cost economics, industrial organisation and strategic management, and will be briefly characterised here.

The transaction cost approach (TCA) developed by Coase (1937) and Williamson (1971, 1975, and 1985) provides a coherent framework for investigating the determinants of VI over different industries. Transaction costs can be defined as being “*the cost of organising the economic system*”, (Arrow, 1969). The choice of organisational arrangements of economic activities 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 should take place within the firm or be mediated through the market. This becomes hazardous in conducting recurring exchanges involving transaction specific investments and when information is incomplete. In such a situation the firm – or internal organisation – represents a suitable alternative because common ownership discourages opportunism between owners, and ease information transfer. 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 suggested by Porter (1980) among others, argues the opposite way. According to this view, VI can be a valuable instrument for the firm in creating competitive advantages 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 (cost savings) like; economies of combined operations, economies of internal control and co-ordination, economies of information, economies of avoiding the market, and economies of stable relationship. Porter also argues, as do others (e.g. Pfeffer and Salancik (1978)) that VI can be an important way of reducing external uncertainty and securing supply of critical inputs.

The resource-based view of the firm has received much attention in explaining the existence of sustained competitive advantages (Penrose, 1959; Wernerfelt, 1984; Barney, 1991; Peteraf, 1993). According to this view, VI is considered as a way of creating heterogeneous, valuable and rare combinations of resources that may give rise to competitive advantages that are difficult to imitate (Wernerfelt, 1984, Ramanujam and Varadarajan, 1989, Miller and Shamsie, 1996).

The three perspectives have different foci. The transaction cost perspective emphasises that vertical integrated firms will have lower costs than firms that buy in an open market. The IO perspective emphasises VI as a strategy to achieve competitive advantages through exploiting various types of economies. This perspective also connects the impact of VI on performance to the industry specific competitive environment. The resource-based view addresses VI as a complex and costly strategy. Predictions regarding the impact of VI on performance, based on the different perspectives are ambiguous, and so are the empirical findings.

2.2. Definitional issues

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

The TCA-tradition originating from the work of for instance Coase focusing on minimising transaction costs were little concerned with how to conceptually define VI. In the eighties, however, industrial organisation and strategic management focused on VI as a strategic

instrument in creating competitive advantages. 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 advantages. Applying this perspective Buzzell (1983) concluded that VI is an essential strategic management question concerning “make or buy” and “use or sell”.

At the end of the eighties the focus was to a greater extent put on conditions within the firm in order to understand the effects of VI. Joskow (1988), in pointing at the wide range of transactions between spot market and internal transactions, states:

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

de Koning (1994) argues that the traditional definition of VI has some weaknesses, and proposes to look at VI as a continuum. He also emphasises the negative covariation 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.

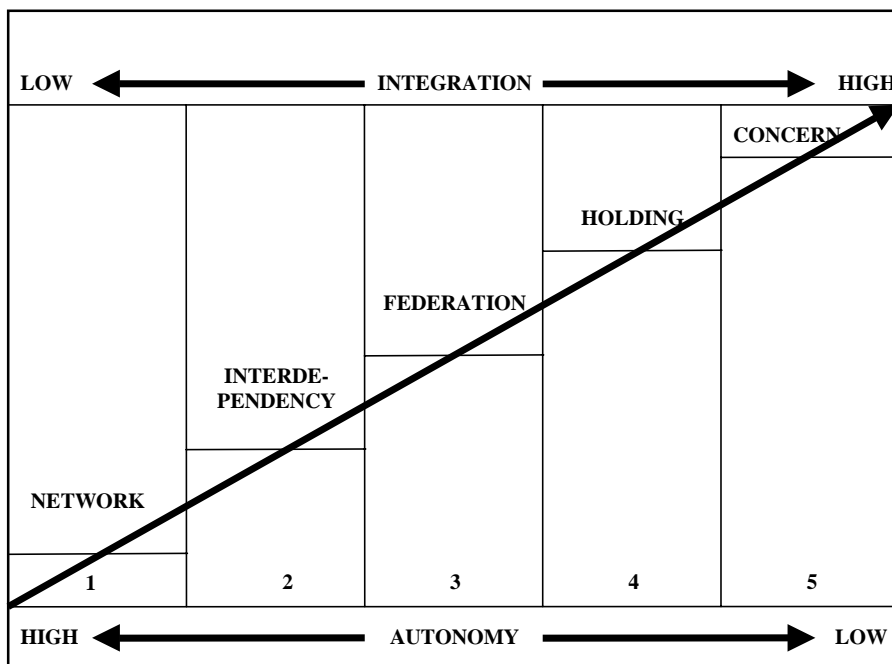


Figure 1 Vertical integration as a continuum (de Koning, 1994)

2.3. Empirical findings

Review of the literature reveals that most of the work concerning VI is conceptual. The empirical work based on the transaction cost perspective tends 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). Number of empirical studies is, however, limited.

Empirical studies resting on the contingency view have mainly focused on when 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 others fail in implementing VI within the same competitive setting. Stuckey and White (1993) reported that VI is a risky strategy, and in addition to being complex, expensive, and hard to reverse. According to these authors 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 the focal company’s stage in the industry chain; integration can 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 the Stuckey and White study is that it is not recommendable to integrate vertically unless it is absolutely necessary. In spite of the negative experiences, VI has been a popular strategy. Stuckey and White (1993) argue that VI decisions is often based on spurious reasons and that managers fail in estimating the cost of investments and management of VI.

The research focus in the last decade – mainly due to empirical evidence – has been on internal resources within the firm and the costs of implementing VI. The main reason for adopting 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 from this research is that new measurements that incorporate the complexity of VI and accounts for specificity both regarding production and competitive setting are needed.

2.4. The present approach

Our study is based upon a combination of the transaction cost, the contingency and the resource-based views. The reasons for doing so are that the transaction cost view is important to understanding the economic benefits of VI. The contingency view is important for understanding the way the competitive setting makes VI valuable. This approach is also important in elaborating adequate measurements of VI. The resource-based view is important to understand what internal resources are needed for implementing VI, and how complexity and internal barriers make VI a costly strategy.

We assume in line with the resource-based view, that due to heterogeneous firm resources and imperfect resource mobility, firms develop different capabilities, which applied in a specific setting, result in different performances. In an industry with strong competition, firms that succeed in developing the essential capabilities will be the survivors. In borrowing from “traditional” research, based on the transaction cost view and contingency theory we test the impact of VI on performance. Our empirical test is conducted in a setting with vast fluctuations in supply of a critical input factor. The firms within this setting vary

both with regard to VI and performance. Based on industry specific continuous measurements of VI, we will, according to the resource-based view, test if the firms that achieve competitive advantages, to a greater extent are vertically integrated than those who do not succeed in this industry.

3. RESEARCH METHODOLOGY

To test the impact of VI on survival and performance longitudinal and detailed data at the firm level are needed. Two considerations have had a major impact on the design chosen in this study. First, we have chosen a design that makes it possible to measure VI as a continuous variable rather than a dichotomous variable. Second, due to industry variations we have chosen to analyse the relationship between VI and performance among firms within the same industry.

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 chosen industry population during the same period ("survivors"). In this part of the study survival is chosen to capture performance. The focus on this part of our research is whether the degree of VI differs in the two groups of firms.

Additionally to the survival study we have chosen a classical economic approach by making use of performance measures, analysing co-variation between degree of VI and performance.

The purpose of this study and the chosen design make several requirements that the data have to meet. The industry studied has to be confronted with uncertainty in supply of input. Within the industry there must be variation in the degree of VI. At 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 statistical validity.

4. SETTING

To find a suitable population for the purpose of this study, three requirements must be met. First, the population must be embedded in a competitive setting that brings about the need for VI according to IO and contingency views. Second, the industry must be composed of firms that vary in degree of VI. Third, detailed data at 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.

Mapping of the supply of raw material in this industry shows that volumes and quality of raw material fluctuate highly due to biological variations and problems managing commercial fish stocks (Dreyer, 1998). These fluctuations force firms in this industry to focus on securing the supply of raw material. According to management literature this is a setting where firms face the "make or buy"-problem. The Norwegian fish processing industry is heterogeneous with regard to degree of VI, i.e. ownership in fishing vessels.

Some firms, due to exclusionary provisions, are allowed to own vessels even 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

The data applied in this study originate from "Driftsundersøkelsen i Fiskeindustrien", a yearly, ongoing profitability survey of fish processing plants in Norway (Bendiksen, 1999). Including the same companies each year, these data allow for constructing a panel set to capture time. The annual profitability survey is the primary data source and has been conducted among the Norwegian fish processing establishments since 1977. The survey is based on official accounts and the main indicators to capture the economic performance are return on total capital and operating profit margin.

The second data source is a survey based on telephone interviews with the general managers of the 75 largest fish processing companies within the institutional limits of the largest sales organisation; Norges Råfisklag¹. This survey was conducted to complete the profitability survey. An additional motive was to capture VI at a given point in time – i.e. end of 1997.

The combination of the two data sets gives a unique opportunity to compare the “hard facts” presented in the annual accounts, with the data obtained through interviews. It allows us to analyse development over time and the situations at different points of time. This is unique compared with earlier studies performed in this sector and in comparable studies from other industries where VI is addressed.

6. FINDINGS

The analysis was performed in two distinct separate ways. First, a dynamic approach was conducted, where the detailed data from the profitability surveys was applied. Then information from the interviews was combined with the account figures from the 1997-survey, to examine the effect on economic performance from (up-stream) VI.

A problem arises because of the changes in the survey; i.e. changes before and after 1993. During the first period detailed production, cost and income data among the firms were collected. The data after 1993 are less detailed, and include basically the accounting figures as stated in the annual reports.

¹ 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 of fish in Norway and attended in 1997 to about ¾ of the first hand sales of ground fish in Norway, foreign vessels' landings included.

The vast majority of ground fish trawler landings to the processing industry stems from wet fish trawlers that are controlled by the processing plants, or trawlers that through their licences are imposed delivery terms to specific plants or geographic areas. Among other variables, the «old» design of the profitability study incorporates trawlers share of total landings of fish to the firm, as one variable that was collected from the enterprises. Hence, by the means of this variable we have operationalised a variable that capture the phenomena of up-stream VI. This measurement, however, does not distinguish between autonomous trawlers and those controlled by the industry.

From this data two variables are constructed, **V1** and **V2**², measuring the extent of trawler landings to the total purchase of fish the individual firm does within a period of five 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”) it is possible to examine the impact of VI on performance, as shown in Table 1.

Table 1 Differences in vertical integration between “survivors” and “failures”

N=35	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 variables. 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 received from trawlers are relatively small, for both groups.

We also test, whether the degree of VI influences the firms’ relative profitability (RES); i.e. the economic performance for the individual firm, measured by return on total capital, relative to performance of the whole sample³. The results are presented in Table 2.

² **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.

$$V1 = \frac{\sum_{i=1}^5 r_i}{\sum_{i=1}^5 R_i}, \quad V2 = \frac{\sum_{i=1}^5 \left(\frac{r_i}{R_i} \right)}{5} \quad \text{where} \quad \begin{array}{l} r_i = \text{annual trawler landings} \\ R_i = \text{total annual landings} \end{array}$$

³ This was developed 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.

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 co-variation between the two variables. The correlation coefficients are close to zero, and thus, insignificant.

A central motive to integrate vertically towards vessels is to assure the supply of the most important raw material, fish. Previous analyses have shown, however, that “failures” in this industry have more stable raw material supplies – what volume concerns – than firms who achieve sustained competitive advantages (Dreyer, 1998). This shows that stable supply of raw material is not vital for the profitability in this industry!

An additional analysis on annual basis for all the years in the “old” profitability study was carried out. Note that the variable for vertical integration used here is consistent with **V1**, only with one year instead of five⁴. Profitability is measured by return on total capital the given year. The results are shown in Table 3.

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

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

* Indicates significant at a 1% significance level.

⁴ The corresponding variable is therefore: $\mathbf{VI} = \frac{r_i}{R_i}$ (Notation is given in footnote 2).

The results coincide with our above findings. For the total sample we see that every year, except one, there is a negative co-variation between profitability and VI, as captured by our measures. This applies in most years for the freezers as well. For these firms the correlation coefficient demonstrates the largest problems around 1990 when the cod quota was at its lowest. This can, among other factors, be due to the “trawl ladder⁵” and high capacity costs – both at vessel and processing level.

The conclusion that can be drawn from these three analyses 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 co-variation is, however, not significant, but the conclusion is strengthened as all three analyses from the profitability study point in the same direction.

The fish processing industry has shown to be very dynamic where changes take place quickly at both the firm and the industry level. To capture changes after 1992 and to measure VI in a better manner, managers in the largest establishments in the north of Norway were interviewed⁶. This resulted in a continuous variable on VI, here categorised into three groups as shown 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.

As seen from Table 4, results depend on variable chosen. While RTC captures the yield of the total capital, independent of funding, OPM measures the profit from total sales. Applying OPM indicates that VI has a positive impact on performance, whilst the conclusion is opposite when applying RTC. This suggests that the most integrated firms in 1997 had the highest operating margin, though not sufficient to compensate for the additional capital tied up by ownership in vessel(s).

⁵ 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 The main intention of the telephone survey was to establish an understanding of the range of VI in the processing plants. Amongst other questions, the managers were asked about the share of the raw material basis that was acquired from vessels where the firm had proprietary interests. Other questions were how many vessels/which vessels the plant had proprietary interests in; how much capital was tied in these investments; whether other vessels had special landing conditions connected to the specific plant; changes in this situation in later years and future strategy with regards to VI.

The plot diagrams in Figure 2a and 2b show the dispersion on return on total capital and operating margin respectively in 1997.

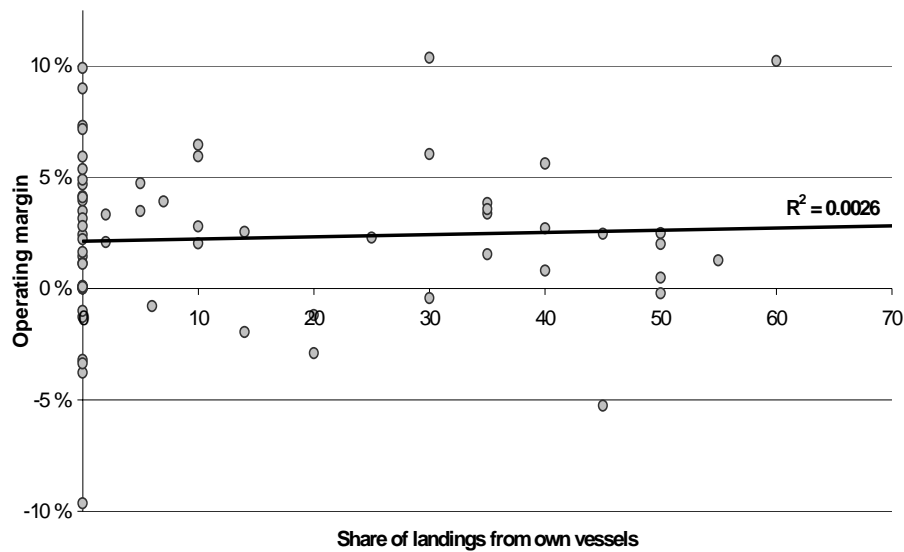


Figure 2a Plot diagram on operating profit margin (OPM) and degree of VI among Norwegian fish processing plants in 1997

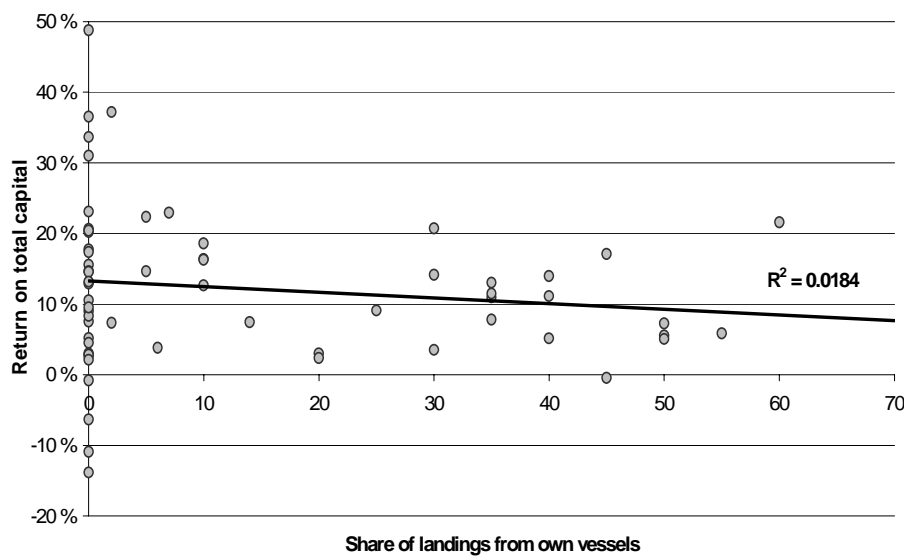


Figure 2b Plot diagram on return on total capital (RTC) and degree of VI among Norwegian fish processing plants in 1997

Plotting the dispersion around the average, uncover great variation. The plots exhibit near to zero 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, demonstrated the same: VI has no impact on performance. The results from the analyses above show that *it is not possible to explain the variation in economic performance by degree of VI among the Norwegian fish processing plants.*

7. CONCLUDING REMARKS

The industry studied is exposed to an imperfect raw material market that, according to theory reviewed, 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 advantages in a turbulent setting. Property-based resources are predicted to be sources for sustained competitive advantages in stable and predictable settings. Our findings are supported by these theorised predictions. Other studies of variation in performance among these firms show that firms in the economic frontline are characterised by a high degree of flexibility (Dreyer, 1998). Our results also seem to confirm the prediction of de Koning (1994), who predicts a negative correlation between degree of VI and autonomy.

According to Stuckey and White (1993) motives for VI among the managers are ambiguous. Required investments and management challenges seem to be underestimated and the positive impact on performance exaggerated. They recommend 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 indicate that in order to achieve and sustain competitive advantages, a company in this specific industry does not have to be vertically integrated. Most of the firms in the competitive frontline do not own vessels. However, some of the integrated firms are performing well, thus, an interesting question for further research will be to explain this observation.

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 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 analysis. Such a priority will obviously lead to less external validity. On the other hand, this dilemma may also explain the contradicting conclusions in both theoretical and empirical studies concerning the impact of VI on performance.

Acknowledgements

The authors wish to thank Bjørn Inge Bendiksen and Audun Iversen (Norwegian Institute of Fisheries and Aquaculture) for valuable assistance at earlier stages in this study.

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