Upstream vertical integration and financial performance

The case of the Norwegian fish processing industry

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Foreword

How can I use a foreign language to express my gratitude to people I know well? To me, that’s simply impossible. In my view, this piece of the thesis – serving as a ‘speech of thanks’ rather than a formalistic acknowledgement – it is best served by my own dialect. However, a very brief summary in English will be given.

Vertikal integrering i feskerinæringa… Smak litt på det… Korr sexy kainn *det* gjøres? Tell tross førr at de stringente reglan før vitenskapelig arbeid ikkje bestandig har høvd mæ like godt, så har dettan arbeide’ vorr både utfordranes og underholdanes. At nåkka passa bedre ”*in my mental models*” einn ”*svart på kvitt*” e’ en ny og muligens god lærdom.

Mett syn på deinnan avhandlinga som nu foreligg har fra start’n av vorr fatalistisk: Begå det tell fuille, eiller la det ligg! Ei vælsegna ambisjonsfri og ryggeslaus holdning. Når æ nu står i skade førr å kom i mål e’ det opptell fleire persona og institusjona som førtjæn sin takk – teldels fleire, og store sådanne åsså.

Deinn første og største takken går tell han Bent – lofoting, kontornabo, ressursperson, mentor og ”*Oh Høye Herre og Mester!*” – Dreyer. Då æ ætter fjortendaga i arbeid her på huset blei tellbydd plass som stipendiat på en NFR-søknad innaførr bioøkonomi, blei æ råda tell å takk nei av nyærværva medarbeidera, med årelang fartstid i stipendiatstillinge. Meldinga fra daværende cand.scient’n va klar: Det kainn gjøres på en smidi’ar måte, deklamert han. Og vi gjor det! Det har tatt si tid. Mi tid som relativt nyansatt må vel vær over snart. Han Bent har vorr nært, og stådd sentralt i det mæste æ har foretatt mæ sia æ byint på Fiskeriforskning (det e’kje bærre i Bergen de har ’rævediltere’) og det har heile ti’a vorr en betryggelse og ha hannes ryggdækning. Dét har æ tell fuille nytt godt av. Deinn kar’n veit’kje ka godt han ska gjør før aindre. Det seies om hannes motsatsa at de kuinn ha solgt si eia mor. Han Bent trur æ hadde gjett ho bort, dersom det kom over han at nån andre trængt ho meir. I korte trækk: Ingen Bent, ingen avhandling! Tusen hjærtelig takk!

Med oss på laget har vi hadd uvurderlig hjælp av han Kjell Grønhaug. Førr dettan har ætter mi meining vorr et team-arbeid. Hannes nærmast ubegrænsa kunnskap innaførr de fleste nærligganes fagfelt – kobla med en imponeranes arbeidskapasitet som kainn misuinnes av de fleste i dessert- og oppvaskgenerasjon’ – har mang en gong imponert mæ. *”John, du som er sosialøkonom, du kan jo dette myye bedre enn meg…”* Nei, æ trur egentlig ikkje det Kjell! Æ e takknæmlig førr å ha fått profittert av dett kunnskapsoverskudd, dine go’e idéa, vælvelje og pedagogiske ævna som har spora tell videre innsats (*”Det e’ veldig bra John, men ka om du hadde…”*). Du har – ilage han Bent – mykje av skylda førr at dettan e’ kommen i stand.

I næste række går takken tell Fiskeriforskning, som sammen med Forskningsrådet og andre, har stilt midla tell rådigheit som har muliggjort deinnan oppskrivinga. Uatskillelig fra Fiskeriforskning må de nævnes aille de som gjør Fiskeriforskning tell det det e’ og har vorr, og som i høgaste grad har bidratt tell at det sosiale miljø har utgjort en vælsegna adspredelse fra de – i Rogersk terminologi – ’akademiske armhævingen’. Det har ikkje vorr ainna einn lutter glede å arbei i lag med gjængen på SØM! Og koffør ikkje byinn me’ han Roger – en roolig mainn (tell han fekk på sæ fotbaillskoen) me’ godt humør – pragmatiker’n som såg værdien av de herran doktorgradan. Han Bjørn Eirik ska og ha takk førr å sjå gagn i en sosialøkonom ilagme aille feskerikandidatan. Og mæns vi e’ oppi hjørnekontoran ska ho Heidi – språkrådets førlænga arm (Ok då; du har som regel rætt!) – ha aill værdens ros førr sin stålkontroll på skreft og lay-out, og ailt ainna som feill under hænnes jurisdiksjon. Han Bjørn Inge førtjæn en stor takk førr tall, tid, kunnskap og ei åpen dør. Dærnæst førtjæn følgende en takk førr samhandling, sosialt samvær og fredagskaffe me’ og ut’n gruff: Pirjo, Jens, Hans-Martin, Audun, Frode, Geir, Oddrun, Morten, Joop, Gøril, Kjell, Bjørg, Thode, Øystein, Finn

Arne, Edgar, Kåre, Stein Arne, Berit, Eva, Torgeir, Jarle, Lene, Jan Arvid, Nina og Ingrid. Andre her på huset har også vænt sæ tell min blotte telstedeværelse og ska ha takk førr å ha stilla tell rådigheit værdifuille øyeblekk (det være sæ fesk, artikla, rapporta, en tunnel, en pris snus eiller bærre en god latter): Torbjørn, Kjetil, Frank, Lise-Lotte, Bente, Ingebrigt, Mats, Sjur, Heidi, Gunn-Berit, Agnar, Karsten og Øyvind, m.fl. Før ikkje å snakk om kantinedamen som gjør lønsjen (ætter matpakken) tell en kulinarisk opplevelse!

Det va det profesjonælle; så tell deinn meir private sfæren a mett liv. En kollega e' av deinn oppfatning at doktorgradsarbei burde framgå i statistikkan som en av skilsmisseårsakan. Deinn luksus'n har ikkje æ å skyld på, mæn æ e' min "føra-detta" – ho Sonja – en takk skyldig førr å ha tatt takan heime mæns æ vævla rundt på konferansa og begikk deinnan utdannelsen. Samtidig ska ho Regine – min store skatt – ha takk førr å ha lært mæ å innsjå ka som e' de vektige tengan her i livet… Ho Lena – kjærest'n min – har vorr en deilig adspredelse fra dettan arbeie'. Om vi'kje har diskutert vertikal integrering så mykje så har vi allikavæll fuinn ton'. Også me' SASBraathens og Norwegian. Det e' heiller ikkje vanskelig å finn ti'a tell å sett på kontoret når kjærest'n e' 150 mil uinna!

Familien min har ailltid betyidd mykje førr mæ – og korr æ einn befinn mæ hæn i livet så e' mett *heim* fast førankra meilla kjer'går'n og Storvar'n i Hovden. Det e' dær ho mamma og han pappa hold hus, og av aille skola æ har begådd e' det deinn som har forma mæ mæst og e' mett hjærte nærmast. Om æ i aill beskjedenheit får sei det sjøll: Dåkker har gjort en formidabel jobb! Mange takk! Mange søsken (Ulf, Robert, Berit, Frank og Ørjan – æ mått bærre nævn dåkker), over tid også svigersøsken, og hærlige onkelonga har ailltid vorr en berikelse før mett liv. Førr ikkje å snakk om bidraget tell lønsj-prat'n. Takk tell dåkker aille.

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Sku æ nu ha glømt nån så ligg det'kje nåkka djupar meining bak det! Og la det vær sagt: Om æ hadd fått vælt, så hadd NFH-logoen pryda framsia! Førr tænk atte…

English summary**:**

This thesis has benefited greatly from the generous help and guidance of my supervisor Bent Dreyer, accompanied by the wisdom of Prof. Kjell Grønhaug. Their endless patience, knowledge and willingness to spend a great deal of their time on my problems have been of invaluable help. (The schizophrenic language in this thesis – alternating between "I" and "we" – is caused by the mere fact that I regard this work as brought about from *teamwork* rather than individual academic push-ups.) I also wish to thank Prof. Derek J. Clark for constructive feedback on a late version of this manuscript.

Thanks go also to all of my present and former colleagues with whom I have had the joy of discussing my problems (and a couple of other things) and from whom I should have acquired loads of knowledge. I am also in great debt to Fiskeriforskning and the Norwegian Research Council for their funding, in addition to all the informants who have provided me with valuable data and information about the industry we are here to serve.

Finally, my gratitude goes to my sweetheart and my family, whose moral (and immoral) support have been priceless throughout this entire process, but also in my former life.

Tromsø, March 20, 2007.

Tell ho mamma og

han pappa

– fordi de fortjener det!

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CONTENTS

Part 1

1 INTRODUCTION

In executing day-to-day tasks, managers of manufacturing firms are faced with many forms of uncertainty which have to be dealt with in an appropriate way, in order to cope with the external environment and the internal life of the firm. These operative managerial decisions are important, but of greater importance are their decisions regarding the firm's *strategy*, which should have a long-term impact.

A business strategy is a long-term plan of action embodying the goals of a firm, a guidance for the managerial routine tasks. Chandler (1962: 13) defines strategy in a broad context as: *"...the determination of the basic, long-term goals and objectives of an enterprise, and the adoption of courses of action and the allocation of measures necessary for those goals."* A more fulfilling strategy definition, which underlines the boundaries of the firm, is made available by Andrews (1971: 18-9):*"Corporate strategy is the pattern of decisions in a company that determines and reveals its objectives, purposes, or goals, produces the principal policies and plans for achieving those goals, and defines the range of business the company is to pursue, the kind of economic and human organization it is or intends to be, and the nature of the economic and non-economic contribution it intends to make to its shareholders, employees, customers, and communities."* Collis & Montgomery (1997: 5) define corporate strategy as *"...the way a company creates value through the configuration and coordination of multimarket activities."* In all the definitions stated above, the business strategy serves as a plan for the firm on how to exploit and take advantage of market opportunities and how to orient towards competitors in its marketplaces to enhance its performance and increase its shareholders' value[1]. This also implies a matching of needs and resources in order for *"...bringing about corporate missions, visions and goals"* (Vernon, 2002: 196), since strategy formulation and implementation is not a costless activity.

Usually, the main goal of a commercial firm's business strategy is a long-term return which is above the average for its industry or competitors. The heterogeneity of firms within an industry has been of primary concern within strategic management, and especially the distinctive competencies and resources enabling firms to attain long-term above average returns. Why one strategy is more effective than another, given product, firm, and industry characteristics, has been one of several important research topics within this paradigm (Dobbin & Baum, 2000). A large stream of research, not only within strategic management, has scrutinised the choice of organisational form, i.e. the structure of corporate governance to effectuate its business strategy. As such, the impact of various organisational architectures on firms' performance has been an often addressed research topic.

A fundamental intention of the theory of the firm is to establish its boundaries: Which activities should be attended within the firm, and which activities could effectively be delegated and transacted through markets and market-like organisations. Establishing and operating under the appropriate scope and scale of the firm is commonly believed to ensure and support the strategic goals of a manufacturing firm – like superior performance, best

[1] Weick (1987) proposes an intriguing approach to strategy, where executing everyday tasks serves as the analysis and the formulation of a strategy is done by the pure implementation. In his view, strategic planning is the pretext under which people act and produce meaning for action that is beneficial for the organisation. His most appealing definition of strategy is "*good luck rationalized in hindsight*" (p. 221). However, he does not oppose strategic planning itself but stress that too much strategy might paralyse the firm, since strategy often is a *"...retrospective summary that lags behind action, and because the apparent coherence and rationality of strategy is often inflated by hindsight bias, strategic conclusions can be misleading summaries of what we need to do right now and what we need to do in the future"* (p. 232).

product quality or customer service. Within this entangling class of managerial tasks lies the choice of 'make-or-buy' and 'use-or-sell'; also known as the *vertical integration* decision.

For whatever reason one embraces or rejects integration of adjacent stages in the value creating chain as part of the firm's corporate strategy, the (long-term) objective for the firm is (or should at least be) to create value for its owners. The pertinent link should therefore be that vertical integration should be chosen when it helps to enhance the firm's performance, in order to remunerate owners' investments and the effort imputed by employees. Therefore, in order to extract extra rents from vertical integration the costs of this governance form must not exceed its benefits.

The research presented here is an attempt to improve and expand existing knowledge on the vertical integration-performance relationship. By first establishing the degree of vertical integration in Norwegian fish processing firms, the subsequent effect on financial performance from this strategic action is examined. The findings are critically assessed and possible explanations of the results are suggested. In this undertaking, multiple theoretical contributions on the vertical integration-performance relationship are examined, and arguments brought forward on why this business strategy should pay off in our research setting. In the next sections the background for this research is presented and the purpose of this study is further elaborated.

1.1 Background

An appealing feature of the Norwegian fish processing industry is the highly heterogeneous and diversified nature of its member firms. They are similar in the respect that they transform fish (and other seafood) into products demanded in both national and international markets. Within this input-throughput-output paradigm firms disperse widely over several dimensions: the raw materials they utilise, the manufacturing processes they undertake, the products they make, the markets they compete in, and so forth. In this highly heterogeneous setting, firms also choose different sourcing methods, i.e. the ways they obtain crucial inputs, and different marketing methods, i.e. whether they sell their products through own outlets or sales forces, or by choice of independent exporters/wholesalers. These choices, regarding the scope of the firm, are the central issues when vertical integration is under scrutiny.

The Norwegian fish processing industry is still characterised by rather low concentration and preponderance of small and medium sized firms, despite a rather turbulent period the latter decades with vast structural changes. The average size of firms has grown in the period, but instead of internalising harvesting and sales activities, as recommended by government agencies and leading business advisors in order to create both upstream and downstream bargaining position advantages, the industry has to a large degree kept its focus on seafood processing. Why is it so?

My interest in this problem arose at the end of the 1990's, where different governmental agencies suggested that vertical integration could serve as a remedy for helping the fisheries industry out of the cod stock collapse crisis they suffered at the beginning of the decade[2]. In a study performed for two Ministries, the Norwegian Industrial and Regional Development Fund (1994) proposed that one should make room for large "locomotives" in the Norwegian fish processing industry in order to improve it's competitive position in international markets.

[2] These recommendations can also be seen as following the general societal liberalisation tendency and practice. For the fishing industry, the statutory framework was suggested heavily revised by an appointed committee (Ministry of Trade and Industry, 1998), where also the possibility for upstream vertical integration was thoroughly discussed and stressed as a bottle neck for free industrial development.

These "locomotives" could, by virtue of size and market power, serve as gate openers for smaller firms, by meeting market demands for stability, professionalism, product range, quality and volume. The Ministry of Fisheries (1998) lowered these ambitions in a report to the Parliament some years later, but upheld that inter-segment cooperation could improve fish processing firms' ability to serve their markets in a better manner, and to better control the different stages in the value chain. The underlying motive was that large firms (or firm constellations), by controlling several levels of the value chain, could exercise some potential market power and thereby gain profits unobtainable by small seafood producers.

The work carried out at my institute (Fiskeriforskning), in which the suitability of upstream vertical integration in the fish processing industry was evaluated (Dreyer, Bendiksen, Iversen, & Isaksen, 1998), can serve as the point of departure. There, we found no significant effect on financial performance from integrating vertically. The work presented here can be traced back to those early findings, and my objective is to develop a deeper understanding on the complex relationship between these two variables, in a dynamic setting like the Norwegian fish processing industry. The purpose then is to empirically examine the performance effects from vertical integration, by inspecting closely various aspects of the vertical integration-performance relationship.

1.2 Purpose

The research presented here elaborates on the actual performance effect from integrating vertically in a competitive, but turbulent environment. Hopefully it can provide improved insights on the net benefits from exploiting this strategic tool. The analysis follows loosely the structure-conduct-performance paradigm[3], where firms' actions – and thereby performance – are determined by the structural characteristics of the industry. One common denominator for the presented work is the setting, which is limited to the Norwegian fisheries industry. The focal level in this value chain is – throughout the thesis – the fish processing industry; located between the fishing industry (upstream) and sales/exports (downstream). The conceptual background, however, is of a more general kind.

My work rests on various theoretical approaches – each of them suitable for understanding the crucial aspects regarding the impact of vertical integration on financial performance. We identify and utilise three main theoretical approaches that are all well designed for this purpose, which function as complementary viewpoints to the phenomenon of vertical integration. First, transaction cost economics focuses on the transactional imperfections which help to define the boundaries of the firm from a classical economic efficiency viewpoint. Also, industrial organisation focuses on market imperfections, but the centre of attention here is on how to achieve competitive advantages[4] through advantageous exploitation of various types of economies when free competition markets do not appear. Industrial organisation links vertical integration to the industry-specific competitive environment, and concentrates on how this environment could be beneficially utilised to the firm's best. The third viewpoint, strategic management – and especially the resource-based view of the firm – focuses on the internal resources and capabilities possessed by firms (as opposed to industrial organisation's emphasis on the external environment) to succeed when choosing strategy. Within this stream

[3] The structure-conduct-performance paradigm posits that the structural characteristics of an industry determine the conduct of firms in it, which in turn determines the market performance. See e.g. Scherer & Ross (1990: 4-7) for an introduction and description of this theoretical paradigm.

[4] According to Porter (1980) a firm has a *competitive advantage* when it can produce a good or service in a superior manner to that of its competitors and earn profits from it. This can be achieved by either a low-cost or differentiation strategy.

of research, the internal resources and capabilities under the firm's authority will be the key factor of success, when firms adapt vertical integration strategies in order to achieve competitive advantages.

In light of the mixed findings in previous empirical investigations on the vertical integration-performance relationship, shortcomings in earlier research are addressed and a context-specific measure for vertical integration in the setting under scrutiny is formulated. My research topic follow from the observation that firms in the Norwegian fish processing industry vary both to the degrees that they have undertaken upstream vertical integration and their considerable variation with respect to financial performance. My *research problem* then, consists of the empirical examination of the performance effects from upstream vertical integration within this setting. This problem can be represented by a research question, which can be further divided into exploratory sub-questions which I attempt to analyse:

To what degree will the adaptation of vertical integration towards the fishing fleet, as an often chosen strategy by firms in the Norwegian fish processing industry, bring about performance effects measured by traditional financial performance measures?

- Which motives are at work for upstream vertical integration in this industry?
- What is the appurtenant way to measure vertical integration within this setting?
- Are there alternative ways to organise the input sourcing from – and relationship towards – the upstream, primary producers?

At least three features make this research problem appealing. First, the empirical literature in this field is limited, and findings are highly ambiguous. Where some find vertical integration highly profitable, others report a negative correlation between the two variables. Second, different theoretical contributions are well suited for studying the link between vertical integration and profitability, and the adequate choice can be made from a series of explanatory models. This multi-theoretical approach can help to reveal which contribution has the best explanatory effect within the setting studied here, with the possibility of making generalisations to other parts of economic life. Finally, vertical integration as a competitive strategy is to a large extent implemented in both the Norwegian fisheries industry as well as in other sectors of production worldwide. Literature on manufacturing strategy clearly states the importance of upstream vertical integration, and emphasises its beneficial effects when raw material costs constitute a substantial part of total costs. In those cases, the endeavour to reduce input costs becomes importunate, and successful sourcing practices that can achieve substantial input price reductions will have great influence on firm's financial performance. Dobler, Burt & Lee (1990) exemplify this in a stylised calculation that a five percent reduction in input prices will have the same effect on financial performance as a 25 percent increase in sales price. Further, Welch & Nayak (1992: 24) underline the importance of vertical integration for manufacturing firms: *"Since purchased inputs are such a large portion of total product costs, the attention that make-or-buy decisions deserve cannot be overstated. In fact, the gains to be made by addressing purchasing issues are far greater than those that accrue by attacking labor costs directly."*

The decision whether to 'make-or-buy' or to 'use-or-sell' often concludes with the superiority of the first mentioned alternative, and an effort to enlighten the understanding 'why' it is so, and what the appurtenant performance effect will be, will offer a valuable addition to present knowledge. Here, the main contribution to existing knowledge brought forward by this thesis, is a thorough empirical analysis over multiple dimensions of the vertical integration-performance relationship, by ways of combining different theoretical approaches and developing a context specific measure for vertical integration. In addition to the empirical analysis, I will give an overview over appropriate theoretical and methodological treatments of the phenomenon. Finally, the results obtained in this study will be placed and positioned within the stream of earlier empirical research. In the next section an outline of the thesis will be given.

1.3 Thesis structure

To address my research question I have chosen to parcel the thesis into three parts, where this current Part 1 serves as an introduction. Introductorily it should be mentioned that the thesis serves as a hybrid – somewhere in between a monograph and a collection of articles – since it rests on the papers attached in the Appendix, but is 'rewritten' as a monograph. The reason for this treatment is the relative modest length of the papers, whose purpose is better served by supplementary reference to theory, method and discussion of findings.

Part 2 deals with the theoretical basis for my research and earlier empirical studies. In Chapter 2, I explicitly examine the fundamental concepts relevant to my research, namely vertical integration and performance. Then Chapter 3 brings forward the theoretical approaches I employ in my research. A thorough – yet pertinent – review is offered, which serves as a background for the phenomenon under scrutiny. It further presents the influence of uncertainty in the treatment of vertical integration, together with propositions from theory on when to integrate and which benefits are expected from such strategic action. In Chapter 4 previous research and findings from the vertical integration-performance relationship is presented with a critical assessment of measures and methodology, before Chapter 5 presents some methodological challenges facing researchers who want to study the relationship between vertical integration and financial performance. Finally Part 2 is concluded by addressing the inadequacies in existing knowledge on the topic chosen.

Part 3 consists of a presentation of my research. Chapter 7 sets out by stating some claims from theory on my research design, before it offers a lengthy description of our research setting with emphasis on the contextual motives for vertical integration. Hence, I try to establish the motivation for utilising vertical integration as a sourcing strategy in this competitive environment. Chapter 7 ends with a presentation of a contextual measure for vertical integration and an assessment of data availability. In Chapter 8, the research process and findings – in form of four consecutive analyses on the vertical integration-performance relationship in this setting – is conducted and presented. These analyses correspond to the four papers presented in the Appendix, though somewhat altered in order to ensure consistency with the prior sections. Part 3 is concluded by Chapter 9, which underlines the main findings from our investigations and offers concluding remarks to the research undergone. There, I point to the contributions from this thesis to existing knowledge within this field of research, and provide some implications for theory and methodology. Finally, the limitations facing this study are addressed, together with recommendations for further research and suggestions for managerial practice in our setting.

Part 2

2 FUNDAMENTAL CONCEPTS

The treatment of concepts is essential within scientific research, especially to designate terms (words and linguistic definitions) to concepts, so that what we speak of – and how we speak of it – is in accordance with what is intended (Zaltman, 1973). Concepts serve as cornerstones in theory building and are the fundamental units under scrutiny in scientific analysis, to which one seeks to establish causal relationships. As such, there is a need for elaboration from how we understand the different phenomenon and objects in real world and the way we treat them as linguistic terms in everyday speech, to the way they appear as abstractions in our world of thought and in theories. Before giving the theoretical concept *vertical integration* a contextual definition for the setting studied here, it is important to assign an adequate meaningful content to the concept – in line with what we understand by the term vertical integration. The development of the appropriate empirical operation and operational measure will take place in Chapter 5.

2.1 Vertical integration

Vertical integration is most commonly believed to involve common ownership of two or more successive stages in the value creating system and has been considered a strategic device in order to cope better with the competitive environment. Riordan (1990: 94) defines vertical integration as "*...the organization of two successive production processes by a single firm.*"

Vertical integration differs significantly from *horizontal* integration by the direction of the acquisition. The latter incorporates activities belonging to the same level in the value chain[5], as opposite to vertical integration where activities in adjacent stages are taken under the wings of the acquiring firm. The effects resulting from vertical integration are also different from those occurring from horizontal integration. Whereas the latter should increase concentration and market power, the welfare effects from integrating vertically, like increasing entry barriers, are highly disputed (Sheperd, 1997).

A common distinction in the treatment of vertical integration is that between upstream (backward) vertical integration and downstream (forward) integration. This notion is rooted in the concept of the value chain, classifying the integration process from whether the focal (acquiring) firm is bringing processes or services under its umbrella that earlier have been undertaken by actors closer to the raw material (upstream) or customers (downstream).

Figure 1 beneath is meant as a generalised and simplified model of *the value chain*, as met in most industries. From the diagram, the distinction between upstream and downstream vertical integration can easily be visualised. An acquisition or merger in line with the direction of the arrows, which describe the flow of goods between the actors in the value chain, is thought of as *downstream* (or forward) vertical integration, while a firm investing in the opposite direction of the arrows is defined as *upstream* (or backward) vertical integration. The focal stage of the value chain is then thought of as the link in the chain which incorporates the preceding or subsequent activities.

[5] When introducing the concept value chain, Porter (1985: 36) defines it as *"...a collection of activities that are performed by the firm to design, market, deliver and support its product"*. He further notes that *"A firm's value chain is embedded in a larger stream of activities (...) the value system"* (p. 34). Others use the term *value-added chain* to denote the various steps a good or service goes through from raw material to final consumption (Johnston & Lawrence, 1988). Here, however, we contradict Porter in our use of the term *value chain* to depict the adjacent vertical activities both within and *outside* the firm, like for instance Cacciatori & Jacobides (2005).

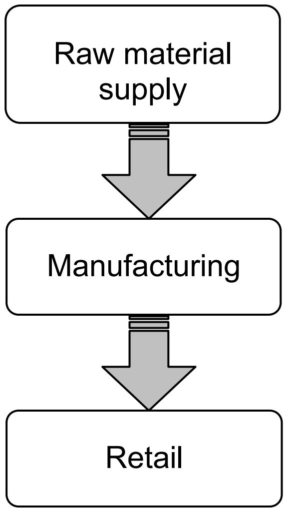

Figure 1 The value chain

Vertical integration is thought of as a means to obtain multiple favourable administrative and operational efficiency attributes, increased market power and reduced information obstacles between commonly owned producing units. As such, legal authorities have taken interest in these actions, and internationally antitrust legislation has to some extent confined the possibilities of integrating vertically. Moreover, academic literature on vertical integration have mostly been concerned with providing reasons for opposing vertical mergers on antitrust grounds (McAfee, 1999), an argument opposed by the Chicago school stating that integration does not rise monopoly power at all as long as the market works well (Spengler, 1950).

Scholars' use and notion of vertical integration when shedding light over this phenomenon[6] points in direction of an identical definition of this concept. Every definition seems to incorporate that ***two or more stages of the value chain – between which a flow of goods and/or services takes place – are under common ownership***. Hence, there is consistency between different schools of thought's construct (or concept) of vertical integration. The definitional claim of ownership to sequential units in the value chain can be said to stem from the need for a suitable contextual definition – in order to operationalise the concept for empirical work. Frank & Henderson (1992) argue that vertical integration is merely one mode of possible structures of vertical organisation, whereas vertical coordination is a more comprehensive concept, which captures the entire process of a value adding system where functions are brought into harmony, and encompassing all means of harmonising interdependent production and distribution activities. As underlined by Seagraves and Bishop (1958: 1814): "*…there are many degrees of ownership and ownership is often quite removed from management.*" The opposite view on ownership in the case of vertical integration is by focusing on decision-making, coordination and resource allocation, regardless of ownership.

[6] This similarity is found by assessing the way different proponents within the fields of transaction cost economics, industrial organisation and the resource-based view of the firm, define vertical integration respectively: *"...given that a final product is to be assembled from a series of separable components, which of these will be bought, which will be made, and how will the latter be organized? This is the vertical integration issue"* (Williamson, 1975: 82). *"The production of any good usually involves a series of stages in which raw materials are first extracted, then processed into intermediate goods, assembled, finished and eventually distributed as final products. (...) Vertical integration joins two or more of these successive stages"* (Sheperd, 1997: 274) *"A firm's level of vertical integration is simply the number of steps in this value chain (i.e. the set of activities that must be accomplished to bring a product or service from raw materials to the point that it can be sold to the final customer) that a firm accomplishes within its boundaries. More vertically integrated firms accomplish more stages of the value chain within their boundaries than less vertically integrated firms"* (Barney & Hesterly, 2006: 180-81).

This is, among others, acknowledged by Blois (1972; 1980) who by the term *vertical quasi-integration*[7] underlines that ownership is not a necessary condition for harvesting vertical integration benefits. Since organisational dependency also can be achieved by being a sole or large customer, this represents a power imbalance between transaction partners that can constitute just as great dependency and threat as ownership can. Here, however, with the emphasis on empirical analysis, the ownership issue becomes a crucial one, with respect to operationalisation of the concept in real-world situations.

Within the early development of transaction cost economics focus was not on the conceptual definition of vertical integration. In the eighties, however, industrial organisation and strategic management focused on vertical integration as a strategic instrument for creating competitive advantages. Porter (1980: 300), being a major exponent for the industrial organisation tradition, defined vertical integration 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."

In his view, vertical integration is a strategic tool for achieving competitive advantages under given conditions. As a strategic choice in a competitive setting, vertical integration is believed to bring about various cost savings when joining production, sales or control (Porter, 1980). In applying this perspective, Buzzell (1983: 93) concluded that vertical integration is an essential strategic management question concerning the "make or buy" and "use or sell" decision, defining vertical integration is a *"…combination of two or more stages of production or distribution (or both) that are usually separate."* There is also conformity among scholars in the definition of vertical integration that the stages integrated should be utilising related and connected product and process technology (Gold, 1986) for a single commodity or class of commodities (Koller, 1950). Casson (1984: 3) gives an exhaustive definition of vertical integration when stating that:

"The essence of vertical integration is that successive stages of production are brought under common ownership and control. The intermediate products flowing between these stages move within the same firm rather than between different firms. Stages of production that are spatially contiguous may form part of the same plant as well as the same firm. When adjacent stages of production occur in different plants, vertical integration leads to intrafirm trade in intermediate products".

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 vertical integration. In pointing at the wide range of transactions between spot market and internal transactions Joskow (1988: 77) states that:

"Vertical integration is simply a means of co-ordinating the different stages of an industry chain when bilateral trading is not beneficial."

McGee & Bassett (1976: 17) argue in line with Coase (1937) that all firms are vertically integrated since: "*…production processes in which any firm is engaged are further divisible into sub-processes and that, in principle at least, each could be undertaken by separate firms.*" On the other hand, *"…if there were no other costs but production costs, we would expect the least possible vertical integration; every stage would be its own firm, and each thus could take best advantage of the particular production economies open to it"* (Langlois, 1988: 637). Without taking a stand as to whether all firms are vertically integrated or not, or why practically no firms undertake all activities from raw material extraction to retailing finished

[7] Blois' definition of quasi-integration deviates to some degree from Porters (1980: 321) identical term, in that Porter also opens for including for partial ownership and other governance forms *"...somewhere between long-term contracts and full ownership"*.

goods, the opinion where vertical integration is regarded as a continuous variable will be defended here. Further we subscribe to the perception that the level of vertical integration in a firm can be the result of not only managerial decisions, but also that of the historical development of the firm ('path dependency') and the dynamic capabilities approach (see for instance Nelson & Winter, 1980; Langlois, 1984; Argyres, 1996; Teece, Pisano, & Shuen, 1997)). Porter (1980: xiii) expresses himself in this manner about the source of corporate strategy: *"This strategy may have been developed explicitly through a planning process or it may have evolved implicitly through the activities of the various functional departments of the firm."*

While theoretical treatments by and large have been engaged in dealing with the polar forms of economic organisation – namely market on the one hand and vertical integration on the other – a greater interest has in later years been taken in studying intermediate and hybrid governance forms, for which there is extensive evidence that these dominate the polar forms of governance (Powell, 1987; Caves & Bradburd, 1988; Hennart, 1993; Heriot & Kulkarni, 2001). As a consequence, Bradach & Eccles (1989) ascertain that the pure types of markets and hierarchies are nonexistent since all possible governance modes include elements from markets, hierarchies and trust.

de Koning (1994) argues that the traditional definition of vertical integration has some weaknesses, and proposes to look at vertical integration as a continuum rather than a dichotomy, since between the polar forms – market and vertical integration – a large body of intermediate forms exist. He also emphasises the negative co-variation between degree of vertical integration and autonomy as illustrated in Figure 2.

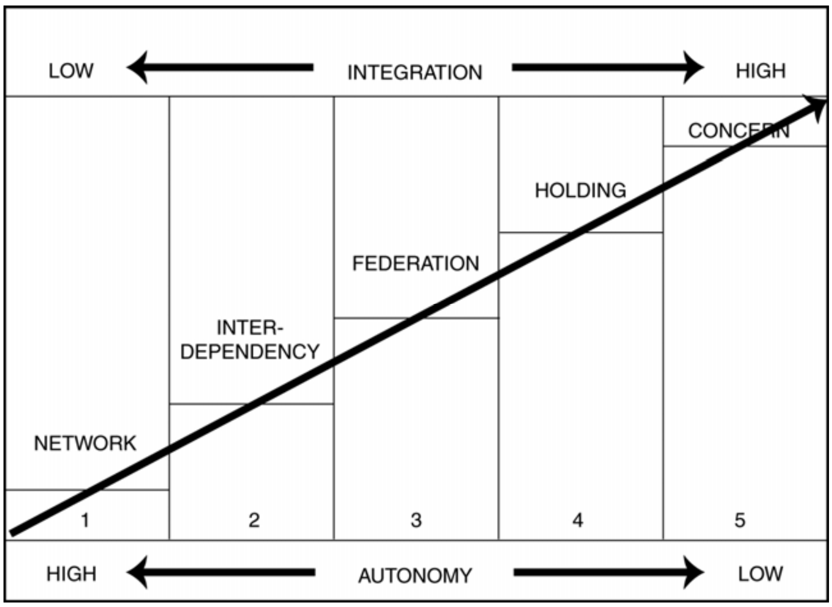

Figure 2 Vertical integration as a continuum. Source: de Koning (1994)

The approach chosen by de Koning indicates that the content of vertical integration is complex and multidimensional, and in most empirical research, when vertical integration is under scrutiny, it is operationalised through continuous variables. Among scholars sharing the standpoint of de Koning is Webster Jr. (1992). He distinguishes between seven different marketing relationships; from discrete market transactions – where the price contains all the information needed to conclude the exchange – at one end of the scale, to vertical integration at the other end. In the line from one end to the other (from right to left in Figure 2) he points at the following buyer-seller relationships:

Repeated transactions; where sellers succeed in winning customer's preferences and loyalty, through which trust and credibility become present.

Long term relationships; typical for industrial markets, in which exchanges are governed by contractual commitments, where price is set by negotiations also emphasising for instance quality, delivery and technical support.

Buyer-seller partnerships (mutual, total dependence); like the Japanese *keiretsu* or *kanban* system, where strategic partnerships with interlinked ownership and trading relationships ensures commitment and stability.

Strategic alliances; when the partnership between customer and supplier becomes a new venture, sharing objectives and joint resource commitments of both parties (like *joint venture*).

Network organisations; "…complex, multifaceted organization structures that result from multiple strategic alliances, usually combined with other forms of organization including divisions, subsidiaries and value-added resellers" (Webster Jr., 1992: 8).

Borgatti & Foster (2003: 995) refer to *networks* as organisational forms that can balance the flexibility served by markets and the predictability of hierarchies while Tsang (1998: 209) describe *strategic alliances* as long-term cooperative involvement in activities between independent firms for mutual economic gains.

The perception of vertical integration has changed over time, together with its popularity among practitioners as well as academic scholars. From being the chosen organisational form in most manufacturing firms (or corporations) for most of the 20th century (Miles & Snow, 1984), as the century turned it was deemed as a 'mastodon on caterpillar tracks' – distrusted in a hypercompetitive global marketplace, where flexibility is needed as customers alter their preferences. As Johnston & Lawrence (1988: 94) put it: *"For decades large, vertically integrated companies have reaped the benefits of their size, growing stronger with every competitor they eliminated or engulfed. But the elephants aren't grazing so freely anymore. Another beast has been nibbling at the herbage, and its presence is beginning to be felt. That beast is the 'value-adding partnership' – a set of independent companies that work closely together to manage the flow of goods and services along the entire value-added chain."* In later years it seems as the greatest popularity within academic treatment have been ascribed to *networks* (Thorelli, 1986; Jarillo, 1988; Powell, 1990; Gulati, 1998; Kranton & Minehart, 2001) and *strategic alliances* (Borys & Jemison, 1989; Schmitz, Frankel, & Frayer, 1995; Das & Teng, 2000; Daboub, 2002).

By conceptualising vertical integration as a procedure or phenomenon undertaking various steps or 'severities', the way to measure and recognise it is also extended. Like Silver (1984: 17) expresses: *"…vertical integration should be understood in terms of more or less, rather than in terms of yes or no"*. This recognition leads to the need for measurements that can incorporate such complexity in empirical work. The way one defines the concept vertical integration will have great impact on how it should be measured to capture the real world phenomenon. Before giving the concept vertical integration a contextual definition for the setting studied here, it is important to give it an adequate meaningful content – in line with what we understand by the term vertical integration (Zaltman, 1973). The scholar who has immersed herself deepest into the topic of conceptualising and how to measure vertical integration is perhaps Katheryn R. Harrigan. She underlines the many dimensions the construct vertical integration can take (Harrigan, 1985a), described by the following four:

Degree – the proportion of output from a business unit sold to, or received from, a sister business unit. *Stages* – the number of steps in the processing chain which a firm engages in. *Breadth* – the number of in-house performed activities at a particular level of the vertical value chain, or rather the number of inputs that are integrated. And *form* of vertical integration – the relative share of ownership in the venture.

Hence, vertical integration comes in many guises and its content has many dimensions. As described above, one distinction is that of the direction integration takes – upstream or downstream the value chain. Yet another is the intermediate forms of governance – or rather level of vertical integration – hidden between the polar forms of economic organisation. As a third aspect of this concept is the various names given to the phenomenon. While vertical integration is the most commonly used terminology, we find other denotations in the literature – often related to the branch of research the scholars belong to. Market or hierarchy, make-or-buy, and sourcing are those which are mentioned most often, and its relationship to the opposite – outsourcing, vertical disintegration and impartitioning – is obvious. Further, whereas vertical integration defines the (upstream and downstream) boundaries of the firm, by what a firm chooses to buy or make, or by the level of service to customers, a distinction can, according to Philpott, Hamblin, Baines & Kay (2004), also be made towards horizontal or product integration (expanding or narrowing the product range) and infrastructure integration (whether infrastructure and technology is bought or invested in internally).

Along with viewing vertical integration as a continuum, scholars have concentrated on the following distinctions (i.e. what Harrigan, 1986b: 95 denotes the *degree* of integration): full integration, tapered integration, long term cooperative relationships and spot-bid contracts. With full integration total ownership and control is established and most firm-transfers are done within in-house units. For tapered integration, the acquiring firm is still supplied, to some degree, with requirements from outsiders, which give them first hand knowledge of costs and prices under competitive pressure. Long term cooperative relationships are similar to strategic alliances, while networks can be found somewhere between such cooperation and market transactions, depending on the severity and mutual dependency of the cooperation. In addition, firms may use barter, countertrade, sole sourcing and multiple sourcing as means to secure inputs to its operations (Heriot & Kulkarni, 2001), or achieve some of the benefits belonging to Blois' (1972) vertical *quasi*-integration. All these dimensions and meanings underline the multidimensionality of this construct, which sets heavy demands on how to operationalise it in empirical research.

With the predominant empirical nature of this thesis, a major task is to find ways to translate our mental models, linguistic terms and what we observe of vertical integration in the real world to an observational interpretation that can assign empirical measures to the concept under scrutiny. The complexity of the *construct* vertical integration further complicates this task, and remedies must be found in order to overcome the inherent methodological problems. In order to develop an empirical measure which envelops the most suitable dimensions of the theoretical concept in the context of the Norwegian fisheries industry, the empirical operation of vertical integration should reflect its theoretical counterpart (Zaltman, 1970: 32).

Similarly, when trying to assess the outcomes of a firm strategy like vertical integration, the problem also arises at the other end of the statistical equation: What is the outcome and how should one measure the performance effect from vertical integration? These questions are addressed in the following section.

2.2 Performance

The natural outcome of creating and sustaining competitive advantages should be some kind of superior performance effects, as performance represents the effectiveness of an outcome (Murray, Kotabe, & Wildt, 1995). Firm performance is interlocked with, and central to, the study of strategy (Barney, 2002). The economic rent associated with a firm's generation of value from the resources it employs – that is higher than what owners expects – is what makes firms prosper and attract new resources. From microeconomic theory and perfect competition, these are firms that can fully compensate the resource owners, and within strategy are said to enjoy a competitive advantage in their market (or industry).

But as with vertical integration, performance is a multidimensional construct too. On the one hand, some performance measures like sales growth, market share, and other strategic outcomes from actions undertaken by firms, relate to the strategic side of the performance construct. Especially market share and its growth, together with industry concentration measures, have been preferred measures when industrial economics 'revisionists' (like Demsetz, 1973) have looked into performance effects (Montgomery & Wernerfelt, 1991). On the other hand, the most common approach is to note that performance has a financial side which can be read from – and related to – the accounts and the financial statements of a firm. Measures like return on sales (ROS), return on assets (ROA) and return on investments (ROI) belong to this dimension. A third measurement of performance can be called market-value-based. Examples here include Tobins *q* (Wernerfelt & Montgomery, 1988), growth in share price (Christensen & Montgomery, 1981) and other capital market performance measures like Hawawini, Subramanian & Verdin's (2003) total market values. A fourth performance dimension can be observed or perceived attributes describing the output or the throughput process (Fisher, 1992), like flexibility, quality, production costs, punctuality, or other operational nonfinancial performance measures (see for instance Park, Reddy, & Sarkar, 2000). A fifth, and final, dimension of performance, is the mere survival of firms as proxy to normal or above normal profitability over time, since below normal performance in the long-run will (in the absence of subsidies) drive firms out of the market. This stems originally from organisation theory and population ecology (Hannan & Freeman, 1977) but is also in coherence with economic theory where market forces enable efficient firms to drive out their inefficient competitors (Tirole, 1988). As Simon (1993: 134) accentuates: *"...the trail of a growth industry is typically strewn with the skeletons of the firms that did not make it."*

Chakravarthy (1986) maintains, when assessing how to measure strategic performance, that a performance reference is crucial for managers to consistently evaluate the quality of strategic decisions, as the outcome of managers' long-term effort of adapting their firm to its environment. For this purpose, he claims, traditional profitability measures do not exhibit the adequate attributes, and one should attempt *"...to measure the satisfaction of all of the stakeholders"* (p. 437). He suggests the ratio between market and book value as a measure of the *"...perceived ability of the firm to return to its stockholders an amount in the future in excess of their expected return"* (p. 444). Furthermore he addresses the weaknesses of performance measures rooted in financial accounting, which in addition to being history oriented, can be said to be prone to the possibility of (i) accounting manipulation, (ii) undervaluation of assets, (iii) depreciation policy distortions, (iv) different methods for consolidating accounts, and (v) different standards in international accounting conventions. Barney (2002) summarises in a similar vein the disadvantages of account-based measures by pointing at managerial discretion (that the interests of managers when choosing accounting methods might differ from those of the owners, i.e. agency problems), short time bias (the perspective of most account-based performance measures are too narrow in time) and they do not fully give an appropriate value to intangible resources and capabilities. The agency problems addressed by Barney become especially important in the presence of make-or-buy decisions, since managers normally tend to emphasise expansionary or sales-maximising objectives rather than profit maximising which is preferred by owners (Etgar, 1978).

Buzzell & Gale (1987: 27) argue in line with Chakravarthy when stating that *"(r)egardless of how performance is defined, actual results must be judged in relation to some kind of standard"*. They suggest three possible reference points, where one is the performance of others in the same industry (the other two being cost of capital and previous experience), which has the benefit of relating a firm to its peers, instead of to firms in other industries where returns might well take completely different levels. Further, they stress the fact that it takes several years for the result of a strategic choice to appear and be realised in terms of readily observable account-based measures. Such results should therefore be evaluated on a long term basis, where *"…average profitability during a multi-year period"* (*op. cit*., p. 26) will be the appropriate reference point of its effects.

In line with this reasoning is the operationalisation of long term performance effects made by Dreyer (1998). There, firms in the industry are ranked by means of ROA each year, and placed in the quartile to which it belongs (the value 1 signalling that the firm belongs to the top 25 percent performers in the industry, and 4 meaning it belongs to the poorest performers). Then the average of this value is computed for all the recorded years the firm participates in the industry, giving an indication of each firm's long-term relative profitability and (intra-industry) performance.

In using performance measures in organisational studies one encounters many problems – methodological as well as conceptual. March & Sutton (1997) demonstrate some existing pitfalls when utilising performance as the dependent variable and try to find variables that produce performance variation in large samples. They assert the main challenges in such research to be that advantageous performance levels are competitively unstable, that the causal complexity that surrounds the performance construct is high, and that severe limitations are incumbent on the application of data based on retrospective recall of informants. In line with their second argument, Wensley (1997) asserts that earlier empirical research has been unable to come up with a variable explaining more than ten percent of the total variation in performance (for instance ROI), due to the high number of factors that influences performance[8]. In addition, maximising profit is not the main objective for all firms. For strategic reasons, the appurtenant choice for some firms is satisfactory – rather than optimal – levels of profit (Newman, 1978), or they pursue a mix of performance goals (Galbraith & Schendel, 1983). If that is the case, then it clearly contributes to complicate the interpretation from statistical analyses in which performance is the dependent variable (Karlsen & Grønhaug, 1991). Bearing this in mind, one could argue that performance and profitability is not the ultimate objective for firms, but rather that performance becomes the measure for firms success in serving their customers since: *"Firms exist to provide a product or service because it is neither efficient nor effective for buyers to attempt to satisfy all their needs themselves. (…) Superior performance is the result of providing superior customer value; it is not an end in itself"* (Slater, 1997: 164). In this view customer satisfaction becomes the superior objective of firms, where success can be measured by a number of measures.

Again, we see a concept taking many and different meanings, which underlines the complexity in unambiguously explaining real world phenomena. The hindrances met in

[8] His arguments are later countered by the managing director of PIMS Associates in London (Roberts, 1997) who asserts that research, measurement and comparison can actually help managers to improve the performance of their business.

empirical research from assigning constructs and values and to these observations place heavy requirements on this transformation process. In Chapter 3 an overview over important theoretical perspectives is given, which contribute to enlightening the vertical integration-performance relationship and can help to give the above mentioned construct abstractions a content which corresponds to the specific phenomenon seen in reality.

3 THEORETICAL CONTRIBUTIONS ON THE VERTICAL INTEGRATION-PERFORMANCE RELATIONSHIP

The purpose of this chapter is to give an overview of the relevant research contributions on the topic of vertical integration. The literature concerning vertical integration is extensive but scattered. Here I have chosen to organize the review according to a three partitioning of the theoretical projections, which Chatterjee (1991) proclaims are the principal research streams to understand this phenomenon.

Historically, the origins of the theoretical treatment of vertical integration can be traced back to Adam Smith's theory of the division of labour, as revitalised by Stigler (1951). In modern economics the main contributions on vertical integration has been Ronald Coase's effort on transaction costs[9] (1937), refined and illuminated by Williamson (1971; 1979; 1985; 1989) and the property rights approach (see for instance Grossman & Hart, 1986 and Hart & Moore, 1990 – acknowledged by others as both a part of, and separable from the industrial organisation theory). Further, industrial organisation economics, with its branching into the Mason/Bain structure-conduct-performance paradigm (Mason, 1939; Bain, 1956; Porter, 1981, 1983), have obviously been the prevailing domain in economics and economic policy, with emphasis on the welfare effects from the mergers (Spiller, 1985). It has most certainly had great influence on antitrust policies world wide. In addition, the strategic management approach (Chatterjee, 1991; Mahoney, 1992), with special emphasis on the resource-based view of the firm (Penrose, 1959; Richardson, 1972; Wernerfelt, 1984; Barney, 1991; Peteraf, 1993; Poppo & Zenger, 1995) have contributed extensively to the understanding of the motives for, the use of, and the outcome from vertical integration.

The list of theoretical approaches that shed light on vertical integration could easily have been extended to include other viewpoints (like agency theory, resource dependency, evolutionary economics, population ecology, institutionalism, business history, industrial geography and competitive strategy), but here the intent is not to cover all possible angles. Also, in the following, the property rights approach will be practically disregarded as this theory only to a very limited degree has been tested empirically (Hart, 1995; Woodruff, 2002), while a short presentation of other perspectives will be derived and referred to when appropriate to understand vertical integration and its performance effects. Therefore, in the next sections the emphasis is on the three theoretical perspectives – transaction cost economics, industrial organisation and the resource-based view of the firm – which are most suitable here.

3.1 Theories explaining the existence of vertical integration

Vertical integration has received considerable attention in the theoretical literature, mainly since it is a frequently implemented strategy by firms in multiple industries. It is an accepted "truth" that in the world of perfect competition vertical integration has no place. Chatterjee, Lubatkin & Schoenecker (1992: 140) 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*

[9] Transaction costs are the costs of searching for exchange partners, negotiating, monitoring and enforcing contractual arrangements. In his seminal article, Coase referred to these as *marketing* costs; *the costs of using the price mechanism* (p. 403).

world vertical integration has little relevance in explaining the relative performance of the firm."

From the quotation above, it seems clear that where standard economic theory is employed vertical integration has no place. This follows from the strict assumptions regarding information on input prices, costs and output prices, in addition to the absence of transaction costs. In the real world, however, the perfectly competitive markets referred to in economic textbooks hardly exist, and markets vary with regards to degree of imperfections, in which slackening the assumptions from standard economic theory brings forward numerous motives for integrating vertically. Here, vertical integration both exists, and is more common in some industries than others[10].

In this thesis, the emphasis will concentrate on three major theoretical contributions that provide an adequate framework for analysing the existence and spread of – together with motives for – vertical integration, and effects thereof on performance. These are transaction cost economics (TCE), industrial organisation (IO) and strategic management – the latter with special emphasis on the resource-based view (RBV) of the firm. The reason why these perspectives are chosen over others are the following: Where TCE goes to the core of explaining the existence and scope of the firm – and thereby vertical integration – IO underlines the environmental and industry features which motivate for this strategic action in order to bring about positive performance effects. On a microeconomic level, the RBV further enlightens the relation between vertical integration and performance, by bringing forward the firm specific factors – and especially their distinctive resource endowments – that can substantiate such action. The three perspectives therefore supplement each other, by offering complementary explanations on different levels of analysis. At the same time, the decision to utilise more than one theory rests on the clear recommendation from proponents within this fields of research (Poppo & Zenger, 1998; White, 2000; Williamson, 2000: 595; Rasheed & Geiger, 2001).

All three perspectives have the same point of departure: the discontent with the neoclassical representation of the firm, portrayed as a 'black box' or a product function, serving as *"...pieces which have to fit together to solve a market or general equilibrium puzzle"* (Addleson, 2001: 170). Transaction cost economics can be said to be an approximation to neoclassical economics (Miller, 1993; Hegji, 2001), but all three schools put considerable focus on disturbances to textbook economics created by market imperfections. Stoelhorst & van Raaij (2004) describe their dissociation from the underlying assumptions in neoclassical theory of perfect competition[11] in the following manner: Where TCE departs from neoclassical economics by taking into account that transaction costs exist, the IO paradigm eases on the assumption that firms are price-takers and allows them to differentiate their output. The RBV consequently breaks with the assumption that all firms have the same access to the productive factors.

The three perspectives are considered separate 'schools of thought' even though they to some degree are complementary (Conner, 1991; Mahoney & Pandian, 1992). According to Mahoney & Pandian (1992), TCE can be said to belong to *organisational economics*, together

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[10] Mahoney (1989) describes the rate of success from forward vertical integration into distribution in U.S. industries at the turn of last century as *wide-ranging* within sewing machines, typewriters, cash registers and harvesters, *insignificant* in drugs, hardware and jewellery, while *mistaken* in beer, sugar and tobacco industries.

[11] In short these can be said to be (a) atomistic competition; all economic actors are price-takers, (b) competition over homogeneous goods and services; no product differentiation, (c) free entry and exit for firms, and perfectly divisible and mobile resources, (d) full information for all economic actors, (e) consumers maximise utility whereas suppliers maximise profit, and (f) transactions are carried out costlessly (Gould & Ferguson, 1980).

with agency theory, property rights and evolutionary economics. It can be argued that RBV[12] also fall under that umbrella, but where RBV is a theory of *firm rents*, TCE is a theory of the *existence of the firm* (Mahoney, 2001). At the same time RBV contains elements from the schools of IO – often referred to the Harvard and Chicago schools (representatives being Bain and Porter, and Stigler and Demsetz respectively). However, where industrial organisation focuses on the environment of the firm (being the industry and product market) the resource-based view seeks explanations within the firm borders (e.g. firm specific resources and capabilities). One of the main differences between the three can be found by looking at the level of analysis. While the actual transaction is (of course) the *"...ultimate unit for economic investigation"* (Williamson, 1975: 254) in TCE, the firm (and its inherent resources and capabilities) is the relevant parallel within RBV. In IO the industry, the business environment or its product markets is the appurtenant unit of analysis/focus of study. Here, when trying to shed light on the vertical integration-performance relationship in the Norwegian fish processing industry, all three perspectives and their unique – but still complementary – basis of analysis seem relevant for our purpose. The three-partitioning of the theoretical approach is also suitable for covering the main features deciding the sourcing strategies of the firm, namely the transactions, the industry structure and the product(s) in question (Murray *et al.*, 1995). In the following we will outline the features of the three approaches, with emphasis on their treatment of vertical integration.

First, however, some light must be shed on the fact that the sense of dividing into three different theoretical approaches is more of practical kind than of classification. In addition, the division between the three theoretical approaches is woolly and the borderline between them is wide. One can, for instance, argue that Porter's five competitive forces model (1980) is one of strategic management, rather than belonging to industrial organisation. It's similarities towards the Mason/Bain structure-conduct-performance paradigm is striking (see for instance Teece, 1984: 95), though the accuracy of classifying the research of Porter and Harrigan together with Stigler and Demsetz is probably limited. It can, however, be argued that this incorporates a natural development within the field of strategic management, starting out with industrial economics in the 1950's, via the contingency view[13] and competitive strategy, before ending up today with more emphasis on firm specific resources. In addition, one can argue that the industrial organisation research branch also embraces transaction cost theory. Here, the theoretical treatment is divided within the confines of the above mentioned directions, even though the division and frontiers might be said to be artificial and odd. But that is the case of firm boundaries as well (Addleson, 2001; Araujo, Dubois, & Gadde, 2003).

3.1.1 Transaction cost economics

Transaction cost economics (TCE) provides a coherent framework for investigating the determinants of vertical integration over different industries. Transaction costs are by Arrow (1969: 48)[14] defined as being *"...the cost of running the economic system*". These costs can

[12] The categorising of theoretical perspectives is not quite straightforward. Conner (1991) includes the following five contributions to the historical development within industrial organisation economics: neoclassical theory's perfect competition, Bain-type industrial organisation (Harvard), the Schumpeterian and Chicago responses, together with transaction cost theory. Stoelhorst & van Raaij (2004) exclude perfect competition from organisational economics, but include agency theory and the resource-based view.

[13] The contingency view proposes, as opposed to classical industrial organisation theories, that there is no one best way of organising and managing, and that *"(o)rganizational variables are in complex interrelationships with one another and with conditions in the environment"* (Lawrence & Lorsch, 1967: 157), which influence the performance effects.

[14] Demsetz (1988: 144) distinguishes between transaction costs and managerial costs: *"...to refer to the costs of organizing resources, respectively, across markets and within firms. This accords with Coase's terminology".*

take the form of (a) search costs, (b) contracting costs, (c) monitoring costs, and (d) enforcement costs (Williamson, 1985; Hennart, 1993). The potential threat and existence of *opportunism* in exchange situations is a key concept, central for transaction cost economics. As Donaldson (1990: 370) express himself when pointing out its departure from traditional economic analysis where firms are composed of labour, capital and an entrepreneur: *"…managers are necessary in a market economy because they cannot be trusted. The opportunism of one group of managers (…) opposite a second group of managers (…) necessitates vertical integration, whereby the two managerial groups are governed by a third group, their superordinate level of management."* The choice of organisational arrangement of economic activities therefore depends on minimising the costs that arise in the presence of *transaction specific investments* and *uncertainty*. In this perspective, transactions are classified according to whether they should take place within the firm or be mediated through the market. The proper form for organising activities in adjacent stages in the value chain – market, hierarchy or hybrid forms – is identified from efficiency considerations, minimising the sum of production and transaction costs. Consequently, the choice of governance between markets (which are the best to signal incentives and to exploit economies of scale and scope from aggregated demand) and internalisation (which best will assure adaptive sequential decision making) is a trade-off between their inherent transaction and production costs (Cook, 1997). Given that transaction costs are zero, economic efficiency will not be influenced by the choice between modes of governance (Kim & Mahoney, 2002).

Transacting with business partners becomes hazardous in conducting recurring exchanges involving transaction specific investments and when information is incomplete. In such situations, the firm – or internal organisation – represents a suitable alternative since common ownership discourages opportunism between owners, and eases 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).

In a tentative recollection of the transaction cost perspective, unanimity can be established around six features giving rise to positive transaction costs, where two are behavioural variables[15], two are environmental factors and two regard the transaction itself. *Opportunism* – in Williamson's (1975: 255) terms: *"self-interest seeking with guile[16]"* – is the ultimate cause of market failure and the existence of organizations (Williamson, 1993). The problem is not that all actors behave opportunistically, but that the firm is unable to know in advance, who is behaving opportunistically, and who is not (Hill, 1990).

The other behavioural variable is *bounded rationality*. It means that humans have cognitive limits (March & Simon, 1958) and fail to know all alternatives, since there exists uncertainty about relevant exogenous events and actors are unable to calculate consequences (Simon, 1978). The result then is the choice of suboptimal alternatives since humans settle for 'satisficing' rather than profit maximising (Simon, 1957), partly due to the fact that humans are limited in their ability to process information (Jones & Hill, 1988). For managers in the process of deciding to make-or-buy, it entails that attention is given mainly to those factors that most directly impact their decision. As such, with limited attention to all possibilities,

[15] According to McGuinnes (1991: 67-8), Williamson (1984) also includes a third behavioural variable, namely *dignity*, which: *"…captures the idea that humanity should be respected for its own sake, so that people should not be treated in organizations solely as the means in an economizing process"*. Here, however, it is given no further mention.

[16] The quotation is collected from the following passage: *"Opportunism, however, is more than just simple self-interest seeking. It is self-interest seeking with guile: agents who are skilled at dissembling realize transactional advantages. Economic man, assessed with respect to his transactional characteristics, is thus a more subtle and devious creature than the usual self-interest seeking assumption reveals."*

vertical integration becomes a more suitable strategic device as opportunism increases, since hierarchy presumably constitute a better way to monitor and resolve disputes in order to reach the firm's goals. This implies that internal bureaucratic and administrative costs are presumably less than the transaction costs associated with exchanges in an inefficient market (Williamson, 1975).

The proper environmental factors that come into account in deciding the size of the transaction costs is *uncertainty* and *small numbers bargaining*, which both are postulated to be positively related to the onset of vertical integration. Uncertainty in the transaction environment makes contractual governance complicated, since managers are boundedly rational. For small numbers bargaining the reasoning is that as the number of exchange partners is reduced, the advantage of market "discipline" is lost and transaction partners risk being exposed to opportunism. As efficient markets for inputs and/or outputs disappear, vertical integration makes more sense economically.

The transactional factors describing the appropriateness of internalising the exchange are *asset specificity* (transaction specific investments) and *information impactedness*, where the asset specificity over time have become increasingly more important on the cost of the uncertainty argument (Krickx, 2000). Asset specificity refers to assets who lose value when utilised in alternative applications, and is important due to the possible unfair treatment of the owner of a transaction specific asset, in the meeting with opportunistic exchange partners. When such "sunk investments" are done before the transaction, the investor might be faced with high switching costs after the transaction (Lieberman, 1991) which can create so-called "hold-up" problems[17] (Klein, Crawford, & Alchian, 1978). Under circumstances where there is a potential for "hold up", sub-optimal investments in dedicated assets will be the result – whereas vertical integration can improve the situation and improve the organisation of production (Williamson, 1985; Klein, 1988; Castaneda, 2006). Information impactedness is present when either of the participating agents involved in a transaction have more information than the other, which impacts on the value of the relationship for him or her. By organising the transactions internally, such information gaps are reduced and vanish completely, since goal congruence between the participants of the transaction should – at least theoretically – be present.

An additional feature of relevance in deciding when to integrate vertically within TCE is the *frequency of transactions*. When transactions are of a recurrent character, vertical integration would be preferable in the face of transaction-specific assets, since it *"...permits greater adaptation to changing circumstances"* (Williamson, 1983: 108) as opposed to the case where asset specificity is absent and the market provides the necessary goods or services in an efficient manner. When asset-specific transactions appear frequently, the use of the market requires a constant monitoring effort by the firm, to which hierarchy should appear as the superior governance form. When transactions occur more seldom, the risks of opportunism and uncertainty might be economised through market exchanges rather than supported by a costly hierarchical governance form (Aubert, Rivard, & Patry, 1996). Another prominent feature of frequent interactions between exchange partners is that it *"…establishes the conditions for relational and structural embeddedness, which provide the foundation for social mechanisms to adapt, coordinate, and safeguard exchanges effectively"* (Jones, Hesterly, & Borgatti, 1997: 917).

With the risk of over-simplifying, the transaction cost logic states that when transactions have highly uncertain outcomes, recur frequently, require transaction-specific investments, or there

[17] The parties to an exchange are reluctant to commit to irreversible transaction specific investments since they, at a later point in time, might be forced to agree on unfavourable terms (Williamson, 1985).

are few potential exchange partners, then they are best performed within a hierarchy, since conflicts can be resolved by authority or fiat (Ring & Van de Ven, 1992; Vannoni, 2002). Further: *"Governance modes that are aligned with transaction characteristics should display performance advantages over other modes: for example, when both asset specificity and uncertainty are high, hierarchy should display performance advantages over markets and hybrids"* (David & Han, 2004: 41-42)

Transaction cost economics is perhaps the most often utilised theoretical framework for investigating vertical integration and firm boundaries, and possibly the most influential. Its impact and applicability have been greatly recognised in a number of studies (Shelanski & Klein, 1995; Rindfleisch & Heide, 1997; Williamson, 2000; Vannoni, 2002; Boerner & Macher, 2003). However some criticism to this theoretical perspective has been raised, also on its applicability on the empirical field and to what degree empirical research has taken interest in all TCE relationships. David & Han (2004) in their study of 63 scientific empirical strategy/management articles remarked that frequency and performance – as opposed to uncertainty and asset specificity effects – had not been under scrutiny at all, and that a great disparity existed in the way central constructs were measured. Silverman, Nickerson and Freeman (1997) note that empirical TCE studies have never assessed whether the correct transaction cost governance alignment is associated with the prescribed performance benefits.

Ring & Van de Ven (1992) remark the following drawbacks of TCE: (1) With its primary focus on single transactions as the unit of analysis, it is a static approach, unable to describe the dynamic surroundings in which managers decide whether to make or buy, and the cooperation between agents as transactions are repeated. (2) TCE is preoccupied in explaining the polar forms of vertical relationships (i.e. market and hierarchy) and thereby neglecting alternative forms of governance. Further, (3) its emphasis on opportunistic behaviour involves a negligence of trust and equity, which plays a key role in inter-organisational relationships.

Much of the criticism against TCE regards precisely the critical assumption of opportunism. Coase (1988b: 44) ascertains that *"A defrauding firm may make immediate gains but if it can be identified, future business is lost as this would normally make fraud unprofitable"*. In this manner opportunism becomes a problem in the short run, while in the long run firms need to take into account the effect of its actions on future business. Hill (1990: 500) calls this the invisible hand's deletion of actors who behave habitually opportunistically, where efficient markets will discourage opportunistic behaviour in the long run. Tsang (2006) draws attention to opportunism as the core assumption of TCE, and that without opportunism, buyers and sellers will act and cooperate on promises, that will protect market transactions. TCE-based empirical research has, in his view, omitted testing this critical assumption and concentrated on asset specificity, rather than opportunism, where the latter is implicitly or explicitly invoked. Hodgson (2004) criticises the emphasis on opportunism in TCE for excluding and misidentifying several additional factors – like misinterpretation, misunderstanding and disagreement – that could be just as likely reasons for hierarchical governance structures. Others have directed criticism at TCE because it fails to account for the social dimensions (i.e. embeddedness; Granovetter, 1985), surrounding economic exchanges (Heide, 1994), and for disregarding the historical development of transactions and firms (Hannan & Freeman, 1977). Within this line of reasoning Zajac & Olsen (1993) also criticise the *one party* cost minimizing logic of TCE for neglecting mutual dependency between exchange partners, a point also brought forward by Jacobides & Hitt (2005: 1224) when arguing that: "*...behind 'the market' lies another firm, willing to supply a good or service at a particular price; and that the ability of any such firm to produce in a cost-effective manner will be an important part of the calculus of the make-vs.-buy decision*".

Finally, relatively few studies within transaction cost economics have explored performance effects from the choice of organisational form (Boerner & Macher, 2003). According to Bridge & Tisdell (2004) Williamsons own critique of transaction cost economics regards the following three conditions: First, its microanalytic view on transactions might ignore possible interaction effects between them, since *"...the whole firm may be more than the sum of its parts"* (p. 809). Second, when relaxing the assumption of specialised investments to support transactions (i.e. asset specificity), in cases where these have not yet been made, then hold-up considerations might be outclassed by more important pre-existing production advantages that the firm possesses. Finally he acknowledges, in line with Coase (1988b), that transaction cost economics - with its weight on the asset specificity and opportunism arguments – have not taken the learning effect sufficiently into consideration.

3.1.2 Industrial organisation[18]

The original interest in vertical integration, according to MacMillan, Hambrick, & Pennings (1986), stemmed from economists who saw the interest in studying how such action had implications for market power and monopolistic conditions when it was undertaken by large firms. The next wave of vertical integration interest, they note, was associated with representatives of industrial organisation who considered vertical integration as a means to reduce costs instead of gaining monopoly power (representatives being Coase, Stigler and Williamson).

Industrial organisation is the applied economics of supply (Sheperd, 1997) or the study relating market structures, the behaviour of economic agents, and their resulting performance. Industrial organisation explains sustainable superior performance from external factors like market structure, collusive relationship, and regulatory settings. Within this perspective, the industry is the primary unit of analysis *"...implicitly assuming that firms within an industry are homogeneous"* (Mauri & Michaels, 1998: 212). The characteristics of the industry then decide the sources of profitability as well as the firm's position in the industry (Amit & Schoemaker, 1993). One observation from mainstream industrial organisation is that vertical integration can increase profits and cut costs if an imperfection exists in the input market (Spengler, 1950). The argument brought forward by Spengler was that full vertical integration could improve economic efficiency by a valuable elimination of the so-called double marginalisation problem. Vertical integration can reduce the price of both input and output when the price of inputs exceeds the competitive price (Fuhr Jr., 1990). Further, this line of research have been interested in how backward vertical integration can increase input utilisation and output efficiency; exclude competitors from supply markets (Perry, 1978); or raise competitors' costs (Salop & Scheffman, 1987). Coase (1988b) criticised the industrial organisation perspective for studying the pricing and output policies of firms – especially in oligopolistic markets – instead of looking into how industries were organized.

The industrial organisation (IO) perspective has a different point of departure to the transaction cost paradigm. While transaction cost theory focuses on economic efficiency as the mechanism to achieve competitive advantages, the industrial organisation view is *"...to shield the firm, to the maximum extent legally possible, from competitive forces"* (Teece, 1984: 94). By turning the traditional view of IO upside down – from industry to firm focus – Porter (1980) twisted the attention from what imperfect competitors should *not* do, to what the smart manager should do (Langlois, 2003) by explaining how industry members are able to

[18] It must be noted, that the denotation made here of *industrial organisation* theory, is more in line with what is known as Bain-type industrial organisation and it's extension into strategic management – as put forward by Porter and others – than the responses made by the Chicago School and the Schumpeterian view. Stoelhorst & van Raaij (2004) and Conner (1991) both provide excellent reviews.

curtail competitive rivalry (Montgomery & Wernerfelt, 1991). In Porter's view, entry barriers are a key weapon, but by erecting such towards the potential threat of entrants – for instance by vertical integration – these might also involve substantial exit barriers for the firm in question (Caves & Porter, 1977; Ghemawat & Nalebuff, 1985; Harrigan, 1985b).

According to this view, vertical integration can be a valuable instrument for the firm in creating and defending competitive advantages by taking advantages in imperfect markets. In discussing different strategic motives for vertical integration, Porter (1980) argues that the strategic purpose of vertical integration is to utilise different forms of economies (cost savings). He also argues, like Pfeffer & Salancik (1978), that vertical integration can be an important way of reducing external uncertainty and securing supply of critical inputs.

The role of the manager is crucial within this school of thought, as opposite to the ignorance shown within textbook economics and perfect competition where the role of managers[19] is to adjust output to the current market in the short run, and to adjust production capacity in the long run (Stoelhorst & van Raaij, 2004). A main task of the managerial function is the creation and defence of competitive advantages which can be reached either by cost advantages or differentiated products that meet the requirements of consumers (Porter, 1985). The general prescription is to internalise operations when they are connected to (future) competitive advantages that can be defended over time, most often associated with core competencies (Prahalad & Hamel, 1990; Bettis, Bradley, & Hamel, 1992; Quinn & Hilmer, 1994). Fronmueller & Reed (1996) accentuate the conventional belief that backwards vertical integration can provide firms with potential low-cost advantages, while forward vertical integration may have the benefit of differentiation advantage. Behind the decision to make versus buy, lies a thorough analysis of the competitive environment of the firm – a key variable affecting strategic decisions (Porter, 1980). In his five forces model, for instance, Porter emphasises that suppliers, with considerable levels of bargaining power, can exercise this power through the price, thereby determine the input costs. A remedy to such a situation can be to buy the supplier, in order to mitigate the potential extra cost. Accordingly, under low levels of suppliers' bargaining power, market exchanges are likely to make better outcomes, and thereby ensure better firm performance.

According to Harrigan (1985a: 402)[20] the following forces affect the adaptation of vertical integration in firms: *"…(1) the phase of industry development, (2) industry volatility, (3) asymmetries in bargaining position, and (4) firms' strategy objectives"*. The first argument concerns the perceived risk of early entry in young industries where demand uncertainty is high and customers are sceptical to new products. The second addresses industry concentration and high exit barriers, where integrating vertically comprises a costly overhead which can lead to extinction if competitors cut their prices to fill their plants' capacities. The third argument, which also includes asset specificity, state that vertical integration becomes less important when firms possess bargaining power over suppliers and/or distributors. The fourth should be obvious; when integration is embraced as an overall objective in the corporate's strategy, more vertical integration takes place, partly to protect past strategic investments, or to neutralise destructive activities of outsiders.

Scholars from this discipline have also emphasised the rich variety of vertical relationships, between the polar modes (market and hierarchy), which can provide the benefits of vertical

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[19] Slater (1980: 521) express his concern in this manner: *"…in all the models of firms usually employed by economists there is no explicit recognition of management having any role to play which bears upon the firm's performance. Thus we have 'Hamlet' without a Prince – management is recognised to be the crucial factor that limits the growth of firms, but our models do not normally include a management variable"*.

[20] In one of her later publications (Harrigan, 1986a), *uncertainty* replaces the *phase of industry development*, the argument being that high uncertainty (and rapidly changing technologies) makes vertical integration more risky.

integration without bearing the associated costs (Harrigan, 1985a; Oliver, 1990; Mahoney, 1992; Ring & Van de Ven, 1992; D'Aveni & Ravenscraft, 1994; Dyer, 1996). The costs in question can for instance be increased production costs due to isolation from market pressure and lacking low-cost production incentives, and since vertical integration creates exit barriers that confine firms into using obsolescent technologies (D'Aveni & Ravenscraft, 1994). Other explanatory factors for raised production costs are increased overhead as capacity increases and more complex logistics (Hayes & Wheelwright, 1984). For instance, Eckard Jr. (1984) attributed the success of Japanese automakers over their U.S. competitors to their quasi vertical integration suppliers network organisation (as opposed to in-house governance in the U.S.), which he describes as 'the best of both worlds' (make-*and*-buy). By choosing between make-or-buy (the polar modes), as U.S. car manufacturers were forced to because of antitrust legislation, the potential advantages from the opposite choice were ignored.

Strategic management has been criticised in its treatment of vertical integration for having so many influential variables that it is hard to keep focus. On the other hand, the rich variety of factors influencing the decision to internalise or not creates a flexible set of models, which is one of the strengths of this perspective. Black & Boal (1994) point to several limitations of Porter's (five forces) SWOT-model of analysing industry structure (Porter, 1980, 1985). First, since it asserts that successful firms are in attractive industries, it can be said to be tautological: Firms are successful because they are in attractive industries. Second, a point made by Porter (1991) himself; the model addresses cross-sectional problems – not longitudinal and dynamic problems, like *why* firms are able to sustain industry positions. These limitations encouraged RBV pioneers (like Barney, 1986; Grant, 1991) to establish that the main source of strategy formulation do not start from an assessment of the external environment, but rather from the internal resources, capabilities and core competencies the organisation posits (Black & Boal, 1994: 132).

3.1.3 The resource-based view of the firm

The resource-based view of the firm – as a relatively newly emergent perspective within strategic management literature – has received much attention in explaining the existence of sustained competitive advantages, i.e. lasting performance differences between firms in the same industry. While its history can be tracked back to Penrose (1959), Richardson (1972) and Teece (1980), it is the work of Wernerfelt (1984) and Barney (1986) which have served as eye openers within the field of strategic management. Any long-lived productive capability – be it physical, like a production plant; or intangible, like know-how – can be defined as a resource (Clemons & Row, 1994). Within this perspective the firm is defined as a collection of resources under common control rather than a production function (Penrose, 1959), and the resource-based view gives a plausible explanation as to why the development in the resource collection of a firm leads to inter-firm differences in performance, as well as opportunities. Following the resource-based view, *"...each firm's opportunity set is unique, a product of the resources acquired as a result of past experience"* (Lockett & Thompson, 2001: 731). This *resource heterogeneity* assumption is followed by one of *resource immobility*; that some of the resources a firm holds is either costly to copy or inelastic in supply. These are the two fundamental assumptions of this view (Barney, 2002: 155), indicating that factor markets for such resources are imperfect (Peteraf, 1993). By internalising and exploiting such resources, the firm might be provided by a competitive advantage, which is associated with above average economic rents (Dierickx & Cool, 1989; Reed & DeFillippi, 1990).

According to this view, vertical integration 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 & Varadarajan, 1989). Further, according to Wernerfelt & Montgomery (1988), if firm skills and knowledge apply across several value chain segments, specialisation (at firm or industry level) is not the best option, though extending the vertical scope of the firm can be a solution. When deciding whether or not to integrate vertically, this view recommends integration into functions where one already is benefiting from such competitive advantages. Like Conner (1991: 140-41) asserts:

> *"…the scale and scope of the firm (...) depends critically on the degree to which new undertakings actually* **are** *specific to the firm's existing asset base. It is such "relatedness" that provides opportunity for the gains from generating new, redeployable resources and from redeploying them, and consequently provides opportunity for earnings growth. Thus limits to integration come from a lack of specificity, and may be tied to diseconomies of scale or scope in management and the value that may be gained from obtaining the new ideas and perspectives of outsiders. Hence a hybrid form of integration, such as a joint venture, which entails a team composed partly of outsiders, may offer the benefits of exposure to outside capabilities, but also can be expected to involve the costs of results that are less specific to and harder to redeploy within the firm."*

On the other hand, the RBV recommends – contradicting TCE – that in spite of significant threats of opportunism, one should not integrate when the potential target firm is too costly to acquire, even if it owns and inhibits resources and capabilities which are valuable, rare and costly to imitate. Penrose (1959), in examining the growth of the firm, draws the attention to the fact that (similar to arguments of TCE and IO), the cost of management will rise with size and complexity unless these are offset by comparable benefits. Since the source of a firms competitive advantage is it's experience in basic competence areas, it should not extend it's boundaries to include too diverse activities. However, closely related activities might reduce costs as resources and routines can be leveraged across them (Madhok, 2002)[21]. From a vertical integration point of view then, the important issue is firm competencies, which have been shown to be important for the make-or-buy decisions (Argyres, 1996; Poppo & Zenger, 1998; Schilling & Steensma, 2001).

Further, the resource-based view is not particularly concerned with firm boundaries, but rather that the vertical scope of the firm changes to exploit particular resources. The resource-based view does not give a specific recommendation to when and when not to integrate vertically or explain which activities should be undertaken by the firm or the market (Grønhaug & Haugland, 2005). However, vertical integration becomes a natural consequence in the pursuit of competitive advantages by exploiting unique and nontradeable resources (Jacobides & Hitt, 2005: 1214) which make variations in asset ownership the main cause for integration variations. Since the firm is depicted as a unique bundle of resources and capabilities, decisions concerning the suitable boundaries of a firm's activities should merely reflect its existing resource bundle. Firms that face the same product and factor market, and possess the same resources, should demonstrate the same patterns of behaviour and performance (Lockett & Thompson, 2001). One of the major assumptions of the resource-based view is that the relation between resources and competitive advantage is "blur", especially to those outside the firm (Barney, 1991). As a result then, competitors cannot easily copy the success, since they are unable to analyse its sources, due to so-called causal ambiguity. The decision on firm boundaries should therefore be made by comparing the relative strength between internal and external (including market) capabilities (Langlois, 1997). The reason being that capabilities (accrued through knowledge and learning) influence transaction costs, and since capabilities

[21] In his article, Madhok points out that this and other prescriptions from the resource-based view can be traced back to Coase's (1937) original elaboration of the firm existence in "*The nature of the firm*".

vary over time, so should also the boundaries of an efficient firm. If firms lack the necessary capabilities to be successful, they can either (a) cooperate with firms that possess such capabilities, (b) try to develop these capabilities themselves, and/or (c) acquire other firms that possess such capabilities (for instance through vertical integration) (Barney, 1999). This *capability* approach contradicts transaction cost economics in that different production costs also influence the choice of governance, and these production cost differences arise not from scale economies but from firm-specific capabilities (Argyres, 1996).

One critique of the resource-based view is that it is fundamentally tautological[22] in nature (Priem & Butler, 2001). Also Porter (1991: 108) criticises RBV for being tautological (at its worst) since *"Successful firms are successful because they have unique resources. They should nurture these resources to be successful"*. Another critique turns to its implicit assumptions of secure property rights to resources (Foss & Foss, 2005), and that ownership of resources automatically generates rents, which are appropriated by firms not the individual resource (Kim & Mahoney, 2002). Another relatively weighty drawback with the resource-based view is that it is inherently difficult to test, since it holds that performance differences develop as historically determined differences in the firms' resource endowments (Lockett & Thompson, 2001). Further, since imitation barriers are present if resources are tacit, diffused throughout the organisation or socially embedded (Reed & DeFillippi, 1990), empirical research within this theoretical paradigm will have severe problems in identifying such valuable resources and will suffer from *measurement unobservability* (Godfrey & Hill, 1995).

3.1.4 Comparison

The three perspectives have different foci. The TCE perspective emphasises that vertically integrated firms will have lower costs than firms that buy in an open market, especially when the threat of opportunism is high. The IO perspective emphasises vertical integration as a strategy to achieve competitive advantages through exploiting various types of economies; i.e. advantageous utilisation of market imperfections. This perspective also connects the impact of vertical integration on performance to the industry-specific competitive environment. The resource-based view addresses vertical integration as a complex and costly strategy, where capabilities, that cause production costs to differ among firms, play an important role when choosing appropriate governance form (Argyres, 1996). Common for all three approaches is the appreciation of vertical integration as bringing several stages of the value chain under common control, and that integration is a matter of degrees rather than pure yes-or-no situations. This is apparent also in Reve's approach to the firm (as a *nexus of contracts*) where the central element of vertical integration from a strategic management perspective is control, not necessarily ownership (Reve, 1990).

Zajac & Olsen (1993), draw a clear resemblance between TCE and the structure-conduct-performance paradigm, i.e. IO. They remark that the latter is mirrored in the first, on a transaction level, and where market structure in the IO perspective influences market conduct and performance, so does transactional structure influence the conduct and performance of the exchange relationship in the TCE perspective (Zajac & Olsen, 1993: 136). They further remark that Williamson's move from emphasis on the environmental character *small numbers bargaining* (1975) to highlighting the transactional factor *asset specificity* (1985) as dominant for the way transactions should be governed, is in fact interrelated. The reasoning being that asset specificity creates the *fundamental transformation* – whereby a large-number is turned into a small-numbers condition (Williamson, 1985: 12). Competition between a few market

[22] A digression: Coase (1988a: 19) meet the tautology criticism against his marginal transaction cost analysis of the firm in the following manner: "*It is the criticism people make of a proposition which clearly is right.*"

participants is at the heart of the industry structure literature, where TCE's *asset specificity* has its counterpart in IO's *exit barriers* (Harrigan, 1985b). Additionally, as forwarded by Pennings *et al.* (1984), the risk of opportunistic behaviour is positively related to the fewness of competitors, hence industry structure.

Further, the IO perspective acknowledges to some degree the arguments brought forward by RBV scholars, especially the so-called *Penrose-effect*[23]. According to Hay & Morris (1991: 347) this managerial constraint infers the traditional IO analysis by a restriction that is difficult to specify and construct mathematically. Also the distinct capabilities possessed by the firm are to some degree included by IO researchers, like for instance in the following statement by Harrigan (1986a: 536):

> *"But vertical integration is more than a make-or-buy decision, because some decisions to integrate upstream (or downstream) require firms to acquire capabilities far beyond the basic strengths of their core businesses. Vertical integration is also a diversification strategy that requires* **conscious management** *of potential synergies."*

According to Barney (2002: 197), TCE looks into the nature of exchanges to formulate the proper governance decision, where the level of governance chosen in a specific exchange is just the one needed to minimise the threat of opportunism. When the threat of opportunism is low, relative to the cost of governance (in our case in-house production), vertical integration will be the chosen strategy for the exchange. RBV, on the other hand, focus on the internal resources possessed by firms, and emphasises that minimising the threat of opportunism (i.e. choosing hierarchical forms of governance) *"…must be balanced against the value that can be created by engaging in exchanges with firms that control valuable, rare and costly to imitate resources that cannot be acquired in a cost effective manner"* (Barney, 2002: 211).

This is in line with Mahoney's (2001: 655) argument that TCE is a theory of the existence of the firm, while resource-based theory[24] is a theory of firm rents. In other words, while TCE focuses on analysing market failure and its influence on efficiency and thereby managerial hierarchy, the RBV concentrates on the response to such market failures. Where market failure in TCE explains the existence of the firm, the RBV considers certain types of market failure as the cause for heterogeneous firms. In this line of reasoning, Stoelhorst & van Raaij (2004) accentuate that TCE does not engage to explain performance differences between firms but seeks to explain the coordination of economic activity. IO and the RBV both set out to explain such differentials, but where the former finds the reasons for this to ly in *product differentiation* and *market power*, the latter explains the existence of performance advantages by *unique* or *costly-to-copy resources*. Further, they argue, in line with Barney (1986) and Wernerfelt (1984), that where IO studies explain competitive advantages by *product* market imperfections, it is *input* market imperfections that give the rise to such in RBV studies. Analogously, Caves & Porter's (1977) *entry* and *mobility barriers* in the IO perspective find their counterparts in Wernerfelt's (1984) *resource barriers* and Rumelt's (1984) *isolating mechanisms* (Stoelhorst & van Raaij, 2004: 472).

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[23] Penrose (1959) denotes this as *managerial diseconomies of growth*. What is meant is that: *"…planning and executing expansion projects require the services of internally experienced managers (…) and consequently the firm must (…) rely on managers' experience internal to the firm and on their experience working with other people within the firm as a team. Since internally experienced managers (…) could only be developed within the firm over time, there are limits to the rate at which a firm can grow at any time. A firm that expands faster than it can increase its internal managerial capacities is likely to incur managerial problems"* (Tan & Mahoney, 2005: 116).

[24] Resource-based theory, according to Mahoney (2001), includes the *RBV*, *capabilities and competence-based theory* (Eisenhardt & Martin, 2000), *commitment and first-mover advantage* (Lieberman & Montgomery, 1988) and *knowledge-based theory* (Madhok, 1996).

The origin of strategic management and business strategy can be traced back to U.S. business schools' case studies of several firms in an industry, revealing that they differed from one another also with respect to substantial and sustained performance differences (Rumelt, 1987). While the IO perspective underlines product market positions as the source of (sustainable) competitive advantages, the RBV perspective seeks its explanations in the unique specialised resources (and their immobility) possessed by the firm. The relationship between RBV and the IO perspectives have also complementary effects. By combining the two approaches in strategy research, they can complement one another, for instance by pointing out which competitive settings that make different resource deployments available, and perhaps valuable, to the firm (Dierickx & Cool, 1989; Seth & Thomas, 1994).

Madhok (2002) suggests that while TCE addresses the question why firms *exist*, RBV tries to answer why firms *differ*. In his study, Madhok also reasons that governance choices are not decided by transactional conditions only, but are produced in alignment with strategic objectives and the characteristics of own capabilities together with the evolved governance context. This is also emphasised by Black & Boal (1994: 146) who state that: *"The specific combination for any firm will be a result of the firm's history (...), a firm's strategy, and the degree to which the firm's strategy fits the external environment, especially in regard to its competitors"*. According to Jacobides & Winter (2005: 396) also Williamson (1999) acknowledges the role of the firm's history and capability endowments as influential to it's vertical scope, serving as a complementary approach to the TCE. Cacciatori & Jacobides (2005: 1853) claim that also Nooteboom (2004) points to the advantages from combining the TCE and RBV perspectives. In his view, RBV complements TCE in its emphasis on managers' constraints in choosing from alternative governance modes – stemming from path dependency and inertia – while TCE helps overcoming RBV's governance issue ignorance.

In the same way as the *degree of autonomy* enters de Konings (1994) illustration of vertical integration as a continuum (see Figure 2, p. 10), so can also the *threat of opportunism* together with the *cost of governance* and *cost of access to valuable resources* be depicted along the horizontal axis. This illustrates and reveals some of the resemblances between the theoretical perspectives visited here.

Despite the similarity between strategic management approaches and transaction cost economics in that both regard vertical integration as a tool for maximising the competitive advantage of the firm, they differ in that strategic management considerations for integration include more than just efficiency considerations. Strategic management has a much wider set of goals and objectives, and can – theoretically – accept short term inefficiency in the interest of longer term competitive advantages. However, predictions regarding the impact of vertical integration on performance, based on the different perspectives are ambiguous, and so are the empirical findings.

The usefulness of including multiple theoretical approaches when dealing with firm boundaries decisions is obvious and arguments therefore are many. In the view of Seth & Thomas (1994), an all encompassing theory of the firm is as difficult to construct as to select *one* theory that excludes all others. In order to answer the variety of questions of interest to the field of strategy research, they claim, necessity calls for multiple theories. As outlined in the sections above, the three theoretical perspectives complement each other. For instance by the way that the different units for analysis cover the broad spectre from the macro environment of the firm, via the firm's resources and capabilities to the single transaction on micro level. The examples of researchers who have made use of such multi-theoretical approaches are numerous, since no single model has hitherto explained comprehensively why firms choose to internalise all or some of their resource needs – and how this affects firm performance. Mahoney (1992), in his study of choice of organisational form rooted in transaction cost economics, found that the insights provided by agency theory, organisational economics, property rights theory and the resource-based view of the firm, would enhance the knowledge of vertical integration strategy. Similarly, Pisano (1990) and Krickx (1991) in utilising transaction cost economics, found it beneficial to their understanding to include resource dependency theory in explaining the puzzle of internal organisation.

Even in industries characterised by low concentration resource dependency can be considered problematic[25]. As prescribed by Hannan & Freeman (1977), when firms depends highly on others, this can be reduced by making the other firm more dependent on you, by managing your vertical exchange relationships differently. In general, this perspective hypothesises that vertical integration will occur more often when both resource dependency and uncertainty is high (Krickx, 1991), since vertical integration allows firms to better control critical resources (Pfeffer & Salancik, 1978). That is why Krickx (1991) draws attention to the overlap between resource dependence and (substantial parts of) the concept of asset specificity.

Table 1 summarises some of the most striking attributes of the three theoretical frameworks (TCE, IO and RBV). The setup rests of course heavily on the sources cited above (and the idea is to some degree adopted from – and inspired by – Madhok, 2002) but is by no means exhaustive.

Table 1 Comparison of the theoretical perspectives utilised

	Transaction cost economics	*Industrial organisation*	*Resource-based View*
Theoretical focus	- Theory of *the* firm	- Theory of imperfect markets, firm behaviour and structure	- Theory of *a* firm
Theoretical question	- Why do firms exist?	- How do markets deviate from the competitive model? - How do firms behave?	- Why do firms differ?
Theoretical concept	- Efficiency, coordinating economic activity	- Structure-Conduct-Performance	- Firm heterogeneity
Level of analysis	- Transactions	- Industry (firms)	- Firm (resources/ capabilities)
Emphasis	- Transaction costs	- Market structure	- Firm resources
Motive for vertical integration	- Asset specificity (and the threat of opportunism)	- Market/bargaining power - Competitive advantage	- Acquire capabilities needed for competitive advantage

When firms decide the appropriate governance mode of exchanges, they place emphasis on a number of factors rather than only one (Mahoney, 1992; Mahoney & Pandian, 1992; Amit & Schoemaker, 1993). In all of these theoretical perspectives a recurring concept is *uncertainty*. In the next section the concept of uncertainty, and its influence on the make-or-buy decision, is elaborated.

3.2 Uncertainty

What exactly is meant by uncertainty in our approach to the vertical integration-performance relationship, and to what degree does its prevalence in the research setting influence the way economic actors behave? Below, some central dimensions of this concept, suitable for this context, will be given.

[25] In our case, industry concentration is low and a great number of potential suppliers exist, but nevertheless, resource dependency is a highly viable issue, since the most important input factor is under control – and legislative so – by the upstream industry. This will be further mentioned in Chapter 7.

Uncertainty is prevalent in situations where the probability distribution of future events is not known. This loose definition stems originally from Knight (1921: Ch. VII) who distinguish between *risk* and *uncertainty* in the following manner: the latter refers to situations were the decision-maker faces a type of randomness, in which he cannot assign mathematical probabilities to its possible outcomes. Risk, then, is randomness with knowable probabilities. Another definition of uncertainty is found in Galbraith (1973: 5) as:

> *"…the difference between the amount of information required to perform the task and the amount of information already possessed by the organization."*

This definition points at uncertainty as the discrepancy between current and needed information in order set out different duties. The mere lack of information on current and future situations makes the predictability of possible outcomes from one's action uncertain.

The importance of uncertainty within the theory of the firm can be underlined by Coase (1937: 392): *"It seems improbable that a firm would emerge without the existence of uncertainty."* In his view, the need for a firm comes about in situations where short-term contracts are unsatisfactory, especially when labour or service – not goods – is for sale. Then, the demands to the resource allocating mechanism are stronger, since all terms of a contract cannot easily be agreed on up front. Uncertainty refers to environmental disturbances of a stochastic nature, with which a firm is confronted throughout the life-span of a contract or a bilateral exchange relationship (Mahoney, 1992), and it affects an organisation's ability to predict – and respond to – future events. Taking into account that firms are open systems that must engage in some exchange relationships, their dependency on their environment, and the uncertainty surrounding it, becomes obvious. Bourgeois III (1985) draws attention to the fact that managers' perception of uncertainty – together with the actions they take in the face of uncertainty in the firm's external environment – has a large impact on firm conduct and performance. High levels of perceived uncertainty in the external environment of the firm are detrimental to performance, he claims.

The emphasis on uncertainty as a key variable for understanding organisational behaviour has also been underlined by March & Simon (1958), but, as pointed out by Sutcliffe & Zaheer (1998), the nature of the relationship between uncertainty and vertical integration is a theoretical and empirical puzzle, where a clear relationship between the two cannot be deducted. However, for all three theoretical perspectives noted above, uncertainty plays an important role when setting the motives for vertical integration straight. Even though asset specificity is the main factor responsible for vertical integration in TCE (Williamson, 1986: 157), uncertainty, as a crucial transactional or environmental factor, interferes when deciding the best governance form. In fact, the emphasis on uncertainty (which makes it impossible to write contracts that cover all possible outcomes) in TCE has declined over time, in favour of asset specificity (Krickx, 2000). Porter (1980) ascribes uncertainty as a major factor affecting strategic decisions, where vertical integration can be the source of informational economies and help to stabilise supply and demand. Also within RBV, the uncertainty (together with complexity) that surrounds transactions relates positively to the threat of opportunism, and therefore also to the appropriateness of vertical integration (Barney, 2002). In Penrose (1959: 63), uncertainty refers to the entrepreneur's confidence in own estimates or expectations, and when it comes to the expansion plans of the firm, this will necessarily be *"…restricted by the capacity of management to deal with the increased problems with which they are confronted"* since the greater uncertainty, the more difficult will the managerial task be.

As shown, all three theoretical perspectives that our analyses are based upon, allow uncertainty to affect the choice of governance form. However, the way uncertainty affects this decision is not straightforward, and in many cases the *type* of uncertainty should be specified.

3.2.1 Different types of uncertainty

The idea of making distinctions between different kinds of uncertainty is not new, and Downey & Slocum (1975) highlight the *environment*, the *individual cognitive process*, the *variety of an individual's experience* and *social expectations* as sources of variability in the perception of uncertainty. By drawing attention to the pioneering work of the contingency view, as one with a strong impact on organisation theory, they also put forward the need to "get the lens right" when looking at uncertainty – a central concept within this branch of organisation theory.

Following the TCE perspective, Williamson (1989: 143-4) adopts Koopmans (1957) approach to facing and dealing with uncertainty as the core problem of the economic organisation of society. Koopman is also the building stone of Williamson's subscription to uncertainty types[26] where he turns to the following distinctions:

(a) *primary uncertainty* – appears as random acts of nature and unpredictable changes in consumer preferences;

(b) *secondary uncertainty* – appears since decision makers with bounded rationality and without full information communicate suboptimally, and;

(c) *behavioural uncertainty* –arises in the presence of incomplete contracting and asset specificity.

Krickx (2000: 313) denotes this latter type *strategic* uncertainty, which leads to uncertainty *"…between firms in their relations with suppliers, customers, and competitors"* due to *"…strategic misrepresentation, nondisclosure, disguise or distortion of information."*

Milliken (1987) distinguishes between different types of *perceived* uncertainty about the environment, as *state*, *effect* and *response* uncertainty, which encloses some of the above mentioned sources of uncertainty put forward under TCE. *State* uncertainty corresponds to *primary* uncertainty in that it covers the economic actors' failure to comprehend and predict how all or parts of the environment might change. *Effect* uncertainty affects how managers are able to foresee the effects on their organisation from environmental changes, and therefore treats the causality between environment and organisation. *Response* uncertainty is about managers' inability to see the options for the organisation to respond to an environmental change, and to see the consequences from their choice of response.

A third and final distinction of the concept of uncertainty is brought forward by Sutcliffe & Zaheer (1998). They start out by pointing at uncertainty as a complex, multidimensional and differentiated construct, which, according to Thompson (1967: 159), appears to be the fundamental problem for complex organisations. Their typology of uncertainty draws on Williamson (1985) and they distinguish between the following sources of uncertainty which are relevant for firm scope decisions;

- *Primary uncertainty* – (analogical to Williamson's notion and content) arises from exogenous sources like natural events, preference-, regulatory- or technological changes, and corresponds closely to Milliken's *state* uncertainty.
- *Competitive uncertainty* – arises from the strategic or innocent actions of actual and potential competitors.

[26] In earlier treatments of uncertainty (Williamson, 1975), TCE no distinction between different uncertainty types was made. Though, uncertainty was considered important, since it complicated contractual governance when appearing together with complexity.

- *Supplier uncertainty* – arises from the strategic actions of the exchange partner firm, and this behavioural uncertainty (cf. Williamson, 1989) stems from the potential opportunistic conduct of the transacting partner.

From our point of view, the distinctions made by Sutcliffe & Zaheer are the most fruitful in our approach to the problem since they so clearly identify the sources of uncertainty that will influence the proper way of adapting to it. Moreover, all three theoretical frameworks presented here have emphasised uncertainty as a heavy moderator of the outcome from 'make-or-buy' decisions. It remains, however, to substantiate how vertical integration could serve as a problem solver in the presence – or under threat – of uncertainty.

3.2.2 Vertical integration in the face of uncertainty

The point of view brought forward in this thesis is that when facing a certain level of uncertainty in the upstream exchange environment, firms can either adapt to some of the uncertainty (and adjust the activity accordingly), or make proactive counterattacks to reduce it. In theory, the most often prescribed remedy is to take strategic actions in order to reduce environmental uncertainty. Cyert & March (1963: 120) state that: *"...firms will devise and negotiate an environment so as to eliminate uncertainty (...) and make the environment controllable."* In their view, vertical integration belongs to the processes of insulation that they name "uncertainty avoidance", and will as such provide a safe-guard against uncertainty. The other alternative, advocated by March & Simon (1958) among others, is by taking actions relating to the internal system of the organisation, in order to adjust the organisation to its environment to cope with the presence of uncertainty. Hence, in the face of uncertainty organisations will either react or adapt to it. The general prediction, if any, from the theoretical perspectives above, is that in the presence of uncertainty, vertical integration can help to reduce this and overcome the problems it creates.

Rules come rarely without exceptions, so also here. In TCE, when a situation is associated with high asset specificity, uncertainty will be a significant determinant of vertical integration (Sutcliffe & Zaheer, 1998). The reason is that both the possibility for hold-up (Klein *et al.*, 1978) and the cost associated with hold-up from opportunistic behaviour will be higher in the presence of uncertainty. From the view of TCE then, vertical integration has materialized since exchange partners protect themselves from the uncertainty of unforeseen events, or the seeking of self-interest with guile (i.e. opportunism).

From an IO point of view, the recommendation is not as unambiguous. The traditional IO paradigm views vertical integration as a means to achieve efficiencies and/or to create monopoly related situations. Uncertainty then has the ability to create entry barriers for potential entrants, since they do not possess the same market knowledge as the incumbents (Sheperd, 1997), just as vertical integration is predicted to do by foreclosing. Industry incumbents' creation of uncertainty can give rise to substantial external uncertainty for other industry participants (Jauch & Kraft, 1986). But as Davies (1987: 95) points out: *"...the desire to avoid or ameliorate uncertainty lies at the heart of many motives for integration."* Davies mentions uncertainty regarding upstream product *quality*, *price* and *final demand* (arguments collected from Silver, 1984; Arrow, 1975 and Carlton 1979 respectively) as specific cases which motivate upstream vertical integration. In Carlton's (1979) model, downstream firms facing variable demand will integrate backwards to satisfy their high probability demand and use the input markets to satisfy their low probability demand, so as to minimise the total costs attributable to demand fluctuations (Lieberman, 1991). Arrow's (1975) argument is that when there is uncertainty in the supply of inputs, integrating backwards can improve downstream firms' ability to forecast the input price and thereby make a better decision on input mix.

The more strategically oriented IO, which is emphasised here by the pioneering work of Porter (1980) and Harrigan (1983b; 1985c), take a slightly different approach to internal organisation in the face of uncertainty. They predict that firms operating under uncertain downstream demand conditions will be less willing to integrate vertically since a large amount of the output from each stage of production will have to be taken care of internally. Harrigan also predicts vertical integration levels to decrease when the uncertainty present is of a technological character. Thorelli (1986) postulates that if technology is perceived to change quickly, a vertical integrated firm will risk losing its strategic flexibility, due to the fear of being locked into massive inflexible commitments to highly specific capital.

Within the RBV perspective uncertainty is not addressed directly as a motivation neither for nor against vertical integration. In Barney (2002: Ch. 6) the consideration of the importance of uncertainty for vertical integration is one which 'bridges' TCE, the capabilities approach (Argyres, 1996; Teece *et al.*, 1997) and the real option approach (Kogut, 1991). There, Barney argues, when uncertainty regards the unanticipated sources of opportunism in an exchange, vertical integration should be the appropriate manner to avoid such uncertainty, in line with TCE. When, on the other hand, uncertainty regards the future value of an investment, flexibility becomes important, and less hierarchical governance should be preferred, as real options theory proclaims (Mahoney, 1992). From the capability approach, high market uncertainty would imply that firms are in doubt as to which capabilities will lead to long-term success. In these situations, flexibility becomes the appropriate strategic weapon, in order to *"...move quickly to develop the required capabilities after uncertainty is resolved"* (Barney, 1999: 142-43).

This latter point can be underlined with the view of strategy as *making trade-offs in competing*, (Porter, 1996: 70). In this way the essence of strategy becomes choosing what *not* to do, rather than what to do. There are many scholars that have turned to flexibility, rather than vertical integration, as a response to inherent environmental uncertainty (Barreyre, 1988; Tannous & Mangiameli, 1993; Beach & Webster, 2003; Olhager & Rudberg, 2003). Langlois & Robertson (1989) show – in following Stigler's (1951) industry life-cycle argument – that a manufacturer in a young industry, who has adopted a capital-intensive production process technology, faces higher uncertainty than one who postpones such investments until consumer preferences have evolved, whereby commitment on mass production is made easier.

From the view of economics, the existence of uncertainty will lead firms to underinvest in specific equipment (Baumol, 1959), which will increase the use of production facilities whose scale of operation is flexible (Ekelund Jr. & Hébert, 1980). Within this theme, Miles & Snow (1986) question the value of highly integrated firms in highly competitive and fast-changing environments. Quinn, Doorley & Paquette (1990) assert that firms operating in such turbulent environments will try to avoid vertical integration in order to minimise the risk accruing from this likely inflexible structure. According to Hill & Hoskisson (1987), environmental uncertainty places a premium on flexibility and state the reason for this trade-off to be that interdivisional links in a vertically integrated firm can constitute a major cause of inflexibility and poor responsiveness. Then, if technology or consumer preferences change rapidly, the advantage of closely linked value chain stages may become outdated over night, as ability to chance becomes valuable. Hence *"(f)lexibility offers the capability to cope with environmental uncertainty"* like Swamidass & Newell (1987: 515) denote it.

Obviously, the recommendations whether or not to vertically integrate when the firm faces uncertainty are not unambiguous. Where uncertainty within the TCE paradigm is treated uniformly as to be better controlled within hierarchy, the approach to uncertainty put forward by both IO and RBV perspectives is one where *type* of uncertainty is decisive to which organisational architecture should be preferred in order to reduce it, or cope with it. In the next section the results from empirical studies on the role of uncertainty as moderator in make-or-buy decisions will be elaborated briefly.

3.2.3 Empirical findings on the uncertainty – vertical integration relationship

Theory predicts that different types of uncertainty prevalent in the firm's environment contribute to moderating the expected benefits from – and reasons for – integrating vertically. The issue has been investigated in a rather large stream of research, but the distinctive kind of uncertainty under scrutiny has varied considerably; so have findings. In this section, only a brief selection of findings from empirical studies is given[27].

Masten (1984), in his study of input procurement practices in the aerospace industry, demonstrated conclusively a positive relationship between *general* uncertainty and vertical integration.

From a TCE standpoint, Balakrishnan & Wernerfelt (1986) in their study of 93 U.S. manufacturing industries, found an unanticipated negative relationship between uncertainty rooted in technology and vertical integration. The reason was that the cost of inter-unit coordination within the firm would increase relative to contracting outside when technology changed rapidly. This negative correlation was also found in Walker & Weber's (1984) study, in which 60 make-or-buy decisions in a component maker division of a large U.S. automobile firm was inspected. In a consecutive study on 'make-or-buy' decisions from the same sample, Walker & Weber (1987) found that technological uncertainty had no effect under low competitive pressure, while leading to market exchanges when competition was fierce. The confusing findings made David & Han (2004: 52) conclude that *"…there does not seem to be a clear relationship between uncertainty and either the choice of governance form or the level of transaction costs"* in their review of empirical literature within TCE. Despite these findings' deviation from TCE logic, they were just as expected from what Harrigan (1985a) reported from her study. Harrigan (1983b) finds that when industries are volatile (i.e. under conditions of high uncertainty – where products are modified frequently) firms should be reluctant to integrate vertically, since vertical integration reduces the manoeuvrability of the firm (i.e. in harmony with the flexibility argument).

In the same studies as reported above (Walker & Weber, 1984, 1987) the authors found that volume (i.e. demand) uncertainty had a large positive impact on vertical integration decisions, as expected from TCE theory. Similarly, they found that when the number of potential suppliers was large, high uncertainty regarding input volumes had little impact on the propensity to integrate backwards. Anderson & Schmittlein's (1984) findings from a study on the sales force in the electronic components industry were consistent with this, and they argued that when uncertainty stems from volume considerations, the costs of contracting with outside suppliers can increase relative to inter-unit transfers, leading to increased levels of vertical integration.

The results regarding demand uncertainty from Harrigan's (1984) and Balakrishnan & Wernerfelt's (1986) studies point in the opposite direction. Balakrishnan & Wernerfelt find that high uncertainty in the demand for a firm's products is negatively associated with its level of vertical integration. Mixon & Upadhyaya (1995) found that demand uncertainty positively

[27] For a more detailed review of studies that have examined the effect of uncertainty on the propensity to vertically integrate, see Krickx (2000). He concludes that a clear relationship between uncertainty and vertical integration cannot be deduced, neither positive nor negative – or random.

influenced the propensity to leasing in the U.S. motor carrier industry. However, Barney, Edwards & Ringleb (1992) concluded that when demand uncertainty where present, flexibility advantages with less vertical integration outweighed the transaction cost advantages of more vertical integration.

Also with respect to demand uncertainty, Lieberman (1991) found support for the Carlton (1979) model when studying 34 producers of chemical products: firms appeared to have integrated backwards to avoid variability in the input marked that was independent of fluctuations in their downstream market. These findings were the opposite of Harrigan's (1983b) but in line with Levy (1985), who in his study of 69 manufacturing firms in a broad range of industries, found that demand uncertainty – measured as unanticipated demand shifts – positively influenced vertical integration.

Leaving demand and technological uncertainty, Buvik & John (2000) found – in a study of the behaviour of 161 industrial buyers – that under modest specific investments, greater vertical coordination could reduce transactional difficulties when adapting to environmental uncertainty. However, when asset specificity was substantial, greater vertical coordination increased transactional difficulties. Taken to the extreme, this can be interpreted as support for Coase's (1988b: 43) postulate that the existence of any systematic relationship between asset specificity and vertical integration is doubtful.

Finally, regarding upstream vertical integration, Fan (2000) found that price uncertainty positively affected the tendency to integrate towards the input source in his study of organisation changes in the petrochemical industry before and after the oil price chock in 1973. Especially in the presence of transaction specific relationship (i.e. asset specificity).

Hence, when assessing the empirical findings regarding the influence of uncertainty on vertical integration, the dispersion observed from the review on theoretical prediction is highlighted.

3.3 Why integrate vertically?

In the particular theoretical treatments that are cited in the preceding sections, the motives for vertical integration are somewhat straightforward. However, when combining the three perspectives, mutually opposed motives arise. Uncertainty can serve as one example; where TCE predicts a positive relationship with vertical integration, IO (Harrigan, 1986a) suggests less vertical integration in the face of uncertainty. As one turns the attention to other factors that motivate for vertical integration, which one should be preferred and emphasised if they are contradictory? And what if these factors prescribe different outcomes regarding integration within different theoretical approaches? Mahoney (1992) concluded from his study that the use of vertical integration was not simply a function of one single factor. Murray *et al.* (1995) underlined that the decision to internalise (or externalise) activities must be based on an evaluation of the industry, the product and the transaction in question. Obviously, according to the resource-based view, an evaluation of the firm specific resources and capabilities will also be present prior to the decision. But if vertical integration is the answer, what is then the question? In other words; why should firms choose to internalise exchanges that easily could be carried out within markets?

The theoretical motives for integrating vertically can be classified in a long range of subgroups. McFetridge & Smith (1988) classify the motives for vertical integration into (a) technological interdependence (economies of vertical scope), (b) transaction costs, and (c) imperfect competition (whereas the first is ruled out, they claim, since Williamsons argument – that technological interdependence is important only insofar as it affects transaction costs –

is widely accepted). Scherer & Ross (1990) argue that two motives for vertical integration exist; (i) to reduce costs – what is seen in the steel industry, and (ii) to give producers enhanced control over their economic environment – to ensure supplies of raw material. Norton (1993) applies a five partitioning; (i) technological interdependencies of successive processes, (ii) market power with imperfect substitutability of inputs, (iii) life cycle of the industry, (iv) asset specificity and potential opportunistic behaviour, and (v) the competitive advantages of coordination within the firm given imperfect information. All of these can be tracked back to one or more of the three theoretical perspectives which are accounted for above, which are elaborated in more detail below.

From transaction cost economics one should integrate in order to realise cost savings, stemming from transaction costs. Due to opportunism, uncertainty, frequency, small numbers bargaining and asset specificity the market is not always the most efficient mode for realising exchanges. Hence, carrying out the activity in-house will minimise the sum of production and transaction costs. And if vertical integration produces greater efficiency, then those firms that are fully integrated should earn more profits than less integrated firms in the same industry (Levin, 1981)[28]. Of course, the cost saving effect of organising activities most efficiently should have positive bearings on the account figures, all else being equal. As such, a profitability effect should occur[29].

Turning to the discipline of industrial organisation and strategic management, vertical integration becomes one of several means to reach the goal of creating and defending competitive advantages. These competitive advantages are rooted in some non-imitable characteristics that lead to greater desirability with consumers (Porter, 1985), and can be defended by innovations or defensive tactics. Vertical integration clearly belongs to the latter class, and can help firms to achieve market power by denying competitors access to inputs or outlets, or to raise entry barriers to prevent potential competitors from entering the industry. The outcome from a successful vertical integration strategy should therefore be positive, especially when achieving one or more of the Porter's (1980) potential cost savings (see Chapter 3.1.2). From analysing the threats and opportunities in the firms' environment he extends the decision on the appropriate level of vertical integration from *"…estimating cost savings of integration and balancing them with the investment required"* to a broader analysis where the decision relies on *"…the magnitude and strategic significance of the benefits and costs of vertical integration, both in direct economic terms and indirectly through its affect on the organization"* (Porter, 1980: 301).

Stuckey and White (1993: 71-2) list four reasons for integrating vertically, which can bring about positive impacts on performance:

> *"(1) The market is too risky and unreliable – it "fails"; (2) Companies in adjacent stages of the industry chain have more market power than companies in your chain; (3) Integration would create or exploit market power by raising barriers to entry or allowing price discrimination across customer segments; or (4) 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 & White study is that it is not recommendable to integrate vertically unless it is absolutely necessary, and that in spite of the negative

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[28] Levin also concluded that vertical mergers in oil extraction reduced profit variance, hence uncertainty.

[29] Fuhr Jr. (1990) concludes, from his investigation in the electric utility industry, that cost reductions which increase economic profit is the most obvious and pervasive reason for integrating vertically. The cost cuts may be due to *transaction costs* reductions from decreasing the *uncertainty* about the product availability (Arrow, 1975; Blair & Kaserman, 1978) or from reducing *imperfections* in the input market (Spengler, 1950).

experiences, vertical integration has been a popular strategy. Further, they stress that when deciding to integrate vertically, one should integrate into those areas where there is economic surplus to be captured rather than to focus on those areas of greatest value added. This corresponds to the advice given by Hayes & Wheelwright (1984), who underline the importance of identifying the capabilities required to support a firm's competitive advantage, when creating, adopting and pursuing an integration strategy.

From the perspective of the resource-based view of the firm one should internalise activities of such a kind, that they can exploit the distinctive skills, knowledge and routines that are already apparent in the acquiring firm (Poppo & Zenger, 1995). This line of research underlines that the decision regarding in-house versus market activities should be guided by whether the firms possesses resources that can provide a competitive advantage for the activity in question. If yes, then the firm should undertake the activity itself; if no, then outsourcing or competing through the market would be the correct plan of action. As put forward by Collis & Montgomery (1997: 100): *"When the firm's resources generate no unique value in a business, it should not enter that business."* The potential benefits from integrating vertically is of course that one by the expansion of firm activities can build on – and take advantage of – existing firm specific resources and capabilities. When additional activities gain from asset interdependencies with existing activities, then the firm can be able to produce more efficient and qualitatively more productively, which should bring about cost savings and the subsequent increase in financial performance (Conner, 1991: 140).

Stigler's (1951) life cycle argument, as scrutinised by Tucker & Wilder (1977), Levy (1984) and Langlois & Robertson (1989), couple the use of vertical integration to the industry life cycle. The claim is that in new and emerging industries, where there are underdeveloped or missing markets for the supply of raw material and the distribution of end products, it becomes natural for the producing firm to set up its own raw material providers and/or to create sufficient outlets and distributors for its product. As the products and the industry mature, the need for owning outlets and raw material sources declines, as the market mechanism provides a better and more effective allocation. As production volumes grow together with differentiation and specialisation, a tendency towards more specialised units occurs. But as the industry grows old and declines, production volumes fall and markets shrink, which in turn can make it necessary to integrate vertically in order to restrict competition. Adelman (1955) uses the same argument in combining vertical integration with economic growth and excess demand, stating that changing and rapidly growing industries bring about motives for firms to provide their own supplies and/or marketing outlets, since markets are too sluggish for the needs of the firm.

Ahead of establishing the suitable level of in-house activities, a thorough analysis of the competitive environment that the firm operates in should be executed. Several aspects regarding the competitive environment motivate for carrying out processes in-house (or utilising other governance choices between the hierarchy and market extremes) rather than through arm-length transactions in the market. The rationale is of course to increase the performance of the organisation (regardless of its objective).

This approach, which emphasises a thorough analysis of the current position of the firm – regarding competitors and other environmental attributes – also places heavy demands on a proper balancing between the three levels under scrutiny: industry, product and transaction (Murray *et al.*, 1995). But the question '*why* integrate vertically' is not the only suitable one to be considered. The ability to put forward an answer on *where*, *when* and *how* to integrate vertically, is just as important. For, as Mota & de Castro (2004: 312) note, firms' boundaries are products of a wide range of factors which interact, rather than simple cost comparisons between 'make' or 'buy'. From a strategic management point of view, the alignment of firm boundaries to the environment of the firm becomes a necessity in the search for competitive advantages. But – as put forward by the RBV – the required resources and capabilities to obtain such advantages are unevenly distributed among firms, resulting in inter-firm differences regarding the best strategic alignment (Jacobides & Hitt, 2005).

Economists who have investigated vertical integration have most often focused on cost reductions, entry barriers and welfare effects. Strategists, on the other hand, have focused on its impact for creating and defending competitive advantages. Practitioners like Stuckey & White have given advice from their real world empirical observations, when to expect profitable outcomes from this strategic action. An often neglected topic they point at, is that vertical integration demands fairly immense irreversible investments – making the acquiring firm unable to realise the anticipated economies – which tends to be underestimated before the actual take-over, merger, acquisition (of shares) or purchase (Stuckey & White, 1993). This is analogous to Williamson's (1991: 83) advice that: *"Vertical integration is the organization form not of the first but last resort – to be adopted when all else fails"*, since *"…internal organization always experiences a loss of incentive intensity and added bureaucratic costs as compared with markets and hybrids"*.

The decision to internalise activities, often taken at a corporate level, is one which involves the acquisition or erecting of extra capacity. As this new capacity is realised, fixed costs are expected to increase, possibly with the reduction in variable costs (for instance due to economies of scale or by reduced transaction costs). This makes it strategically more important to produce high volumes, in order to reduce total costs, which again makes firms vulnerable to poor capacity utilisation (Tannous & Mangiameli, 1993). In cases where capacity is heavily underutilised, production costs might suffer substantially, underlining the disadvantages connected to too high levels of vertical integration (Harrigan, 1983b).

A complicating factor for analysing the effects from vertical integration is that decisions to expand capacity are often taken at corporate – not firm – level. Further, the decision and accomplishment of acquiring or erecting extra capacity is qualitatively different from the choice to utilise this capacity, which is a sequential task. The difference in level, between decision makers, taking the strategic decision to expand, and everyday managers, implementing and operating under the new strategic alignment, may well lead to an artificial linkage, felt like a 'forced marriage'. And as noted by Porter (1987): Competition takes place among businesses, not corporations. Therefore, business managers' heartfelt proximity and participation to decisions regarding capacity and strategy alignment, seems reasonable in order to create an operational excellence – as the source of a competitive advantage.

3.4 Predictions from theory

As shown in the preceding sections there exist many motives for turning to vertical integration as the proper way to govern exchanges, and – as we shall see here – the prescribed outcome from such actions also differ among the theoretical perspectives. Beneath, the predictions of different theories regarding the outcome of vertical integration will be outlined.

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 impact the degree and effect of vertical integration within an industry (Levy, 1985; Shelanski & Klein, 1995). However, empirical research within this theoretic paradigm has not focused on the performance effects from the correct alignment of governance to the transactions in question (David & Han, 2004). This contrasts the equivocal theoretical prescriptions, that organisations – which act in accordance with TCE-principles – will perform better, and, finally, outsurvive competitors who do not (Williamson, 1985).

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, vertical integration has proven to be a rather costly and difficult strategy to implement. Another observation is that some firms succeed while others fail in implementing vertical integration within the same competitive setting. Stuckey & White (1993) accentuated vertical integration as a risky strategy: complex, expensive, and hard to reverse. However, when aligned with the external characteristics (i.e. the industries and markets served by the firm) the organisational structure should be one which matches its capabilities (Besanko, Dranove, Shanely, & Schaefer, 2004). If suppliers hold information (for instance about prices and availability) that is essential to the acquiring firm (Stinchcombe, 1985), or when *task interdependence* is present (Thompson, 1967), upstream vertical integration can be salient.

Another central finding from empirical studies of vertical integration is that polar forms of governance structure are seldom found in the real world, despite the attention given to them in theoretical treatments. Instead, an increasingly large number of researches have drawn the attention to the huge variety of forms – between markets and hierarchy – that cooperative arrangement can take. Powell (1987), who divides between markets and formal organisation by the use of price or authority as moderator for resource allocation, explains the growth of hybrid organisational forms by the shift in customer taste in favour of diversity, which standard products made from vertically integrated mass producers, cannot satisfy. Hennart (1993) states that every transaction will be organised by a mix of price and hierarchy (as organising methods) in order to minimise organising costs. These costs are in turn the sum of cheating (usually highest in markets) and shirking costs (usually highest within the firm). Finally, Heriot & Kulkarni (2001) found in their study evidence that firms were more inclined to use intermediate sourcing strategies (i.e. taper integration and long-term supplier relationships), instead of the polar forms. Another observation of theirs, was that sourcing strategies differed significantly for specialised and unspecialised industries, where transaction cost considerations seemed to be the most influential moderator in specialised industries (thereby making them integrate) whereas for the latter, production costs seemed to be decisive (and exchanges were conducted over the market). This is consistent with Walker & Weber's (1984) findings that for make-or-buy decisions in their setting (a component division in a large U.S. automobile manufacturer) production cost considerations were more salient than transaction costs.

For whatever reason one embraces (or rejects) vertical integration of adjacent stages in the value creating chain as part of the firms corporate strategy, the (long-term) objective for the firm is (or at least; should be) to create value for its owners. The pertinent link should therefore be to choose vertical integration in order to enhance the firm's performance for remunerating owner's investments and the effort imputed by employees. Though, in order to extract rent from vertical integration, the costs of this governance form must not exceed its benefits.

Table 2 gives a view over possible benefits and drawbacks associated with this strategy, as collected from the literature review. The arguments refer to the prescribed benefits or costs to firms integrating vertically.

Table 2 Pros and cons of vertical integration

	Pros	*Cons*
Blois (1972)	- Decreased marketing expenses - Stability of operations - Certain supply of materials and services - Better control over product distribution - Tighter quality control - Prompt revision of production and distribution policies - Better inventory control - Additional profit margins or ability to charge lower prices on final product	- Productive capacity disparities between various stages of production - Public opinion and governmental pressure - Lack of specialisation - Inflexibility of operations - Extension of the management team - Lack of direct competitive pressure on intermediate product costs
Baysinger & Butler (1983)	- Better inter-stage coordination - Tax avoidance - Economising on shipping, reheating and contracting costs - Avoiding monopolistic pricing of inputs	- Organisational inefficiency
Harrigan (1984)	*Internal benefits*: - Cost reductions from eliminated steps and duplicated overhead - Activity coordination reducing inventory costs - Avoiding time consuming contracting costs *Competitive benefits*: - Foreclosure avoidance (input, service, market) - Improved marketing or technological intelligence - Product differentiation opportunity (value added) - Superior control of firm's economic environment (market power) - Creates credibility for new product - Synergies from skilful coordination of vertical activities	*Internal costs*: - Need for overhead to coordinate vertical integration increased costs - Excess capacity burden if unevenly balanced Minimum Efficient Scale plant - If poorly organised, synergies lost *Competitive dangers*: - Obsolete processes may be perpetuated - Creating mobility (exit) barriers - Links firm to sick adjacent businesses - Loss of information from suppliers or distributors - Synergies overrated - Limited managerial horizon over alternatives
Milgrom & Roberts (1992)	- Improved coordination and better investment protection - Reducing the needs for strong performance incentives - Avoiding monopoly distortions - Capturing suppliers' rents - Deterring entrance	- Inability to generate economies of scale and scope - Low innovativeness and effectivity due to low competitive pressure - Risk loosing focus of core competencies
Stuckey & White (1993)	- Reduces risk and transaction costs	- Requires heavy setup costs - Dubious coordination effectiveness - Difficult to reverse
Collis & Montgomery (1997)	- Authority (reducing opportunism and unproductive bargaining) - Coordination (of mutually dependent tasks)	- Bureaucracy (i.e. inefficient information process) - Agency costs (self-interest instead of corporate performance maximising)
Osegowitsch & Madhok (2003)	*According to Mahoney (1992):* - Better control of opportunistic behaviour - Ability to enforce cooperation - Greater audit possibilities, thus improved decision-making on better information - Superior communication	- High performance risk (especially in turbulent environments with uncertain demand and technological volatility) - Loss of flexibility (alliances preferred), market incentives and focus - Bureaucratisation
Besanko *et al.* (2004)	- Improved coordination of production flows - Easier to conceal private information - Reduced transaction costs	- Difficult to achieve scale economies - Bureaucratic inefficiency and lack of innovativeness

Summing up the noted benefits in Table 2, most of them fall into the category labelled *'better inter-stage coordination'* by Baysinger & Butler (1983). These can take the form of better inventory control (Blois, 1972) or reducing the need for strong performance incentives[30] (Milgrom & Roberts, 1992). Another category of benefits address the relationship to the firm's competitive environment, like *entry deterrence* and *private information concealment*. Most of the disadvantages as well are easily categorised as falling within *bureaucratisation* or *diseconomies of scale*, and *exit barriers.*

Choosing the right level of in-house activities should therefore, based on the theoretical contributions presented, imply that the expected benefits by this strategic move more than outweighs the associated costs. Thereby, vertical integration would generate additional rents to the firm, and increased financial performance should be a plausible outcome for those firms who choose to integrate vertically.

In the next chapter we concentrate on the part of the empirical literature that has addressed the empirical relationship between vertical integration and financial performance.

[30] When assessing the performance of in-house or outside suppliers or agents is problematic (i.e. measurement problems exist), it will be quite costly to introduce incentives to conform the activity to the firm's objectives. Internalising these activities and bringing the economic agents under the authority of the firm can pass over some of these problems (Anderson, 1985; Milgrom & Roberts, 1992).

4 EMPIRICAL FINDINGS ON THE VERTICAL INTEGRATION-PERFORMANCE RELATIONSHIP

When focusing on empirical, rather than conceptual, studies of vertical integration, the attention is shifted from predicted to actual (or measured) outcome from the vertical integration decision. As argued above, the adequate effect to be looking for in real world evidence is how vertical integration contributes to reduce costs, to isolate firms from fierce competition or to create competitive advantages – all which should, directly or indirectly, bring about improved performance.

The three theoretical fields mentioned above have all been occupied with finding ways to explain differences in financial performance in organisations, also under the assumption that different organisational strategies, like vertical integration, can bring about such effects. The mainstream research contributions have, however, been of conceptual, not empirical, character, and when empirical studies have been conducted, determinants, rather than effects, of vertical integration have been under the magnifying glass (Shelanski & Klein, 1995; Bhuyan, 2002). Further, when studying the effect from vertical integration on (financial) performance, findings are confusing in the sense that some report a positive relationship between the two variables (Levin, 1981; D'Aveni & Ravenscraft, 1994; Edwards, Jackson, & Thompson, 2000), some find that vertical integration have no or indecisive impact on performance (Vesey, 1978; Buzzell, 1983; Maddigan & Zaima, 1985; Martin, 1986; Harrigan, 1986a; Chatterjee, 1991) while others find that vertical integration and performance are negatively correlated (Rumelt, 1974; Fan & Lang, 2000; Bhuyan, 2002).

4.1 Previous research

Bearing in mind Rumelt's (1974; 1982) findings from a multiple industry approach (Fortune 500 companies), vertical integrated (or rather; vertically related diversified) firms seem to be among the corporate strategies performing the worst, even when controlling for the industry in which firms operate. The reason he gives is that vertical integration appears to lock firms into very mature industries, through the massive and inflexible commitments to a highly specialised capital intensive activity, which exhibit very low returns (ROA). However, from comparing Rumelt's work with the findings of Lubatkin & Rogers (1989), we see the seed to a disagreement in empirical research on the vertical integration-performance relationship. Lubatkin & Rogers – in a re-examination of his work – draw a conclusion opposite to Rumelt's using the same data but a different performance measure; a security market based measure from the capital asset pricing model (Chatterjee, 1991). In the mention of the different empirical studies below, the use of measurements, although a methodological aspect, will be visited for each and every one employed. The treatment however, will be of feasible, rather than complementary, kind, as to give a primary idea of the operationalisation problems.

A useful point of departure for assessing past empirical research related to the vertical integration-performance relationship is the meta-analysis conducted by Capon, Farley & Hoenig (1990). Their analysis include 320 empirical studies from numerous disciplines, stemming from journals, books, proceedings, dissertations and working papers during the period 1921–1987, where financial performance is the dependent variable. The authors identify 15 studies in which the effect of vertical integration (forward or backward) on financial performance is examined. Several studies use multiple tests, so from the 15 studies they find that a positive relationship between vertical integration and financial performance is reported in 69 cases, while 35 tests report a negative relationship. Summing up, these studies show a positive relationship (covariation) between vertical integration and performance. However, when distinguishing between industries and businesses (business units) as level of analysis, the findings become highly mixed, where at industry level the relationship is predominantly negative (in 11 of 12 tests).

To illustrate the variation in studies of the vertical integration-performance relationship, Table 3 gives an overview, reporting both the focal industry and the measures employed for both vertical integration and performance together with the stated association between the measures. Every study will in what follows be briefly reviewed with respect to setting, measures, methodology and findings.

Table 3 Studies investigating the vertical integration – performance relationship

Source	*Focal industry (sample)*	*Theory*	*Co-variation*	*Measure*	
				Vertical integration	*Financial performance*
Vesey (1978)	600 BUs from 100 companies (PIMS)	IO	+/-	VA/S (profit adjusted)	ROI
Levin (1981)	53 oil industry companies	IO	0	Self sufficiency ratio (crude oil and refinery)	(Net income + interest payments) / sales
Buzzel (1983)	PIMS (1,649 BUs)	IO	+/-	- adjusted VA/S - Relative to competitors (self report)	ROI and others
Maddigan & Zaima (1985)	Random sample of 45 firms	IO	-/+	VIC index (Maddigan,1981)	ROA
Harrigan (1986a)	192 firms in 16 industries	IO	+/-	Degree, breadth, stages and form	Successful vs. unsucc-essful (self report and objective measure; ROS)
Martin (1986)	288 U.S. industries	IO (SCP)	+/-	Back- and forward integration from Input-/output tables	Price cost margin = VA adjusted for labour and capital costs / sales
Chatterjee (1991)	116 vertical mergers (1962-79)	SM	0/+	Actual mergers compared to firms in the same industry (SIC)	Cumulative abnormal return in market value
D'Aveni & Ravenscraft (1994)	3,185 BUs from 200 industries	SM IO	(+)	Internal flow of goods relative to external	Operating revenue over total sale
Edwards *et al.* (2000)	22 U.S. oil companies	IO	+/++	Share of own production from subsidiaries	Standard & Poor's stock rating
Fan & Lang (2000)	About 500 industries	SM TCE	- -	Vertical relatedness (Rumelt) – input transfer between industries	Excess value=firms actual value over imputed value, (market value)
Bhuyan (2002)	43 food manufacturing industries	IO TCE	- -	Forward integration from input-output tables (Davies & Morris,1995)	Industry price cost margin: (total sales – total costs)/ total sales
Gilley & Rasheed (2000)	94 manufacturing firms	IO	0	<u>Outsourcing</u>: Breadth and depth (Harrigan,1984), self report	Subjective measures compared with similar firms; ROA, ROS.

Vesey (1978) utilises Adelman's (1955) measure of vertical integration as: *"...the ratio of value added to sales, with both numerator and denominator adjusted for profits"* (e.g. value added divided by sales, VA/S[31]). He measures profitability by return on investments (ROI), and uses the PIMS (Profit Impact of Market Strategies) database with about 600 businesses from 100 companies. By using the cutpoints for VA/S that divides the PIMS data pool in three (53 and 68 per cent) he uses a tabular investigation to unveil which level of integration (low, moderate or high) that is the most profitable, also measured against other strategy variables (innovation, capacity utilization, productivity, etc.). He finds that high degrees of vertical integration is not always the most profitable; that backward vertical integration is more profitable than forward, and that vertical integration – in the business climate at that time – was the third most profit influencing factor, after market share and business climate.

Buzzel (1983) also employ the VA/S measure (adjusted for net profit and 20 % of investments in both numerator and denominator) and the PIMS database, for data covering 1,649 business units in manufacturing industries. In addition, he applies a relative measure for vertical integration, obtained by asking managers whether their line of business or company were more or less vertically integrated than competitors. The method utilised corresponds with Vesey's study, where visual investigations of more fine-grained tables (i.e. vertical integration levels in 10 per cent intervals from 'less than 40' to 'over 70') and average scores provide support for his conclusions. Profitability was (mainly) measured by means of ROI, and he found that either very low or very high levels of vertical integration yielded above-average rate of return. Further, he found that ROI declined consistently over the whole range of VA/S for producers of raw and semifinished material and that for the relative vertical integration measure, ROI was slightly enhanced from backward vertical integration.

The justification for using VA/S as a measure for vertical integration was under the assumption that it would increase as firms integrated vertically, forwards and/or backwards, when transactions were carried out within instead of across firms (Davies & Morris, 1995). Several authors have pointed at shortcomings associated with this measure. For instance Maddigan & Zaima (1985), who – as a direct answer to Buzzel's study – assert that VA/S will be higher at earlier stages of production, and that more profitable firms, or firms with relatively higher labour and capital productivity, will tend to score higher on this measure.

Maddigan & Zaima (1985) utilised Maddigan's (1981: 330) Vertical Industry Connections (VIC) index as a measure of vertical integration, which is *"…a function of the relative contribution of the firm's inputs and outputs to the industrial production process"*, resting on detailed statistics on inter-industry transfers. In their comparative exercise of the VIC index and the profit adjusted VA/S they use values from 1972 from a random sample of 45 firms collected from COMPUSTAT. From assigning firms to their belonging quartiles on the two measures and their scores on ROA, they could interpret the differences between the measures and found that the two ways of measuring vertical integration drew the opposite conclusions. While the adjusted VA/S showed that extreme levels of vertical integration were the most profitable, Maddigan's VIC index suggested moderate levels of vertical integration to induce the greatest profitability. However, when regressing vertical integration measures to ROA (together with a time and industry dummies) for the years 1963, 1967 and 1972 they found that in both models vertical integration was positively correlated with profits, but the adjusted VA/S-variable more so than the VIC-index.

[31] Adelman (1955: 282) also denotes this measure as the ratio of *income* to sales where: *"…complete integration would mean that the ratio Y/S (where Y denoted income, and S sales) would equal unity"*. He also suggests using the ratio of inventory to sales, where *"…the longer the production line and the more successive processes are operated by one firm, the higher the ratio"*. To my knowledge the latter has not been utilised in later studies. The operationalisation of value added from financial statements usually takes the form of sales minus all purchases (Buzzell & Gale, 1987: 165).

Levin (1981), in relating vertical integration and profitability in the U.S. oil industry (53 large oil companies in the period 1948-72), introduces "self-sufficiency" as a measure of vertical integration. In this industry he defined self-sufficiency to be the quotient of crude oil production divided by the sum of crude oil production plus refinery runs, which will be 0 for unintegrated refiners and 1 for unintegrated crude oil producers. Balanced integration, he states, will be given the value 0.5. Profitability is the dependent variable, measured by net income plus interest payments divided by total revenue. His regression models include several additional variables to self-sufficiency (like assets, equity minus assets, foreign minus world production, capacity utilization and their interaction effects with self-sufficiency). Levin finds from a pooled cross section-time series firm data model that there "*…is virtually no evidence of economies to vertical integration*" (p. 224) in crude oil or refinery production within the time span, but vertical integration helps reducing the variation in profits. He identifies considerable variation in the self-sufficiency ratio for most firms over time, and that this evolutionary approach does not reveal any trends in neither more nor less vertical integration.

Harrigan (1986a) visits many facets of vertical integration when emphasising it as a multi-dimensional construct. She distinguishes between *degree*, *stages*, *breadth* and *form* of vertical integration. From in-depth interviews with managers in 192 firms in 16 industries in the period 1960-81 she identifies successful (n=140) and unsuccessful firms (n=52), and vigorously examines the patterns of differences between the successful and unsuccessful firms on all of her four dimensions. Then for these firms she records significant differences over a vide range of variables anticipated to affect the vertical integration choice (see her Table 3 at p. 540-1). Her main findings were that involvement in many integrated stages can not be sustained with the same success throughout the industry's entire life span and that vertical integration is indeed a costly strategy. Hence, vertical integration should be adjusted to changing conditions. From a contingency view, she adds, no vertical integration pattern proves successful under all circumstances, but occurs more successful under given settings.

Martin (1986) constructs an input-output table measure of the average industry vertical integration (backward and forward respectively), varying between 0 (no vertical integration) and 1 (full vertical integration). Industry profitability, the dependent variable, is measured by a price cost margin, and backward and forward vertical integration are the independent variables (together with industry concentration and minimum efficient scale) in his regression model, tested out on different industries and a pooled sample of industries. He finds that the effect of backward vertical integration is significant and positive only in the food industry, while forward integration's effect on profitability is inconsistent and complex: it will increase profitability if concentration is large but reduce it if concentration is low. In the food industries forward integration affects profitability negatively unless concentration is large. The effects also depends on whether one integrates *into* the industry or *out of* the industry, which he claims supports a 'case by case' approach when vertical integration is contemplated.

Chatterjee (1991) studies 116 U.S. vertical mergers from 1962 to 1979 and compare them to 1,459 rival firms in the acquirer's industries. He measures profitability by cumulative abnormal return (stock market measure) and finds, in an OLS-regression analysis including growth rates, concentration and relative market power, that target firms gain about 20 per cent in cumulative abnormal returns while the acquiring firms have (on average) next to no effect on this measure, but with large variations. His finds support for IO arguments where vertical integration advantages are greatest when acquiring firms operate in concentrated markets, and target firms are in competitive markets, so that mergers lead to increased market power.

D'Aveni & Ravenscraft (1994), in their study of 3,185 manufacturing business lines in 200 industries in 1976, use the internal flow of goods relative to the external flow as a measure of vertical integration. A business line is in their study defined as vertically integrated when some combination of its forward or backward transfers exceeds 10 percent of its sales or cost of sales. Operating revenues over sales (return on sales) was their performance measure, and from sophisticated within industry and cross-sectional generalized least squares regression analyses they report that vertical integration units displayed marginally better profitability than unintegrated business lines in the same industry, after controlling for economies of scale and scope, though insignificantly. When distinguishing between forward and backward integration, significant effects were found, where the first had positive and the latter negative effect on profitability. However, vertical integrated units had higher production costs (especially backward vertically integrated units), but economised through other cost components (R&D, advertising, administrative and general expenditures). The significance of their findings and the effect of vertical integration on performance seemed also sensitive for whether their return on sales measure were based on reported (transfer pricing) figures or market-based prices. Their conclusion was that "*…vertical integration has a weakly positive association with performance*" (p. 1195).

Another study examining the vertical integration-performance relationship is Edwards *et al.* (2000) investigation of 22 companies in the U.S. oil industry. Vertical integration is regarded as the share of production from own crude oil extraction and share of refinery runs shipped through own pipelines (i.e. up- and downstream integration respectively). Profitability is measured by the company's Standard & Poor's stock rating (from A+ to D, translated into 1–8, hence, an ordinal scale) and they utilise regression models (both OLS and ordered Probit-models) to assign stock rating effects form crude oil and pipeline integration together with net assets and equity relative to capitalization. From observing two distinct separate time periods (1972 and 1992–94) they find that crude oil production (upstream integration) strongly enhances firms' performance, while pipeline integration (downstream) shows a weak positive effect. However, none of the explanatory variables proved significant.

Fan & Lang (2000) utilise Rumelt's diversification strategies (Rumelt, 1974) and apply commodity flow input-output tables to capture inter-industry and inter-segment vertical relatedness for more than 1,000 firms in the period 1979–97 from the COMPUSTAT database. Performance was measured by firms' excess value (ratio of actual to imputed book value), and from a log-likelihood regression analysis inter-industry and -segment vertical relatedness were found significantly associated with poor performance. Inter-industry or inter-segment complementarity, however, were positively related to firms' excess value (and significantly so), but only in the 1970s and early 1980s.

Bhuyan (2002) examines how vertical mergers in 43 U.S. food manufacturing industries affect performance, when also controlling for industry characteristics like productivity and competitive conditions. He uses a forward vertical integration measure based on input-output tables (Bradburd & Caves, 1982; MacDonald, 1985; Davies & Morris, 1995) showing that the industries on average are modestly integrated. His performance measure is computed as net industry profit – a price-cost margin – and the regression model produces robust results where forward vertical integration negatively affects performance, while other variables have greater effect on profitability (domestic demand and advertising). He explains the negative association by the failure of vertical mergers to create cost savings for the integrated firm.

Finally, this review includes a study by Gilley & Rasheed (2000) which sets out to examine how outsourcing intensity influence firm performance. Their outsourcing measure is similar to Harrigan's (1984) conceptualisation of vertical integration, hypothesising that performance effects from outsourcing should be similar to those of vertical integration. They use survey data from managers of 94 manufacturing firms in various industries, where the outsourcing operationalisation was on *breadth* (ratio of outsourced activities to the total activities performed) and *depth* (average percentage of each outsourced activity being provided by external suppliers – distinguishing between core and peripheral activities). Performance was operationalised as managers' subjective report on how they assessed ROA, ROS and overall financial performance for their firm, compared with similar firms in the industry. Their findings when using outsourcing intensity of peripheral and core activities (with past performance) as predictors for financial performance in a multiple regression model suggest that outsourcing has no significant direct firm-level effect on financial performance. Though, core activity outsourcing coefficients were negative, while coefficients for outsourcing intensity of peripheral activities showed positive signs, as expected.

From the inspection of past research on vertical integration one can conclude that:

- ✓ vertical integration is a multidimensional construct which can be measured throughout a number of dimensions, and as such
- ✓ vertical integration is difficult to measure, or even capture through one construct only.

Further – when looking into the vertical integration-performance relationship – these additional observations can be highlighted:

- ✓ Results from different studies are difficult to compare, since level of analysis differ from business unit to industry/nation, different industries are under scrutiny and point of time/time span of analyses differ
- ✓ Findings on the vertical integration-performance relationship are ambiguous, where some report positive, some no and some negative co-variation between the two.

Another problem arising in attempts trying to establish the vertical integration-performance relationship is how to measure performance. In past empirical studies multiple measures have been applied, including accounting measures providing the operating performance – giving an indication of past and present organisational adoption – and market based performance measures (Tobin's *q*, abnormal return, etc.) – giving a future-oriented consideration of organisations ability to change. What seems to be the case when trying to give a true picture of the outcome from market based actions is that: *"Performance is a difficult concept, both in terms of definitions and measurement"* (Keats & Hitt, 1988: 576).

4.2 Evaluation and critique of previous research

The literature on vertical integration and its impact on firm performance is extensive, though the majority of scholars seems to have concentrated on conceptual issues, which to some extent neglects to monitor real life situations empirically. As such, the attempts to illuminate the state of which firms and industries implement this strategy together with the empirical relationship between vertical integration and performance is scattered, to which we here seek to make a remedy.

A range of empirical studies scrutinising conditions regarding vertical integration in firms and industries have employed multiple industries as the point of data collection (PIMS-database, Fortune 500 companies and COMPUSTAT). However, some have narrowed their analysis to manufacturing firms only, or single industries, for instance defined by SIC-codes. The most often addressed industries in empirical studies outlining the nature of vertical integration are:

- ✓ the *automobile industry* (Crandall, 1968; Monteverde & Teece, 1982b; Eckard Jr., 1984; Langlois & Robertson, 1989; Masten, Meehan Jr., & Snyder, 1989; Mullins, 1990; Helper, 1991; Butler & Sohod, 1995; Alley, 1997; Peters & Becker, 1998; Veloso & Fixson, 2001; Dobrev, Kim, & Carroll, 2002; Nobeoka, Dyer, & Madhok, 2002; Kotabe, Martin, & Domoto, 2003),

- ✓ the *food industry* (Kilmer, 1986; Barkema, Drabenstott, & Welch, 1991; Frank & Henderson, 1992; Henderson, 1994; Viaene & Gellynck, 1995; Hennessy, 1996; Boon, 1999; Galizzi & Venturini, 1999; Lanciotti, 1999; Nefussi & Priolon, 1999; Mènard & Klein, 2005),
- ✓ the *aluminium*, *iron and steel industry* (Dennison, 1939; Mancke, 1972; Perry, 1980; Stuckey, 1983; Hennart, 1988),
- ✓ the *electric utility industry* (Landon, 1983; Joskow, 1985; Kaserman & Mayo, 1991; Kerkvliet, 1991; Kwoka, 2002),
- ✓ and the *oil industry* (Levin, 1981; Dahlstrom & Nygaard, 1993; Norton, 1993; Edwards *et al.*, 2000).

As to the spread of vertical integration to different industries, Desai & Mukherji (2001) conclude in their comparative analysis of different time periods and geographical areas that the era of vertical integration is coming to an end. What we are left with are different forms of quasi-integration, since vertical integration requires great investments and leads to loss of respond flexibility to environmental changes. Those industries where vertical integration still occurs, they claim, are industries with high capital investments where the environment is relatively stable (like the oil- and mining industry). In other industries, which meet volatile markets with rapid technological shifts (like the automobile industry) this organisational form is becoming extinct. MacDonald (1985) argues likewise, that despite being an important strategy, vertical integration is dominant only in a few manufacturing industries. These are capital intensive industries, he argues, or industries in which buyer or seller concentration are high, where leaving the allocation of resources to the market is costly – which force firms to transact internally. Other empirical and conceptual contributions point to the revitalisation and new era of vertical integration, as it is emerging in new industries, highly exposed to environmental turbulence (Richardson, 1996; Gertner & Stillman, 2001; Osegowitsch & Madhok, 2003).

But rather than assessing the performance effects from vertical integration in the different industries and settings, most studies have had the objective to identify the determinants at work which lead to the internalisation of adjacent stages in the value chain. However, attempts to surveying the industries longitudinally have – to my knowledge – only to a limited degree taken place. Furthermore, most studies have undertaken an analysis of cases, or more or less narrow samples from the whole population, and under no circumstances have the whole population of firms in an industry been under scrutiny[32]. A third straining point is the fact that good measures for vertical integration (and performance) are hard to find, and that measures applied vary inevitably from study to study. Findings from different studies are therefore hard to compare, and with a few exceptions only have multiple measures been applied in the same study (Harrigan, 1983b; Maddigan & Zaima, 1985; Harrigan, 1986a). A challenge will therefore be to seek a remedy for some of these shortcomings in past empirical research, at least to investigate the possibility for such remedies.

The theoretical predictions, stating that the correct alignment of governance modes regarding transactional, environmental and firm specific factors will bring about positive performance effects can not be said to be unambiguously supported by the empirical findings. But why is that? One possible explanation is that managers make the wrong assessment of the apparent variables that should influence the make-or-buy decision. The cognitive limits of managers (March & Simon, 1958) might be a contributing factor, which lead different decision makers

[32] Ohanian (1994), who studied the determinants of vertical integration in the U.S. pulp and paper production between 1910 and 1940, serves as an exception. She also employs longitudinal data on the total population.

to draw different conclusions – and thereby actions – from the same or similar influential factors. Another theoretical field explaining persistent suboptimal economic developments is that of the New Institutional Economics like North (1990), where path dependent self-reinforcement *locks-in* once established institutions[33]. In his view organisations are rational actors who pursue gains stemming from relative price changes, and the interactions between institutions and organisations shape the economic development through the competition over scarce resources. In this line of reasoning the undertaking of vertical integration might be from social embeddedness reasons as well as from efficiency reasons, thereby not bringing about the favoured performance implications.

Also the suggestion of organisational *isomorphism*[34] put forward by institutional theorists (DiMaggio & Powell, 1983) can be influential. Although the isomorphism standpoint is one of resource dependency theory, scholars within strategic management and industrial organisation also turn to this explanation. From this reasoning, vertical integration becomes a "Follow-the-leader"-strategy, not necessarily rooted in a well-considered analysis of external threats and opportunities together with internal strengths and weaknesses (SWOT).

The phenomenon of firms subscribing to the same strategy is also adopted by 'practitioners', but not necessarily as an outcome of copying the industry leaders. Hayes & Wheelwright (1984) explanation why firms within the same industry utilise similar methods for securing supply, takes a natural stand, since these similar responds are substantiated by the same industry phenomena which firms adapt to.

Another reason why empirical results do not support the theoretical predictions can be the vast variety of differentials in the researched areas. From Table 3 at p. 44, it is demonstrated, that no overall conclusion on the vertical integration-performance relationship can be made, since the various studies differs over central dimensions like the setting, level of analysis, analysis' time span, measures used for depicting vertical integration and performance, together with underlying theoretical views and of course conduct and conclusions.

The appropriate level to measure the magnitude of integration and the (prescribed) corresponding performance effect is an important question. Harrigan (1986a) maintains that the appropriate level is firm – not industry. Galbraith & Stiles (1983), in their study of profitability from relative firm power (the firms ability to influence prices, contracts, etc.), emphasise that firm profitability is not only decided by own industry structure, but also the relative power towards firms and industries from which one buys, and to which one sells. They hypothesise that firms, whose transactions have a favourable importance and exclusivity, should exercise a tendency towards greater profitability, and find support for it, where both industry and firm specific factors affect profitability. They conclude that managers should look to vertical, as well as the lateral, aspects regarding the competitive situation.

Cool & Henderson (1998) also investigate the power relationship and profitability between buyers and sellers, located in supply chains between both types of firms. In an empirical test on profitability they found that backward vertical integration had a considerably positive

[33] According to Ebbinghaus (2005) Douglass C. North points to two additional causes for suboptimal economic development: 1) *Transactions costs* which are high due to non-competitive markets, which make prices unable to mirror the scarcity of resources, and 2) *Political factors* obstructing the institutionalisation of property rights, therefore rending properly functioning competitive markets.

[34] *Isomorphism* means that as industries mature, organisations within the industry, which faces the same set of environmental conditions, become more similar to one another, where less powerful participants copy the systems and procedures of industry leaders, not necessarily from efficiency reasons, but from legitimacy reasons. As such, firms confronting the same input and output markets will tend to adopt the same vertical integration strategies.

effect, together with suppliers and buyers structural power. In their model, industry variables had greater effect than firm specific factors (measured by relative market power).

All together, these anecdotal issues put forward problems that have to be dealt with in empirical research. At least to the point that one need to be attentive to such sources of spuriousness, so as to ensure the research design to controlling for possible effects stemming from them. Therefore, in Chapter 6 a more concentrated revision will be outlined, which brings to market the gaps encountered in previous research – theoretical and methodological, as well as empirical – to which one seeks a remedy in this thesis, and which also prepare the ground for the research conducted here. Though, before setting the agenda for the research design, the next chapter will address some additional methodological problems.

5 METHODOLOGICAL CHALLENGES

When attempting to assess the relationship between vertical integration decisions and their impact on performance, several methodological obstacles have to be dealt with. This is the issue under scrutiny in this chapter, especially the essential question of how to measure the variables of interest. Thus we address several concerns regarding measurement problems that appear when assessing to what degree vertical integration is undertaken by firms or industries.

Before turning to the discussion on measurement problems of concern here, let us just set the record straight regarding the measurement of vertical integration. Here we subscribe to the idea that vertical integration – as highlighted in Chapter 2 – is a matter of degree rather than 'yes or no'. As Seagraves & Bishop (1958) argues, the shortcomings of empirical research on vertical integration are largely due to definitional issues. Even though some of the previous research regarding the proper form of governance in manufacturing organisations has concentrated on the option either to integrate vertically or to utilise the market, according to most research cited here (Walker & Weber, 1984; Levy, 1985), there is an unanimous understanding and acknowledgement among scholars that the variable should be operationalised in terms of degree rather than as a dichotomous variable taking the values 'vertically integrated' or 'not vertically integrated". Like Baumol (1997: 26) humorously articulates it: *"(V)ertical integration, unlike virginity, is a matter of degree. The question, then, is not whether a firm will be integrated or unintegrated, but the degree to which this should or will occur. In practice, it will almost never take either polar form*[35]*"*. In fact, there is no sound argument from prevailing theory or research that should substantiate a 'yes or no' approach to this problem.

In the following sections the measurement problems one meet when trying to assess the level of vertical integration will firstly be addressed, based mainly on the measures found in the preceding literature review. Then a discussion at what level vertical integration should be measured follow, especially on the distinction between firm and industry, which ends out with a general proposal. Next, the appropriate choice of data quality and demand is attended to. Here, measurement problems regarding performance measures are addressed. Finally some recommendations are given as to where the main methodological hazards can be found when aiming to assess the relationship between vertical integration and performance.

5.1 Measurement problems

Obvious from the review of prior empirical research, the way to measure both vertical integration and performance has been a subject under substantial dispute and discourse for as long as research on these matters have been undertaken. The severity surrounding these issues is underlined by Hay & Morris (1991), who assign the lack of systematic studies of vertical integration partly to the measurement problems assigned to such studies. Spiller (1985: 286) takes a similar stand when asserting that: *"Empirical analyses of vertical integration are handicapped by the difficulty of defining its extent."*

Here, the measures for vertical integration utilised and the analysis level employed in earlier empirical studies are addressed.

[35] Baumol (1997: 18) notes additionally that: *"...the issue normally is not whether an industry should or will eschew all vertical integration. For it will always (or almost always) be integrated vertically to some degree, because of start-up or transport costs, if for no other reason. Rather, the issue is whether the degree of vertical integration should be increased or decreased from some given level."*

5.1.1 Measures for vertical integration in previous studies

From the 12 studies reported here we see that at least as many measures for vertical integration is utilised as there are studies. The measures vary both in terms of where the measurement takes place as well as how data is gathered for the measure to take the correct value. The measures used can be categorised into following broad classes: VA/S (Vesey, 1978; Buzzell, 1983), flow of goods indices or tables (Maddigan & Zaima, 1985; Martin, 1986; D'Aveni & Ravenscraft, 1994; Fan & Lang, 2000; Bhuyan, 2002) self sufficiency ratios (Levin, 1981; Edwards *et al.*, 2000), actual mergers (Chatterjee, 1991) or a multidimensional stance (Harrigan, 1986a; Gilley & Rasheed, 2000). Underneath these measures will be evaluated closer.

Adelman (1955) self, who introduced the ratio of value added to sales (VA/S), was the first to comment that this measure was sensitive for proximity to the raw material source. Even though other criticism has been indited, the arguments against the VA/S measure, for being higher the closer the firm is to the raw material source, have been prominent. Others have criticised the measure for (1) being more sensitive for backward than forward integration (Martin, 1986), (2) that it does not reflect the choices firms make about coordinating potentially separable economic activities (Caves & Bradburd, 1988), (3) when measured at individual enterprises it becomes sensitive for multiplant backward integration (Levy, 1985), and (4) that it does not capture the firm's partial consolidation of control through contracts and other agreements (Frank & Henderson, 1992). Burgess (1983a; 1983b) criticise the VA/S-measure, for being inadequate at both business unit and corporate level. He recommends indexes that can describe the *length* of the vertical chain, as well as describing the average *linkage* between the stages (parallel to Harrigan's *stages* and *degree*).

Maddigan (1981) introduces a Vertical Industry Connection index, which relies on national input-output tables (Leontief, 1951), "*...defines a pair of matrices for each firm according to it's product line*" and "*...is a function of the relative contribution of the firm's inputs and outputs to the industrial production process*" (Maddigan, 1981: 330) taking values from 0 to 1. Also Maddigan's VIC-index has been met with criticism: for failing to account for partial integration within an industry (Levy, 1985) and for being a firm level index and therefore not feasible at industry level (Davies & Morris, 1995). Henderson (1994) also criticises this measure of vertical integration for only including industries where the firm in question posits a 100 per cent ownership share, and thereby omitting instances where quasi-vertical integration are at line (i.e. control through partial ownership). Similar criticism has also been raised against other input-output tables, especially that the outcome of such measures are mainly applicable when industries are the correct level of analysis. D'Aveni & Ravenscraft (1994) are the only of the reviewed studies, which from utilising input-output tables prescribe and employ a pure dichotomous view on vertical integration – as integrated or not. A strength with their approach, however, is their utilisation of two different regressions, dividing between a cross-sectional and an intra-industry model.

The two self sufficiency ratios presented for, and applied on, the U.S. oil industry by Levin (1981) and Edwards *et al.* (2000) are different in nature. While Edwards *et al.* distinguish between, and attach values to, backwards and forward integration before regressing them against stock ratings, Levin (1981: 220) claims that self sufficiency is *"...the quotient of crude oil production divided by the sum of crude oil plus refinery runs"* measured in barrels. Levin's self sufficiency ratio will take the values from 0 to 1, where 0.5 will be a balanced integration whereby the firm refines all its crude oil. A measure of self sufficiency has appealing attributes when emphasising the sole or most important input factor for a firm. The drawbacks of such a measure would be realised when applied to inputs or outputs far from the firm's core activity.

Chatterjee's (1991) approach to the measurement of vertical integration seems unimpeachable since he addresses actual mergers taking place. Similarly, due to the complex and multidimensional construction of measures, Harrigan (1986a) approach seems equally robust. These studies – even though compelling – also appear as hard to replicate. For instance, at the conclusion of lengthy in-depth interviews, managers were asked to evaluate the effectiveness of firms' vertical integration arrangements as "successful" or "unsuccessful". A successful vertical integration strategy can from my point of view just as well be one which is heavily rooted in outsourcing rather internalisation.

As noted above, the reported studies do not only differ in terms of measure employed for vertical integration. The level of economic activity from which data is gathered is another discourse, addressed beneath.

5.1.2 Level of analysis in previous research

From the results from previous research on the vertical integration-performance relationship reported in Chapter 4, most studies were involved in explaining the phenomenon on firm or single business unit (SBU) level, whilst three inspect the relationship at industry level (Martin, 1986; Fan & Lang, 2000; Bhuyan, 2002), whereas the other research attempts look for explanations at firm level. Additionally, the two studies directed towards the oil industry (Levin, 1981; Edwards *et al.*, 2000) are the only ones addressing one single industry and not a multiple industry approach. However, a few of the reported studies on multiple industries or firms/businesses in multiple industries (so called cross sectional/sectorial analysis) sought remedies for this by utilising intra-industry models (as reported above for D'aveni & Ravenscraft, 1994), specifying industry specific factor (Harrigan, 1986a) or isolating the industry specific effects (Martin, 1986; Gilley & Rasheed, 2000).

Clearly, the difference in measurement techniques, as well as the point of where to measure vertical integration, will influence the results and contribute to explaining the vast ambiguousness as reported in the studies reviewed. As underlined by Caves & Bradburd (1988: 265): *"…devising measures of vertical integration that are meaningful and comparable among industries has proved difficult"*. The proposal made here is therefore that the heterogeneity observed as to the influence of vertical integration on performance is largely due to the lack of well performing uniform measures on vertical integration *across* industries. Here, our approach is founded in the anticipation that the fruitfulness of integrating vertically differs substantially across industries, or even firms, so that no easily obtainable industry-wide measure might exist. Therefore, the level of analysis will be further investigated on a general basis in the next section, so as to motivate for the need for industry- (or even firm-) specific measures for vertical integration.

5.2 The appropriate level for measuring the degree of vertical integration

As outlined above, in the theory of industrial organisation the main determinants of firm performance can be found from industry attributes (like concentration, entry barriers, and so forth) while within the resource-based view of the firm performance drivers and determinants of competitive advantages are found within the boundaries of the firm. Therefore, in a considerable number of studies on firm's profitability, the purpose have been to assign profitability effects to whether they stem from industry specific of firm specific factors, respectively (Schmalensee, 1985; Hansen & Wernerfelt, 1989; Rumelt, 1991; Roquebert, Phillips, & Westfall, 1996; McGahan & Porter, 1997; Mauri & Michaels, 1998; Hawawini *et al.*, 2003). The findings from these studies have to some degree been conflicting: While some researchers subscribe to industry factors as the main performance drivers (Schmalensee,

1985) the majority of the studies find that firm specific factors account for the largest share of performance effects (for instance Rumelt, 1991; McGahan & Porter, 1997; Mauri & Michaels, 1998).

In the studies mentioned, measurement and methodological obstacles have been incumbent, as underscored by Hawawini *et al.* (2003). By utilising another performance measure they find that only for the leaders and losers in an industry are firm-specific factors the most dominant, while the industry effects are more important for the majority of firms[36]. So, although supportive to the majority of the studies, Hawawini *et al.* put forward results that indicate industry specific factors may have meaning for different types of firms within an industry, especially those that do not outperform or under-perform (cf. 'the swollen middle' of Hennart, 1988). For those firms, whether using account or market based measures, they found that industry factors had a large impact on performance.

When relating this discussion to the vertical integration-performance relationship, we see from the studies cited above that for many of them, the industry – and inter- and intraindustry transfers – have been the unit of analysis (Martin, 1983; Caves & Bradburd, 1988). Harrigan (1986a), ascertains that measures for vertical integration strategy should not be on industry level in order to be useful for managers. Some measures should be on firm or company level, some should regard the relationship between business units, while others should include comparisons of how competitors use vertical integration. Further, Eckard Jr. (1979) points out that employing value added over sales (VA/S) as a measure for vertical integration strategy on the industry level, like Tucker & Wilder (1977) do, is not suitable for aggregated plant data since vertical integration is a company level phenomenon, and not the same as what appears on the industry level. He cites Stigler (1951) for his point, stating that the ratio of value added to sales is a crude index of the extent of vertical integration within establishments, implying that this measure systematically ignores other forms of integration, like the capacity expansion taking place by mergers and the set up of new plants.

So, despite the fact that industry has often been the level under scrutiny in prior research, a majority of scholars suggest that the firm should be the appropriate unit for studying such effects. Analogous to the proposition made by Porter (1987) – that firms compete, not corporations – we will argue that neither does industries. Hence, the appurtenant level for analysing the performance effects from strategic decisions is at the firm level. That is also the primary level at which performance is realised.

But still, there remains the question on how then should industry specific effects on performance be taken into account in empirical research, since, to some degree, the motives for vertical integration are, as predicted from the industrial organisation approach, due to factors associated with industry attributes. Even though it is firms (or rather their decision makers) that take decisions regarding the scope of the firm and it's boundaries, the motives for doing so might – as seen from theory – be found in the external as well as the internal environment of the firm. In other words: the decision to integrate might be influenced by firm factors (i.e. firm specific resources and capabilities) as well as industry factors (i.e. competitive pressure, primary uncertainty) and transactional factors (asset specificity, threat of opportunism).

[36] In their study of 342 firms across 55 industries in the years 1987–96 they found that "*In general, for a majority of the industry's firms, when the industry's outliers (leaders and losers) are discarded, industry effects seem to dominate firm effects in explaining the variation in performance*" (p. 12). The procedure to exclude outliers was done by identifying the two industry firms that consistently performed the worst and best with respect to the industry average for the maximum number of years. Performance was measured by ROA, total market value/capital employed and economic profit/capital employed.

From this point of view it becomes an imperative for empirical research on vertical integration to narrow the analysis at least so as to ascertain that when comparing firms to which degree they differ in adopting a vertical integration strategy, the whole sample face somewhat the same motives and competitive conditions. Joskow (1988) underlines this when criticising the use of inter-industry data in industrial organisation research for having significant limitations. This statement of his emphasises the need for good data (1988: 111):

> *"I believe that good empirical work aimed at testing theories (...)* **requires** *that we know a lot about the characteristics of the firms and products that we are relying on in the empirical work. The use of industry-level aggregate values for the relevant variables, drawn from hundreds of industries, precludes doing so. Measurement of the degree of vertical integration, using the kinds of inter-industry data that are readily available, is itself a very difficult problem."*

In a foot note, he extends his argument to also being valid for cross-sectional analyses, where included firms are obtained from different industries. So, not only does he subscribe to the inclusion of firms to which the researcher have thorough knowledge, but also that firms included in the same study should face the same conditions, in which there are motives for integrating vertically (or not).

As an experiment of thought, imagine a sample of firms from different industries, demonstrating a vast heterogeneousness when it comes to vertical integration. For the sake of smoothness, let us just concentrate on backward vertical integration. Some firms are to a highly degree vertically integrated towards their sources of supply, while others are not – or to a minor degree. It is easily recognised, that firms facing a highly uncertain supply, or where it exists obvious advantages from inter-stage cooperation (say, the co-localisation of iron ores and steel producers) have strong incentives for integrating vertically. At the other hand, manufacturing firms buying inputs from upstream markets where competition is next to perfect (say, spinning mills buying cotton at world market prices), where transaction costs are low and supply is perfectly elastic, might see few advantages from vertical integration. Other firms again, might find supply conditions beneficial for making some requirements in house and some bought through market operation (i.e. tapered integration) supportive for convenient levels of upstream vertical integration. Taken together, the overall results might show modest levels of vertical integration undertaken by firms, while what is really at stake is that in some industries, in which the firm operates, integration is found beneficial, while not in others. Therefore, it can be explained, that findings from the assessment of the degree of vertical integration, where studies lean on inter-industry samples, might hide more than reveal the real world evidence it is meant to examine. As a consequence then, denoted by Dess, Ireland & Hitt (1990) as a possibility for avoiding the *industry effect*, we recommend setting a single industry under study.

From the arguments above we subscribe to the notion that empirical research on vertical integration should take place at firm level, and further, that those firms, or samples of firms, that enter the analyses should be similar with respect to the industry membership – and thereby to some degree the transactional environment – in which they find their motives for integrating vertically. Within this constraint, the valuable resources and capabilities can be appreciated by most firms in the same context and setting (Jacobides & Winter, 2005).

By concentrating to one industry then, one avoids macroeconomic and sector specific factors that influence the result and it will be easier to identify firm specific factors' influence and their explanatory power. Since all firms under scrutiny are found in the same industry setting, the surpassing of macroeconomical and sectorial causes may contribute to a 'cleaner' assessment of the influence from firm factors and, finally, possible identification of business aspects that best explain the firm performance differences. Again, in line with the institutional perspective (DiMaggio & Powell, 1983), firms in the same industry seem to choose the same strategy since they respond to the same phenomena, and the cost advantages or disadvantages linked to vertical integration are most often linked uniquely to the firm or the industry in question (Hayes & Wheelwright, 1984).

By limiting the analysis to one industry, only the reliability of the variable in question should increase. However, generalisibility is normally reduced (Monteverde & Teece, 1982a). Choosing to focus on one industry also sets requirements to *where* in the industry (or rather; the value chain) this effect should be measured; since products become more and more specialised the closer to the customer you find them. According to Heriot & Kulkarni (2001) degree of specialisation for the industry in question significantly influence the sourcing strategy of that industry, where for unspecialised products procurements more often take the form of competitive bid and long-term supplier relationships than for specialised products. The reason is rooted in TCE-arguments: Specialised products encounter high transaction cost through asset specificity, whereas for unspecialised products, the threat of opportunism from suppliers is less likely to occur.

What remains to be solved after advising the measurement of vertical integration to be confined to one industry only, is a general definition on *how* to measure vertical integration: Which aspects of the concept should be emphasised when operationalising vertical integration to industry specific real world situations? Again, the quotation from Joskow (1988) above can serve as a good – although broad – advice: Thorough knowledge about the setting studied – both firms and products – will give the best foundation for composing one or more suitable measures. The one industry approach is also advocated by Masten *et al.* (1989; 1991) since by narrowing the analysis this way, results will be 'neater' and more controllable due to lower 'industry-specific ideosyncracies' than in inter-industry studies.

The evolutionary approach to firm structure (Schumpeter, 1950; Chandler Jr., 1962; Nelson & Winter, 1980; Chandler Jr., 1992) has taken the historical development into consideration when explaining the prevailing and different structures among firms. From this perspective, the prescription is that the firms' history has some bearing on the present exercised borders. Ohanian (1994: 202–3), in her study of the development of vertical integration in the U.S. pulp and paper industry, asserts for instance that her transaction-cost based explanatory model *"...performs better among recent entrants than established mills, because once built, few mills altered their integrated status despite changes in the regional market environment"*. The historical development of the firm can have it's origin in the industry or product development and technological 'shifts' that appear (i.e. a life-cycle approach: Stigler, 1951; Wright & Thompson, 1986; Mascarenas & Aaker, 1989; Covin & Slevin, 1990; Birou, Fawcett, & Magnan, 1998), but will of course also be influenced from the managerial decisions regarding the scale and scope of the firm: of primary interest for strategy research. The latter call for narrowing the approach to the measuring problem to a limited number of factors since decision makers in their meeting with numerous incentives – both inside and outside the organisation – have *cognitive limits* (March & Simon, 1958) and will concentrate on – and substantiate their choices from – the factors that most directly address their decision. As pointed out by Garicano (2000: 874): *"...each individual is able to acquire knowledge about a narrow range of problems"*, and have limited ability to process information (Jones & Hill, 1988). Therefore, we find it important to limit the operationalisation of vertical integration to as few – but the most important – factors as possible, without loss of the crucial aspects of the concept. The scope of the study will also play an important role in deciding the appropriate factors to emphasise in measurement construction: if the analysis focuses on cost savings, then the production cost structures and TCE factors should be the relevant angles of attack, whereas when the phenomenon under scrutiny is the adaptation to turbulent environments, then uncertainty reducing factors should be emphasised.

To evolve industry specific vertical integration measures without thorough knowledge to the industry in question will be difficult. Reality is complex, and the distinctive institutional embeddedness differing from industry to industry, from country to country (or even thinner geographical limits) will implicate unique measures adapted to the context in question. Further, the qualitative disparity between the directions of the integration undertaken between stages in the value chain also calls for different measures. In other words, good arguments might exist for differentiating between the way one operationalise and measure upstream and downstream vertical integration, since behind the decision for which direction integration should take stand distinct different strategies.

The multidimensional nature of vertical integration suggested by Harrigan points out that a good measure should incorporate more than just one aspect (see Chapter 2.1). In empirical research, she claims, the emphasis should be put on those dimensions which are the most critical in the context under scrutiny. When sourcing (i.e. backward vertical integration) is the studied transactional phenomenon, Murray *et al.* (1995) highlight the ownership aspect to be crucial, which could be suitable explained by evaluating the nature of the industry structure, the product and the transaction.

Here we will argue similarly: After establishing the industry structure characteristics, it is crucial to anchor the measurement procedure by taking the manufacturing process, or product throughput in question, into consideration. In sourcing strategies, the point of departure for developing an adequate measure should therefore be heavily weighted by the necessity of the input factor in question. A good example can be Levin's (1981) approach to the oil refinement industry, where the measure of downstream integration is built on to which degree firms are self-supported by the most important input: crude oil. For service providers, the approach would of course differ in that degree of downstream vertical integration could take the form of agreements with producers, and as such, the intersection with end customer (i.e. forward integration) could more heavily influence the overall performance of the firm than its relationship to suppliers/contract partners at the other end of the value chain.

This calls for the need to also look into the transaction itself, and the environmental factors surrounding industry, product and transactions. For a totally integrated mine-mouth coal-fired electric utility plant the transactional hazards are far from those experienced by plants supplied by coal on long- or short-term contracts (Joskow, 1985; Kerkvliet, 1991). However, the degree to which utilities in this industry are vertically integrated towards the coal mining process is in fact a response to the hazards perceived, or the managers' perception at earlier stages of the industry to perceive the ownership of coal mines as a resource valuable to the firm's pursuit for competitive advantages in the end markets.

The presence of vertical integration seems to require that markets do not operate perfectly (Chatterjee *et al.*, 1992), and the phenomenon that most often leads to the break-down of the neo-classical assumptions on the transactional level is the lack of perfect information. Uncertainty is a main cause of information asymmetry or general lack of information, and as Aubert *et al.* (1996: 52) argues: *"Uncertainty is the root of all market failure or transactional difficulty."* As markets fail then, certain resources and capabilities become the source for firms to acquire economic rent (Amit & Schoemaker, 1993) which can lead to competitive advantages. Especially when uncertainty is associated with the acquisition of important, scarce resources, then, by internalising production, the firm can reduce this uncertainty and gain greater control, especially from reducing the dependency on outside agents (Pfeffer & Salancik, 1978). These resources can be acquired by integrating vertically. When transactions are carried out in an environment enveloped by uncertainty, managers' ability to predict and react adequately to future events is affected. As underlined in Chapter 3.2, uncertainty can relate to the natural events or environments, to competitors innocent actions or to the strategic actions of exchange firms (Sutcliffe & Zaheer, 1998). In our view then, an adequate measure for backward vertical integration on firm level should:

- ✓ concentrate on one industry
- ✓ establish a connection which involves ownership to the source
- ✓ be coupled to the most important input factor
- ✓ take into consideration and be rooted in the kind of uncertainty (or other market failure) that motivates for integration.

With this in mind, the measure chosen will not merely identify the ownership issues regarding control of the input factor, but also be tightly connected to the industry and firm specific factors that motivate such expansionary activity up in the value chain. However, a remaining challenge when operationalising this concept is the appropriate choice of time at which the empirical relationship should be established. A range of researchers have underlined vertical integration as a dynamic concept, which tends to differ over time due to industry-wide or firm specific changes. According to Harrigan (1986a) decisions regarding the boundaries of the firm (i.e. vertical integration strategies) should be re-evaluated as conditions in the competitive environment changes, thereby influencing the position of the firm. This becomes highly incumbent in fast-changing, highly competitive environments, where an elaborate and possible inflexible structure from integration imposes risks for the competitive strength of the firm (Miles & Snow, 1986; Quinn *et al.*, 1990; Stonebraker & Liao, 2004).

The necessity to incorporate the dynamic firm boundaries is supported by Miller & Shamsie's (1996; 1999) findings from different periods for the Hollywood film studios, who by distinguishing between property-based and knowledge-based resources, found that control over the first mentioned resulted in superior performance during periods of stability, while by controlling the latter firms achieved performance advantages when the environment was characterised by changes. Closely related to these arguments are the prerequisites that should be demanded from data appropriate for testing the vertical integration-performance relationship. That will be the issue of Chapter 5.4. First, I will address the relationship between the two variables more closely.

5.3 The vertical integration-performance relationship

Strategic management has in general limited its focus to *"…the firm's problem of establishing and maintaining a competitive advantage in its product markets"* (Walker, 1988: 62). This search for competitive advantage is done by scope decisions or resource deployments that should turn out successful for the firm. In order to evaluate the outcomes of these strategic actions, and to be of any value for strategic managers, they must be judged up against the corresponding outcomes of their rivals in the product market in which they compete. In order to be of any practical value, strategic management research should therefore engage in evaluating the performance effects from strategic moves, since managers are unable to assess the quality of their strategic decisions objectively or consistently (Chakravarthy, 1986).

As earlier acknowledged, the ways to measure performance are many, and the proper one must be aligned with the purpose of the study in question. Buzzel & Gale (1987) argue that actual results must be judged in relation to some standard in order to be meaningful, regardless which performance measure one uses. What then comes into consideration, when the effects of vertical integration are to be assessed, is the possible difference in performance objectives between firms. Even when we disregard the possible misjudgement advocated by the agency cost view[37] – that the agenda of managers might deviate from that of the owners – the goal of a vertical integrated firm might differ from an unintegrated one. While the objective of an integrated firm might be one which seeks to maximise profit for the whole of the value chain that is under common ownership, rather than the profit for the single business unit, as for an unintegrated firm. As a consequence the allocation of profit between value chain stages might be altered from one where the market attend to the exchanges, and further, the presence of transfer pricing and absence of competitive pressure in intra-firm transactions might also be one of concern. Additionally, the possibility of lower costs of capital stemming from risk assessment in financial markets favour larger companies over small ones (D'Aveni & Ravenscraft, 1994; Mixon Jr. & Upadhyaya, 1995), while at the other hand, overhead costs will fall the lesser vertically integrated a firm is (Brück, 1995). Ebben & Johnson (2005) argue that since small firms lack the access that large firms have to financial resources, they are unable to undertake large investments in fixed assets that can provide them an efficiency advantage. These aspects call for a careful inspection when assessing the performance effect from vertical integration.

Another problem emerging when evaluating the performance effect from vertical integration in a stringent isolated analysis, is the neglection of taking other variables into account. Jacobson (1990) and Wensley (1997) both point, from different angles, to the effect unobserved variables have on the performance relationship. Wensley advocates that the number of variables that influence performance is so high that it is impossible in a study to come up with only one variable that explain more than 10 per cent of the variation in, say, return on investment (ROI). Jacobson accuse the neglect of unobservable variables (like corporate culture, management skills and luck) for leading to conclusions in which the strategic factors are both biased and exaggerated. David & Han (2004) also address this problem, and make it clear that tests regarding the performance effects from firm's boundary choices are likely to suffer from 'self-selection' issues, i.e. that both organisational choice and performance are affected by unobserved variables, which have the potential of making estimates biased.

The most obvious problem for studying the performance effects from strategic moves is what measure should be employed, and how to measure it. In Chapter 2.2 it was accounted for different operationalisations of the performance variable, where the most commonly employed are account based measures like return on sales (ROS), assets (ROA), investment (ROI) or equity (ROE). The applicability of such profitability measures have been under scrutiny by a large number of scholars, and Venkatraman & Ramanujam (1986) find them to be appropriate in "within-industry-studies" when data on financial aspects otherwise may not be available. They do however point to the limitation that differences in accounting policies may limit its use for comparison purposes. ROA, which reveal the efficiency of operations and the productivity of the firm's asset base, has the following shortcomings according to Woo, Willard & Daellenbach (1992)[38]: (a) it fails to indicate the degree of congruence

[37] Besanko *et al.* (2004: 478) refer to agency costs in the following manner: *"There are countless examples of problems in agency relationships. In the case of a firm's shareholders and its CEO, the shareholders' objective is to earn a return on their investment. A CEO may enjoy undertaking acquisitions (whether they are profitable for the firm or not) in order to boost his or her reputation in the business community. Alternatively, a CEO may like spending the firm's money on perquisites for the top management team, such as fancy offices, country club memberships, or corporate jets."* Thus, managers want to increase the size of the firm in order to achieve benefits which clash with the owners' desire for profit maximisation.

[38] See also Hay & Morris (1991: 217-20) who point to seven shortcomings when referring to ROA as the salient measurement of profitability.

between intended goals and performance, (b) the use of book values of investments and current rates of return may distort the comparison of performance across companies with different asset's ages, and (c) it provides only a static view and does not reflect the long term earning potential of the firm. The second argument is the most severe shortcoming since it contributes to discriminating between firms within a cross sectional study, while the other two hits all firms equally. Still, even if their applicability is highly praised by researchers, there are arguments weighing against the use of such account based ratios. Mosakowski (1991) produce one, stating that the use of ROA might be a misleading performance indicator in situations where firms recently have expanded their asset bases, and the strategy, structure and outcome of these have not been adjusted accordingly.

As pointed out above by Venkatraman & Ramanujam (1986), account based performance measures have the advantages of being relatively easily available since firms may be reluctant to release profit data (Dutta & John, 1995). There is, in other words, another way of collecting data, which is to employ firms' self reported indicators on the variable in question, either as managers' *subjective* or 'self reported' *objective* measures of performance (Dess & Robinson Jr., 1984). The advantage from such measures is the availability also on business unit level (in stead of company or corporate level) and that it is easier interpreted and less aggregated (Venkatraman & Ramanujam, 1986). However, perceptive data from primary sources might be biased and difficult to obtain due to confidentiality. Especially, responses might be biased due to social desirability, since respondent want to set up a 'good façade' and answer accordingly. However, Dess & Robinson (1984) in their study strongly support the use of subjective perceptual performance measures, but only when (a) objective measures are unavailable, or when (b) the alternative is to omit the performance variable. Priem, Rasheed & Kotulic (1995) find them highly correlated with objective performance measures.

Two of the studies reported in Table 3 used of subjective profitability measures (Harrigan, 1986a; Gilley & Rasheed, 2000). In Harrigan's study, the subjective measure (i.e. was the firm's vertical integration strategy perceived as successful or unsuccessful by the manager?) was controlled against an objective measure (unsuccessful firms were those with significant losses in their industry – exceeding 5 percent ROS rates over 5-year averages), and found to be highly correlated. Gilley & Rasheed (2000) asked managers to rate their firm's financial performance (ROA, ROS and over all performance) relative to similar firms in the same industry the last 12 months and 5 years, respectively, on a five point scale. They also took non-financial performance variables (R&D outlays, stability/growth of employment, process and product innovations, supplier and customer relations, and others) into consideration.

Empirical studies employing self reported performance (or even vertical integration) measures have, from the view of strategic management, the advantage of putting the emphasis on manager's subjective perception. These measures relates to how managers perceive the forces at work, whether it is their perception of the environmental uncertainty and how they 'turn their organisation' to meet those perceived challenges, or how they interpret their organisation's performance relative to competitors. These measures are strongly committed to the resources the organisation possesses, i.e. the managerial resources and capabilities responsible for making strategic decisions. Such firm specific resources can be the sources of competitive advantages, if they possess the ability to predict the future correctly and align the organisation beneficially to those predictions. They may also constitute a source of uncertainty to outsiders to the firm (Jauch & Kraft, 1986).

Another problem facing empirical research on the vertical integration-performance relationship regards the hypothesis' causality. Hitherto we have described vertical integration as a favoured strategy in order to create and/or maintain a firm or value chain structure that can substantiate superior performance effects. However, the direction of causality could easily be turned the other way around: Firms that achieve sustainable competitive advantages, or possibly only transient or temporary substantial earnings, are by the nature of increased financial strength able to put forward structural moves like acquisitions and mergers that take the form of vertical integration. In fact, some of the arguments from IO (foreclosing and raising rivals' costs) can easily be put into this category of claims, especially when the industry is characterised by a small numbers of firms, with substantial market power. The argument then turns out to a discussion on what came first, a tautological question that must be considered by the use of causality tests like Granger cause test[39], or the like. As underlined earlier, when testing the vertical integration-performance relationship in a single variable structural equation, there is a danger of omitting variables that could easily help achieve better explanatory power and moderate the predicted relationship.

Finally, from the viewpoint of strategic management research, the focus has been on the firm's problem to establish and maintain a competitive advantage in its product market (Walker, 1988; Dobbin & Baum, 2000), while for firm managers the most critical issue is its long run performance (Hofer & Schendel, 1978). Since competitive advantages are not realised within a relatively short time horizon, this calls for performance assessments based on longitudinal data. In the next section claims on data, revealing outcomes over a longer period of time are presented.

5.4 The need for longitudinal data

Vertical integration enters, as one of several structural decisions, the strategic orientation[40] of a firm. As such, the proper vertical integration strategy should be one that aids aligning the firm to its environment in an overall efficient manner. Since firms that operate in environments which are dynamic of nature need a constant focus on strategic alignment, the process of matching its vertical integration strategy to the environment becomes one that need continuous attention – especially the operative part of it. Accordingly, the environmental variables that influence the appropriate level of vertical integration might vary for different stages in the value chain, and, indeed, at various points of time. This points at another need for measurements in empirical research: to incorporate and assess the level of integration over a relatively long time span. When measured at a short term basis (i.e. cross sectional analyses at only one point of time) the level of integration can erroneously be stating that the firm is misaligned, which is adjusted and accounted for in the next period.

When assessing the vertical integration-performance relationship one should bear in mind that since some strategic moves require fixed asset investments, there might well be a lag in time between the *ex ante* decision and the *ex post* effects. Like Caves (1984: 129) maintains: *"…business competitive moves generally have intertemporal investment aspects. The implied depreciation rates of the investment components range from short to very long."* The vertical integration decision fall into this line of strategic moves, where there is a considerable time

[39] Kennedy (1992: 62) refers to causality tests in this manner:"*One application of the **F** test is in testing for causality. It is usually assumed that movements in the dependent variable are caused by movements in the independent variable(s), but the existence of a relationship between these variables proves neither the existence of causality nor its direction. Using the dictionary meaning of causality, it is impossible to test for causality. Granger developed a special definition of causality which econometricians use in place of the dictionary definition; strictly speaking, econometricians should say "Granger-cause" in place of "cause", but usually they do not. A variable **x** is said to Granger-cause **y** if prediction of the current value of **y** is enhanced by using past values of **x**."*

[40] *"Strategic orientation refers to how an organization uses strategy to adapt to and/or change aspects of its environment for a favorable alignment. This orientation has been described variously as strategic choice, strategic thrust, strategic fit, and strategic predisposition (Chaffee, 1985)"* (Manu & Sriram, 1996: 69).

span between deciding to acquire or expand capacity, and to utilise that capacity. While managers' decisions regarding firms' resource deployments takes place *ex ante*, the empirical analysis of the effects from these strategic actions are *ex post* (Amit & Schoemaker, 1993).

The need for longitudinal data must be balanced against the demand for cross sectional data since a firm's level of vertical integration at any given point of time can deviate substantially from the previous or next period. It could also be influenced by the measure applied to quantify such a construct (for example the ratio of value added to sales or self-sufficiency ratios when supply fluctuates heavily). The attributes of environment, competition, and/or transaction which motivate for vertical integration might be of highly temporal character and vary greatly from one period to another, thereby influencing the possible outcomes from this decision. Christensen (2001: 105) asserts this in the following manner: *"If history is any guide, the practices and business models that constitute advantages for today's most successful companies confer those advantages only because of particular factors at work under particular conditions at this particular time."*

There are numerous arguments for why empirical approaches that seek to reveal the performance effects from government choices should be attended with special attention. From a strategic management point of view the issue of particular interest is long run performance and sustainable competitive advantages, which point to a longitudinal assessment. The benefits from integrating vertically may stem from imperfect product or input markets, which can be of transitory nature, and change from period to period. Then, disequilibrium in the organisational boundaries might be a necessary condition in order to study performance effects (Mosakowski, 1991). Further, Amit & Schoemaker (1993) predict market failure to be the prime determinant of economic rent. Correspondingly, Barney (1988) argues that in order to obtain above-normal returns from acquisitions, they should be carried out only in imperfectly competitive markets. The mere existence of persistent or temporary market failures points out the motive for vertical integration, while the expected effects might only be realised after a period of time.

Similarly, as time goes by, product, process or system innovations may heavily influence the 'rules of competition' in an industry (Schumpeter, 1950), pointing again to a narrow time frame for the analysis in question, in order to rule out transitorily shifts. Additionally, since some industries exercise high performance variations between years – due to cyclical inputs or stochastic product market trends – these effects could be diminished by by employing 3- or 5-year averages (Harrigan, 1986a; Gilley & Rasheed, 2000).

The next chapter sums up some of the challenges one meets when assessing the effect from vertical integration, from theoretical, methodological and empirical angles, when this phenomenon is submitted to critical empirical research.

6 *'MIND THE GAP!'* INADEQUACIES IN EXISTING KNOWLEDGE

The previous sections on theoretical, empirical and methodological issues regarding vertical integration can be said to constitute the cornerstones of this thesis, on which the contribution brought forward rests. Alongside these blocks of central scientific knowledge, onto which my intention is to build a research contribution on the performance effects from upstream vertical integration in the Norwegian fisheries industry, there can be identified some gaps in present knowledge; a cavity whereby it is my hope to contribute – at least to a partial fulfilment.

Introductorily, the fundamental concepts of this thesis were examined from different viewpoints. A main finding from inspecting the previous conceptual contributions was that there seems to be a high level of conformity between the intension of vertical integration in the different theoretical perspectives. In short, they all point to the fact that various stages in the value chain – where raw materials are converted into end consumer products and services and then brought to the market – are under common ownership and control, or conducted within the boundaries of the firm. However, the treatment of this phenomenon – in theoretical as well as empirical studies – has suffered from an inaccurate definition, often regarded as a dichotomous variable and the choice between 'make-or-buy' or 'use-or-sell'. A much more fruitful approach to the concept is one that acknowledges the many intermediate forms between the polar ones (market and hierarchy) and incorporates the existence of *levels* of vertical integration rather than a 'yes-or-no' issue. The ultimate challenge remaining is how to operationalise the concept and assign numerical values to it in empirical research. That is a methodological issue.

Another fundamental concept in my analysis is performance, to which scholars have assigned different contents, and which needs a context specific elaboration and operation. By limiting its extent to *financial* performance, a narrower range of meaning is achieved, assigning it directly to well-known account based measures like ROA, ROS, ROI and the like. However, since the effect of strategic actions is not restricted to the periodical range of one year – usually employed in firm's financial statements – one should try to envelop the long-term outcomes and the dynamic changes rather than short term flow variables. A remedy to this in cross sectional analyses can be to utilise multi-period averages or rankings over the measures employed, or survival rates or mappings in competitive environments over longer periods.

The theoretical considerations regarding vertical integration are many and the phenomenon – regarding both its extent and diffusion – has been under scrutiny by scholars from many social science disciplines. Here, a multi-disciplinary approach – recommended by scholars like for instance Seth & Thomas (1994) – is adopted, in order to capture the huge variety of motives to integrate and predicted outcomes from such action.

When reviewing the research literature, the concept of vertical integration can be said to be conceptual to a larger extent than empirical – a finding which to some degree is assigned to the difficulty of finding appropriate ways to measure the phenomenon and to employ such measures in empirical tests. Also when it comes to the motives for bringing different lines of businesses in the value chain under common ownership and control, there is a huge variety to choose from – from asset specific investments in TCE, via stage in the industry life cycle within IO, to resource complementarities in the RBV – to which there hitherto have been no assignment of which is the most important motives.

Further, one common motive for integrating vertically in all three theoretical perspectives elevated here, is the persistence of uncertainty in the business environment. However, uncertainty can take many disguises, and in earlier conceptual studies the uncertainty under scrutiny has most often been one of strategic kind, which stems from economic actors' *"…strategic misrepresentation, nondisclosure, disguise or distortion of information"* (Krickx, 2000: 313). Another important uncertainty source which has been neglected in previous empirical studies on motives for integrating vertically is one that stems from random acts of nature. In this study, primary uncertainty is the one under the magnifying glass, since it exists inherently in all production processes where biological resources enter supply. This is a kind of uncertainty to which it is hard to protect oneself from, even by the means of vertical integration.

The literature on vertical integration suffers from the lack of good empirical analysis to which degree, and from what motives, this strategic move is undertaken by firms. When visiting empirical research on the vertical integration – performance relationship, some more gaps in existing knowledge can be added to the list. First, related to the uncertainty argument above, research on vertical integration has very often addressed large oligopolistic industries (like automobiles, oil extraction and refinement, defence industry and national dairy and food product producers), in which the uncertainty is of strategic kind and can almost be represented by the Cournot- and Bertrand type of competition that we find in micro-economic (game) theory. In the industry analysed here, as noted, the uncertainty is predominantly *primary*, and the transactional environment can be characterised by next to perfect competition, in the meaning that a huge number of potential buyers and sellers exist, with whom sourcing transactions can be carried out.

There have also been methodological challenges in prior research, to which sufficient solutions have not been presented. This regards especially the way one chooses to measure vertical integration – where we find a huge number of measures employed – and at which level vertical integration should be measured. These measures vary from sophisticated input-output matrixes on industry level, where the degree of backward or forward vertical integration is determined from the flow of goods between industries, to simple self-report answers to questions like: *Do you consider your firm more, less or integrated to the same degree as the peers in your industry?* Here, the appropriate level of measurement is addressed, and an unbiased data consistent measure, though not easily available, is proposed and utilised.

But as in other studies that try to assess the relationship between vertical integration and performance, problems are encountered here also. For instance: How to construct an adequate measure for the measurement of vertical integration in the setting under inspection? And which research design is the most suitable for assessing the mentioned relationship? These and other questions will be addressed in the next chapter, setting straight the context in which this study is carried out and evolving how it is done.

Part 3

7 RESEARCH STRATEGY

The purpose of this chapter is to give a broad description of the empirical context in which we attempt to establish relationship between vertical integration and performance. Further, it will be accounted for the choices made with respect to the research design pursued in the next section, where our research is summarised. The choices made become a central element of this empirical thesis, since the research contributions are all performed within the same setting and by utilising the same fundamental measures.

The preceding sections regarding theory, prior empirical research and design, set demands on data, level of analysis and methodology on the research undertaken here. In this section we will further enlighten the demands in question, and elaborate and argue for the fundamental choices we undertake regarding our research approach.

The chapter sets out by summing up some incumbent claims to the empirical context, which follow from the research problem and chosen design. After presenting the projected demands, a literature review is given concerning prior investigations on vertical integration in the fisheries sector. The next section seeks to give an exhaustive description of the empirical context visited here, with emphasis on the Norwegian fish processing industry and the value chain to which the industry belongs. Some fundamental conditions (historical contingent as well as present) in this value chain are elaborated. The industry setting is presented with emphasis on characteristics that are expected to affect firms' propensity to integrate vertically, also with respect to historical and regulatory reasons and barriers. Then a brief outline of the degree to which vertical integration is employed in this setting is given, making the transition to the next part – offering the anticipated motives present for integrating vertically in this context – natural. Here we classify the various motives according to what makes them attractive: Is it the need for stabilising the supply of fish that force fish processing firms to integrate vertically? Or is it to avoid the transactional hazard that can exist in their trade with fishing vessels? Can it be that processing firms want to achieve parts of the rent that fishermen obtain by harvesting a conditional renewable natural resource, or do the motives for integrating vertically originate from historical or regulatory reasons? The potential advantages from vertical integration– relevant to the setting under scrutiny – are all discussed here. Since theory offers a great variety of motives for integrating vertically, some arguments are overruled by others. We therefore bring forward and discuss some inconsistent and contradictory arguments to the motives for integrating vertically in the succeeding section, where it is shown that the potential advantages are not necessarily unambiguous. The next subheading deals with the appropriate way for measuring vertical integration in the setting under scrutiny. The choice of measurement is rooted in the recommendations found in theory and earlier empirical research. Finally, this chapter is completed by giving a review of the data available for putting this empirical context under scrutiny, with regard to data on performance and vertical integration.

Summing up then, the present chapter seeks to explain and argue for the choices made to define the range, and improve the quality, of our research. From these series of interlocking choices that have been made, a sound environment for studying the effects of vertical integration is created, which is more accurately depicted in Chapter 8.

7.1 Research design requirements

The research problem and design, which set out to investigate whether performance effects among firms exist – and can be identified – from integrating vertically, place requirements on both the empirical context and the data to be applied. Initially, however, an elaboration on the limitation we impose on the research setting is needed.

7.1.1 One industry

Following our recommendations from Chapter 5 we subscribe to the idea that the best suited research approach for studying the vertical integration performance relationship is by narrowing the scope of the study to one industry. The argument can be said to come from the Bain-type industrial organisation school of thought, which called attention to the importance of the external environment surrounding enterprises in the same industry, as a major influential factor for the conduct of firms in the given industry.

It has also been shown empirically that vertical integration is undertaken to an extensive degree in some industries (examples being the aluminium industry and oil industry), while in other industries (like the U.S. beer brewing industry) there is seemingly modest or no interest taken in such strategic action (Mahoney, 1989; Bhuyan, 2005). The underlying assumption to this contrary adoption of a popular structuring strategy in different industries, are again that the core conditions affecting the 'make-or-buy' decision differ from industry to industry.

Here we subscribe to the idea that the choice of vertical integration can be ascribed to transactional features, as well as both firm and industry specific factors. Hence, some conditions influence the whole population while others are effective only for individual firms. In order to measure to what degree this choice influence firm performance, one should to the greatest possible extent strive to isolate these effects in order to assign them to the present influential conditions which simultaneously have bearing on the whole population. One uncomplicated measure to obtain a more practical research environment is by constricting the setting under study to one – well defined – industry, in which the population and sample are subject to the same – or at least similar – economic laws, competitive pressure and regulatory authority. Methodologically, the external validity will suffer from such a limitation, but, hopefully, the immense improvement of the internal validity will outweigh this negative aspect.

Again, we push Joskow (1988) in front of us as our captive justification for doing so, in as far as his critique on inter-industrial average values on vertical integration was precluded from being labelled *good empirical work*. Even though others will be the judges to which this study is included in the good company of good empirical work, we believe that limiting our research setting to one industry improves the ability of acquiring such a membership.

7.1.2 Claims on the research setting

Having concentrated our study then to one industry, it still remains to take into account other obligations which rest on our research approach. First, firms belonging to the particular chosen industry must be easily separable from firms in other industries. Here we concentrate on the Norwegian fish processing industry[41], which consists of firms that buy (input), process (throughput), and sell (output) fish, which in the end will be used for consumption, domestic or abroad. They are identified and classified by SIC's (Standard Industrial Classification) NACE register group 15.2 – "*Processing and preserving of fish and fish products*" – which is

[41] Fish meal and oil production, together with seaweed, is excluded to as far as possible extent, since they are primarily made for industrial – not consumptive – uses.

further divisible into subclasses like drying and salting (15.201), freezing (15.202) and canning (15.203) of fish (see Statistics Norway, 2003a for further details). Other sources for identifying firms in the fish processing industry could have been utilized, like the Directorate of Fisheries' *"Register of approved buyers of fish in the first hand market"* or the Norwegian Food Safety Authority's *"List of approved establishments for fishery products and factory vessels"*, though these do not highlight whether the approved establishment has its main activity within fish processing or not. Entry on one of these registers merely states whether the establishment have fulfilled some objective criteria in order to buy or process fish.

Second, we need a competitive setting in which motives to integrate vertically exist. As will be further elaborated in Chapter 7.3, firms in the Norwegian fish processing industry are motivated to integrate vertically by a number of reasons, uncertainty in the procurement of inputs serving perhaps as the most pervasive argument. Still, other complimentary reasons exist in this competitive context.

Third, the industry must be composed by firms, which have undertaken vertical integration to a varying degree. Since we first and foremost are concerned with firm's procurement of the most important input factor, namely fish, the appurtenant direction of integration in this case is upstream – or backwards – towards the fishing fleet. In Chapter 8 we will map to what degree firms in this industry have undertaken upstream vertical integration, by first operationalising this variable, which show that this is in fact highly fluctuating from firm to firm in this industry.

A fourth demand set forward by our research design, is that we need very detailed data on firm level in order to study and measure both performance and level of vertical integration. Further, our research problem also requires detailed knowledge to the industry, the processes and the products brought forward by firms in this industry (Joskow, 1988). Additionally, it is called for in-depth knowledge of firms and the resources that can constitute potential competitive advantages in this empirical context, when leaning on the resource-based view.

In what follows, it will be shown that the Norwegian fish processing industry meets the demands which are developed above. We start our by reviewing the industry's fundamental surroundings and the value chain it belongs to. Then, the motives for integrating vertically in this industry are presented. And finally, descriptive data available for undertaking this research in this particular context outlined. These tasks provide a sound preparation before performing the actual tests on the vertical integration performance relationship. Introductorily, however, a brief review of earlier studies on vertical integration within fisheries is given, with emphasis on the relevance it bears on the research carried out here.

7.1.3 Previous research on vertical integration within the fisheries industries

Although a high number of researchers have addressed the spread and diffusion of vertical integration in different food sectors, there are only a limited number of studies – to my knowledge – where the fisheries industry has been under scrutiny. The few studies found are most often within bioeconomics or industrial organisation, and in most cases the analyses have concentrated on the effects realised at the fishing industry level – not the fish processing industry, which constitutes the next downstream level in this value chain. However, since the effects that deposits in the fishing industry can, and most often will, have repercussive effects in the adjacent value chain stage, some of the findings are worth noted here. Below, a short reference to studies of the most interest to my work is given, appearing in chronological order.

A suitable point of departure, is Clark & Munro's (1980) conceptual study, where they to their bioeconomical analysis of the harvesting sector add an independent processing sector. They analyse the implications this will have for the management policy (of the fishery) where governmental regulations and social welfare optimum are important and central scales. They first make it clear that the usual analysis of managing a common-property resource has ignored the processing sector, which is a safe omission as long as it is characterised by atomistic competition. However, when a highly competitive harvesting sector meets a oligopsonistic processing sector (the most usual in Western societies) then the processing sector should be included in the analysis. They further claim that the processing sector is usually a natural monopsonist in the first hand market since there is a scarcity of good sites for processing plants. Then, under the usual assumptions, they find that:

> *"If the monopsonist were able to integrate backwards, he would profit, not only by being able to capture the producers' (i.e. fishermen's) surplus in the harvesting sector, but also by virtue of the fact that his harvesting plans through time would no longer be distorted by an upward bias in perceived harvesting costs"* (p. 610).

The latter stems from the fact that backward integration will give the processor new information, not held earlier, which will restore his input ratios. This point clearly leads us to a motive for why processors integrate, and bring forward a reason for interpreting the input market as monopsonistic.

Another study in this line, bringing forward knowledge transferable to this thesis, is Wilson's (1980) research on the New England fresh fish market. He finds that even though this market seems to possess conditions not far from the perfect competitive one (atomism, small entry and exit barriers, near full info and homogeneous products) it deviates substantially from these when inspected more closely. For instance, information is unequally distributed (i.e. high levels of uncertainty) and ownership to boat offloading facilities sets severe limits to the number of buyers to each transaction. Instead of the expected injustice and resource misallocation one should expect from the problems of uncertainty and small numbers bargaining, he finds a market with a high variety of implicit contractual arrangements in which relative long-term bilateral exchange patterns have evolved between buyers and sellers as a response to the uncertainty and small numbers bargaining problems. He concludes, from his detail rich study in this specific market, that as the transactors realise – and act according to – their mutual dependency, a trustworthy relationship is established, under difficult circumstances. In the case where such bilateral arrangements are not reached, fishermen tend to sell to larger buyers or brokers, which minimises the information cost of the fishermen. Further, this market suffers from costly inefficiencies and reduced constraints on opportunistic behaviour when supply is short or in excess. Parts of the findings his analysis concludes with can easily be translated to the conditions prevailing in the setting under scrutiny here, like the existence of long-time bilateral relationship rather than a widespread use of vertical integration. Another interesting feature of his conclusions regards the product quality uncertainty, where the nature of the bilateral agreements results in situations where: *"...implicit product quality standards often tend to approximate a simple "acceptable" or "unacceptable" state and actual product quality falls to the lowest level consistent with acceptability"* (p. 503–4). Within the regime at work in Norway, where a minimum price is set by sales organisations, assumes a minimum standard to the quality of fish landed. If quality is poorer than the standard, buyers can underpay the price floor.

A third work in this stream of research is Acheson's (1985) study from the Maine lobster industry, an industry he localises between market and hierarchy. He shows a large number of firms who – horizontally as well as vertically – sell to and buy from each other, between whom, long-term bilateral relationships have evolved. In this industry environment, which he characterises as highly risky and uncertain due to unforeseeable price movements, asymmetric information and a great deal of opportunistic behaviour, no totally vertically integrated firm has emerged (controlling every stage of the value chain), and firms rather sell and buy to the same finite number of firms with whom they have developed ties. These ties help reducing risk and uncertainty, and give the market a relational character where prices alone do not clear the quantities traded, but is also influenced by the individuals at both end of the transaction. The transactional environment surrounding Maine lobster market calls according to Acheson, for hierarchical governance. Yet, he subscribes to three social factors that prevent this industry from being constituted by large vertically integrated firms: the agency or measurement problems stemming from supervising fishermen's effort at sea, their valuation of independence as self-employed tradesmen, and the property rights to lobster territories. The two first mentioned factors both apply in our setting and can help explaining why a development – not different from the Maine lobster industry – have occurred in our setting.

Gallick's (1996) study stem from an investigation the Federal Trade Commission did on the contractual arrangements between fishermen and processors in the U.S. tuna industry. The reason for the investigation was that U.S. processors paid less for domestic tuna than foreign tuna, and a main finding from the FTC study was that this price difference was not a sign of monopsony but more a result of processors' vessel co-ownership and non-price payments to tuna vessel captains. Additionally the price difference could be explained by the marketing cost included in auctioning of foreign tuna, whereas the common up front contracting for U.S. tuna (which mainly goes to canning – not fresh consumption) is more efficient in the U.S. market. One interesting feature he found was the alteration in vertical ties in the industry that followed in the wake of the technological leap in the harvesting sector as purse seiners took over for bait boats. As this technological shift took place, co-ownership became the rule since the expected costs of exclusive dealing arrangements increased. Earlier, bait boat captains were less vulnerable for hold-up from processors since processors' reputation was important to obtain landings in this competitive industry. But as the purse seiners entered the market with larger catches and lower landing frequencies, the threat of opportunism from processors increased – since they could delay unloading of the vessels until the captains accepted their price terms. In Gallick's view the use of co-ownership and exclusive dealing contracts made both vessels and catch relationship specific assets better off, since the potential performance monitoring problems, accruing from full vertical integration, were by-passed.

Koss (1999) give a fairly extensive analysis of the nature of transactions in the intermediate market for raw fish (in British Columbia, Canada), with special emphasis on their inherent asset specificity. According to her analysis, the trade with raw fish between fishermen and processors suffers considerably from the existence of significant quasi-rents stemming from the time and space considerations. This temporal and geographic specificity increase as potential buyers become fewer, the more perishable the catch is and the more dispersed the buyers are. She finds, in her empirical analysis, a strong correlation between the vertical ties between fishermen and processors (measured by whether the processors had majority, minority or no ownership to the vessel with which it transacted) and the degree of temporal specificity in the transactions (measured by the type of gears used and their suitability towards the processors production technology). The situation she describes does not differ much from the setting studied here, which underlines the needed emphasis on context specific knowledge in order to understand the motives of economic actors that leads to contractual arrangements rather than vertical integration.

The Norwegian aquaculture industry has also been studied with regards to vertical integration. Tveterås & Kvaløy (2003) give an assessment of the spread of vertical coordination in the salmon supply chain, and find that it was limited until the early 1990's but has become more widespread thereafter. The most striking examples are huge companies (as opposed to the SMEs in the industry's childhood) that control every production activity from hatcheries to export companies after severe integration activity – both horizontally and vertically. This development, they assert, has occurred due to a long list of explanatory incidents and motives, and among them, the following: (a) A shift in focus for cost reduction from primary production to downstream activities like distribution and processing. (b) Economies of scale have lead to horizontal integration in primary production, which in turn has played a role in the increased vertical coordination – both upstream and downstream. (c) Increased focus on food safety together with increasingly demanding food retailers is better served by larger producers and better ensured through vertically coordinated activities.

Dawson's (2006) approach to vertical integration in fisheries is somewhat different from the preceding in that he explores how a regulatory change (i.e. the introduction of an individual fishing quota program in the U.S. halibut fishery) alters the degree to which vertical integration is undertaken by the industry participants. The IFQ program was introduced in 1995 as a response to immense overcapacity characterised by an Olympic fishery where the fishing season had been reduced substantially to only two or three allowed fishing days per year per vessel. He finds that the IFQ program met one of its primary objectives, namely to ensure the small scale nature of this fishery. However, as a consequence of the longer fishing season, the structural changes were experienced in the processing sector since more fish went to fresh fish products (as opposed to canning earlier). The reduced 'stress' in the harvesting sector weakened the vertical ties between fishermen and processors, since fishermen were not longer forced to make a quick delivery in order to continue fishing within their limited season. As such, the bargaining power shifted from processors to fishermen, leaving the processing sector with reduced profits. Dawson's findings point to the effect on vertical structure from this governmental regulatory reform, was one with weaker rather than tighter vertical ties appeared. Inevitably, this indicates to the complexity of factors influencing the degree of vertical integration – from Dawson's point of view – at industry level.

The last study on vertical integration within the fisheries sector mentioned here – deviating from the chronological order of the previous – is also the one with the closest resemblance to our study. Flaaten & Heen (2004) visit the same setting as I do, and compare the profitability of Norwegian trawlers, separating between vessels with and without geographical delivery conditions, and those delivering according to the obligation and those not doing so. Even though vertical integration is not a specific theme, the development of such delivery obligations is inextricably connected to vertical integration, since trawler licenses were originally only granted to processing plants who wanted to 'lengthen' the seasonable supply from the coastal fleet. They show that average profitability was highest for vessels without delivery obligations, while those not complying with the obligations had slightly higher profitability than those who pursue the purpose of the license. They furthermore find that the average price achieved for fish follow the same pattern – obligation free vessel are paid the best, in preference to those not complying and complying to the license regulations. The latter finding might very well be because the most profitable vessel group is younger and have the ability and technology to freeze the fish on board: a commodity auctioned to a greater market which acquire higher prices. However, from the eyes of the fleet, it could also be due to unfavourable transfer prices, dictated by the owning processor; a curse of being denied access to well paying markets.

The brief description of earlier research contributions analysing different sides of vertical integration within different settings related to the fisheries industry, give additional knowledge to the mentioned theoretical and empirical analysis, and contribute to develop the understanding of this complex phenomenon. Furthermore, they help translating the problems encountered in theoretical analysis to a setting not far from the one studied here, which is the matter visited in the following section.

7.2 The Norwegian fish processing industry

Situated between the raw material providers and the seafood traders and exporters as it is, the Norwegian fish processing industry have a long history as a vital employer and important contributor to the business activities in many local communities along the lengthy coastline of Norway. Even though it belongs to a highly dynamic and competitive business environment today, with few entry barriers and high turnover (in terms of firms going in and out of business), it has not always been that way. In the presentation of this industry a brief history, together with the regulatory environment surrounding this industry will be given, before vertical integration in this industry is explained to a greater detail.

7.2.1 A brief historical outline of the fisheries industry

Fishing has historically been an important activity in providing nutritious and essential meals to the coastal population, and has in later centuries developed to serve as the major income generator for thousands of households. The growth of a fish processing industry – serving local fishermen in one end, and international markets at the other – started in the 18th and 19th century. Then, especially in northern Norway, merchants were granted sole rights for commercial activities in most important fish harbours where control of the first hand fish sales were the most important privilege. The fisheries industry has always been an open one where exports have generated the major incomes, and the oldest examples include dried fish exported to Italy and dried (stockfish) and salted fish (clip fish) exported to Portugal and Spain. These products have been manufactured for centuries, and serve as examples for the most important single species in the Norwegian fisheries industry – for the fishing fleet, the processing industry as well as the export of wild fish – namely cod.

The old system where merchants owned – and where given sole legislative rights from the Crown – and traded fish both at first hand and in end markets, was in fact a monopsonist system. These merchants ("væreiere") were sole demanders for fish (and often for labour as well) in the fishing villages, and they had the fishermen in their power since the fishing fleet was not fully motorised until the second half of the 20th century and therefore had limited mobility and range of action. However, in order to participate in the most important fish seasons – like the Lofoten-fishery and cod fishery in Finnmark in the spring – fishermen covered vast distances by use of oars and hand power, or sails.

The modern fisheries industry saw the light of day at the end of the interwar years. As the fleet became motorised to a larger degree, and the political winds blew in favour of the Social Democratic party, fishermen gained more bargaining power and legislative amendments and new laws called for greater influence by the fishing industry. One of these were the Raw Fish Act ("Råfiskloven") of 1938 (later 1951) which had – and still has – a major impact on distributing power between the chains in the fisheries industry. By virtue of this act, the fishermen's own sales organisations were given statutory monopoly in the first hand sales of fish. The sales organisations were organised either as monopolists within a geographic area, or as monopolists for classes of species or single species (pelagic). By 1960 there were 16 such legally protected sales organisations (Gerhardsen, 1964: 26), of which only six still remain today, whose objective is to ensure high and stable prices and reliable terms of payment, normally by ways of setting minimum first hand prices determined through negotiations with the processing industry umbrella organisations. The only first hand sales of fish that are not attended to legally protected sales organisations is the farmed fish[42] sales.

Needless to say, the institutional embeddedness that this industry finds itself belonging to – which will be dealt with under the next subheading – has contributed fairly to the development of this industry. A brief historical description of some aspects concerning this industry which shed light on the main stages of development for some chosen years after 1960 is given below in Table 4.

Table 4 Descriptive statistics on the historical development of units, value and volumes traded in the Norwegian fisheries industry. Volume in 1,000 tons, value in (nominal) mNOK

	Fishing industry				*Fish farming volume*	*Fish processing industry*		*Export(-ers)*	
	Fisher-men	*Vessels*	*Volume*	*Value of landings*		*Firms*	*Employ-ment*	*Number*	*Value*
1960	49,720	41,636	1,342.8	664.6	-	485[3]	13,065[3]	-	791.2
1970	31,884	36,201	2,707.2	1,426.4	400	510[3]	13,039[3]	-	1,359.3
1980	25,140	26,408	2,400.2	3,501.3	7,980	657[3]	14,041[3]	About 350[1]	2,948.5
1990	20,475	17,391	1,591.6	4,976.5	150,651	494[3]	10,019[3]		13,002.4
1995	17,160	14,189	2,523.7	8,218.2	277,226	479[2]	10,606[2]	499[4]	20,095.0
1998	15,141	13,248	2,860.7	10,522.1	410,449	478[2]	10,554[2]	477[4]	28,164.5
2001	13,679	11,922	2,686.3	11,440.0	508,497	461[2]	9,786[2]	487[4]	30,645.5
2004	12,677	8,184	2,519.7	10,343.2	634,850	383[2]	7,483[2]	532[4]	28,273.6

Sources: Directorate of fisheries, Statistics Norway (various years of Norwegian Official Statistics: Fishery Statistics, Fish Farming, Industry Statistics, External Trade and Historical Statistics), [1]Hallenstvedt (1990), [2]Bendiksen (Bendiksen & Isaksen, 1998; Bendiksen, 1999; 2002a; 2005), and [3]Ministry of Trade and Industry (1998), [4]Norwegian Seafood Export Council.

In short, several structural developments can be read from the table. First, within the fishing industry, we can see the number of fishermen (having fishing as sole or main occupation) have decreased drastically in the period. From 2004 to 2006 the number of fishermen fell by another 1,461 persons, where the decennial average exit of fishermen from the fleet has been about 30 per cent. Also, the decline in number of registered vessels shows a similar development as for the number of fishermen. In 2006 the Norwegian fishing fleet consisted of 7,305 registered fishing vessels, showing a 49 per cent reduction since 1995. However, the efficiency and productivity of the fleet and fishermen has increased substantially as roughly the same amount of fish is taken with much less factor input (at least regarding labour) than earlier. The volume caught (seaweed excluded) has in the period 1975–2005 fluctuated within a range of 3.4 (1977) and 1.6 (1990) million tonnes, with an average of 2.5 million tonnes. However, since some 1.5 million tonnes on average have entered the fish meal and oil production, the available raw material quantity for the fish processing industry have been about 1 million tonnes: though with yearly fluctuation ranging up to 26 per cent. Since 1995, however, the annual fluctuations in overall supply have been rather small in a historical perspective, and have, with one exception (a 12 per cent reduction in volume from 1997/98), been within the range of +/- 10 per cent. The value of landings, as recorded in the last column under the fishing industry, has been increasing in the whole period. In terms of real value

[42] Also for farmed fish it existed a legally protected monopoly, but the Fish Farmers Sales Organisation went through a devastating bankruptcy in the early 1990's, after trying to stabilise prices for farmed fish in end markets by freezing in parts of the production for thereby controlling the supply (Bjørndal & Salvanes, 1995). Thereafter, the trade with farmed fish on first hand has been subject to 'free trade' and voluntary buyer-seller relationships, like in other manufacturing industries.

(1998-NOK), the catch in 1960 was worth 5.7 billion NOK, just below the *real* catch value in 1989 and 1990. The 1970-catch value of 8 billion NOK is in real terms just as high as in 2003, and the closest to the mean in the period 1960–2005. The real value of landings has also fluctuated heavily from year to year, where its standard deviation attains 15 per cent of the mean real value of landings in the period1975–2005.

Second, we can see that the Norwegian aquaculture industry – farming mainly Atlantic salmon (89 per cent of the volume in 2004) and trout (10 per cent) – has undergone a rapid and substantial growth in the period. Since 1990 the quantity farmed and sold had increased by extraordinary 320 per cent. The employment effect from this activity is, however, limited and in 2003 about 2,500 persons were employed permanently, which is even less than the employment in 1995 (about 2,900 persons permanently). But this industrial new-comer has in export value terms grown to be a giant. From an export value from Norwegian seafood in 2005 reaching 31.7 billion NOK, the share stemming from aquaculture reached 47 per cent. In 1998 the corresponding ratio was 35 per cent, whereas in 1980 it was only one per cent[43].

Third, the two columns in Table 4 which deals with the fish processing industry, are perhaps those that display the greatest stability. However, the historical trend is negative, both for the number of firms and employment in this sector. Also, since the historical data for this industry are gathered from different secondary sources, we refer here only to the latter four rows, stemming from *Driftsundersøkelsen for fiskeindustrien* (Bendiksen & Isaksen, 1998; Bendiksen, 1999, 2002a, 2005), an annual study which assesses earnings and profitability in the Norwegian fish processing industry. From that study, we can see that the number of firms in the industry has fallen by 20 per cent between 1995 and 2004, while employment has decreased by 30 per cent[44] in this industry in the period in question. Since this is the focal industry in this thesis we go further behind the descriptive figures on number of firms and employment. Profitability in this industry showed a peak in 2004, nearly as high as in 1998 – the best year ever – and more than 61 per cent of the sample had a positive EBIT (earnings before interest and tax). In 1998 that ratio was 68 per cent. In 2004, the total revenue in this industry amounted to 22 billion NOK, which converted into 1998-prices constituted about 19.5 billion NOK or 80 percent of the total sales value in 1998. Another feature concerning this branch of the fisheries industry, which will be further elaborated later, is the share of costs of goods consumed to the value of output is rather large. In 2004, this ratio was 74 per cent, where raw material (i.e. fish) makes the greater part of goods and services consumed.

Finally, the industry link farthest downstream in this value chain can be labelled the seafood exporters. The number of exporters has been varying with the regulatory schemes surrounding this activity, and before the new fish exports act entered into force in July 1991 – as will be further referred to under the next heading – there is no exact knowledge over the total number of seafood exporters. Hallenstvedt (1990), however, maps the number of exporters authorised by the many seafood exports councils (i.e. exports or trade committees for salt fish or clipfish, salted herring, salted roe, stockfish, canned seafood, frozen fish and fresh fish) and found it to be about 350 in 1987/88. Since one producer or exporter could hold several licenses from different exports councils, this is a too broad estimate, meaning that the exact number of exporters were less. In order to put the fisheries industry in a favourable light, assessments are often done with reference to the export value from Norwegian seafood, which holds a 2nd place after metals (oil and gas excluded). In terms of traditionally export value, the fisheries industries share of total Norwegian exports in 2004 was approximately five per cent (or nearly

[43] In 2006, Norwegian seafood export value from farmed fish was for the first time greater than that for wild fish.
[44] According to Driftsundersøkelsen (Bendiksen, 2001) the highest employment in the industry was in 1997 with a total of 11,157 employees. This implies an employment reduction by one third in the period 1997–2004.

10 per cent when oil and gas export are excluded). Similarly, when deflating the exports value to fixed 1998 prices, we find that the Norwegian seafood export reached a peak in 2000, due to all-time-high export prices for farmed salmon. And even if the nominal value of exports in 2005 (31,7 billion NOK) was 300 million higher than in 2000, the real value of the 2005 exports was 2 billion NOK less than in 2000, and made only fifth place on the top-ten seafood export years in real terms.

When summarising the development in the Norwegian fisheries industries the latter decades – simultaneously distinguishing between the fishing, fish farming, fish processing and seafood export industry – the most important features have been the following:

The fishing fleet has rapidly decreased, both in terms of units and fishermen, moving from small scale fisheries to more capital intensive fisheries with higher productivity (the average catch per vessel in 2001 was three times higher than in 1970). In fact, in 2004, some 1,913 whole year operated vessels accounted for 94 per cent of the volume of landing, of which 254 large vessels (above 28 meters) make up for 77 per cent.

The aquaculture industry, mainly salmon farming, has emerged during the last 25 years. From small scale pond farming and problems with diseases, marketing and market access in the 1980's and early 1990's it has grown to be a substantial and important industry, with a limited employment effect, however. Today, about half the export value from the fisheries industry stems from fish farming, and more than 80 per cent is sold unprocessed as gutted, whole fish.

The fish processing industry have undergone major structural changes, leading to fewer small processors within conventional production (drying and salting) and medium sized fish freezing plants. The effect on employment has been harsh as well, where estimates show a 24 per cent decrease during the period 2000–2005 (Bendiksen, 2005). Many local fisheries communities have lost their main employer and only purchaser of fish.

The fisheries industry has always been export oriented and competing in international markets. The globalisation process has impacted every chain in this industry, where it seems like its role as raw material manufacturer and exporter has become enhanced and increased. The increased value of exports have to a large degree it's origin in an increasing farmed fish production, where the deregulation of seafood export system has lead increased numbers of exporters and an atomistic adaptation in this link of the value chain.

7.2.2 The regulatory environment

In general, the fisheries industry is a highly regulated business environment, where the Raw Fish Act serves as only one of many statutes regulating the economic activity of the value chain members. Most of the laws and regulations encounter the fishing industry, as is the primary producer, and the corresponding catch of fish, but they impact of course also the subsequent links in the seafood value chain as well. Beneath I will present some statutory matters concerning the fish processing industry, emphasising those that will affect the strategic adaptation towards the fishing fleet: some of which are only of historical matter, while others are still in effect.

As mentioned, the Raw Fish Act gives sales organisations, controlled by fishermen through their organisations, the exclusive rights to the first hand sales of all fish and crustaceans (except for farmed fish). The sales organisations' utilisation of minimum prices for fish clearly reduces the incentives for upstream vertical integration since the chance for effectively using transfer pricing policies is rather limited, and a floor-price must be upheld at all times.

Second, the Participation Act ("Deltakerloven") from 1999 (earlier 1972) states that in order to utilise a vessel for occupational fishing, the vessel owner or major ownership share of the vessel, should, as a principal rule, be held by an active fisherman. The law therefore prohibit fish processing firms from taking other than minority ownership interests in vessels that are registered for fishing, and carry participation access or licences for specific fisheries, which clearly limits the possibility for upstream vertical integration in the fish processing industry. There are, however, no legal obstructions for the opposite: A fisherman, or the owner of a fishing vessel, can acquire a fish processor fully, or freely erect own processing capacity, under compliance to objective rules similar for all processors (governmental approval of quality, facilities and financial warrants for the ability to purchase fish). However, exemptions from this principal rule can be made, and was so frequently in the 1950's to 1970's. Then, from regional policy reasoning, a number of fish processing firms, were granted cod trawl licences and allowed the right to own vessels, to ensure a stable supply to large fish filleting and freezing plants, in order to secure employment in communities relying heavily on fish processing firms, and improve profitability (Dreyer, Isaksen, Bendiksen, & Rånes, 2006).

The previous Trawl Act ("Trålerloven" of 1951 - now incorporated in the Participation Act), also limits fisheries industry firm's from crossing over inter industry links effectively, since the right to process the catch on board becomes apparent in individual licence terms for each vessels. Vessels are not allowed to set up or expand processing facilities on board, unless a preceding authorisation from the governmental agencies exists. This also protects parts of the fish processing industry from fiercer competition. Additionally the individual vessel licenses, for cod trawlers, may in some instances reduce the mobility and profitability of the vessel operations since they are subject to special delivery obligations (Flaaten & Heen, 2004) which specify that some, or all of the catch shall be delivered to a named processing firm, geographic places or regions. These obligations are closely linked to the exemptions from the Participation Act, and in 2004 such delivery obligations where incumbent on about one third of the approximately 100 cod trawlers operating in Norwegian waters (Dreyer *et al*., 2006).

Further, some explanation should be given to prior legislation and political treatment of this industry, as it has influenced the conditions under which the firms studied are operating. Not only have the transfers between catch and production been regulated by law, but also those between processors and exporters. By the Fish export Act ("Fiskeeksportloven") of 1955, the right to export seafood products was regulated by law, where export councils for each product range gave regulations on *who* could export to *which* markets. In practice the export regulation was administered by the exporters themselves which served as foreclosure of (or at least weighty entry barriers for) outsiders without export licence, which had to export through the approved exporters. There were, for instance, only three legally approved exporters of frozen fish, and corresponding limitations for other product groups. After the revision of the Fish Export Act in 1990 the number of export councils was reduced to only one and objective rules on who could be approved as exporters downscaled the entry barriers considerably. In fact, at the end of 2004 there were 532 approved Norwegian seafood exporters. Of these, many export license holders are also fish processors, which only export some of their production and rely on 'professional' exporters for most of their output.

Another formerly operating law which regulated the structure of the fish processing industry was the Fish manufacturing Act ("Fisketilvirkningsloven") from 1963, which was meant to adjust the extent of capacity expansion within fish freezing or canning. Its purpose was to protect parts of the processing industry from potential competitors when features of the fish supply, production, or sales conditions spoke against it or when it was not in the interest of society. The act was set aside in the early 1980's which also contributed to a downscaling of entry barriers in this part of the industry and increased competitive pressure.

As a part of, but still detached from, the regulatory regime that has surrounded the industry was the General Agreement between the fishing industry (the fleet) and the Government which was in effect from 1964 until 2004. In short, since the fishing industry was considered so vital for Norwegian communities and economic life in general, rather large amounts of support was aided over Government budgets in order to increase the profitability in the fishing industry and to provide for fishermen to obtain revenues on a level with income in other occupations. The Fishermen Association could demand support negotiations with the Government when the earning capacity for all-year, well operated and facilitated vessels under normal catch conditions was low compared to (employment) earnings in other industries. Large amounts where transferred to the fishing industry over this scheme, with a NOK 1.4 billion peak in 1980 which constituted about 30 percent of total first hand sales value that year (Isaksen, 2000). Also the fish processing benefited from these schemes, especially since large shares of the total support (about 45 per cent in the period 1977–1999) were distributed as a price subsidy constituting a price 'wedge' between the amount paid for fish by the fish processing industry and the amount obtained by the fishing fleet. The support was in later year gradually reduced and constituted only about NOK 50 millions, as this subsidy scheme was phased out in 2004. One possible effect form this large scale (price) subsidy could have been a harvesting industry much larger than 'natural' and substantial overfishing and overcapacity since prices were not allowed to mirror the true value of the resource. The considerable decline in number of units – in both the fishing and processing industry – as this scheme was gradually phased out after the mid 1980's, can be taken as a sign of over capacity, though since the deregulation and liberalisation of these industries occurred at the same time, it is hard to isolate the single effects.

In Figure 3, the main acts regulating and influencing fish processing firm's ability to integrate vertically in the Norwegian fisheries industry are depicted in a value chain perspective.

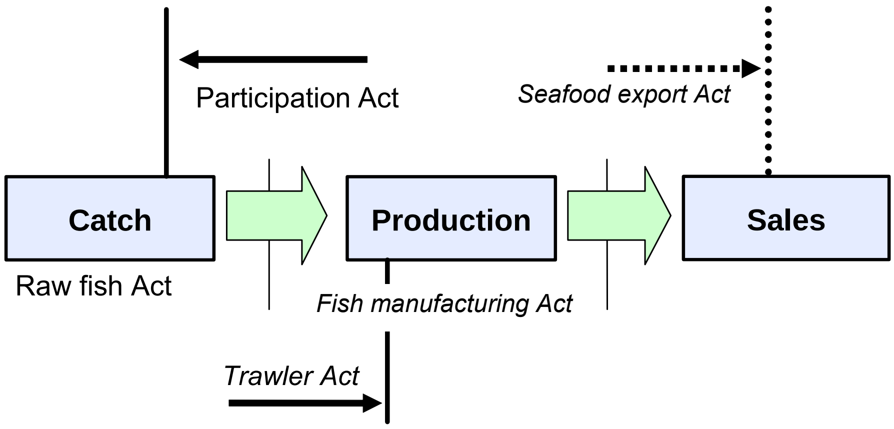

Figure 3 Important statutes influencing the inter-link integration mobility in the Norwegian fisheries industry. (Amended or repealed statutes in italics). Source: Dreyer (2001)

The figure shows that several regulatory schemes set limits to the ability of companies to integrate vertically across the value chain stages in the fisheries industry, where the boxes and arrows illustrates a stylized example of this value chain. In short, by starting with the altered or repealed laws *(in italics)*, going upstream the value chain: The Seafood export act (of 1955), which was replaced by a new one in 1990, set severe limits to which firms was approved as exporters, thereby limiting the number of exporters and heavily influencing the competitiveness and ability of firms to appear in international markets. The Fish manufacturing act served as an effective barrier for potential competitors to enter the freezing sector of the fish processing industry, and as a barrier for expanding capacity for firms already in (preemptors). The Trawler act, and its clauses which demanded individual licences for vessels in order to trawl for fish, are also retained by the incorporation in the Participation act (1999). These purviews also require special permissions in order for trawl (and other) vessels to attain on board processing activities normally carried out in the fish processing industry, thereby limiting the fishing fleet's ability to perform processing activities on board.

The Participation act gives registered fishermen the sole right to be majority owners of registered fishing vessels. However, there is no law against fishermen or vessel owners to set up fish processing firms – a practice that to some degree has been undertaken in preceding years. One facet of the body of laws surrounding this context which does not appear from Figure 3 is that in conformity with large scale fishing vessels, the fish farming industry is also regulated with licenses: In order for firms to farm fish for food, have hatcheries or even for intermediate storing of wild caught fish (also called capture-based aquaculture) one needs a licence issued by the authorities. Finally the Raw fish act the give fishermen-controlled sales organisations a sole – legislative protected – right to control the first hand sales of all fish (crustaceans and marine mammals included, farmed fish excluded).

All of these laws and regulatory schemes have direct impact on the degree of vertical integration undertaken by firms operating within this context. The purpose of the next section is a closer inspection of the fish processing industry, particularly on what concerns the way and ability of integrating vertically.

7.2.3 The Norwegian fish processing industry and vertical integration

The fish processing industry's stage in the seafood value chain is situated between raw material suppliers in form of fishing vessels and/or fish farmers, and those bringing the (processed) fish to the marked. Not surprisingly, there are seafood processing companies that carry out all the activities in the value chain: firms who harvest the main raw material at sea or farming it in own sea pens in coastal areas, manufactures it into marketable products and sells it internationally or domestically markets. However, as a main rule, the division of tasks is undertaken by separate units limited to only one of the stages in the value chain.

As in other sectors of economic life, the organisations we find in the fisheries industry are 'open systems' depending on their environment, which to a high degree engages in exchange relationships with other organisations. For the fish processing industry, the costs of fish that entered production constituted on average nearly about 83 per cent of operating revenues in 2003, where the costs of total consumed goods amounts to a 90 per cent share (Bendiksen, 2004). It should be given, then, that there exists a relative high mutual dependency between the adjacent stages (vessels and processing plants) as fishermen have few other buyers for their fish, whereas the processing plants have next to no other sources of supply. But as the example of the largest cost component suggests, when it comes to the price for the input, the two industries have, of course, totally opposite interests despite their mutual dependency.

Within this 'input – throughput – output' paradigm constituted in the fish processing industry, we find a great number of firms with vast heterogeneity over a number of dimensions. As accentuated by Table 4, the number of fish processing firms which entered the analyses in "Driftsundersøkselsen" in 2004 was 383 (Bendiksen, 2005). The average firm had a sales revenue of 62 million NOK, but with a large spread ranging from 0.5 to 900 million NOK (with a standard deviation of 105 mill NOK). Further, underlining the heterogeneity among firms, while the average firm employed 20 persons, the smallest had only one person on the pay roll, while the largest had about 256 employees. The firms also undertake very different manufacturing processes, where various products offered in the markets. While some conventional production processes are rather labour intensive and builds on ancient manufacturing techniques, like stockfish production, others, like fish filleting and freezing, are labour intensive as well, but require modern technology and capital intensive facilities. While stockfish producers have based their production on a seasonal harvesting scheme, larger freezing plants are in need of greater continuity in their supply.

As outlined above, when subscribing to the idea that this industry is an important contributor to Norwegian economy, the value of exports is often emphasised. Even though the overall significance of the fisheries industry is modest, its reputation domestically as well as abroad is often exaggerated and to a larger degree associated with Norway than for instance the oil and gas production. In Isaksen & Bendiksen (2002) the fisheries industry's share of GNP is estimated to be about 1.1 percent in 2001, and with a corresponding share of total employment. However, for many communities and even counties, the fisheries industry's significance can not be overstated, for instance for Finnmark, where the fisheries industry's share of the regional gross product and employment in 1997 amounted to 11 per cent (Isaksen & Bendiksen, 2002) – about the same as the Icelandic economy's fisheries 'dependency'.

In the setting described, a fish processing firm which purchases fishing vessels serves as an example of upstream vertical integration, whereas the acquisition of an exporter will be a case of the opposite. Below is a simple model of the Norwegian seafood value chain, which easily visualises the distinction between upstream and downstream integration. The arrows visualise the flow of goods between the value chain actors, where an acquisition (or capacity creation) in line with the direction of the arrows is defined as *downstream* (or forward) vertical integration, while a firm investing in the opposite direction 'commits' *upstream* (or backward) vertical integration. The different size of the ellipses is merely mirror their relative importance for the focal stage – the Norwegian fish processing industry – and one should bear in mind that the graphics do *not* take all possible flows of goods into consideration. For instance, the fishing industry does in some occasions deliver fish directly abroad or to retailers/consumers, just as it can be argued that large shares of the fish farming production go directly to export without passing through the stage of the fish processing industry.

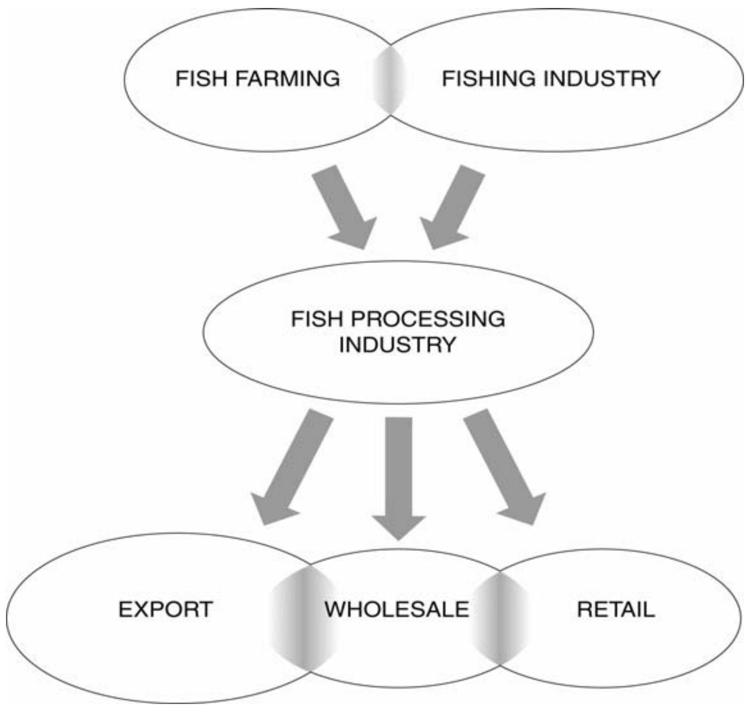

Figure 4 The Norwegian fisheries industry; the seafood value chain

A feature of the Norwegian fisheries industry that is omitted in Figure 4 is the direct exports (or domestic sales) from primary producers, which bypasses the processing industry. From the emergence and growth of the aquaculture industry, it has been an increasing part of the trade with Norwegian seafood. Additionally, the shift in the fishing industry, towards on board freezing facilities in larger fishing vessels, and the growth of large cold storage plants for smoother logistics in the trade of frozen fish, has in many cases altered the traditional flow of raw material in this value chain. Formerly regionally restricted Norwegian fish have become a part of a global business environment, and through this extended market for fish, increased competition has been the outcome (Bendiksen & Dreyer, 2003; Bendiksen, Dreyer, & Grønhaug, 2003). This has in return impacted the traditional raw material flow in this value chain, leading to increased competition in upstream markets and to some degree altered traditional production processes and technology in order to process from frozen raw materials.

Firms that have undertaken upstream vertical integration in the fish processing industry have to some degree been able to avoid this increased competitive pressure created by these new distribution channels and possibilities. However, the new possibilities that have emerged in the first hand market of fish have also brought attention to the alternative price of raw material traded internally between jointly owned vessels and processing plants, and served as eye-opener for the potential earnings that can be realised when fish is sold to world market prices, not minimum prices.

This calls for a closer attention to what is the most appropriate way of integrating vertically, or identifying vertical integration in the fish processing industry. Here, it will be argued that the 'salvating' way of integrating vertically is by ways of avoiding the increased competitive pressure on first hand – i.e. upstream integration – towards the fishing fleet. The arguments are several: First, as mentioned, one can avoid (some of) the competitive pressure in the first hand market for fish. Second, by integrating upstream, the possibility of taking part in the value added generating extracting process, which is higher there than in the other end of the value chain, becomes feasible, and can contribute to increased financial performance for a profit maximising firm. Third, the entry barriers in this end of the seafood value chain are considerably higher than towards the product market, which limits competition and eases the process of creating and sustaining competitive advantages. The possibility for following such a strategy is severely limited by the legal framework, which makes vertical integration in the fisheries industry deviate from textbook cases where free enterprises are able to expand as long as they do not foreclose competitors or exercise dominating market power.

7.3 Contextual motives for integrating vertically

In the forthcoming, I will argue for different motives at work in our empirical setting when upstream vertical integration towards the fishing fleet is considered, regardless into which taxonomy of the above mentioned theories it falls under.

The intentions mentioned here to integrate vertically are by all means not complete, in the meaning that they do not cover all aspects of economic life in this industry that might induce the undertaking of such strategic action. The list might even exclude important moderators to which degree backward vertical integrated will be exploited, but is to the best of my knowledge the most important ones. However, the motives at work in this context might – as shown in the theory review – very well be set off by other environmental conditions at effect, making vertical integration a suboptimal solution to the initial problem. As underlined by the resource-based view, specific industry driven incentives to integrate might very well not be feasible for firms that do not possess the strategic resources necessary in order to take advantage of backward vertical integration as a strategic weapon. Again, the limited ability of downstream managers to optimally utilise the assets and resources acquired in the upstream industry can serve as an example (Williamson, 1975; Flaherty, 1981; Subramaniam, 1998).

Furthermore, different theoretical contributions do to some degree reach different conclusions regarding vertical integration as the correct strategic action to the same context specific characteristics. For instance, Stigler (1951) and Harrigan (1983a) draw the opposite conclusions regarding the right level of vertical integration based on industry age, and there is considerable discrepancy in scholars' advices regarding vertical integration in the face of technological uncertainty. This will, however, be further elaborated under Chapter 7.4.

7.3.1 Unpredictable supply – primary uncertainty present

The supply of fish to the fish processing industry can be characterised by a very high level of uncertainty (Prochaska, 1984; Dreyer, 1998; Ottesen & Grønhaug, 2003; Dreyer & Grønhaug, 2004), both in volume of landings and species, as it is subject to the Lord Almighty's control over climate, weather and various biological factors. Also catch attributes like the size of the fish, the composition of species in landings and the quality of the fish vary considerably. The latency of these uncertainties in our research setting – independent of the strategic moves and actions of competitors and co-operative partners – corresponds with what Williamson (1989) label *environmental* or *external* uncertainty, what Milliken (1987) label *state* uncertainty, and will here be categorised as *primary* uncertainty, analogous to Sutcliffe and Zaheer's (1998) and Ottesen and Grønhaug's (2003)treatment.

The fish processing industry face uncertainty on many arenas, for instance in volatile end markets as well as the actions of competitors, but the principal source of uncertainty is found in the source of supply. Ottesen and Grønhaug (2002; 2003) for instance, show that managers in this business environment emphasise the upstream markets when assigning significance to market orientation. Dreyer and Grønhaug (2004) find that supplied volume to this industry are characterised by much higher fluctuations than for instance input prices. They also assess the product mix and industry profitability as highly turbulent.

In Figure 5, the uncertainty present in this industry, regarding the supply of fish is depicted by means of annual quotas and monthly landings for cod and herring in 2004: the two most important species with regards to value of landings.

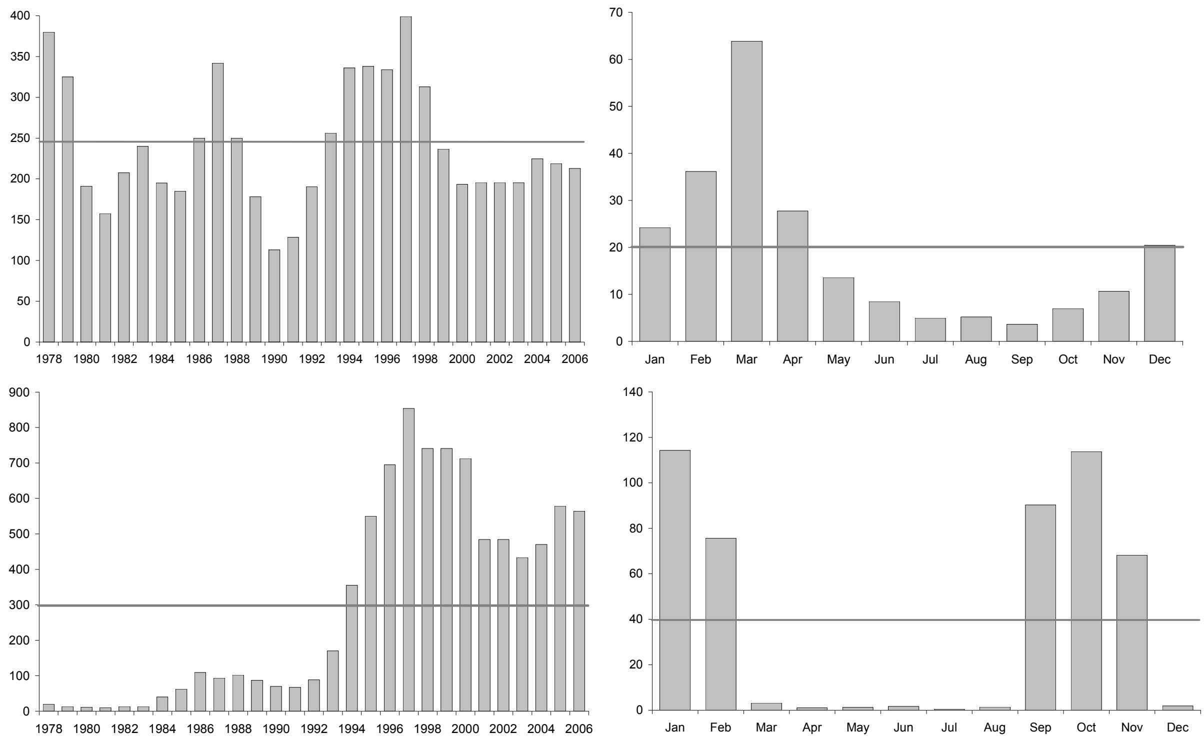

Figure 5 Annual Norwegian quotas (1978–2006) and monthly landings (2004). North-East Arctic cod (upper graphics) and Norwegian spring spawning herring (lower graphics). 1,000 tonnes. Source: Directorate of Fisheries and Marine Research Institute

The illustration to the upper left show annual cod quotas for the Norwegian fishing industry – as bilaterally set by The Joint Norwegian-Russian Fisheries Commission – from 1977 (as the 200 nautical mile exclusive economic zone was established outside the Norwegian coast line) to 2006, ranging from 113,000 tonnes (1991), to 399,000 tonnes (1997). The horizontal line show the average cod quota in the period, 245,000 tonnes, of which only nine of the 29 years in question are within a 20 percent limit of the average annual quota. The standard deviation from the average amounts to 75,000 tonnes. The rather unusual stability the latter seven years is partly due to a recently introduced allocation rule (2003) stating that whatever stock estimates coming from the International Council for the Exploration of the Seas (ICES), annual quotas are not allowed to deviate more than +/- 10 per cent from the previous year, in order to secure stability and predictability for the fisheries industry. However, as shown to the upper right in Figure 5, the landings of cod, on a national level, still fluctuates heavily within the yearly catch seasons as well. In 2004, monthly landings averaged 19,000 tonnes (as shown by the horizontal line) whereas the related standard deviation amounted to 17,500 tonnes. In March, landings peaked with 64,000 tonnes, whereas in September only 3,500 tonnes were landed. This pattern of landings repeats it self more or less annually due to the seasonality in the fishery, where about 80 per cent of the cod quota is taken during January to April. This is due to the hard catch pressure set in by the fleet as the cod is on its way to spawn – or spawning – in the Lofoten area, and the coastal fishery for cod in the spring along the Finnmark coast, as younger year-classes of cod follow and feed on the capelin on it's way to the coast where it spawns. During these two seasonal coastal fisheries the abundance of cod is at the greatest and most easily caught, resulting in high volumes of landings to the least possible cost. But the weather during winter and spring in North-Norway, where the cod is caught, makes the predictability of catches from day to day, or week to week, difficult. Like the annual quotas, the uptake in the spawning fishery in Lofoten and the spring cod fishery in

Finnmark is highly fluctuating, due to the strength of the year classes, the weather, the capelin biomass, economical viability of competing fisheries, and other influential aspects.

For the annual quotas of (Norwegian spring spawning) herring, as shown in the lower right graph, the fishery in late 60's and early 70's almost wiped out this species, and commercial fishing for herring did not recur until the late 1980's and early 1990's. The average quota in the period was nearly 300,000 tonnes, with a corresponding standard deviation only 10,000 tonnes lower, and only one of the annual quotas in the period was within a +/- 20 per cent range[45]. While both herring quotas have been relatively stable in recent years, varying between 430,000 and 580,000 tonnes in the period 2001–2006, the inter-yearly fluctuations show vast variations. In short, practically all herring is caught during January/February and September to November as shown in the low right graph of Figure 5. It literally gives no meaning to speak of average monthly landings; in fact its standard deviation exceeds the average of 40,000 tonnes with 9,000 tonnes.

The graphs show that volumes can be said to vary substantially both between and within years. There are huge fluctuations between years on which quantities can be expected landed. These fluctuations are qualitatively different from the intra-year fluctuations, which to some degree is anticipated and expected by economic actors, since the landing pattern repeats itself yearly due to biological reasons, whereas annual quotas are under the influence of the stock assessments done by national and international marine researchers. But even though the seasonal fluctuations can be predicted, they still induce a source of uncertainty and constitute a severe problem for capacity alignment for the single firm as well as for the industry as a whole[46]. Despite the certain knowledge of economic actors in the fishery industry about which periods the main part of landings will occur, there still exists uncertainty regarding *where* the fish will be landed and in what form (fish size, quality, etc.).

Some of the manufacturing processes conducted by firms in the Norwegian fish processing industry are fit to such highly varying patterns of landings. For instance, in the Lofoten, the largest number of stockfish producers is found, where fish biology and catch seasonality are in accordance with the local climate conditions, which gives the best possible production and product. For other processors, this seasonality constitutes a main problem facing the manufacturing operations which creates great obstacles in the production planning when the objective is to serve customers continuously with fresh, chilled or frozen products, with high volumes all year round.

Large scale manufacturers, also in the fish processing industry, depend on rather high production volumes in order to realise any economies of scale (Chu, Teng, Huang, & Lin, 2005) where high fixed costs only can be defended by high production batches. These producers clearly see the benefits from uniting with vessels that can bring high catch volumes to their production, since the internalisation can reduce the uncertainty and the risk they encounter by depending upon others for critical resources (Klein, Crawford, & Alchian, 1978; Pfeffer & Salancik, 1978) and control the fishing activity to surpass the seasonality problem. Further, in general, if the purchasing price of the input also carries profit and depreciation consideration imposed by the supplier, then the cost of this good – by ways of internalising

[45] If we limit this analysis to the years 1993–2006 the average quota was 560,000 tonnes with a standard deviation of 180,000 tonnes (almost the same average quota/standard deviation ratio as for cod) and with six out of 14 years within the +/- 20 per cent range.

[46] The intra year fluctuations are still present if we map total volume of landings from the Norwegian fishing fleet, instead of only cod and herring. In 2003, December landings share of total landings (2.5 million tonnes) were only 2.7 per cent, whereas March landings were 14.2 per cent. If capelin and blue whiting landings – which mainly enter the fish meal and oil production process - are deducted, then total landings amount to 1.4 million tonnes, of which December landings amount to 3.7 per cent, while the October landings' share is 18.7 per cent.

it's production – should be lower than the purchase price, if the acquiring firm is as efficient as its suppliers (Tang & Zannetos, 1992).

The arguments above accords with Riordan and Williamson's (1985) statement that firm size is positively related to VI, since with size, input requirements rise and in-house production of the input reduces the production costs due to scale efficiencies. However, in this setting, since markets are 'thick' and sales organisations set a price floor, lower costs on the input might not be accrued (legally at least) in circumstances other than when supply is abundant and exceeds demand – a situation which clearly do not qualify for vertical integration. And, again, integration will induce additional costs which again will heighten fixed costs even further, setting extra claims to operational efficiency.

It is an irrefutable fact that both the Norwegian fishing industry and the fish processing industry hold substantial overcapacity (Bendiksen, 2002b; Dreyer & Bendiksen, 2003; Lorentzen & Hannesson, 2003; Lorentzen, 2005; Steinshamn, 2005) which inevitably can partly be owed to the generous governmental transfers to this industry earlier (Isaksen, 2000). Another contributing reason can indirectly be seen from Figure 5: As long as there are specialists in the fleet or processing industry, catching or processing mainly one or a few species, a certain amount of overcapacity is needed to in order to catch or process the peaks in quotas, abundancy and volumes caught. For the fish processing industry this is a necessity since the perishability of fish sets severe storing and stocking limitations, and landings therefore have to be dealt with properly and often manufactured at the time of landing. Further, since overcapacity easily leads to excess demand for fish, prices will often increase above the price floor set by the sales organisation.

As a consequence, controlling productive assets in the fishing industry, and thereby surpassing the seasonality of harvesting, can substantially reduce uncertainty regarding supply. This will be especially important for those following a manufacturing strategy where they seek to supply their markets continuously, which possibly can bring about some or all of the economies from integrating vertically suggested by Porter (1980). These are, ('translated' to our setting):

- ✓ *economies of combined operations* – by utilising slack capacity in the processing plant (or fishing vessel),
- ✓ *economies of internal control and coordination* – by levelling capacity at both production stages
- ✓ *economies of information* – by reducing upstream market surveillance efforts looking for suppliers
- ✓ *economies of avoiding the market* – for the same reason as above, and for avoiding transaction costs
- ✓ *economies of stable relationships* – since the hazard of opportunism diminishes and trust is attended to.

The primary uncertainty present in the upstream stages of the fisheries industry, as argued for above, can to a certain extent be evaded by internalising the transaction between the two adjacent stages in the value chain - namely between fleet and processing industry. A large number of scholars has argued for such action, and among them is Carlton (1979), who models that under uncertainty, firms have an incentive to internalise the production of input, at least to satisfy their 'high probability' demand. Lieberman (1991) extends these findings in his empirical study from chemical production, in that producing firms are more susceptible to integrate vertically when the input accounts for a large proportion of total costs. He adds that backwards integration is a probable response to avoid variability in the input market, independent of fluctuations in their downstream markets. This argument regards capital utilisation and is more important for large scale processors with substantial capacity costs (Levin, 1981; MacDonald, 1985).

In our context, were a large number of fish processing firms compete over fish landings from a large number of vessels, the first hand market for fish can be characterised as *next to perfect* (Ottesen & Grønhaug, 2005), in the meaning that the market is nearly atomistic and that participants are price takers. Even though in many cases the number of market participants is limited, for the industry as a whole the '*next to perfect market*' assumption holds. Then, undertaking a vertical integration strategy as a means to achieve *foreclosure* of competitors in the first hand market for fish, will be extremely demanding, and gaining monopoly power seems quite unrealistic in this setting.

As will be dealt with under the heading 'Contradictory recommendations' in Chapter 7.4, not all arguments point in the same direction what concerns the features of this industry seen up against vertical integration. However, as has been suggested, the presence of uncertainty in the first hand (upstream) market give fish processing firms a strong incentive to acquire productive capital in the fishing industry and to internalise (parts of) the supply. The '*next to perfect market*' approach brings us over to other – transaction cost – motives for integrating vertically in this industry.

7.3.2 Transaction cost arguments

Transaction costs – defined as the costs incurring from making economic contracts in the marketplace when future events are not fully anticipated – underlines that it is not costless to utilise the market for governing input procurement exchanges, and costs accrues as the firm searches for contract partners, writes, monitors and enforces contracts. As underlined in the theory chapter, the main argument for integrating vertically within transaction cost theory is in the presence of asset specificity – i.e. that economic actors have undertaken investments in relation specific assets. Further, in the presence of high uncertainty and frequent transactions between contracting partners, higher degrees of asset specificity are predicted to lead to vertical integration.

We have above argued for the presence of high degrees of (primary) uncertainty in the intersection between the fishing and the fish processing industries. Even though Williamson (1985) separates primary and environmental uncertainty from *behavioural* uncertainty, which in his view is the *"…key form of uncertainty relevant to the transaction context"* (Sutcliffe & Zaheer, 1998: 3) he nevertheless predicts a positive correlation between primary uncertainty and the degree to which firms will undertake vertical integration. In addition, a number of empirical studies utilising transaction cost economics have shown that uncertainty affects the make-or-buy decision even if asset specificity is not present (Anderson & Schmittlein, 1984; Balakrishnan & Wernerfelt, 1986; John & Weitz, 1988; Heide & John, 1990).

Frequency in transactions is also upheld in this transaction environment. For instance, within Norges Råfisklags geographical area (the northernmost sales organisation) there were written contracts for almost 200,000 separate landings of fish, from about 5,600 different Norwegian vessels to 250 registered and approved purchasers in 2004 (Norges Råfisklag, 2005). Simple calculations of the mean show that, on average, every registered buyer wrote 800 different contracts with vessels and each vessel wrote 34 contracts with purchasers[47]. One could conclude that in this commodity market spot market transactions are the usual, however, as always in this industry; behind the rather deceptive average reflection a highly heterogeneous reality is hidden. In fact, the largest number of contracts (deliveries) done by a vessel in 2004 was 253. Correspondingly, the largest number of purchasers served by one vessel was 46, but after deducting vessels that deliver to auctions – where the number of buyers that can bid for the fish is high, and delivery place and buyers localisation is physically detached – no vessel had more than 20 purchasers on their customers list. On average then, each vessel delivered to 2.6 purchasers, whereby two thirds of the vessels supplied only one or two purchasers. At the other end of the transactions, the largest number of contracts written by one single fish purchaser was 7,230 with an average of 564. Summing up, the average vessel within Norges Råfisklag's district delivered fish to 2.6 purchasers, writing 33 contracts (or rather; mandatory contract notes), while the average purchaser wrote 564 contracts with 46 vessels[48].

The recurrent transactions in this business environment, where seller and buyer repeatedly transact, are anticipated to enhance the level of vertical integration, since they increase the threat of opportunism and hold-up problems. When transaction specific investments are made (especially when primary uncertainty is prevalent), one way to protect them against the potential for hold-up, is by means of vertical integration and governance control mechanisms (Anderson & Schmittlein, 1984; Heide & John, 1988). For instance, Majumdar & Ramaswamy (1994) in a cross-industry study found that downstream distribution activities were more likely to be integrated when goods were frequently purchased. In this particular setting, however, integration will not reduce the overhead costs associated with the writing of contracts, since it is enforced by regulations and cannot be surpassed by intrafirm transactions. But by introducing authority in the relationship between buyer and seller through means of vertical integration, the constant haggling and negotiating over prices (above the price floor, of course) can be dismissed, together with coordinating supply-side and demand-side product and quality attributes (like freshness and size of fish).

Obviously, the term *"next to perfect market"* holds for our transactional setting, even though there is a tendency of fewer and larger units in both the fishing industry and the fish processing industry. In such an environment, reputation – and trust between the transaction partners – becomes highly important, since the perception of a breached contract or inferior input quality makes it easy for processors to shift to another supplier or for vessels to find new customers (all the time they exist within proximity).

But after establishing that this transactional environment is in fact characterised by both high frequency among transaction partners, and that (primary) uncertainty is indisputable present

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[47] The frequency is in fact higher since about 20 per cent of the volume (much less ratio of landings) are delivered as frozen fish to fish freezing and storage plant, where landings are divided further into batches depending on species, size and quality, and auctioned to the ones paying the best, not necessarily approved as a purchaser within Norges Råfisklag's district. This represent a significant thickening of the market whereby first hand prices far exceeds those achieved through direct agreements between vessels and purchasers (Dreyer *et al.*, 2006).

[48] Actors in this business environment, both at sea and land, operate in a highly dynamic setting. This is emphasised when looking at the development in numbers of actors and transactions from 2004 to 2005. In that period the number of vessels that landed catch in Norges Råfisklag's district was reduced by nearly 10 percent, from 5,578 to 5,090. At the same time the number of registered and approved buyers fell by 12 percent (from 254 to 221) and number of transactions by seven percent (from 195,000 to 182,000).

here, what can be said about the existence of asset specificity?[49] Asset specificity, which can be described as sunk costs in dedicated assets (between transaction partners) for which their value in alternative uses is less than in the current, interlock buyers and sellers to one another. If, as noted by Zajac & Olsen (1993), asset specificity is synonymous with small numbers bargaining, then asset specificity – in general – should not be a problem in our setting since (again – in general) the transactional environment can be characterised by '*next to perfect'* markets in the meaning that a large number of raw fish providers and procurers exists.

According to Williamson (1985: 95-6), asset specificity can take three main forms involving specific *physical* capital, *human* capital and/or *site-specific* capital. It is hard, at industry level, to indicate to which degree the two first mentioned forms of asset specificity are present. As Williamson emphasises, these qualities must be asserted at firm, or transactional level. Undoubtedly, physical asset specificity is highly present in some transactional constellations. As an example there are processing plants which have specialised on processing live-stored saithe, which are caught by vessels allowed to use saithe seine and have the gear to do so. Additionally some manufacturing plants only process fresh or frozen whitefish caught by trawl (and frozen on board) whereby the delivery installations are restricted to be supplied by large trawlers or by carriers from freezing and storage plants. Others again, putting emphasis on high product quality, are eager to procure fish caught by long-line, which holds the best quality when tended properly. Conducting fishing with this gear, however, put great claims to on-shore facilities like bait supply, baiting station, baiters and in many cases housing for fishermen. Investments in these transaction specialised assets, and their disposal for fishermen, will probably not be undertaken by the quality seeking processor unless they are secured a relatively lasting relationship with the fishing vessel. Without going further into details, what might seem as an arms-length spot market transactional environment is in fact constituted by several markets in which the presence of physical asset specificity is highly varying, from firms which candidly receive all fish they can get from whoever wants to deliver, to highly specialised units to which only own vessels are allowed to land fish, and additional supply is secured in auction markets for frozen fish. Human capital specificity, is, presumably, present here to the same rate as in other industries, in that the quality and amount of knowledge, abilities and relations upheld by members of the staff, in either fleet or processing plants, contribute to the total value to the firm/vessel from the procurement/sales process.

One distinct feature which can be seen from this setting is the existence of site specific assets. Even though the fleet is highly mobile, every vessel has a home port from which the action radius is limited, at least to some degree, by the size of the vessel – and partly by the portfolio of participation rights/licenses held by the vessel together with its particular use of fishing gears. The attachment to a specific locality (local community) is striking for most vessels and – in general – the smaller vessel the denser coupling. In general vessel owners store their gear, make their provisioning, refuel and – most often – deliver their catch at the local fish processing firm, typically in or nearby their home port. Also, due to the perishability of the input in question to which government agency regulations set claims to the quality of fish, one will expect that both site-specificity and temporal specificity play an important role for the transactions carried out between them. Consequently, buyers and sellers develop over time a

[49] Asset specificity, uncertainty and frequency is, according to Williamson (1985) the main transactional properties influencing the governance choice. I do not, however, neglect the behavioural aspects – that managers are bounded rational and that information impactedness exists – but rather assume that they are equally present in this context as in other parts of economic life. What concerns opportunism, it is reasonable to believe that it exist here to as large degree as in other industries, without rejecting the conception and existence of trust as at least as important as opportunism in this setting.

long-term relationship and make arrangements to streamline their operations to one another, if not necessarily turn to vertical integration, whereby vertical coordination and quality control improvements can be made.

Summing up the transaction cost motives for integrating the units in the fishing industry and fish processing industry then, especially two conditions speak in favour of integrating vertically (besides uncertainty – which seems as the most plausible): First, the recurring transaction environment in which fishermen and processors often repeat transactions on daily or weekly basis. Second, the presence of asset specificity – especially site specificity (as studied by Joskow, 1985; Levy, 1985; and Spiller, 1985) but also – to a lesser degree – physical asset specificity (Lieberman, 1991; and Weiss, 1992; under scrutiny by Coles & Hesterly, 1998) – would make hierarchical governance preferred over market transactions since they reduce the potential for opportunistic behaviour (Monteverde & Teece, 1982; Lieberman, 1991; Whyte, 1994).

7.3.3 Upstream rent accumulation

Since the fishing industry to an increasingly degree has developed as a limited entry industry, where licenses and participation rights regulate the right to fish, a 'resource rent' – a Ricardian rent (Amit & Schoemaker, 1993) – could be expected from this activity if the resource is harvested efficiently. These rents can easily be separated from rents generated from strategic barriers to competition, like economies of scale and scope, and sunk costs (Yao, 1988), and the *economic* rent in question here is the *"...payment for the service of a factor* ***in excess*** *of that minimally necessary to call forth its services"*, due to scarcity (Lippman & Rumelt, 2003: 904). By the virtue of fishermen's – or rather; fishing vessel owner's – granted rights to extract the growth surplus from the renewable natural resource a fish stock represents, a rent is expected to be generated from the fishing activity as long as total revenues exceeds total costs. However, amongst other factors, the open access policy previously practiced in some Norwegian fisheries (for instance coastal fishery for demersal species) and the historical development of this industry have implied overcapacity in this industry, and therefore no such rent extraction in most Norwegian fisheries (Flåm, 1981; Moxnes, Sunnevåg, & Aarrestad, 1989; Flåm, 1993; Kjelby, 1993; Flåm, Kjelby, & Rødseth, 1997). A recent computation of the resource rent in the Norwegian fisheries (Steinshamn, 2005), shows that the situation today generates a resource rent (when the required rate of return is set at 5 per cent) of about 750 million NOK, but with a potential of 8.5 billion NOK if the resource was managed optimally (i.e. maximise rents). But in order to realise such a potential would imply that the number of (whole year active) vessels was reduced from 2,200 to 280, which in turn would reduce employment from 10,200 to 3,000 persons. The calculation is, however, somewhat sensitive for the choice rate of return, where an increase from 5 to 10 per cent would decrease the resource rent gained today from 750 million NOK to –790 million NOK.

The potential of a positive economic rent generated in the fishing fleet forms a contingency for the processing industry to access this resource and take part in the rent generating activity, thereby acquire rents earlier achieved by the supplier (Casson, 1984). The regulatory restrains from resource management objectives, which blocks the access to the resource, make this factor/product market imperfect competitive. This is the most common reason for obtainable supernormal profits in an industry (i.e. entry barriers) (Grossman & Helpman, 1991: 335). Since the fish processing industry in Norway is one with a great many processors, fishermen achieve larger portions of the rent than in the case of monopsony. But even then processors have to share some rent with fishermen. In order to capture all the rent stemming from the right to fish within a closed common, the processor have to *"...eliminate the seller with whom* *they share the rent; vertically integrate their operations"* (Dawson, 2003: 25). Then upstream vertical integration would give rise to rent opportunities, but still, require monitoring problems to be dealt with.

Within the same line of thought, but from a slightly different point of perspective, it has been claimed that if processing firms can behave as monopsonists (i.e. sole demanders for fish) towards a highly competitive harvesting sector, backward integration will make them able to capture the producers' surplus in the harvesting sector (Clark & Munro, 1980) and increase profits substantially. This is not the case in the setting under scrutiny here (at least not up until this point in time), where the processing industry has been under more competitive pressure than the fishing industry. An indication is the lack of (regulatory) entry barriers in the fish processing industry, whereas such are highly present in the fishing industry.

Correspondingly, a similar rationale for integrating backwards toward the fishing fleet is the importance of an input to a buyer. In Caves & Bradburd's (1988) study, conducted on an industry level, the buyer's total costs accounted for by inputs purchased from the supplier is the single most important determinant for vertical integration. Since fish constitute the single largest component of total costs for fish processing firms, large price premiums paid to the supplier (i.e. fishing vessels) will have devastating effects on firm profitability. According to transaction cost theory then, the hazard of lock-in problems towards opportunistic suppliers should motivate for internalising these transfers, which can contribute to obtaining rents previously accrued by the supplier.

7.3.4 Regulatory and historical reasons

A reason, not motive, for finding high degrees of vertical integration in this industry stems from historical and regulatory causes, rather than – or in addition to – deliberate profit maximising actions undertaken by managers of fish processing firms. The context in question is of course – as other parts of economic life – a result of the historical forces which have been in action up until this day. When taking a glance on the fisheries industry, the typical vertically integrated unit is a fish filleting firm, traditionally freezing plants, with large (40-70 meters) off shore trawlers serving as the main suppliers of fish.

One of the first laws regulating the Norwegian fishing industry was the Trawler act (of 1908) which explicitly banned the use of trawl as fishing gear in Norwegian waters. The use of trawl in cod fisheries was seen as a major threat against coastal fisheries by fishermen as well as politicians, for overexploitation of the stocks as well as threatening the position of the fishermen and coastal population, until the early 1960's (Gerhardsen, 1964). The reconstruction of the northern Norwegian fisheries industry after World War II involved an emphasis on large fish filleting and freezing plants serving as main employers in many communities where fisheries were the main occupation and industry. In order secure a stable supply of raw material to those plants – for the purpose of creating profitable units offering all-year employment opportunities – a number of processing plants were granted exemption clauses from the Participation act together with licences for cod trawling. In later years, the fish processing industry has to a larger extent taken part in equity financing for smaller vessels in the coastal fleet, within the limits of the Participation act which states that the majority holdings in fishing vessels are reserved to active fishermen.

Even today, a large proportion of fish processing industry's positioning towards the fishing industry is still mirroring the governmental policy carried out in the 1950's through 1970's. Despite the fact that much of the vertical integration we can observe in this context is due to these historical facts stemming from institutional embeddedness, the vast structural changes in the fisheries industry have loosened this obvious plausibility. One reason is that the waves of economic change that have washed over this economic landscape have lead to a number of bankruptcies from which the ownership of processing plants and fishing vessels have been divided. As processing firms have lost control over trawlers, the bindings towards the specific plants have eroded and new landing patterns have emerged. Partly due to technological changes where on board freezing of fish have lead to auctions of the catch in 'thicker' markets, fish prices have been more advantageous there than when landing fresh fish (Dreyer *et al.*, 2006). In describing the turbulence in this industry, Dreyer (1998) points to the fact that out of 500 firms active in the period 1985–1995 only 120 operated continuously throughout the period. Of the remaining, 85 go through some form of financial restructuring and re-enters the business, 235 goes out of business, while only 50 newcomers enter this industry. The traditional fillet freezing industry – where the typically units, integrated with cod trawlers are found – has been reduced from 25 firms in 2000 to only 14 in 2004 (Bendiksen, 2005).

Additionally, also within the fishing fleet we have seen vast changes the later years, were governmental structuring schemes together with the economic forces at work have lead to fewer vessels holding more licenses to fish (or participation rights). Markets for fishing rights have evolved outside the legal entities (stating that quota rights are untradeable) which have effectively made it clear for the economic actors that the limited right to fish comes at a price. Indeed, a high price. In this 'new' economic reality, fish processing firms which possess both vessels (with fishing rights) and processing plants have in light of discovering the alternative cost of supplying own plants – emerging from well functioning and better paying auction markets for fish – to a larger degree optimised profitability in the harvesting sector rather than the joint outcome from the two links. In other words, auction markets have revealed the true costs of cross subsidising the processing plants and protecting from market pressure – where some have found it too costly (Dreyer *et al.*, 2006).

7.4 Contradictory recommendations

From different theoretical contributions, as well as empirical research, the advices on when, how and where vertical integration will be advantageous are in some cases in conflict with one another. Underneath a few examples will be given regarding the setting under scrutiny here: fish processing firms' vertical integration towards the fishing fleet.

One such discrepancy can be found within the stream of research in which industry life cycle is given explanatory power on the widespread of vertical integration. Following Stigler (1951) vertical integration will be a more exploited strategy in the early and late phases of an industry since then, the markets through which intermediary products flow are curtailed or underdeveloped. When the industry is 'at it's prime' well functioning markets will aid transactions between the adjacent stages of the value chain and vertical integration will be redundant. Harrigan (1983a) argues the opposite way, when she states that as the industry matures and enters the later stages of its life cycle, vertical integration becomes a hazardous strategy as lock-in into obsolescent technologies might set severe limits on firms' ability to be flexible as consumer's tastes and demand changes.

Even though the recommendations regarding vertical integration and industry life cycle are contradictory, I will argue that the arguments refer to different phenomena. Where Stigler's statement considers the market structure and possibility for hold-up due to small numbers bargaining (i.e. where markets are too thin to uphold favourable conditions for arms-length transactions), Harrigan's argument is one that affects the optimal organisational structure as a response to the influence of environmental – and technological – uncertainty. In my view, their disparity refers to different approaches when referring to the industry life cycle.

Another angle of attack where scholars seem to disagree regarding the appropriateness of vertical integration regards the before mentioned balancing of flexibility needs and possible scale economies. Mpoyi (2000) also subscribe to the understanding of vertical integration as a hazardous strategy when environmental uncertainty is high and competition is intense, since high levels of vertical integration can induce managerial diseconomies of scale (Coase, 1937) and increase strategic inertia (Hitt, Hoskisson, & Harrison, 1991). If vertical integration should lead to a competitive advantage due to lower production or total costs, then the extra investments due to the vertical expansion favour the supposition that it requires larger production batches and throughput in order to divide the higher fixed costs on as many units as possible. High batches with supporting efficient production equipment become an effective flexibility barrier in situations where demand is highly uncertain. If the formerly separated units do not succeed in balancing their throughput (Casson, 1984), for instance if their scale efficiencies differs too much (D'Aveni & Ravenscraft, 1994), the underutilised capacity will be a heavy burden to bear. Furthermore, if in-house procurement implies that the firm fails to obtain input to lower market prices, the lack of competitive pressure will lead to unnecessary high input prices (Mpoyi, 2000).

We have already discussed how the uncertainty regarding volume and timely supply in this setting should affect the motives for integrating vertically. Another element of uncertainty regards the quality of the landings. Different processors have different claims on quality depending on which products they process and market, and some may even be in need of very high quality inputs in order to satisfy customer demands. Vertical integration can help disseminate this essential information upstream to the harvester, and make him act in the best interest of the processor. However, like Gallick (1996) underlines, vertical integration does not *per se* alleviate the monitoring and performance measuring problems inherent when the vessel operates far beyond the limits controllable by the owner. To overcome those problems, an effective incentive scheme is needed to make the *agent* (i.e. the fisherman/crew/captain) maximise the profit of the *principal* (i.e. the processor). The Norwegian fisheries industry have often been claimed to be volume, not quality, oriented, where quality have been sacrificed on the altar of quantity. Even though products that are distributed fresh to the consumers set stronger claims on quality when landed than the various processed products, the rule is that some minimum quality objectives have to be met by landing – or else first hand price can be drastically reduced. There are, however, tendencies showing that larger landings are better paid per kilogram than smaller landings – which can easily be explained by transaction cost logics. When this is the case, fishermen – whose remuneration is based on so-called *sharecropping* (see for instance Bergland & Pedersen, 1999; Matthiasson, 1999; Daníelsson, 2002) – will optimise their own profit, which not necessarily accords with the maximation of the processor's profit. Vertical integration then will not improve the profitability of the processing firm if incentive schemes (i.e. the remuneration of vessels) are not sufficiently effective designed in order to overcome these moral hazard problems.

In our setting, the input in question, namely fish, is – despite the various species and firms' varying degree of specialisation – characterised by rather low product complexity. It is not that the fish is a simple natural creature, but rather that its production – until caught – is untouched by human hand and therefore sets relative low demand on technology involved. Neither can the various ways fish is processed by the industry participants be said to involve very complex technologies. Filleting, drying, and salt- and clipfish processing, are all old manufacturing processes with century long traditions. Following transaction cost logic, a low degree of product complexity requires low levels of vertical integration since product complexity can be seen as a proxy for transaction costs (Novak & Eppinger, 2001), since the costs associated with coordinating complex systems are minimised within an internalised production. Also Monteverde & Teece (1982) take advantage of this approach when they utilise engineers hours undergone in the making of a component as a proxy to the transaction costs involvement in that specific asset. Translated to our setting, the spread of vertical integration should be limited here since the product technology is a rather simple one, where the hazard of transferring specific knowledge to suppliers (and thereby exposing oneself for hold-up) is relatively low. However, different production technologies are utilised in the processing sector – with various elements of complexity, perhaps greatest within the labour and capital intensive filleting industry – in which different degrees of vertical integration should be found.

The above mentioned argument is also analogous to the *"next to perfect market"* assumption since the input in question is commodity like – i.e. the inputs are quite homogeneous as they arrive at processing plants (there are limits for the variation cod can take in say; size, quality and freshness). Thus, one should expect low degree of vertical integration in this industry, since competitive bids and long-term supplier relationship would safeguard the sourcing strategy better than tapered or vertical integration. Especially so since the Norwegian fish processing industry to a low degree produce specialised products, an argument following Heriot & Kulkarni (2001). The reason is that the more specialised production, the higher is the corresponding transaction costs (Williamson, 1985) which therefore should increase the probability of vertical integration. When the production is characterised as unspecialised, production costs are more decisive for the undertaking of vertical integration, since producers are less likely to face opportunism problems from suppliers. The argument is easily extended to the production technology. A producer, confronting a make-or-buy decision for a component entering his production, will, in the absence of proprietary technology in that component, be more likely choose to buy from external markets, since there he can benefit from scale efficiencies and reduced bureaucracy (Murray, Kotabe, & Wildt, 1995). In our setting, this speaks in favour of modest levels of vertical integration, but varying, since, with specialisation the degree of proprietary technology employed in fish processing differs.

The ruling *"next to perfect market"* conditions in our setting, regarding the atomistic structure of the first hand market for fish, also influence the bargaining power of the actors operating here. Although the price floor set by the fishermen's sales organisation provides a security and indisputable autonomous power for fishing industry, the actual price paid for fish in the first hand market follow the rules of the market, where supply and demand conditions prevail. Though, to a varying degree, since monopsonism is upheld by some processors, who can dictate minimum price for landings towards the smaller immobile fishing vessels[50]. Porter (1985) prescribes vertical integration as a possible solution when the bargaining power of suppliers is high, in his five competitive forces model. Suppliers can exercise power through the input price, thereby having the potential of immense bearing on the cost of inputs for the procurer. In our setting the bargaining power imbalance, and in some cases monopsony, at the hand of the processor is off-set by the legislative minimum price setting of the sales organisation, which in no cases can be underbid, except in the case of wreck fish below some up front announced quality standards. Then, the bargaining power argument is reduced to a minimum, and hardly provides a good reason for vertical integration.

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[50] Bearing in mind that most vessels in our setting deliver to only one or two processors, for small coastal vessel then, this situation corresponds with Blois (1980) notion of quasi-integration, where the largest customer constitutes major parts of the total production, and can exercise organisational domination through this power imbalance. In his view, quasi-integration can be defined as the firm's ability to obtain the benefits of vertical integration without the potential costs associated with the physical extension of operations into adjacent phases of the production chain (Galbraith & Stiles, 1984).

As mentioned earlier, Riordan & Williamson (1985) impose a positive relationship between firm size and vertical integration. However, the capacity balancing problem between adjacent stages of production may very well include different efficient scale economies. Then, if the wrong assessment is made before undertaking vertical integration, the acquiring firm might be forced to produce below the efficient level at one stage, or selling excess production in an open market. Such errors can easily be done in an environment with fluctuations due to biological reasons like the fishing industry, and since both underutilisation of production capacity and the market bearing of excess production accrue additional costs, firms should be discouraged from integrating vertically.

Despite the above mentioned arguments that blur the clear motives and prescriptions for integrating in a setting like ours, it should be noted that there is a unanimous recognition that supplier relationships are important determinants of a firm's competitive position (Walker, 1994). Even though the theoretical contribution do not give a clear recommendation when coupled with the environmental factors apparent in our setting, we are left with some inducement that speak in favour of the acquisition of fishing vessels by the processing industry. Taking these motives into consideration and comparing them to the specific setting that prevails in the Norwegian fish processing industry, we should expect that firms which avail themselves of backward (or upstream) vertical integration towards fishing vessels, should generate higher profits than those not employing this strategy[51]. This would be the plausible outcome, given that a successful vertical integration strategy should contribute to

- ✓ reduce uncertainty on the supply side,
- ✓ reduce transaction costs and the threat of opportunistic behaviour between former trade partners – now different profit centres in the enterprise, and/or
- ✓ acquire (parts of the) rent formerly exploited unilaterally by the downstream supplier.

At least, this is what we could expect from the theoretical treatment of vertical integration – and its effect on performance – from the academic disciplines mentioned above. But in order to test empirically whether the undertaking of vertical integration in our setting in fact bears forward the prescribed effects on financial performance, we need good measures for preceding our research, together with good data, which are available, or at least obtainable. In the next section, an appropriate measure for vertical integration is accounted for. Finally data sources at hand – with its possibilities and limitations – and the additional data collection needed to carry out the proposed research activities, are presented.

7.5 A contextual measure for vertical integration

In Chapter 5.2 we argued for the suitable way to measure upstream vertical integration within empirical studies, and ended out with a fourfold recommendation. First, we find it essential that the units under scrutiny are situated in the same industry, in order to ensure that they are under influence by the same environmental aspects, motivating them to integrate vertically or not. The argument follows from the fact that most interesting variables are difficult to measure consistently across industries, and that multi-industry cross-sectional studies cannot control for unobserved firm-specific characteristics (Klein, 2005).

[51] One argument, however, goes against this appealing causality: if a good is in excess supply, it's value is usually reduced – so also with the value of a strategy. Caves (1984: 131) put it this way: *"The rent (i.e. advantage) commanded by a strategy declines with increases in the number of rivals that can replicate it and their reaction speed."* Hence, the effect on performance should be positive, but diminishing so, in an industry where first-mover advantages could be upheld by those attending first to this strategy.

Second, we find it vital that the appropriate measure for upstream vertical integration is closely connected to the most important input factor for the firm or industry in question. Since backward vertical integration is primarily a sourcing strategy, it becomes necessary that the degree of vertical integration is weighted against the effectiveness of such a strategy. A fish processing firm that acquires it's earlier supplier of package products do integrate vertically, though it do not necessarily improve the flow of most important input; namely fish. An adequate measure of upstream vertical integration should therefore be coupled to the input factor that is of greatest importance to the firm.

As a third ingredient, we find it important that a good measure must include the proprietary aspect of vertical integration; i.e. it should reflect that the downstream firm hold some ownership interests in the upstream firm. This ensures the coupling of business units, and a devoted and deliberate act in form of capital deposit from the downstream to the upstream firm, which also excludes the misrepresentation of tapered integration, stemming from market power or monopsony cases. This argument is closely related to the property rights approach to the theory of the firm (Grossman & Hart, 1986; Hart & Moore, 1990) which emphasises the meaning of asset ownership as a source of power over residual control rights[52] when contracting is incomplete (Kim & Mahoney, 2002).

The fourth and final point, when constructing a good measure is to take into consideration what is (anticipated to be) the most imminent motive for integrating backwards in the context in question. If the motive is to avoid uncertainty in one important input factor on should address this specific source. If the motive is to avoid transaction cost in the trade with some specific goods then the measure should incorporate this merchandise. If integration is strategically motivated – for instance to increase entry barriers in the industry by 'price- or supplier squeezing' – then the measure should at least address the competitive environment over which one seeks to improve control.

Our choice of measure for backward vertical integration in the Norwegian fisheries industry follows – not surprisingly – the propositions suggested above. As a part of the research design, the problem of finding a relevant and good measure for what we try to assess and evaluate is crucial for the quality of the research. If our operationalisation of the concept backward vertical integration does not capture the true inherent properties, then the attempt is flaw full and fruitless.

We therefore suggest that within the setting studied here, the measure for upstream vertical integration undertaken by fish processing firms must incorporate their ownership in fishing vessels which supply them with their most important input factor; namely fish. Furthermore, for this industry the supply of fish to the processor is – for most units – the part of economic life which is encumbered with the most severe uncertainty, and which demands the most attention from managers (Ottesen & Grønhaug, 2005). This uncertainty influences heavily firms' supply expectancies – in both short and long term – which is qualitatively different from strategic uncertainty, regarding their anticipation of competitors', suppliers' and customers' moves in the specific business landscape.

Our operationalisation of vertical integration may be described as a conditional 'self-sufficiency-ratio'. Conditional since ownership shares in many instances are too small to deem the vertical relationship as one where the processing firm can control and influence the operation of the vessel. It maps the quantity fish each firm receives from fishing vessels in which they hold a proprietary interest, as the share of total landings to the firm. By utilising

[52] *"…the right to decide all the usages of that asset in any way not inconsistent with a prior contract, custom, or law"* (Hart, 1995: 30) is upheld by the owner of that specific asset.

this measurement for upstream vertical integration we incorporate all the needed characteristics argued for above. First of all since fish is the most crucial input factor to every fish processing firm, entering every production process and constituting the lion's share of total costs of firms in this industry (Bendiksen, 2005). It is therefore an appropriate measure for all firms in this industry[53]. An additional beneficial feature of using a ratio in stead of nominal figures of input representing the flow between value chain stages is that it enables us to compare and combine data from units of very different sizes. The same benefits are achieved by using financial performance key figures in terms ratios.

From theory, the appurtenant way of defining vertical integration is by reviewing firms under common ownership and control (Porter, 1980; Riordan, 1990). In our setting, however, the regulatory framework sets an effective barrier for common ownership over both fishing vessels and fish processing firms, which only exclusionary appears in the Norwegian fisheries industry. For that reason, it is essential to expand the definition to also include the possibility for minority interests in fishing vessels. The direction of integration which follows from viewing fish processing firms' ownership in fishing vessels, simultaneously rules out the downstream integration made by fishing vessel owners in fish processing industry. This omission is – from our point of view – important, in that there, presumably, are different motives working for integration in the two cases: While the fishing processing firm wants to assure the supply of fish through upstream integration, the reason for the fishing vessels to integrate might be to secure their sales or to uphold a delivery possibility in rural areas. By including the latter, the result could easily damage the reliability of the findings since what we primarily is interested in is the performance effect of the vertical integration decision, as measured at the processing stage.

Since minority (or even majority) ownership in fishing vessels do not necessarily mean that one are able to control the flow of fish from the fishing vessels to an advantageous degree, we have chosen a variable that partly neglect the degree of ownership to the vessel. Rather, we have emphasised the actual flow of raw material originating from the vessels, where the fish processing firms through proprietary interests *can* exercise influence on. The main reason for this is that control of the raw material flow does not automatically follow from a minority ownership share. Even in cases where control can be exercised over the vessels, where the landing place can be dictated by the fish processing firms, market forces will influence the choice of landing place, since the prices for fish can vary with place of landing – and in some cases with the production process it enters. The following quotation – from a manager in a fish processing firm who 'owned' two vessels – can serve as an example: *"We own a 48 per cent share in two small trawlers, but after they installed freezing equipment on board, they prioritise landings to freezing auctions, which means that we don't even get a fish tail from those vessels that can enter our production. In hindsight view, one could call it a bad investment. Today, the money would have been invested in the local coastal fleet instead."* (Isaksen & Iversen, 1998: 22 - *own translation*). In this particular case, the fish processing firm was owned by fisheries industries concern – located elsewhere – which had undertaken the investment to secure the supply to this particular firm. However, as frozen fish storage plants grew up in coastal places, central to logistics, an evermore effective auction market for fish emerged with considerably higher first hand prices than what could be obtained at local processors. As a consequence, vessels were allowed by company head-quarters to maximise profit autonomously, thereby disregarding the processing firm's input needs.

[53] As will be underlined later, for fish processing firms utilising farmed fish, a synonymous measure, using the share of fish stemming from own aquaculture farms, gives the same meaning as this one.

Although our operationalisation of upstream vertical integration seems to fit well to the context under scrutiny here, and from our point of view capture the most essential properties of the theoretical concept, there are some drawbacks stemming from the very same setting. First, our measure for vertical integration may not fully incorporate all raw materials handled by the fish processing firm. In our approach, firm managers were enquired on how much of the fish delivered to the firm came from vessels in which the firm had proprietary interests. The reported share (as percentage of total raw material purchase) was checked up against detailed landing statistics from the sales organisation in question, and the stated name(-s) of vessel(-s) in which the firm owned shares in. However, due to limited statistical recordings, we were unable to obtain data on second hand sales and purchases of fish between processing firms. From our knowledge of this industry we recognize that there exist trade patterns between fish processing firms, where raw material (e.g. fish) is exchanged for instance when supply in some areas are in excess of demand, while, at the same time, there are shortage on fish in other areas. In other periods of the year, the situation is reversed due to the migrating pattern of this biological recourse, and so the net transfer of fish from processor to processor has a tendency of evening out. Also, fish is exchanged between firms when the size of the fish landed is too small or too large to enter the specific production process attained to by the fish processor to which the fish is landed. Then, a neighbouring – or even distant firm – might be offered the unsuitable fish in return for more appropriate fish, or by covering the cost borne by the original recipient. The quantities comprised by such arrangement are quite modest in relation to the total quantities obtained by firms, and therefore the source of error stemming from this will be small, if not negligible.

Another criticism that can be raised against the measure for vertical integration which we employ, is that we – by making ownership shares in fishing vessels a necessary and exclusionary condition – fail to fully incorporate what Blois (1972) denotes *vertical quasi-integration*: that some benefits from vertical integration can be obtained without the corresponding disadvantages connected to capital binding ownership. Like in situations when the fish processing firm is the only – or largest single – customer of the vessel. In such cases, where monopsonistic demand conditions rule, a fish processing firm obtains the fish from local suppliers by virtue of being the single demander within a specific area, restricted by the operating mobility of the fleet. Such conditions are deliberately ignored from our side, since it by nature means no *vertical integration* involvement from the side of the fish processor, and can be considered a valuable firm specific resource. With that we do not mean to say that vertical quasi-integration don't appear in our setting. *Au contraire;* there are many examples in the Norwegian fisheries industry that processing firms are sole demanders of fish – from the rather immobile coastal fleet – in specific areas. In fact, nearly every firm receive from little to larger shares of their raw materials from a 'home-fleet' which are either bound to deliver to that firm, or have other social bindings to the fish demander. But these nature-given advantages do not follow from a strategic decision to undertake upstream vertical integration and are therefore omitted from our operationalisation of this concept.

Central to our choice of measure is the presumption that the research setting in question has immense bearings on how to operationalise vertical integration, in order to capture the fundamental properties in the specific business environment. We therefore argue that in the same way as vertical integration motives vary from industry to industry, setting to setting, the way of measuring vertical integration should also be founded in a contextual argumentation.

7.6 Data availability

The data available for our study – or rather studies – are first and foremost collected from the before mentioned profitability study (i.e. *"Driftsundersøkelsen")* in the Norwegian fish processing industry carried out by Fiskeriforskning. This study has been undertaken, on an annual basis, from 1977 up till today, where account figures, structural characteristics and first hand fish sales statistics for most fish processing businesses are collected and presented. The study reports industry and branch averages from an extensive database containing all firms that have entered the study from 1993[54] until today. Prior account figures are also at hand even though difficult to compare with more recent data. Most data are obtained through official registers, since most businesses are subject to mandatory official reporting schemes, and as a consequence, most firms in the database are private limited companies (AS). Still, enquiries have made possible the inclusion of the most important individual enterprises, general partnerships (ANS) and companies with limited liabilities (BA). Thus, over the years, the study have covered about 85 per cent of the firm population in the fish processing industry, and the omission of the remaining firms is due to three reasons: they are either too small (turnover less than NOK 500,000 in 2004), their accounts are unofficial or unobtainable, or they perform so many, or different, activities within the enterprise entity besides processing of seafood, that their accounts to not mirror and reflect the activities stemming from fish processing. For 2004 most omitted firms are sole proprietorships or aquaculture companies where costs and earnings stemming from processing activities cannot be detached from their main engagement, namely fish farming. For the year 2004 then, the profitability study covered 409 businesses employing about 9,200 persons (about 7,900 man-years) with a NOK 23.8 billion turnover. Profitability considerations for 208 businesses that export or wholesale seafood products for a NOK 22.5 billion value are also included (Bendiksen, 2005). Even though both the number and share of firms omitted from the study is substantial, the sales value and employment in these firms is rather modest compared to the surveyed businesses.

The profitability study at hand is well suited for studying similarities and differences between firms and branches within the fish processing industry, both within and between years, based on the account figures from every individual firm that enters the study. In this respect, individual key figures for, say, profitability can easily be computed from the database at hand and assigned to each business. And since the database is based on an all-enterprise selection criterion, we have the possibility to put a rank order to every individual firm, based on the profitability they obtain in the year in question, as long as the firm stays in business. These can in turn be transformed into long-term profitability values. Such transformations can reveal the potential sustainability in the profitability rates a firm – or group of firms – accrues from its everyday and longer term operations. Needless to say, it assumes that the firm is operative throughout the time span in question.

Further, the database subscribing from the profitability study gives us the opportunity to conduct longitudinal studies as well as cross sectional statistical analyses. Since we possess data for the whole population, on firm level where each firm is assigned a unique identification label, firm level performance can be mapped from the year it first appeared in the study, to the latest year in question, which gives the opportunity to conduct time series analysis. Also the sub-classification into different production classes – such as clipfish,

[54] Due to a regulatory amendment and altered financing schemes in 1993, the profitability study changed its character from being a sample study – covering 70–90 units from year to year – to covering the whole population (from which account figures could be obtained). This represented a regime shift that created a breach in the time series of the database. Today, it gives more meaning to speak about two times series: the first covering the years 1977–1992 and the second from 1993 till today.

stockfish, filleting, etc. – enables us to track branch- or sector performance mappings over time. Where the advantage of cross-sectional analyses is that they can bring about the needed variation in firms' approach to vertical integration in the first hand market for fish, time series analyses give the possibility to explore more long-term effects from integrating vertically, or even the sustainability in financial performance from such a strategic choice.

One striking element when looking into the profitability study is the mentioned subsistent heterogeneity in this industry. Not only does the geographical location of firms represent a source for regional differences, but firms also differ substantially with respect to the various types of fish they obtain and utilise, the production technologies they apply in their operations, the product – or range of products – they produce and, finally, the financial performance they achieve from their day-to-day operations. This vast heterogeneity on many levels of the economic life in our industry constitutes a major challenge when analytical comparisons are to be made between firms – or groups of firms. Undertaking analytical assessments of the kind in question in this thesis, where the degree of vertical integration is held up against the financial performance in the surveyed firms, set heavy demands to thorough knowledge about the empirical setting that is surveyed in order to avoid spurious relationships. These claims, I will maintain, are met through the accumulated knowledge to this industry that is accumulated at my institute over decades.

The studies presented in the next chapter rely on both primary and secondary data. The data from the mentioned profitability study is for the most part of secondary character, even though official account data in many cases are extended through interviews with managers and other industry representatives. Account data alone is not satisfactory to establish the kind of operations carried out by a business. So in order to assign businesses to a specific operational branch (depending on which production is undertaken) interviews and other data sources have to be addressed. Further, official landing statistics helps determining the degree of activity within fish processing throughout a year, which can be achieved from Statistics Norway, the Directorate of Fisheries or the different sales organisations. For the purpose of this research, the help and data gathering collected from Norges Råfisklag have represented a substantial economising on time and resources spent on this work, and been of immense help.

But secondary data on financial accounts together with statistics on fish landings to the firms in this industry is, for our purpose insufficient to establish what we regard as the actual level of vertical integration undertaken by firms in this setting. In order to assign to the firms the correct level of vertical integration we were compelled to address the firms themselves, since no official registers were accessible, from which fish processing firms' ownership shares in fishing vessels could easily be read. For some of the studies, semi-structured interviews were made, addressing general managers in fish processing firms, chosen from criteria needed to get representative samples, over categories as size, location and production classes. This will be further elaborated in the next section where the different research approaches are undergone to more detail.

From a general point of view it is accepted that business leaders are very busy individuals (Mintzberg, 1973) – an observation that holds in our setting as well. The businesses confronted in our studies are small and medium sized enterprises, most often lead by an active owner or co-owner. In our search for information we therefore addressed the senior managers, since he/she have knowledge to most everything going on within the enterprise. Not only do they possess first hand knowledge on the day-to-day operations, they are also responsible for the strategic actions and assessments undertaken at the top level, including the orientation towards the input- and output markets. Busy as they are, however, we found that semi structured telephone interviews, covering only one or a few topics, were the most appropriate in order to keep his or her interest for up to half an hour, to secure 'good' answers and a high response rate. When confronted with mailed questionnaires, our experience from earlier studies has been that managers often respond that they have no time for it, since they are levied a pretty strict and mandatory reporting scheme from governmental offices or through different other regulations. The approach chosen was found appropriate and suitable for our purpose, although attached the usual limitations from self-report data, which can be heavily biased from the *social desirability ratio* (Dess & Robinson Jr., 1984).

The questionnaires for the different telephone surveys were all chiselled out in cooperation with colleagues, who have worked within this field of research for decades, possessing expertise knowledge. Subsequently, it was tested out on two or three businesses, evaluated – and if needed – rewritten, to attend to issues that were omitted or insufficiently covered by the original questionnaire. These will be explained in more detail as the different surveys are presented under the next chapter, on our research.

8 OUR RESEARCH AND FINDINGS

Our research challenge can be viewed upon as a model where the structural characteristics of the Norwegian fish processing industry (uncertainty and other) serve as a determinant for the conduct of firms in this setting. The basics of our research model are analogous to the SCP-paradigm. More precisely, under scrutiny is the decision to integrate vertically towards the fishing fleet, which in turn should determine the market performance of the firms undertaking such a strategy. From theory at least, the vertical integration performance relationship is expected positive. However, when taking not only intra-industry conditions, but also the individual firm specific resource portfolios into consideration, the prescribed positive relationship between conduct (i.e. vertical integration) and performance might be blurred since firms – although under influence of the same industry wide factors – have different qualifications for succeeding from strategic grips like vertical integration. Then, by utilising the resource-based view of the firm, the variety in the individual portfolios of firm specific resources will moderate the firms' propensity to exploit the chance to integrate vertically. These resources can be of financial kind (i.e. the ability to acquire merger candidates) or they can be constituted by the competence that the work force or managerial team possess (i.e. whether existing managerial skills harmonised at one stage of the value chain can be easily transformed and in accordance with skills needed in another).

Our research model and design combines the approaches from these diverse models, opening for influential factors not only on industry, but also at firm level. The industry level factors that call for vertical integration (like primary uncertainty, bargaining power imbalance and rent accumulation opportunities) might be countered by firm specific inadequacies to obtain the gains from vertical integration (like financial resources to acquire fishing vessel or limited managerial skills to exploit the potential favourable interaction-effects from co-operating fishing and fish processing activities).

An attempt to illustrate our research model is done in the graphic beneath, which bears the grounds for the research conducted here. Figure 6 therefore depict how industry factors – external to the firm – are anticipated to influence fish processing firms' tendency to integrate vertically towards the fishing fleet, whereas firm specific factors are expected to influence the same tendency, as well as the profitability effect one can expect from such action. In our mental model, firms decide their strategic action (i.e. whether to integrate vertically or not towards the fishing fleet) after thoroughly analysing both the setting in which they operate, and the degree to which the firm possesses the pre-requisites needed for succeeding such a strategy, upfront the investment decision. If then the assessment is conducted carefully and correctly, the right decision based on own strengths and weaknesses and the possibilities and threats inherent in the setting, should make the firm better off. In other words, both firms specific, industry specific and environmental variables affect the choice of vertical integration. And again, firm specific factors influence also the gains from taking the decision to integrate vertically.

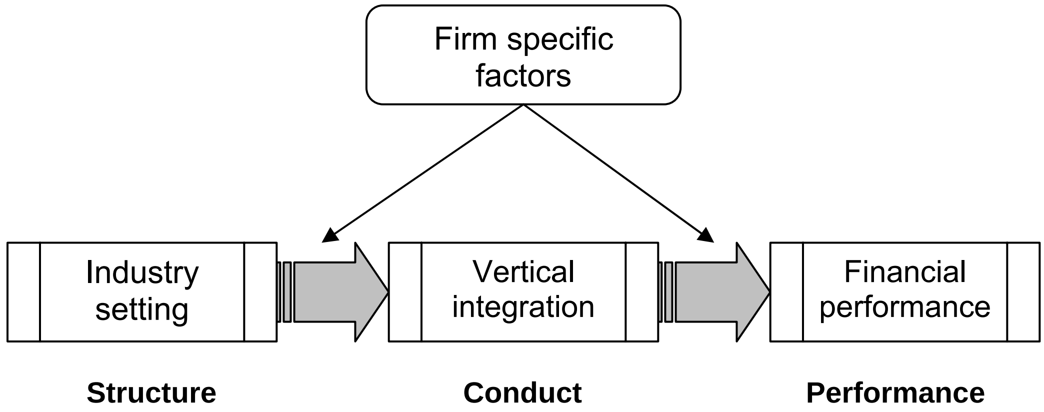

Figure 6 Research model

The research model can then be referred to as a modified structure-conduct-performance (SCP) model, where we allow for firm specific factors to affect both the propensity to integrate vertically and the outcome from pursuing a vertical integration strategy. In a general manner then, in line with existing theories, our working hypothesis is that the primary uncertainty present in our industry setting, together with transactional features in the Norwegian first hand market for fish, would lead to better financial performance for firms that undertake vertical integration, than for those who do not. However, if firms do not enjoy the skills needed in order to take advantage from such a strategy, then this hypothesised causal chain might very well be violated, and a performance disadvantage could be the result.

In our studies, the environmental factors described above are expected to array the way they are depicted in Figure 6; namely by affecting the conduct of firms and their tendency to integrate vertically. The structure of the industry is only one of more factors covered by the box labelled “Industry setting”. Furthermore, transactional parameters like asset specificity and threat of opportunism enters, together with the presence of uncertainty in this industry. Then, as accounted for earlier, the operating businesses should respond by deciding some degree of vertical integration as an advantageous conduct to the existing phenomena. The advantage should then be realised as above average profits, read from the financial statements of the businesses. However – and this is where the firm specific factors enter and alter the SCP model – the bundle of resources under control and disposition by the firm, are unequally distributed in the industry, whereby the necessary conditions to thrive from a chosen strategy are unevenly distributed. In this manner, firms’ inclination to undertake upstream vertical integration, and the ability to harvest the advantages from such a strategy here, depends – to a certain degree – on the bundle of resources possessed by the firm.

In the following sections we will examine other theoretical viewpoints are examined as the research materialises. The industry life cycle can be an important moderator from some viewpoints, which is expected to affect the appropriate level of vertical integration between processing firms and their suppliers. Especially since two distinct raw material sources can be identified in our industry; on one hand wild caught fish – building on century old traditional activities along the Norwegian coast, and on the other, farmed fish; a relatively recent industry development weighed up against the former.

The main ‘building blocks’ of this chapter are the research papers I–IV that are enclosed in the Appendix. They are presented chronologically, based on the time they were performed and written, and follow a natural explorative procedure. In the first section an overall investigation on the status of vertical integration in the fish processing industry is undertaken, utilising both special designed longitudinal and cross sectional measures for measuring degree of vertical integration as well as its implication for financial performance in this industry. In the second section, competing theories that motivate for vertical integration in this setting are introduced, and tested on different segments in this industry, by utilising “strategic groups” as the operative tool at hand. The third section ties our measure of vertical integration to other measures prescribed in theoretical contributions and utilised in earlier empirical research. A close assessment of their adequacy in our setting is given. Further, the measures are linked to one another to consider their strengths when coupled with data from financial statements, and the so-called industry effect is discussed. In the last section, a case study research design is utilised, where two different businesses – similar in some respects – are scrutinised, who financially have outperformed their colleagues for the latter decade, but have made totally opposite adaptations in the first hand market for fish. The to firms’ adaptations in this market is thoroughly examined, especially regarding their sourcing strategies, in order to reveal and illuminate additional features from the apparent vertical integration performance puzzle.

By this choice of presentation, I hope to bring forward a holistic thesis – where the end product is greater than the sum of its parts – and to give an outline and clarification of the research process undertaken.

8.1 The art of vertical integration – profitability considerations

Our point of departure was the interest in – and the need to establish – the effect from integrating vertically in the Norwegian fish processing industry – towards the fishing fleet – on financial performance for firms in this setting. Could it really be as easy as governmental and non-governmental agencies had pointed to, that firms organising according to a value chain principle – from harvesting to marketing – would experience advantageous profit gains in this setting where so many heterogeneous actors – both at sea and land – operate?

In exploring this landscape, the underlying prerequisite which immediate became clear for us was the need to establish a sound measure for establishing the degree of upstream vertical integration, and a sound way of coupling this to an adequate performance measure. The research problem formulation then was to demonstrate approaches which could prevail over the difficulties met in conducting empirical studies on the impact of vertical integration on performance. More accurately it could be the expressed as an exhausting attempt to establish the degree to which backward vertical integration is undertaken in the Norwegian fish processing industry, and examining the performance effects from downstream vertical integration in the same industry.

Initially, a thorough literature review – surveying both theoretical and empirical research – was undertaken. Even though the literature concerning vertical integration is extensive, it is mainly conceptual, giving little advice on *how* to measure vertical integration. Moreover, the different theoretical contributions draw the attention to the factors which motivate for integrating vertically, rather than the anticipated effect from this action. Further, the concept of vertical integration is traditionally treated with inaccuracy, where you either ‘make-or-buy’ or ‘use-or-sell’. The applicability of vertical integration becomes multiple as one permits the use of *degree of* vertical integration as a continuous variable, rather than a dichotomous one.

The major theoretical treatments of vertical integration, on which we build our research, can all be cited in support of vertical integration in a setting like ours. From the viewpoint of transaction cost economics, vertical integration *can* reduce potential hold-up problems, reduce transaction costs between former separate value stages, and ease information transfers. In the eyes of industrial organisation, vertical integrating towards the fishing fleet can produce gains from combining successive operations, which calls for internal control and co-ordination, and gains from avoiding the competitive pressure in the first hand market for fish. Finally, the resource-based view of the firm, calls the attention to the fact that some firms hold resource portfolios which are better fit for improving the firms' competitive position, than other firms in the same setting. Within this line of reasoning, heterogeneous resources and their limited transferability and mobility create different firm capabilities over time which can help achieve and maintain sustainable competitive advantages. Recent trends within the strategic management research framework have underlined the role of firm specific resources and capabilities, for understanding the evolution of firm boundaries (Schilling & Steensma, 2002; Mota & de Castro, 2004). Then, vertical integration can be considered a way to create heterogeneous, valuable and rare combinations of resources that may give rise to competitive advantages, which are difficult to imitate (Wernerfelt, 1984; Ramanujam & Varadarajan, 1989; Miller & Shamsie, 1996)

In the opinion of practitioners like Stuckey & White (1993), the benefits from integrating vertically are in many cases exaggerated, when weighed against the belonging costs. From their business consultants experience they recommend that vertical integration should not be undertaken unless it is absolutely necessary, in order to create or protect value. They do, however, acknowledge that vertical integration can reduce some forms of risk and transaction costs, but the potential drawbacks firms might experience are higher capacity costs and efficiency gains that fail to materialise.

In empirical research on vertical integration, the phenomenon under scrutiny has to a larger degree been the factors motivating for vertical integration rather than what has been the effect from integrating vertically. Though, scholars attending to this problem in empirical research have shown that the expected performance gains from vertical integration do not always come about. Like Reed & Froenmueller (1990: 183) concluded from their study on 40 UK firms (20 vertical mergers) in the period 1970–1984: *"From the empirical evidence presented in this study it may be concluded that the strategy of vertical integration in and of itself does not produce superior levels of profitability, does not produce increased rates of growth and does not produce greater or reduced levels of risk."* The authors do however stress that their findings can not be interpreted as a general rejection of the association between strategic postures and superior corporate performance, but rather that such advantages will subscribe to realised economies of scope or scale, financial synergy or production capabilities – not to the vertical integration decision alone.

To sum up, theoretical literature reports the motives for, and gains from, integrating vertically in a supplementary manner. The main lesson to be learnt is that vertical integration, under the right circumstances, can enhance firms' profitability. However, according to empirical research and advice from practitioners, the outcome of vertical integration is not unambiguously positive. There, vertical integration is profitable in some cases, counterproductive in others, while for some it has no effect. Our research question remains: How is it in the Norwegian fish processing industry? Does upstream vertical integration towards the fishing fleet produce beneficial performance effects for those firms who undertake such strategic moves?

8.1.1 Research design and setting

In the setting we set out to explore the vertical integration performance relationship, there are properties existent which motivate for vertical integration and make our approach rewarding. First, our empirical test is conducted in an industry where the supply of the critical input factor fluctuates heavily, which motivates for bringing this source of supply under control – where one major adjustment is by ways of upstream vertical integration. The firms in this industry vary extensively both on the level of vertical integration undertaken, and their profitability. This enables us to wind up and test whether the firms that succeed and prosper in this setting, are vertically integrated to a greater extent than those who fail to achieve favourable economic results.

By developing a continuous variable for vertical integration in this setting, we allow for a test which not only do discriminate between those who have integrated versus those who have not, but also between to which *degree* fish processing firms have undertaken vertical integration towards the fishing fleet. And by limiting the setting under scrutiny to one industry – where the same environmental attributes presumably influence the whole population in the same manner – we avoid the possibility of poor statistical associations when comparing businesses in different competitive environments. Behind our test lies the basic assumption that all the firms in our study are subject to the same environmental influential factors, since inter-industrial variations are avoided.

Two approaches are brought forward here. First we lend the notion of 'failures' and 'survivors' from the organisational ecologists, an approach also called for by transaction cost representatives. By including longitudinal data and comparisons between those that succeed and those who do not, we are better capable of including the market forces at work that provides for the efficient sort of governance structures. Like Williamson (1985: 119) put it: *"...backward integration that lacks a transaction cost rationale or serves no strategic purposes will presumably be recognized and will be undone[55]."* Hence, high cost penalties attended with maladaptation and misalignment of organisational governance form, can ultimately lead firms to going out of business, and will – if identified – be reacted to properly. For instance Silverman, Nickerson & Freeman (1997) showed that firm survival in the U.S. trucking industry where positively correlated with transaction cost efficiency (Klein, 2005).

Here two diametrically opposed 36 firm samples are compared. The 'failure'-group consists of fish processing firms that went bankruptcy in the period 1977–1993, whereas the group of 'survivor' firms is a collection of firms which in the same period produced the best economic results in this industry. By utilising a longitudinal approach we seize the possibility of revealing an eventual *sustainability* in any competitive advantages created from integrating vertically. If the 'survival'-group is composed by firms having undertaken upstream vertical integration to a larger degree than the 'failure'-group, then it is plausible to assume that this kind of raw material sourcing in the fish processing industry helps maintaining sustainable competitive advantages.

Since there are no records in the profitability survey ("*Driftsundersøkelsen"*) over the state of vertical integration in the industry, a proxy for this variable had to be formed, which held the properties we connect with this concept. Above, the importance of assigning the actual flow of inputs stemming from units in the upstream stage, in which one holds proprietary interests, is justified for, when composing a variable for vertical integration in this setting.

Common for both approaches we employ is the focus on *upstream* vertical integration: we do not consider firms' integrating activities in the opposite direction, namely towards wholesalers, exporters or retailers. This is a point of incoherence since performance effects

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[55] In yet another publication, Williamson (1988b: 174) lists up this point as one of five areas where he will put forward some self-critique on behalf of the transaction cost arguments: *"The argument relies in a general, background way on the efficacy of competition to perform a sort between more or less efficient modes and to shift resources in favour of the former. This seems plausible, especially if the relevant outcomes are those that appear over intervals of five or then years rather than in the very near term. This intuition would nevertheless benefit from a more fully developed theory of the selection process. Transaction cost arguments are thus open to some of the same objections that evolutionary economists have made of orthodoxy (...), though in other respects there are strong complementarities between transaction cost economics and the evolutionary economics view".*

can just as well stem from successful acquisitions and mergers downstream the value chain. There are, however, two main reasons for disregarding this kind of integration. First, the traditional fish processing industry is comprised by a large number of actors, serving a global market with nearly homogeneos products to world prices, over which the processors have little or no control. Empirically, these firms have to a little extent been integrated forward, except for their acquisition of export licences (after the deregulation of the Export Act in 1991) and in some cases small local outlets for seafood and seafood products. Second, in our original attempt to map the state of vertical integration in this industry, we set out also to determine the level of downstream integration. However, our effort eroded as we found it very difficult to establish a good measure for this activity: Should it be measured in terms of how many man-years dedicated to sales and export activities? Could it be quantified in terms of production share, that flows through own export licenses or to own outlets? As a result of these difficulties this task was largely omitted, other than giving some descriptive statistics on the matter of to what degree the sales function was incorporated in the firm or left to others. The findings indicated that two thirds of the firms were proprietorially linked to those in charge of the sales, but most often through horizontal rather than vertical integration, since sales in many cases were attended to by a sales department within the same concern (Dreyer, Bendiksen, Iversen, & Isaksen, 1998).

Beneath, we outline the research design in the two different approaches, from the old and new sample of the profitability study in Norwegian the fish processing industry, respectively.

The old sample – a longitudinal assessment

In the earlier years of the profitability study, from 1977 to 1992, data from a sample of roughly 80 to 90 firms were collected. Each year, information on the raw material flow for each firm was obtained – in particular, from which vessel groups inputs were purchased. In that period of time, fishing vessels were generally owned by self-occupying fishermen, and only exceptionally by processors. The exception was wet fish cod trawlers, which to a large degree was subject to special delivery obligations (Flaaten & Heen, 2004; Dreyer *et al.*, 2006), – instructing them where to land their catch. The geographical bindings were stated to be one or more specific processors and/or within a geographic region. In most cases these processors (in some cases together with local banks or fishermen) were the owners of these trawlers through a widely used exemption clause in the Participation Act, and with contention in the Trawler Act[56]. For this period (1977–92) the most plausible construct of a variable for vertical integration is based on the landings the fish processing firms obtained from trawlers. The suitability of this proxy is ensured by the fact that – to our knowledge – trawlers were the the only vessels category the processing industry had ownership interests in, over which they could command where to deliver and – in some degree – to which terms (price, quality, species, etc.). It remains to be mentioned, however, that we by this operationalisation of the vertical integration variable fail to deduct the inputs stemming from trawlers not under

[56] In 1991 a total of 123 cod trawlers existed, of which 51 were wetfish or round fish trawlers (some of them with additional shrimp trawl licenses). At the same time, there were 21 factory trawlers and the remaining 51 had a limited cod trawl licence. The quantity delivered from factory trawlers to fish processing firms is neglectable, which – according to computations on fishing capacity from the Directorate of Fisheries (Ministry of Fisheries, 1992: 38) – made landings from the wet and round fish trawlers to constitute about 80 percent of the raw material available from the trawler fleet, if quotas and landings follow the same progress as capacity. According to the Ministry of Fisheries (1990), the number of wet fish trawlers not connected to the fish processing industry have been heavily reduced, even though small changes in the ownership structure was recorded the preceding 20 years. After the cod fish crisis in 1989–91, governmental structural schemes coupled with voluntary arrangements reduced this fleet considerably. In 1998 there were 39 wet fish/round fish trawlers (out of a total of 103 cod trawlers), whereas in 2004 there were 31 wet fish/round fish trawlers (out of only 69 cod trawlers in total). The corresponding number in 1991 was 51.

influence by the fish processor, neither to adjust for the degree of control the processors can command upon the vessels. Also their possible ownership in other vessels than trawlers – which we assume is modest – and thereby additional raw material flow, is ignored in our treatment.

The variables we utilised as a proxy to the true level of vertical integration in this setting then were two different computations of the five (consecutive) year averages over trawler landings, and follow from the formulas below:

Equation 1 $$\mathbf{V1} = \frac{\sum_{i=1}^{5} r_i}{\sum_{i=1}^{5} R_i} \qquad \mathbf{V2} = \frac{\sum_{i=1}^{5}\left(\frac{r_i}{R_i}\right)}{5} \quad \textit{where} \quad \begin{aligned} r_i &= \text{annual trawler landings} \\ R_i &= \text{total annual landings} \end{aligned}$$

As can be seen from Equation 1:

- ✓ **V1** give, for each of the 72 processors, the sum of raw material volume from trawlers over five consecutive years, divided by the total sum of raw material landings to the firm in the same period.
- ✓ **V2** is the share the trawler landings constitute of total raw material flow, as an average over a period of five consecutive years the firm have been in operation.

Two different variables for the share of landings from trawlers were chosen to mirror the state of vertical integration in the 'failure'- and 'survivor' groups. The reason is that the arithmetic mean of the trawler landing share (**V2**) might possibly over- or underestimate the true level of trawler landings when the raw material volume – or the volume from trawlers – fluctuates heavily between years (see Figure 5, page 83). The five year average – expressed by **V1** – will smooth out potential inter-year fluctuation in trawler landings, and give the 'true' average from the five year period.

For the 'failure' group then, the variable requires that firms have been operating for at least five years in the period 1977–1992 before bankruptcy, where the last year recorded is the latest full operation year before bankruptcy were announced. The recorded periods of the 'survivor' group firms were chosen individually to match the firms in the 'failure' group. We were unable to match the two segments totally, but a qualitative acceptable match with satisfactory coherence was made, where the mid-operation year (of the five) for the 'failure- and 'survivor' group was 1985 and 1984 respectively. This design corresponds with the methodological recommendations on discriminant analysis made by Altman (1968) among others. He compares financial ratios (on profitability, solvency and liquidity) between equal sized groups of bankrupt and non-bankrupt firms, where the latter group are carefully selected to match the bankruptcy firms regarding firm size, time period and industry. In our case, the latter is attained to whereas for firm size, the "survivor" firms are on average considerably smaller than the "failure" firms regarding raw material supply (−36 per cent) and total assets employed (−34 per cent).

Also, in order to relate this measure for vertical integration to the belonging performance effect, a longitudinal measure for performance had to be established. This was done by exploiting the quartile and median qualities for the statistical register on return on total assets (RTA) in the years in question. For each year then the total sample in the profitability study where divided into four equal sized sub-groups depending on their relative profitability, where the inter-group limits where decided by each years upper quartile, median and lower quartile in the sample. Firms with an annual profitability (RTA) above than the upper quartile value belonged to the first quartile and were assigned the value 1 and those performing worse than the lower quartile value, belonging to the fourth quartile, were allotted the value 4. Accordingly, firms performing better than the median value but below the upper quartile (the second quartile), and those performing better than the lower quartile but worse than the median (the third quartile), were assigned the value 2 and 3 respectively. Consequently, the long term profitability variable was computed as the arithmetic mean of values assigned to the firm over the five years. Illustratively then, a firm, whose financial ratios belong to the upper quartile each year would take the value 1, while a firm, whose profitability ended in the third quartile for two years and the second quartile for three years, would end up with a value of 2.4 on the performance variable.

By operationalising both vertical integration and performance like this, longitudinal measures were assigned to both the variables, allowing us to take long-term performance consequences from integrating vertically into consideration.

The new sample – a cross sectional study

In more recent years of the profitability study – after 1992 – the whole population has been surveyed rather than a chosen sample. The increased reporting regarding number of firms has however meant sacrificing some of the richness of details that was covered within the structure of the old survey. Back then, a great many structural variables (like landing statistics, production statistics and a marginal contribution statement) were included, whereas nowadays, the survey is based on the financial accounts of each enterprise, as reported to public authorities, and key statistics obtained from this source.

This unique panel data set, that covers financial account data for all firms in the industry, obtained from public registers, gives us the possibility to rank all firms based on their profitability every single year. However, in order to test if firms that achieve competitive advantages in this industry (i.e. obtain higher profitability), to a greater extent are vertically integrated than those who do not succeed, we need a variable that maps firm’s degree of upstream vertical integration. Since such a variable – from our point of view – cannot easily be obtained from the account sheets of the firm. Therefore, an additional survey was undertaken to establish the degree to which fish processing firms have acquired fishing vessels to secure own raw material needs.

This additional survey was performed by telephone interviews the autumn of 1998, were managers of 75 large processing firms (by fish processing industry standards) within the geographical limits of the northernmost fish sales organisation, were asked about their strategy actions with respect to vertical integration in 1997. The interviews followed the setup from a semi structured questionnaire, where the respondents (i.e. managers of firms filleting and freezing fish, or undertaking conventional production like clipfish, saltfish or stockfish) stated quantitative as well as qualitative data. The 75 firms represented one third of the firm population in this industry (in this region) that year. The choice of participating firms in this survey was done to ensure a highest possible coverage with respect to fish landings in 1997, and the raw material supply to the sample we addressed constituted about 70 per cent of total landings to firms in this region reaching nearly 500,000 tonnes this year (Isaksen & Iversen, 1998). A motive behind the choice of firms to this survey was the supposition that there existed a lower level regarding firms’ size – especially concerning their financial capability – before they were able to engage their resources in, or even to consider, vessel ownership. Another motive for this sampling method was the expectation that large firms, to a larger degree than smaller firms, would take well considered actions regarding their sourcing strategy, since, to these firms, high fixed costs make input variability and production standstills to an even bigger problem than for smaller firms.

The questionnaire sought to map each firm's proprietary interests in the fishing fleet over dimensions like number of vessels, size of ownership share, the actual year of acquisition, which type of vessel(-s) they had proprietary interests in, how much capital was tied up in vessel investments, and whether the firm had undergone changes regarding the degree of vertical integration later years, together with their future plans for investments in the fleet. We further tried to establish *how much of the total raw material supply stemmed from fishing vessels in which the firm had proprietary interests*. This variable constitutes our approach to the degree to which the firm was upstream vertically integrated. Our variable then is continuous, which denotes each firm's self-sufficiency regarding raw materials, and takes values from zero to one. By this operationalisation the vertical integration emphasis on control was partly set aside, since processing firms only exceptionally are allowed to own more than minority shares in fishing vessels. Indirectly then, we let the flow of raw material stemming from vessels in which they hold (minority) ownership shares, denote the strength of control the processing firm can levy over the vessel. The pure fish flow from vessels to processors might just as well reflect the vessel owners socially awareness – and a self-imposed moral imperative – as the degree of control the owner can render on the vessel operator.

The registration of the firm's degree of vertical integration in 1997 (i.e. the share of total raw material supply stemming from vessels in which the firm had ownership interests) was coupled with the belonging performance figures the same year, which enabled us to couple the two variables in order to uncover any co-variation between the two.

8.1.2 Findings

In the treatment of findings a similar lay-out as earlier is employed where the choice of samples are decisive. The first stem from the old sample of the profitability survey, and in the second, additional information from the interviews are coupled to survey data from 1997.

The old sample

By means of the data in the old sample we have, in Table 5, noted how the two 36 firm groups of 'survivors' and 'failures' differ with respect to upstream vertical integration, as measured by the extent of trawler landings to the total purchase of fish the firms acquire within a period of five consecutive years (**V1** and **V2**). The table shows with clarity how the two groups differ and the result of a *t*-test on whether the 'survivor'- and 'failure'-group differ significantly regarding degree of vertical integration[57], i.e. a null hypothesis expecting equal means in each sample – that the degree of vertical integration do not (significantly) differ between the 'survivors' and 'failures'.

[57] The test for statistical significant difference between the groups is performed with an independent sample *t*-test, where the population standard deviations are assumed normally and symmetric distributed ($\sigma_1^2 = \sigma_2^2$). Here, N = 72, where the null hypothesis H_0: $\mu_1 = \mu_2$. Then, at a five per cent level of significance ($\alpha = 0.05$), the critical value of the test statistic is $t_{\alpha/2}\{70\} \approx 1.997$. The null hypothesis, which assumes equal means in the two population groups, can be rejected if the test statistic $|t^*| > 1.997$, (Byrkit, 1987).

Table 5 Descriptive and test statistics on vertical integration in the 'survivor' and 'failure' groups

Variable (N=72)	*'Survivors'*		*'Failures'*		*t-value*
	Mean	*Std. Dev.*	*Mean*	*Std. Dev.*	
V1	0. 0802	0.1966	0.1683	0.3195	-1.390
V2	0. 0795	0.1980	0.1379	0.2300	-1.139

Table 5 reveals several issues. First, we see that vertical integration were – on average – quite modest for both groups within this period of time (1977–1992), as measured by the share of landings from trawlers. Further, the group of 'survivors' was vertically integrated to a lesser degree than the 'failure' group in the period, as measured by an eight per cent share of total landings that they received from trawlers, regardless which measure (**V1** or **V2**) is employed. However, with a standard deviation 2.5 times the simple mean, there is large variation in the group of 'survivors'. Also within the group of 'failure'-firms, which on average receives 14 or 17 per cent of landings from trawlers (depending on which measure is utilised) there is inherent variation in the sample, where the standard deviation is up to 1.9 times as big as the mean. That the 'failure'-group scores higher on the **V2** measure than the **V1** measure, indicates that for this group there is an overweight of firms whose landings records show years with high total landings together with high shares from trawlers, or years in which total landings are small and the corresponding landings from trawlers are even less. This is due to the implicit weighting of averages to the yearly total input that takes place in the first measure (**V1**), where as the second measure (**V2**) functions as a 'smoothing' device, where by every yearly trawler landing share is given equal weight when dividing by five.

Table 5 exhibits tendencies contrary to what we expected. The means of the two groups reveal that firms, who go bankrupt, are to a larger degree vertically integrated than those who achieve sustainable competitive advantages in this setting. This is an interesting aspect and points to vertical integration as a highly risky strategy (Stuckey & White, 1993). However, when inspecting the *t*-values, we see from Table 5 that we fail to reject our null hypothesis that the means in the two groups are – from a statistical point of view – equal, since (the numerical value of) the test statistic ($|t^*|$) do not exceed the critical value. This implies that we cannot overrule that the values the population means take are identical. Likewise, we are unable to conclude that the two different groups – from a statistical point of view – are significantly different with respect to vertical integration by the way we have measured it. Even when increasing the probability for wrongfully rejecting the null hypothesis to 10 per cent we still are unable to reject the proposal that the samples have equal means (level of confidence equals 90 per cent where critical value decreases to 1.905).

When taking this finding into consideration, pursuing further differences between the 'survival' and 'failure' groups will probably not produce any statistical robust results. Regardless this rebound, we continue by examining whether the level of vertical integration in firms – on an overall basis – have any bearing on the profitability realised by the firms. We therefore alter our approach slightly. Again we limit ourselves to the same firms, the same time period (1977–1992) and the trawler share operationalisation of vertical integration. Though, in stead of discriminating between 'survivors' and 'failures' we draw the distinction between ‘all firms’ in the industry and the so-called ‘freezers’[58]. Our approach to financial performance is *relative profitability*, i.e. each firms’ score on the return on total assets, ranked related to the annual quartile values, from which a simple mean for the five year period is computed. The performance variable then takes values from 1 to 4, where a high numerical value indicates relative low profitability score – as compared with other firms in this industry.

Table 6 exhibit the Pearson correlation matrix between the two vertical integration variables and the relative profitability variable for all firms and freezers respectively.

Table 6 Correlation matrix on the relation between vertical integration (V1 and V2) and relative profitability for all firms and freezers

Variable	*Relative profitability*	
	All firms (*n = 72*)	*Freezers* (*n = 36*)
V1	0.168	0.012
V2	0.164	- 0.016

A first glance at the correlation matrix in Table 6 reveals that vertical integration have no statistical significant effect on performance, since none of the correlations are significant different from zero. When inspecting the second row for ‘all firms’ we find that our variables for vertical integration (**V1** and **V2**) are positively correlated with our measure for firms’ relative profitability. However, since a high score on our profitability variable corresponds with relatively low profitability, the more vertically integrated firms are (in terms of acquiring fish from trawlers) the less successful they are in terms of relative profitability. This relationship is, however, weak, since a twenty percentage point increase in the share of total landings from trawlers will only increase our profitability variable (correspondingly; decrease relative profitability) with a numerical value of 0.034. For comparison, it is about one fifth the effect of a single year one quartile fall in relative profitability for a firm entering the sample.

When narrowing the operation to testing for the processors undertaking filleting and freezing operations – those that generally are integrated with trawlers – the findings become even weaker and more indeterminate. As can be seen from the last column, a 10 percentage point increase in the share of raw material from trawlers – regardless which vertical integration measure used – will, on average, hardly have any effect on their profitability score. The correlation coefficients take the opposite signs on the two vertical integration variables, which emphasises the indecisiveness of predicting performance effects from vertical integration in this exercise. A contributing factor to this indeterminacy can be that this segment of the fish processing industry over the years has been one of the worst performers regarding profitability (Bendiksen & Isaksen, 1998). However, there should be enough intra-segment dispersion to establish interesting findings on performance differentials. Though, as it seems,

[58] This latter group is traditionally the one with the closest ties to the trawler fleet, where they in 1950’s to 1970’s were granted trawl licences and the right to own fishing vessels. This governmental instrument was initiated and implemented in order to fulfil the raw material needs – and a stable supply of fish – to some favoured firms. The objective was to secure employment and profitability, since the units favoured were important employers and activity creating in rural areas where the fisheries industry constituted the main outcome for people. These producers were considered important businesses since they employed a great many people and were the sole employment providers and fish recipients in many local communities in North Norway. Filleting and freezing of fish has been one of the most labour intensive segments of the fish processing industry. The end products have traditionally been frozen consumption ready packages of frozen fish – in later years also fresh packaged – sold ready for consumption in important export markets.

there is no sign of it substantiated in the degree of vertical integration (or rather; share of raw material usage from trawlers)[59].

The non-appearing effects on profitability from vertical integration in the previous tests makes it interesting to examine whether there were inter-year differences between the share of fish acquired from trawlers and the corresponding performance effect, and whether a single year analysis would produce significant correlations between the variables for all the years from 1977 to 1992. In Table 7 the results from this correlation analysis is exhibited, which is based on the **V1**-variable, where the summation sign is omitted since only trawler landings share of total landings the prevailing year is in demand. For this analysis, the chosen performance measure is the actual score each firm obtain on the key statistic *return on total assets* (RTA). Therefore, one should, when viewing the results, bear in mind that a negative correlation coefficient implies that vertical integration is negatively correlated with profitability the given year.

Table 7 Correlation coefficients (r) between vertical integration and profitability among fish processing firms, 1977–1992

Year	*All firms*		*Freezers*	
	r	*n*	*r*	*n*
1977	- 0.1211	75	0.1794	27
1978	- 0.2458	76	0.0123	29
1979	- 0.2437	77	- 0.0410	22
1980	- 0.2210	84	- 0.1590	29
1981	**- 0.2959***	85	**- 0.4283***	31
1982	- 0.0773	78	- 0.0186	24
1983	- 0.1137	74	- 0.2920	25
1984	- 0.1655	68	- 0.1457	20
1985	- 0.2382	63	- 0.1640	22
1986	- 0.0224	85	0.0437	24
1987	0.0359	82	0.1152	32
1988	- 0.2086	79	- 0.1647	26
1989	- 0.0721	75	0.0427	23
1990	- 0.1695	80	- 0.1318	19
1991	- 0.1812	77	- 0.2726	24
1992	- 0.2079	68	- 0.2627	24

*) Significant at a one per cent level ($\alpha = 0.01$)

The annual test results provided in Table 7 show practically the same outcome as accounted for above. Again we see that the trawler share of landings is negatively associated with performance for all firms, and in only one of the years in question a positive correlation

[59] There is, however, one significant weakness burdening our 're-sampling' of the 'survivor/failure'-exercise into an 'all firms/freezers' analysis. In the first, our performance measure was implicitly decided by the design, while in the latter a new average performance variable is introduced, and the original pairing of firms (one failure for each survivor) is abandoned. As a consequence, the 'all firms/freezer' groups in our second approach might be significantly skewed regarding time, firm size and other descriptive variables. However, the nuisance is facilitated by the fact that both tests are robust in the sense that they indicate the same relationship between vertical integration and performance in this industry. Hence, we emphasise the coinciding findings more than different sampling in the two tests.

coefficient between the two variables is produced[60]. This lends support to the previous finding that 'failures' to a greater extent are vertically integrated than those who achieve sustainable competitive advantages (i.e. 'survivors'). Also, when only the freezing plants are under scrutiny, this general observation holds, even though here, five of 16 years show a (small, but) positive co-variation between trawler share and return on total assets. However, the demonstrated negative co-variation between profitability and vertical integration, for freezers as well as all firms, is only statistically significant in one out of 16 years. This occurs in 1981 and is significant for all firms as well as for freezers. Hence, it is obvious that the degree of trawler landings is unable to explain the performance differences among firms in the Norwegian fish processing industry. Our simple one explanatory variable regression model is inadequate to tell the whole truth, which underlines that important external factors to explain the vertical integration performance relationship are omitted. Beneath, some of these external factors will be mentioned.

In 1981, the total allowable catch of North East arctic cod was historically low (see Figure 5, page 83 – cod quotas), while at the same time the total quantity of cod fish (cod, saithe, haddock, and others) available to the Norwegian fish processing industry increased by 13 per cent. That year, profitability rose substantially for freezers, while for conventional producers, the profitability fell despite favourable currency developments and increased stockfish sales. Conventional producers received about 95 per cent of landings that year from the coastal fleet, while freezers share from trawlers was 27 per cent (Løvland, 1983). On an overall basis, profitability rose in 1981, while share from trawlers fell from 1980. The findings in Table 7 point in direction of an overrepresentation of freezers performing at their peak in 1981 by firms that receive relatively little from trawlers. Another development from 1980 to 1981 was that small freezing plants shifted some of their production from filleting to drying of fish.

As a preliminary conclusion from the tests based on the old sample in the profitability study one can maintain, despite the lack of statistical significance, that all our findings point in the same direction – namely that firms with higher shares of trawler landings in their total raw material purchase have generally lower profitability than the rest of the firm population.

The results from these tests are rather counterintuitive all the time we have argued that the industry specific factors speak in favour of vertical integration in a setting like ours. However, these findings are in accordance with what Dreyer (1998) points at, namely that the supply of fish to 'failure'-firms in this industry has a tendency to exercise greater stability – in terms of less volume variation – than that to the 'survivor'-firms. In other words, stable supply of fish to firms in this industry does not seem vital for the profitability experienced by the firms. The traditional vertical integration constellation between trawlers and fish freezing plants has throughout the whole period of the profitability study been of the worst performers. That may, partially at least, be due to fierce international competition and market conditions, totally isolated from the way they organise their raw material sourcing. Though despite our attempt to isolate the freezers in our analysis, the negative effect is only mildly moderated, and the general finding supported.

To some degree the findings reported in Table 6 and Table 7 are supportive of each other, but it is obvious that large portions of the variance in performance remain unexplained by our vertical integration variables. An obvious conclusion then is that our models are misspecified,

[60] That 1987 is the only year in which the share from trawlers to all firms is positively correlated with profitability is rather counterintuitive. That year, the cod quota was at its peak, which in general should diminish the value of vertical integration. The reason being, when supply is good – or even in excess of demand – cost increasing efforts like vertical integration to secure supply will have a detrimental effect on performance, since markets will govern and assure supply to lower costs.

where central variables to explain the performance variations are omitted. Before introducing the analysis from the other data source and research design, that is to say the new sample with a cross sectional approach, one bring the attention to the fact that the analysis above is sensitive to our operationalisation of the vertical integration variable. We have narrowed the meaning of vertical integration to the degree to which fish processing firms receive fish from trawlers, since this is – or was – the traditional constellation within the Norwegian fish processing industry where vessels are under ownership of fish processors. However, it exists and have existed trawlers owned by fishermen, a raw material source we have not been able to adjust for in our data, which may constitute harmful divergence from the vertical integration performance association our analysis have provided.

The new sample

The problems we meet from lacking a good measure to map the state of upstream vertical integration in the fish processing industry made it obvious that action had to be taken in order to meet this remedy. We therefore conducted the additional explorative survey in 1998 to reveal the state, and plans, of vertical integration for firms in the fish processing industry[61]. Managers of 75 fish processing firms where addressed, to which 71 agreed to participating in the study, and were asked – in relatively short telephone interviews – about their current plans of, and attitudes towards, vertical integration, as well as their firm's state of vertical integration in 1997[62].

The answers given by managers, on how much of the total fish input to the firm that stemmed from fishing vessels which the firm had proprietary interests in, gave us the opportunity to map the degree to which the firm was upstream vertically integrated. This was attended to by creating a continuous variable, taking values from zero to one – where the latter implied that all fish inputs stemmed from vessels where the firm had ownership interests. In Figure 7 we have depicted the distribution of the answers given by the 71 managers of fish processing firms that chose to answer our questions regarding vertical integration.

[61] More detailed information on the sampling for the survey, together with further explorative data can be found in Isaksen & Iversen (1998) and Dreyer *et al.* (1998).

[62] Before presenting the findings one should considerate the fact that in 1997, the quota for North-East arctic cod where at its peak, and at the same time, Russian fishing companies found it expedient to land their catch in Norwegian ports, to achieve earnings in Western currencies and to avoid special investment or landing taxes in Russia (Bendiksen & Nilssen, 2001). This constituted a favourable supply situation for Norwegian fish processors, for which 1998 was the best year ever regarding profitability (Bendiksen, 2003). At the time we conducted our survey (late 1998) quota expectations was reduced and it was clear that Russian trawlers would land less fresh fish to Norwegian ports, as their vessels to a larger extent were provided with on board freezing equipment. In light of this, most of the fish processing managers we spoke with were positive to, and had expansion plans for undertaking or further utilisation of, vertical integration towards the fishing fleet.

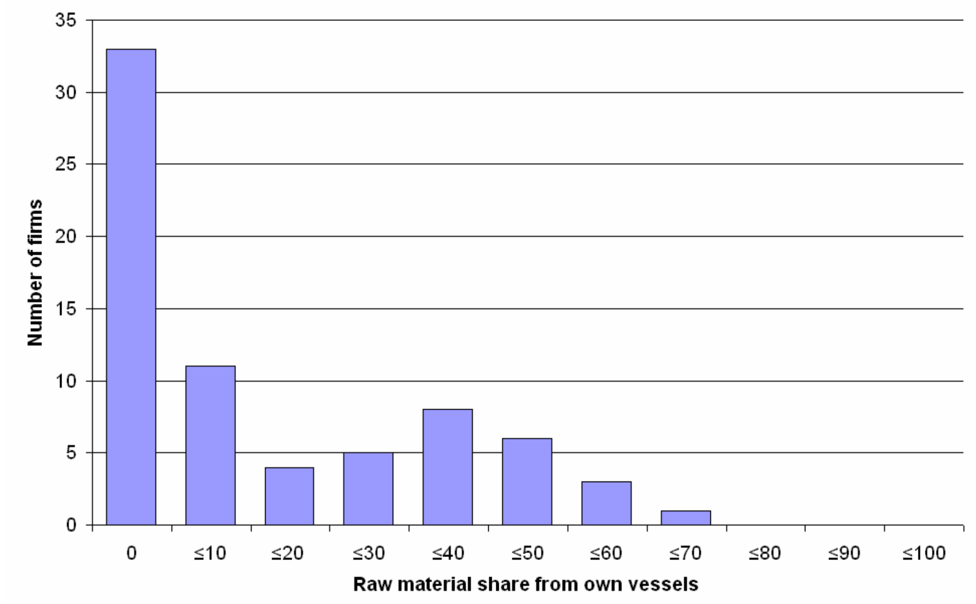

Figure 7 Histogram for distribution of our vertical integration variable (per cent) in our sample of fish processing firms (N = 71)

The plot clearly shows that the largest single group of firms are those who receive no fish from own vessels, i.e. firms that are not vertically integrated towards the fishing fleet in our terminology, with nearly half the sample. The average firm in this sample receives nearly 16 per cent of its raw material volume from vessels they have ownership shares in, whereas the median of the sample is 5 per cent. However, if we weight the shares by the firms share of total raw material to the sample, the average level of purchases from own vessels increases to 26 per cent. This underscores our assumption that upstream vertical integration in the fish processing industry is an activity mainly undertaken by relatively large firms. The graphic illustration and this interpretation also help us deciding how to arrange comparable groups of firms, where our sample is categorized by more or less than 25 per cent.

What remains is coupling our vertical integration variable with a measure for performance. Here we have chosen to utilise two measures for profitability[63]. First we use gross profit margin to depict how much of total sales ends up as profit to the owners (and the state through taxation), whereas return on total assets are included since the first profitability indicator does not capture and discriminate on how much productive capital is employed in, say, a vertically integrated concept.

Table 8 gives a description of the sample and how the firms distribute regarding our vertical integration variable and the two profitability variables in 1997. The firms are grouped into three categories: unintegrated, modestly and highly integrated firms. The first group is self-explanatory and contains firms that receive nothing from vessels that they own. Our operationalisation opens for unintegrated cases where firms in fact own vessels, but for some reasons receive little or nothing from those vessels. The next limitation between firms are set at 25 per cent from own vessels, where those receiving more are highly integrated and those receiving less is modestly integrated. The reason for choosing this share is motivated partly

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63
$$Gross\ profit\ margin = \frac{profit\ before\ extraordinary\ items \times 100}{Net\ revenues}$$
$$Return\ on\ total\ assets = \frac{(profit\ before\ extraordinary\ items\ \text{-}\ interests\ charged) \times 100}{average\ total\ assets}$$

from the weighted average accounted for above, where the average firm received 20 per cent from own vessels, and partly from the fact that this limitation is the closest to dividing the integrated firms in equal numbered groups. Another reason is that the supply of fish to these firms in 1997 was exceptional high, due to a peak in cod quotas and favourable Russian landings[64], which presumably would reduce the score on our operationalisation of the vertical integration variable this year. However, our operationalisation deviates considerably from Harrigan (1986a) who, distinguish between some and most internal purchases at above five and 50 per cent respectively, and between full and partly ownership at 95 per cent.

What additionally needs to be elaborated is the fact that when summing up the last column, only 66 firms – of the 71 we obtained answers from – are accounted for. This artefact stems from the lack of account figures in 1997 for some of the firms that entered the survey. In three cases the account figures were unobtainable since the firms were registered as individual enterprises, general partnerships (ANS) or companies with limited liability (BA). For the other two 'ejected' firms, the business units we addressed were parts of greater diversified conglomerates, whose lion's share of the account figures mirrored activities so distant from fish processing that we simply could not include them. These omissions take place in all three categories of fish processing firms, as can be seen from the difference between the number of firms in first and last column in Table 8.

Table 8 Descriptive statistics: Share of raw material supply from own vessels (vertical integration) and average profitability of Norwegian fish processing firms in 1997. (Standard deviation for profitability scores reported in parenthesis)

Share from own vessels (n)	*Average profitability*				*Number of firms*
	Gross profit margin		*Return on total assets*		
Nothing (33)	1.95 %	(4.1 %)	12.04 %	(13.5 %)	31
0 – 25 per cent (17)	2.14 %	(2.7 %)	13.61 %	(10.1 %)	16
More than 25 per cent (21)	2.73 %	(3.6 %)	9.69 %	(6.0 %)	19
All firms (71)	2.22 %	(3.6 %)	11.74 %	(10.9 %)	66

Inspecting Table 8 and the average profitability scores for firms with either no, some or high levels of upstream vertical integration, reveals some interesting aspects. First, when the column for gross profit margin is examined, we see that as the degree of vertical integration increases, so does profitability. The firms that were not vertically integrated in 1997 had a profit before extraordinary items and taxes of approximately 2 NOK for each 100 in income. For the firms receiving more than 25 per cent of their raw material supply from own vessels, about 2.75 per cent of sales were profits. Those with modest levels of vertical integration, (up to 25 per cent from own vessels) had – on average – a gross profit margin somewhere in between the other two groups, underlining the positive relationship between the variables.

When looking at the return on capital employed in firms – regardless of fundings as measured by the variable return on total assets – the registered scores, when measured up against the degree of vertical integration, indicate the form of a concave function, where it seems to exist an optimal level of vertical integration. This is quite the opposite from the findings Buzzell (1983) reported from a study of 1,693 manufacturing-processing units (PIMS). He found that for most businesses, vertical integration led to reduced profitability, but that large businesses

[64] An indication of this is the findings from our 1998 survey (Dreyer *et al.*, 1998) were there where more fish processing firm managers who responded that the share of landings from own vessels had decreased, than those reporting the opposite, despite the fact that a majority of the managers (85 per cent) appraised vertical integration and considered to extend their ownership engagements in the fleet.

with strong market positions were most likely to benefit from integrating vertically. When comparing his vertical integration measure (value added over sales) to net profit as percent of sales, he found – like us – a positive relationship. However, when assessed against Return on Investment (ROI) – a profitability measure in accordance with our return on total assets – he finds that the vertical integration variable exercise a "V-shaped" relationship towards profitability, where modest or high levels of vertical integration produce better performance.

The findings from Table 8 are, however, weakened by the fact that there could not be found any statistical significant difference between the groups of firms we have utilised, neither with respect to *gross profit margin* nor *return on total assets*. Nor when manipulating the straining points for group classification, to say 20 or 30 per cent, could any significance be established. This is underlined by the huge variance in the profitability scores in each of the groups, as illustrated by the corresponding standard deviation for each group. The variance levels of the profitability measures also reveal that the groups – from a general point of view – vary less the more vertically integrated they are.

Beneath, in Figure 8 and Figure 9, an additional description of the correlation between vertical integration and performance is given, as the share of raw material stemming from own vessels is plotted against gross profit margin and return on total assets, respectively. Within the graphics we have included the trend line provided by OLS regressions.

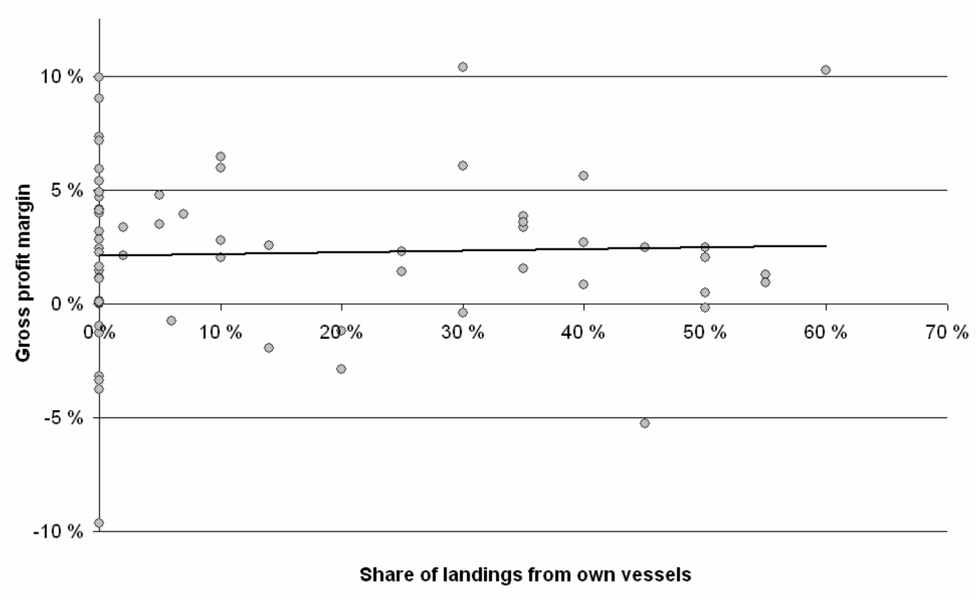

Figure 8 Plot diagram of vertical integration on gross profit margin in 1997

From investigating visually the scatter diagram on the vertical integration gross profit margin (GPM) association in 1997 one can hardly reveal any linear correlation between the two. If any such relationship exists, it is positive, but negligible so. This is underlined by the solid line representing the result of an OLS-regression, which can be seen to be incrementally upward sloping. The result from the regression can be read from Equation 2:

Equation 2 $$\mathrm{GPM} = \underset{(0.005)}{0.021^*} + \underset{(0.023)}{0.007} \cdot \mathrm{VI} \quad \textit{with} \quad \mathrm{R}^2 = 0.0016$$

In Equation 2, the standard deviation is reported in brackets under each of the regression coefficients, and the asterisk (*) implies a coefficient significantly different from zero, at a five per cent significance level. The results from the OLS-regression show that when fitting the data points to a line, it is only barely positive but not significantly different from zero, and less than two per thousand of the inherent variation in the data material can be explained by the regression line. The intercept with the Y-axis, however, is significant different from zero (at a one per cent significance level), implying that we could just as well have expressed our model as a straight line through the points in Figure 8.

Beneath, in Figure 9, we have displayed a similar scatter plot, showing return on total assets (RTA) together with level of vertical integration in the surveyed firms.

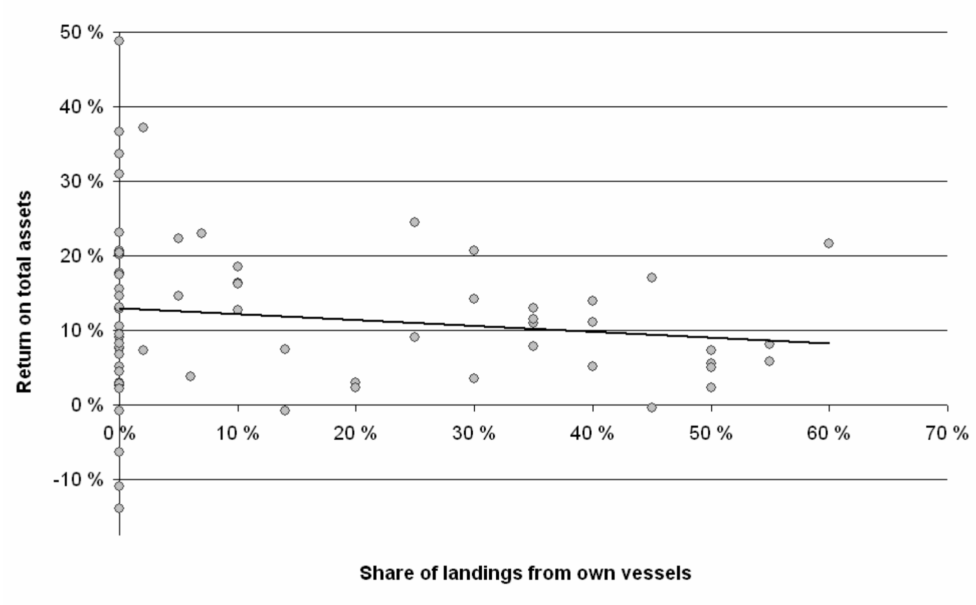

Figure 9 Plot diagram of vertical integration on return on total assets in 1997

Inspecting the equivalent scatter diagram for Return on total assets and vertical integration reveals, if we add some goodwill, that the dots can more easily be fitted to a straight line. Also here we include the OLS-regression line, which reveals a negative association between the degree of vertical integration and performance (as measured by return on total assets - RTA). The results from the OLS-regression can be read from Equation 3:

Equation 3 $$\mathrm{RTA} = \underset{(0.017)}{0.129^*} - \underset{(0.070)}{0.077} \cdot \mathrm{VI} \quad \textit{with} \quad \mathrm{R}^2 = 0.0185$$

The results show a negative covariation between vertical integration and performance, but again, only the interception term is, from a statistical point of view, significantly different from zero (at a 95 per cent confidence level), despite improved explanatory power through a higher – but still poor – R^2. Only two per cent of the variation in the data material is explained by fitting the observations to the prescribed regression line.

Holding these findings together first and foremost reveal that not only are there great variation in vertical integration in the firms under scrutiny, but also in the profitability they perform the year we have studied. This is underlined by the plots exhibited in Figure 8 and Figure 9. Further we see the regressions produce nearly no correlation between the degree of vertical integration and performance, since the correlation coefficients are not significantly different from zero, and the infetisimal squared sample correlation coefficient (R^2) disclose practically no explanatory power from our regression lines and the lack of any linear association between vertical integration and performance.

Some methodological issues remain to be commented. Considerable parts of the variation inherent in our data material spring from the firms whose own vessel landings share of total supply equals zero – either because they own no vessels or because own vessels do not land in their home port. These firms amount to nearly half of our respondents, and constitute a severe problem if trying to transform our variables into, say, natural logarithms. Ohanian (1994), for instance, recommends using a Tobit regression when vertical integration is a continuous truncated variable and logit regression when it is treated as a dichotomous dummy variable. Here, however, the clustering of limit values (zeros) are the outcome of discrete managerial decisions, not censoring, which limit the applicability of the Tobit-model (Greene, 2000). In an attempt to circumvent this problem, we disregarded these firms despite their large numbers and perform our OLS-regression again. Then, for the case of the gross profit margin (GPM), the slope coefficient takes a negative, again insignificant value, while R-square is further reduced to half the value of the original regression. In the case of return on total assets (RTA), however, the sign of the slope coefficient remains the same (negative) but is close to being significant at a five per cent level. Additionally, R-squared increases and enables the models to explain 10 per cent of the variation – five times as much as the original regression. Secondly, when forcing our regression models – in case of both GPM and RTA – to take a polynomial function form (both second- and third-order), R^2 was only a marginally improved. Hence, the assumption made from Table 8 that return on total assets is a concave function of vertical integration, do not hold statistically. Though, when the zeros are excluded from our material, the polynomial regression functions improve the explanatory power (R-squared) with up to 2 and 15 per cent for GPM and RTA respectively. However, it is hard to give a fulfilling explanation to why the way vertical integration improves profitability (as measured by RTA) in a concave manner, even though it is coinciding with the data in Table 8.

In retrospect, we fail to explain the profitability in the Norwegian fish processing industry by means of the degree to which firms have undertaken upstream vertical integration – at least not for the firms entering our study for the year 1997. Our analyses show unmistakably that the variation in economic performance in this industry can not be explained by the degree of upstream vertical integration among Norwegian fish processing firms alone.

There are, however, some trends regarding performance and vertical integration in our data material that we cannot neglect entirely. From Table 8 we observed that gross profit margin increased with degree of vertical integration, and that return on total assets displayed and inverted “V-form” with increased vertical integration. The inherent trend – without statistical significance – could be explained by the fact that the highly vertically integrated firms have high *pretax profit margins*, but this is not sufficient to compensate for the additional capital tied up in vessel investments entering the firms’ total assets. Further, if return on total assets is scrutinised, an optimal level of vertical integration between the extremes should exist. This fact based speculations can be interpreted in favour of a moderate degree of vertical integration, which ensures flexibility without throwing all the efficiency gains from vertical integration over board, analogous to Porter’s (1980: 319) prescription on tapered integration.

8.1.3 Discussion

The preceding analyses are undertaken in an industry where uncertainty regarding input volumes is high. Further, firms in this setting are exposed to an imperfect raw material market, where biology, market power imbalance and institutional barriers impose further uncertainty to the processing firms. According to the reviewed theories these factors motivate for integrating vertically towards the source of supply. Our survey, which was undertaken in 1998, revealed that a majority of fish processing firm managers had great confidence in vertical integration as a means to secure the control over the raw material supply, that they considered vertical integration to be an even more important for their firm in the future, and that they intend to take more investments in the fleet in the years to come (Dreyer *et al.*, 1998). Even though managers in this industry were eager to vertically integrate backwards toward the fishing fleet in order to secure supply, and to some extent had exerted this option, our findings indicate that this is not a necessity to achieve sustained competitive advantages. In fact, the variation in profitability for vertically integrated firms is so great that we can not derive any precise conclusions regarding the vertical integration performance relationship. Our findings, which show indecisiveness regarding the profitability effects one can expect from an expansion path like upstream vertical integration, place the attitudes of fish processing firm managers in a strange light. The findings further acknowledge the recommendations made by Stuckey & White (1993) who advice managers to consider other strategies than vertical integration for reducing uncertainty, since required investments and management challenges are often underestimated, at the same time as the corresponding positive impact on profitability from integrating vertically is exaggerated.

The efficiency argument, brought forward by Levin (1981), presumes that vertical integration (in the U.S. oil refining production) which secures the most important supply, can bring about cost savings in from three sources: production cost achievements by increasing the capital utilization, reduced transaction costs, and the reduction of risk. The difference between the U.S. oil industry and the Norwegian fish processing industry could perhaps not be any greater, but some similarities exists, which makes Levin's efficiency argument conceivable also in our setting. First, even though the production levels in our industry are much smaller than what is achieved in the oil refining business, high capacity are still associated with high fixed costs, which poorly utilised is associated with a substantial cost penalty. Therefore larger firms should be more eager to secure supply, than smaller – more cost flexible – firms.

From transaction cost theory the size argument for integration vertically is threefold: First, the cost penalty from a production interruption will be greater for large firms than for smaller firms, since, usually, higher fixed costs are involved (Temin, 1988). Second, if larger firms have higher transaction frequency than small firms, transaction cost benefits will increase with size and favour internal organisation (Williamson, 1985: 60). And third, if there are scale economies involved in the upstream stage, a large firm will enjoy these better than a small firm will (Williamson, 1985: 94). Levy (1985: 440) on the other hand point to the opposite relationship between vertical integration and size due to limited managerial resources (Penrose, 1959) and expects vertical integration to diminish with the scale of the firm's primary activity. In our sample, an OLS-regression of total raw material supply (in volume terms) on vertical integration (i.e. the share of raw material supply stemming from own vessels) uncovered a significant positive covariation. However, only 17 per cent of the variation was explained by this linear regression model[65]. This suggests that larger firms, which in cost terms are more vulnerable for production stand stills, have a greater incentive to undertake vertical integration in our industry. The two other arguments – transaction costs and risk – are easily converted to the fish processing industry, as accounted for earlier: Integration

[65] Formalistic the regression model was this: $\mathrm{VI} = \underset{(4.606)}{0.791} + \underset{(0.906)}{3.248^{*}} \cdot \mathrm{RMS}$ where VI was our definition of vertical integration, RMS = total raw material supply in 1,000 tonnes, and the corresponding $R^2 = 0.169$. Regressing total sales against vertical integration gave similar results; a significant positive regression coefficient with the same strength in explanatory power.

can reduce the constant haggling over first hand prices and might contribute to less variation in business profits[66].

Having established that an overall relationship between vertical integration and profitability in this industry is absent, a problem that remains unsolved is the existence of highly integrated firms that are highly profitable. Because, in the vast heterogeneity that distinguish this industry, we find such examples just as often as we find unintegrated firms with low profitability. Another study in this industry found that firms in the frontline concerning profitability were units that were characterised by a high degree of flexibility over several dimensions (Dreyer & Grønhaug, 2004). That supports Miller & Shamsie's (1996; 1999) argument – rooted in the resource-based view – that for firms in stable and predictable settings, property based resources will best help creating and sustaining competitive advantages, while for firms in highly turbulent environments, knowledge based resources can best help achieving those advantages. Translated to our setting then, it should be knowledge based resources which should prevail for producing profitable firm constellations, where successful firms with vessel ownership most likely possess and govern skilful and talented persons, who know the best way to coordinate the vessel operation with the needs of the processing plant in order to bring about the best results.

Methodologically, by dividing our analysis in two separate designs we have sought to cover the longest possible period. Comparing the two approaches is difficult, not only because of the different use of measures for vertical integration, but also due to the different business environments they are undertaken in. The competitive environment in question is highly dynamic (Dreyer & Grønhaug, 2004) and the gains from integrating vertically might very well change substantially over relatively short time spans as fundamental conditions in the raw material supply change. One example in our setting can be the dramatic increase in Russian landings to the Norwegian fish processing industry in the beginning of the 1990's as the Fishery limit Act[67] was inverted; landings which decreased dramatically as Russian vessels was rebuilt to freeze their catch on board at the end of that decade. At the same time, it can be can be argued that the regulatory environment have been altered considerably in the years between 1977 and 1997, as accounted for under Chapter 7.2.2.

Our analysis is further rested on the observations of *upstream* vertical integration in fish processing firms. The study does therefore not take into consideration the degree to which fish processing firms have undertaken *downstream* vertical integration. We tried, but found no reasonable ways of measuring this kind of integration in this industry – neither in terms of volume nor value. The fact that this industry is prominently a raw material supplier, with mainly industrial customers at its end market, where downstream vertical integration is utilised limitedly, does not free our analysis for benefiting from including such a variable.

Analogous to Wensley's (1997) argument that no single factor can explain more than ten per cent of the study sample variation in performance, a long range of moderating factors could have been included to account for the variation in our sample. However, financial and time constraints have – like everywhere else – also limited the effort set in here. This 'excuse' can also be maintained for the rather unsophisticated statistical remedies utilised. However, since the residual analysis from the OLS-regression exercised satisfactory attributes (by visual

[66] In Dreyer *et al.* (2006) we show that fish processing firms with ownership in trawlers with special delivery obligations show a more stable development in profitability over years than firms without such bindings. However, profitability for the first mentioned firms (as measured by return on total assets) is at a lower level than what other firms in this industry can refer to, and when profit is negative, there is little or no comfort in stability. This stability is probably due to the relatively larger asset bases found among firms with trawler ownership.

[67] Act relating to Norway's fishery limit, prohibiting fishing etc. by foreign nationals inside this fishery limit.

inspection of their plots) and polynomial models gave no more extra explanatory power, further statistical analysis were abandoned.

Setting these apparent weaknesses aside, our analysis has demonstrated a fruitful way to undertake studies of the vertical integration performance relationship, which is tailor-made for the setting under scrutiny. Further, our study is an important increment to the rather limited number of analyses, which empirically examines this relationship. The setting specific measurement development serves as guarantor of the internal validity together with data quality and first hand knowledge to this industry in an empirical study like ours. Though, the emphasis placed on industry specific conditions, necessarily means that external validity is sacrificed. Even though the theoretical basis is of a general kind, the empirical results obtained here for the Norwegian fish processing industry can not easily be transferred and maintained to be prevailing in other industries. In that respect, we call attention to Joskow's (1988) recommendation to thorough knowledge to the industry and products studied, when conducting research on vertical integration.

Our contribution slides easily into the comprehension we are left with from earlier studies, that the effects from vertical integration on performance is ambiguous and confusing. As mentioned earlier, some report a positive covariation between the two, others no covariance, while some find that vertical integration is connected to deteriorating performance. While this ambiguousness is collected at a higher level, i.e. the results from different empirical tests in different industries or even cross-industry samples, our findings – which is carried out in a one industry setting, where firms are faced with similar environmental influences – tends to confirm the bewilderment regarding vertical integrations influence on performance.

From the general finding that it is not possible to explain the spread in economic results in the Norwegian fish processing industry merely by means of vertical integration towards the fishing industry, there are several avenues for future research. The setting studied is one where the uncertainty of supply constitutes a major motive for integrating vertically, and where heterogeneity prevails since some vertical integrated firms have success while others fail in their pursuit of competitive advantages. From an overall view, vertical integration does not seem to be a successful strategy in this setting, at least not under the ruling regulatory environment. In line with the cautions pointed at by Stuckey & White (1993), integrating vertically towards the fishing fleet do not overcome the fundamental uncertainty in the raw material supply, which first and foremost is a nature created uncertainty influenced by biology and climatic conditions. However, a growing, an ever more important part of the Norwegian fisheries industry is one which produces fish under biologically controlled constraints, where the challenges regarding production are highly uncoupled from the supply uncertainty motive. This alternative raw material source then constitutes an important alternative to integrating towards the fishing fleet, since the raw material in question is subject to a biological production process under nearly complete control.

When measured in export value terms, the Norwegian aquaculture industry is more important than wild caught fish (as of 2006), and the fish processing industry is to a larger degree than earlier constituted of firms utilising this farmed fish, rather than (or in addition to) wild caught fish. In our next research contribution, we include this part of economic life in the Norwegian seafood industry, and evaluate how different theoretical presumptions regarding motives for vertical integration influence the economic actors in this industry, and – again – how vertical integration affect the performance of firms.

8.2 Vertical integration towards different sources of raw material

Earlier, we found that in our setting – the Norwegian fish processing industry – upstream vertical integration seems to have no overall bearing on the profitability of firms. A weak tendency, however, was detected, showing that vertically integrated firms were a bit more profitable in terms of gross profit margin (operating profit) but not sufficiently to produce a satisfactory level of return on total assets deployed by firms. The results were collected from firms that utilised mainly wild whitefish in production. But what happens as a new source of raw materials becomes available in the input market? And is upstream vertical integration a more appropriate sourcing strategy towards some raw material sources than others? These are the main research questions we seek an answer to in this section.

As outlined earlier, we find a high degree of heterogeneity in this setting, over many dimensions. One regards which type of fish is attended to by different processors. In many cases different types of raw material determines the processing technology which can be utilised, and thereby the product mix offered by the firm. Analogously, the supply and purchase of raw material is determined by the production technology possessed and utilised by the processor. There are, however, regulations which make it mandatory for processors to take all the delivery from fishing vessels – if welcome to land – not only the most wanted species or sizes. Hence, specialisation with regards to raw material purchases is only possible to a certain extent.

The industry structure is to large degree denoted by a rather strict demarcation between firm types depending on which raw material they let enter into their production. However, the boarders between sectors (or branches) of this industry is not definitive or unbridgeable. From the profitability study (Bendiksen, 2005) we have detailed knowledge about firms in this industry. When assigned to their different raw material utilisation, a coarse-grained categorisation of the firm population can be made. If seafood production *not* consumption purposes is excluded (together with firms which raw material supply is beyond our knowledge, i.e. we have no register of their input sources) a total of 425 firms constituted our industry in 2004. Of these roughly 55 per cent utilised only wild caught whitefish (but to some extent combined with other species than farmed fish), about 25 per cent utilised farmed fish, while 5 per cent took advantage of both those sources in producing seafood products. The remaining 15 per cent of the firms processed either pelagic species or crustaceans like shrimp or crab, or they ‘committed’ canned production.

Like in most other industries, the technological development has involved a specialisation within the fish processing industry, also with regards to raw material supply, due to the replacement of machinery and technology at the cost of labour. The pelagic freezing industry can serve as a good example, and grew considerably from the beginning of the 1990’s due to increased quotas for herring, mackerel and capelin at the same time as new markets emerged in the former USSR and Eastern Europe. In 2000 the 39 firms within this branch of the fish processing industry had increased its production capacity three times since 1993. The increase in number of firms were 44 per cent, while the corresponding increase in number of employees where only 13 per cent[68] (Bendiksen & Isaksen, 1998; Bendiksen, 2005). Another source of specialisation is the customising of the production lines for the main production of firms. This also helps specialising firms, since radical transformation of these stream lined production processes, for the purpose of letting anomalous raw material through, is not only costly but ineffective as well.

The angle of attack here is a repetition of the analysis made in the first paper where profitability is sought explained by the variation in vertical integration, but here a procedure is introduced where we discriminate between firms that utilise different sources of raw material. Two different theoretical schools influence this choice: First, different raw material sources are encumbered with different levels – and different sources – of uncertainty. Second, different products stemming from different raw materials are in different stages of their product life cycle. Underneath, a brief theoretical reasoning for such discrimination will be elaborated before testing is carried out and conclusions given.

8.2.1 Two competing theoretical motives

Dividing our industry into branches utilising different types of input – or should we say; fish – makes it reasonable and interesting sense to discriminate between competing motives for vertical integration. The reason is that different raw material usages are encumbered with different attributes, which are interesting for the perceived development in strategy decision making and depending upon what input the firm exploits. Beneath, an outline will be given for the two competing – still compelling – reasons for undertaking vertical integration in our setting, namely the uncertainty supply motive and the industry maturity motive. The sections will be concluded by theory driven hypotheses on the expected effect the different input utilisation will bear on the level of vertical integration.

The uncertainty argument

Representatives for all the three theoretical perspectives that we have built our analysis on have to some degree stressed upstream vertical integration as a means to reduce uncertainty in supply. Though the various approaches emphasise different kinds of uncertainty, and thereby the realisation of different kinds of achievements from integrating vertically. Since it seems unreasonable that there exist an obvious relation between uncertainty and vertical integration, as underlined by Krickx (2000) and Sutcliffe & Zaheer (1998) among others, a short elaboration will be given here on the manner uncertainty affect vertical integration.

Transaction cost theory scholars have accentuated the way vertical integration enables firms to reduce the transactional hazards between two formerly autonomous contractual partners. Their emphasis rest on supplier uncertainty, in the meaning of *"...behavioral uncertainty arising from the strategic actions of the exchange partner firm"* (Sutcliffe & Zaheer, 1998: 4). The principal form of uncertainty leading to vertical integration within this framework is behavioural uncertainty, which is qualitative different from the primary uncertainty we visit in our research. We address uncertainty stemming from the unexpected changes from 'state of

[68] This is no different from the development we have seen in the primary production of seafood, e.g. in the aquaculture and fishing industry. In 1994 there were nearly 4,400 persons employed in hatcheries and grow out aquaculture installations for salmon and trout, producing a total of 219,000 tonnes. In 2005 the corresponding number of employees was 3,000 producing almost three times as much (641,000 tonnes). In the Norwegian fisheries, fishermen caught approximately the same volume of fish in 1994 and 2005, but with smaller efforts the latter year. While there were 7,700 registered fishing vessels and 11,850 persons having fishing as their main occupation in 2005, the corresponding numbers in 1994 were 15,200 vessels and 16,450 fishermen respectively. The number of whole-year operated vessels decreased from 3,032 to 1,678 in the same period (-45 %). (Source: Directorate of Fisheries)

nature'-events rather than from opportunistic exchange partners. State of nature events do, however, lead to the difficulty of writing contracts covering all possible future events, and will therefore, according to Williamson (1985), lead to higher levels of vertical integration.

Industrial organisation exponents have underlined competitive uncertainty, regarding the moves of current or future competitors – which might bear influence on the focal firm's vertical scope decisions (Porter, 1980). Within this paradigm the reduction of risk and uncertainty in supply have been one of three main reasons that makes vertical integration beneficial[69]. Different researchers have analysed competitive uncertainty's effect on the vertical integration decision, especially technological uncertainty (Balakrishnan & Wernerfelt, 1986; Walker & Weber, 1987; Poppo & Zenger, 1998) which negatively effects managers' propensity to integrate vertically. Further, industrial organisation proponents are not equivocal when it comes to demand uncertainty's effect on vertical integration. While Harrigan (1985a; 1985c) reports that there exists a negative relationship between demand variability and vertical integration, Walker & Weber (1984; 1987) find that volume uncertainty positively effect vertical integration[70]. Similarly, Harrigan's (1986a) findings that sales variability reduces the chance of vertical integration is in clear contrast to Levy's (1985) findings that the variance of sales have a positive (and significant) effect on the spread of vertical integration.

In his detailed analysis of chemical firm's backward integration decisions, Lieberman (1991) hypothesised that firms would be more likely to integrate backwards when other buyers of the input had high variability in demand. This was supported by his data. The economic rationale for this hypothesis is found in Carlton (1979), who expected firms to integrate backwards in order to satisfy their 'high probability' demand, while their 'low probability' demand could be satisfied by sourcing in the open market. Carlton demonstrated that when markets fail to clear in a spot mannered way, there are incentives for upstream vertical integration to secure supply if demand for inputs is uncertain. This integration, he claims, can be full or partial, in the sense that the *"…integrated firm is able to satisfy high probability demand by itself, and pass on the low probability demand to some other firm"* (Carlton, 1979: 207).

Backward integration becomes even more compelling when the demand of other input buyers in the open market is highly variable, which forces input prices up. This is equivalent to Porter's (1980: 319-20) *tapered* integration argument, that leaves the risk of fluctuations to independent suppliers, whereas in-house suppliers carry out stable production volumes, safe-guarding the firm – to some degree – against inter-stage imbalances. Lieberman (1991) anticipated that firms would be more eager to backward integrate if a) their demand for the input in question constituted a large portion of total demand, b) if fluctuations in downstream demand is not correlated with input demand, or c) when firms face stable downstream demand. He finds, however, no statistical support for these hypotheses in his data, though the respective regression coefficients take the expected sign.

However, following Porter (1980), backward vertical integration will ease the input-throughput-output planning in the case of uncertainty in supply, by joint production, sales, purchasing and control, that helps aligning adequacy and timing in supply. That is the kind of uncertainty we meet in our setting, where demand for seafood products is rather stable, and where the technological development is rather sluggish compared with what we find in adjacent stages (the fishing and aquaculture industry).

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[69] The other two classes market of imperfections which give rise to vertical integration benefits are according to Balakrishnan (1994: 553): *"…the elimination of production and cost inefficiencies due to imperfectly competitive intermediate markets and efficient quality and product differentiation by vertically integrated manufacturers"*.

[70] In the latter study they found that high volume uncertainty contributed to backward vertical integration when a small number of potential suppliers existed (thin market), but not when numerous suppliers existed.

From the standpoint of resource-based view representatives, vertical integration might be an appropriate governance form when high levels of uncertainty and complexity envelop an exchange and creates great threat of opportunism from transaction partners (Barney, 2002). However, uncertainty – in the meaning that the future value of an exchange is unknown at the time the investment in that exchange is carried out – weighs against vertical integration since in these situations flexibility becomes more appealing. As a consequence then, strategic alliances might be preferred to vertical integration, where at least some benefits from entering another industry can be harvested without the associated full scale entry costs (Barney & Hesterly, 2006). All in all, the duality prescribed by this perspective, is – per se – not different from the transaction cost economics and industrial organisation prescriptions, where high uncertainty in the transactional variables should lead to increased integration, while in other situations – under which flexibility needs to be maintained (like high technological or demand uncertainty) – vertical integration is opted against. Hence, there exists – to some degree – uniformity between the three perspectives, where in cases of high levels of uncertainty regarding input volumes and timing, upstream vertical integration should be a favourable means of sourcing the inputs.

Analogously to the resource-based view prediction, organisation theorists like Pfeffer & Salancik (1978) accentuates that a firm in an open system will have to secure vital resources which enter the production process, since, if these components are exchanged externally, the encompassing uncertainty must be controlled. The reason is that uncertainty becomes problematic if organisations develop interdependence (resource dependence) since the components controlled by others are important to the customer, it constitutes a large share of inputs, the opposite firm controls the needed resource or there exists few sources of supply (Krickx, 1991). One – often implemented – strategy to increase such control – and abolish the problematic uncertainty - is by ways of upstream vertical integration. This is supported by Masten (1984) who in his study of the aerospace industry found that uncertainty in general (or rather the complexity of the procured item) increased the probability that the item in question would be sourced “in-house”.

When explicating which types of resources will be valuable for the firm, Miller & Shamsie (1996) found that during times of stability – in terms of predictability of future events – property based resources created superior performance depending. Under uncertain and changing environments, they claim, knowledge based resources were the most beneficial to firms. In a later study, they found that environmental state uncertainty (following Milliken’s, 1997 typology, the inability to forecast future events, which affects all firms equally due to demand and competitive volatility) induced increased product variety as a response to changing consumer preferences (Miller & Shamsie, 1999). Metaphorically, it would be easier to hit a moving target with a shotgun than with a rifle. In our setting, it is the upstream, first-hand market which is under scrutiny and which exhibits the major source of uncertainty. Though, since the demand for inputs is derived form the end market (or consumers’ demand), the latter will have bearings for the first, influencing the sourcing decision indirectly.

Nevertheless, despite the ambiguous findings in previous studies regarding uncertainty’s influence on firm’s propensity to integrate vertically upstream, we hypothesise a positive correlation between the uncertainty in supply of inputs and the degree to which firms are vertically integrated:

H1: The degree of vertical integrations towards the input source is positively correlated with the existence of uncertainty in the raw material supply

In a later section this hypothesis will be adjusted to the setting in question here, and empirically tested. First, a competing hypothesis and its arguments will be elaborated; namely industry life cycle hypothesis.

The life-cycle argument

The oldest argument for integrating vertically (or even; not to integrate vertically) is rooted in Adam Smith's considerations that the division of labour is limited by the extent of the market. Following Smith's reasoning and his pin factory example, as markets increase in size, each stage in the production becomes more specialised, which results in greater production per unit of input. Hence, an efficiency gain is obtained, and it is easily seen that specialisation helps increasing societies' welfare when all of us do not have to make our own bread, milk and clothes.

Adam Smith's reasoning was refined and illuminated by Stigler's seminal article *"The division of labor is limited by the extent of the market"* (Stigler, 1951). There, he analytically positions why the degree to which firms will undertake vertical integration, differs across the life cycle of the firm or the industry it belongs to, as production becomes even more specialised. MacDonald (1985: 328) interpret Stigler in view of market power theories, where vertical integration occurs in industries with higher buyer or seller concentration if high concentration is necessary for market power. The argument is intuitively and well described by Balakrishnan (1994: 553), however, from another point of view than market power predictions alone: *"Scale economy in the upstream stage is the central idea in Stigler's life cycle theory, which argues that the level of vertical integration depends on the size of the downstream market. As the demand for a product expands, the derived demand for an input for the product also expands. If there are economies of scale in manufacturing this input, then a separated upstream firm as a supplier will be economically viable only when the market for the downstream product has expanded sufficiently. We will therefore observe a decrease in vertical integration as the market expands."*

As industries come to existence and develop, they move through stages of being emergent to growing, maturing and declining. And as firms and industries go through these stages of development, the propensity to integrate varies. Following the life cycle theorem, vertical integration will be adapted to a larger degree of firms in young industries, since the providers of input factors to a fast growing industry will not grow rapidly enough to satisfy the demands of the producers. Then competitive firms may integrate towards their source of supply to avoid price squeezing from suppliers. As the industry emerges, the demand for new inputs – unknown to the current economic system – will enforce a fast growing industry to integrate upstream in order to secure own needs (Adelman, 1955). Reaching maturity, the upstream markets will have ceased the potential for supplying the industry its inputs, and as specialisation takes further place in the upstream industry, the markets for inputs become reliable, which causes a diminishing need for self-production and therefore decreasing levels of vertical integration. Further, as the industry grows old and declines, upstream market opportunities are no longer found favourable, and the industry itself has to provide their inputs to their own production – hence the level of integration increases. The argument could easily be carried out for *forward* vertical integration, in the cases where fast growing industries have to carry out the marketing, distribution and outlet effort themselves, with corresponding effects for integration in the other phases of the life cycle as well. The development is depicted in Figure 8, which is adapted from Tucker & Wilder (1977: 88).

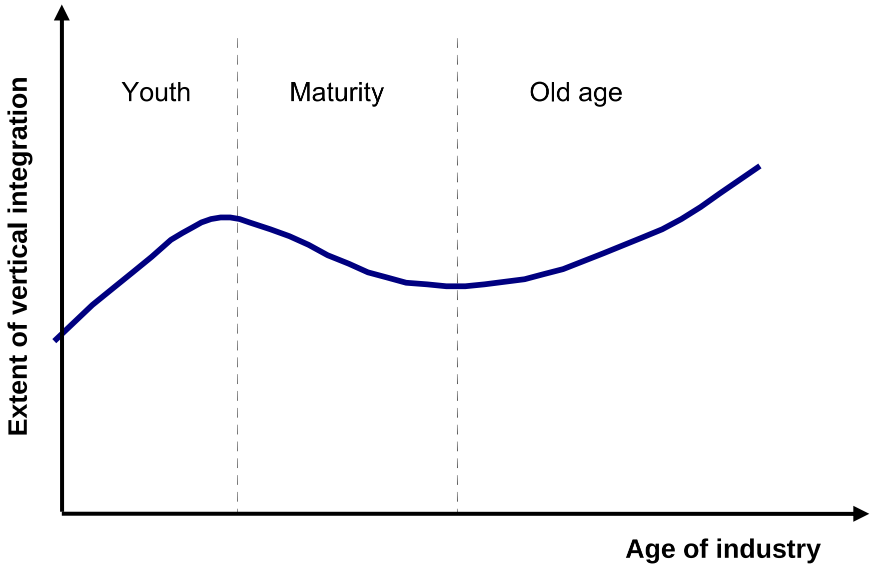

Figure 10 The life cycle theory of vertical integration[71]

There is a large string of research on vertical integration within the perspective of the life cycle approach, as first pronounced by Stigler (1951). In addition to Adelman (1955), Tucker & Wilder (1977) and Levy (1984), still others have looked into the matter of differences in vertical integration over time (Laffer, 1969; Adamson, 1980; Maddigan, 1981; Wright & Thompson, 1986; Langlois & Robertson, 1989; Covin & Slevin, 1990; Klepper, 1997; Elberfeld, 2002; Arora & Merges, 2004), if not necessarily from the same life-cycle perspective as Stigler – where industry is in focus – but also seen from the view of product (Birou, Fawcett, & Magnan, 1998) or market (Hofer, 1975) life cycle. An interesting finding is that of Harrigan (1983a), which is the contrary of Stigler's expectations, namely that firms in declining industries – in order to survive – will have to *"...reappropriate functions which are no longer carried on at a sufficient rate to support independent firms"* since – at this stage of the industry age – *"...these subsidiary, auxiliary, and complementary industries begin also to decline"* (Stigler, 1951: 190). Harrigan's postulation is that as the industry reaches it's 'age of retirement' vertical integration within firms will become less likely since, as uncertainty regarding future business increases, the inflexible costs in the wake of vertical integration becomes important, turning firms to opt out such action. Hence her prescription to vertical integration in an industry life cycle perspective is the opposite of what is illustrated in Figure 8, namely that *"...the number of stages of integration will be low in the early and late stages of an industry's evolution, particularly if sales changes rapidly"* (Harrigan, 1985a: 404). In other words, her argument is linked to the uncertainty reasoning above, where the demand uncertainty firms meet for their output, is especially great in growing and declining industries, and therefore work against vertically integration that can give rise to low capacity utilisation when inter-stage transfers have to be absorbed internally.

[71] The graphics is adopted from Tucker & Wilder (1977), whose research and findings were vigorously countered by Levy (1984: 377-8). Levy wrongfully pointed at Stigler's (1951: 189) original hypothesis that *"...vertical disintegration is the typical development in growing industry, vertical integration in declining industries"* when he rephrased it as *"...vertical integration should be the typical development in growing industries, with vertical disintegration more prominent in declining industries"*. Levy missed, however, an important *dis-* in front of the first *vertical* in his Tucker & Wilder-quotation (1977: 82).

As Harrigan (1986b) calls attention to, one reason that her findings depart from those of Stigler (1951) and Tucker & Wilder (1977) is that she focuses on vertical integration on firm level in stead of industry level. Firm level vertical integration can deviate from the industry life cycle since firms comprising an industry may not have been present in the industry for as long time as the pioneers, but have chosen to enter as a diversification strategy to obtain greater growth potential and earning power. One of Stigler's arguments was based on his findings that larger industries (in terms of wage-earners) had smaller value added ratios than smaller industries, hence, vertically integrated firms where found in smaller industries than vertically disintegrated firms, which he interpreted in favour of his hypothesis that vertical disintegration would be typical in growing industries.

The result is, also here, a lack of uniformity in the predictions regarding the life cycle's influence on vertical integration. As an illustration to the literature diversity on the life cycle approach, one could highlight Silver's (1984) conclusion that vertical integration is *"…modern, only in the limited sense that it accompanies rapid economic change"* (p. 47). He further claims – after an intuitive marginal analysis – that *"…vertical integration to exploit newly perceived economic opportunities will be, on the average, a short-run phenomenon"* (p. 63) since the cost benefits from innovative vertical integration will decline over time. However, we expect, contrary to Harrigan, and in accordance with Stigler that vertical integration upstream vertical integration is more likely to occur in young industries than in mature industries, based on the efficiency and specialisation argument. In our view, Harrigan's argument is rooted in – and coincides with – the uncertainty argument, which disables it from being a 'competing' motive for vertical integration. We therefore hypothesise:

H2: The degree of vertical integrations towards the input source is more pronounced in younger industries than in more mature industries

In the reviewed literature both uncertainty and industry life cycle are presented as influential to the extent of vertical integration within industries and firms. Further, as important attributes in firm's business environments, both uncertainty and the stage of industry development will serve as important moderators for the performance effects expected from vertical integration. In the next section we will elaborate further on these hypotheses to make them testable in our setting. Then a description of the data employed to test these hypotheses is given.

8.2.2 Research setting

Again, the Norwegian fish processing industry is under scrutiny, and the incumbent firms' propensity to vertically integrate upstream towards their raw material suppliers. However, a major modification is made to our previous approach. Here we extend our sample of processing firms to also including those who attend to farmed fish. As earlier accounted for, in the Norwegian fish processing industry we can roughly distinguish between firms that apply whitefish, pelagic fish and farmed fish as their main source of input, though some attend more than one – or even all three – inputs simultaneously.

That firms in our industry have access to different raw materials, to which different levels of uncertainty are associated with – is one of two prerequisites in order to test the hypotheses stated above. The other claim, following from our second hypothesis, is that we must be able to divide the industry into different age-groups, dependent on which source of input they employ in their everyday production.

The firm's choice of input factors then reveals the adaptation to the uncertainty they are faced with for one, and secondly, which part of the industry – younger or older – they belong to. According to theory, a successful adaptation to the inherent uncertainty, or even, a beneficial organisation of activities in accordance with the industry's life cycle – will be determinative for the profitability of the firm. Then, the degree to which firms have undertaken vertical integration towards it's main source/-es of raw material as an efficient means to avoid uncertainty, or to exploit economies of scale or scope, should also contribute to a performance effect in excess of what misaligned firms in this business environment could expect (cf. Levin (1981: 216) who suggests that if vertical integration promotes efficiency, then those firms in an industry that are more fully integrated than others should earn higher profits).

In order to test out this vertical integration performance relationship, some additional features regarding the industry under scrutiny have to be elaborated and determined, at least to show how this industry has developed and how different levels of uncertainty are attended with different sources of raw material. In the following I will therefore add some branch specific details to the analyses to follow.

We have earlier argued that our traditional industry – based on wild caught whitefish – have evolved throughout centuries. Since the barter economy ceased to exist, where relative simple labour intensive productions like stockfish and clipfish production dominated the industry, until today's heavily automated processes of for instance fresh fish filleting, where sophisticated marketing and logistic solutions is needed from catch to consumption. The last twenty five years, however, after a pioneering era at the late 1960's and early 1970's, a new alternative source of supply has emerged on the raw fish market – namely farmed fish. And when input volume is concerned, the biologically controlled process from hatcheries to slaughtered farmed fish is far less encumbered with uncertainty – as evaluated by a wide range of measures – compared with the traditional harvesting of wild fish.

In this study two important industry branches are left out: Those who process consumption seafood from pelagic species and those processing shrimp or other crustaceans. The reason is their highly specialised means of production, where also the existence of economies of scale is obvious. Additionally, for the pelagic industry, the production is closely connected to a larger degree seasonal harvesting activity as well as huge over-capacity with intense price competition for raw material. In the shrimp industry, the production is dominated by three parties, cooperating to some degree, whose exports amount to 95 per cent (Bendiksen, 2005) of the total Norwegian shrimp export. The distinct characteristics of these parts of the fish processing industry would, from our point of view, if included, increase the inter industry heterogeneity even further, without adding much explanatory force to the analysis. The reason is that profitability for these firms have shown to be highly cyclic over the years, following the annual quotas and end market developments. When vertical integration is concerned, the same regulations as for other sectors apply to assure that active fishermen – as a principal rule – are the owners of fishing vessels. Firms in both sectors are to some degree rather vertically integrated. One of the three major firms in the shrimp industry own (or rather; is owned by a firm that owns) trawlers that hold shrimp trawling licenses. Within the pelagic industry however, the situation – today – is rather that vessel owners have proprietary interests in the pelagic freezing industry, i.e. downstream vertical integration from the fishing industry rather than upstream integration from the fish processing industry[72].

In Figure 5 at page 83 we exhibited the yearly quotas for cod in the period 1978–2004 and the monthly landings in 2004 to illustrate the huge variations in this source of supply. Below, the

[72] Five years ago the direction of vertical integration in the pelagic industry was dominantly upstream – towards the fishing fleet. Pan Fish, the largest Norwegian fish farming firm had value chain control ambitions back then, and purchased shares in several firms owning large purse seiners, to assure supply to their fish meal and oil factories (Pan Pelagic) – the main ingredient in fish feed. As Pan Fish altered its strategy – concentrating its core business to aquaculture only – its feed producing company was sold out together with the shares in fishing vessels. Today, the sold out company, is – at least partly – controlled by owners of large purse seiners. This example points to the dynamism of vertical integration in this industry.

aggregate monthly landings of cod, saithe and haddock in the period 1992 to 2001 is displayed to the left in Figure 11 together with the monthly export of farmed trout and salmon in the same period[73], for the sake of illustrating the qualitatively difference with respect to volume uncertainty in the two sources of supply.

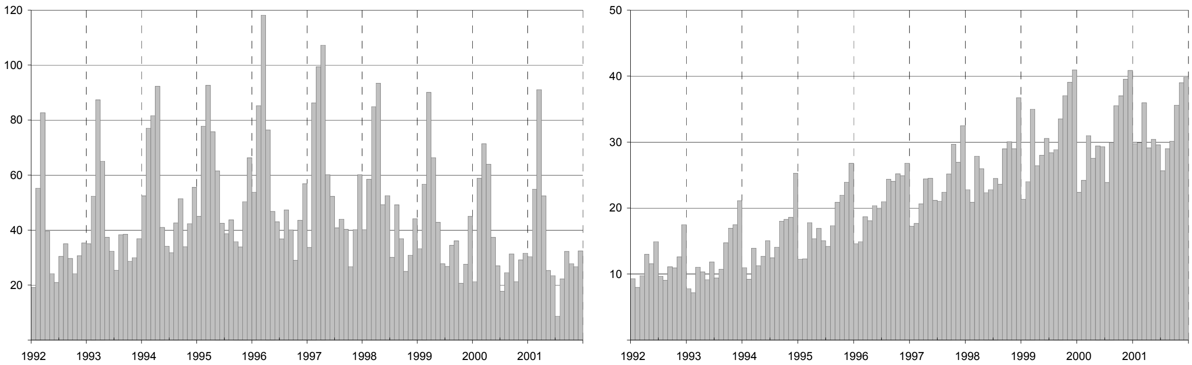

Figure 11 Monthly landings of the most important demersal species (cod, saithe and haddock; left graphics) and monthly export volume of salmon and trout (right graphics) in 1000 tonnes, 1992-2001. (Source: Directorate of Fisheries and the Norwegian Seafood Export Council)

Merely by inspecting the plots of monthly whitefish landings and monthly farmed fish exports, we see that the differences between peaks and floors in the leftmost graphics are much larger than in the one to the right. For whitefish, the peak was in March 1996 with 118,000 tonnes, while in July 2001 less than 9,000 tonnes were landed. When considering the scale differences on the y-axis, the discrepancy grows. For farmed fish we see the largest variations at the end of the time scale, emphasising a growth trend in our data.

For the wild whitefish supply stack bars, 1996 seems to be the year with the greatest supply, with increasing yearly landings until then and a decreasing trend thereafter. When summing up the monthly quantities, 1997 was in fact the year with the largest whitefish landings (691,000 tonnes). The farmed fish export graphics show an increasing trend over the years in question, where in 2001, however, the growth stagnates. Though, in the following years, the export of farmed fish has again increased, and in 2005 a total of 597,000 tonnes were exported, a 76 per cent increase since 1996.

A more scientific approach to the problem is to utilise well known and established measures for uncertainty. Here we have borrowed the concept of *volatility*[74] from optimal portfolio

[73] Due to the lack of monthly series on production data for the aquaculture industry, we employ export volume figures as a proxy to the primary production. The approximation is coarse, but serves well, since only a small share of the aquaculture production flows to the domestic market. For instance in 2005 for salmon, the export was 544,000 tonnes (Norwegian Seafood Export Council) of a total production of 582,000 tonnes (Directorate of Fisheries, 2006) – a 93 per cent export share. Since farmed fish production is biologically controlled to a large degree, fish farmers have the possibility to slaughter and sell fish in accordance with a seasonal market demand. Therefore production and export figures will be highly correlated. Since export figures are in product weight, they are lower than the actual production. Trout constitute about 10 per cent of total annual farmed fish export.

[74] Mathematically the s-value can be expressed in terms of:

$$s = \sqrt{\frac{1}{n}\sum_{i=1}^{n}\left(u_i - \bar{u}\right)^2} \quad \textit{where} \quad u_i = \ln\left(\frac{X_t}{X_{t-1}}\right)$$

theory (Hull, 2003) and the *"random walk"* regression model[75] from statistics/econometrics (see for instance Greene, 2000: 776). Both methods produce, in a relative simple manner, a measure which is easily applicable, enabling us to compare different time series. Where the volatility measure (s) measures the inherent uncertainty by utilising the natural logarithm of the standard deviation of the monthly observations, the R^2 from the random walk regression model give us an idea how well suited last month's observation is to explain the volume this month. Correspondingly, a high s-value and/or a low R^2-value both indicate large variation from period to period, hence, greater uncertainty. In Table 9 these values are denoted for the time series plotted in Figure 11; the monthly supply of whitefish and export of trout and salmon, respectively.

Table 9 Uncertainty in the supply – the whitefish and farmed fish supply – measured by volatility and random walk regression model variance explanatory power (s and R^2), 1992–2001

Monthly observations 1992-2001	*Volatility (s)*	*Explained variance (R^2)*
Whitefish supply	0.39	0.37
Redfish export	0.23	0.72

Table 9 verifies the tendency seen in the graphics, that there is more uncertainty connected with the whitefish supply than what is seen in the redfish (here; trout and salmon) export. We see that the random-walk measure is much higher for farmed fish than wild whitefish, i.e. that last month's landings of whitefish only modestly can explain the landings the current month. And further, that the instability of the time series, as measured by the volatility measure, are much greater for whitefish landings than for farmed fish export.

Having established the different level of uncertainty regarding the separate sources of raw material utilised in production, it remains to establish a difference in the industry age concerning the type of raw material utilised in different production. Figure 11 gives a good hint in the way that the farmed fish export is steadily increasing, whereas the whitefish supply fluctuates heavily. The emergence of the aquaculture industry and the importance of this raw material source can be further seen from official export figures. In 2005 the export value from farmed seafood constituted 47 per cent of total seafood export. 20 years earlier – in 1985 – the same share was 18 per cent. In volume terms, farmed fish represented four per cent of the total seafood export in 1985, a share that increased to 30 per cent in 2005.

The development of total raw material volumes available to the two industries is easily seen in Figure 12, where the annual production of farmed fish and catch quantities of whitefish (cod, saithe and haddock) are plotted for the 15 years period 1990–2005.

[75] A time series is denoted a *random walk* if the error terms (u_t) from the regression $X_t = X_{t-1} + u_t$ have a mean μ, a constant variance σ^2 and is serially uncorrelated. Then the value of X at time t is equal to its value at time ($t - 1$) plus a random shock. Stock prices are a good example of random walk series, where today's stock price is equal to yesterday's stock price plus a random shock (Gujarati, 1995).

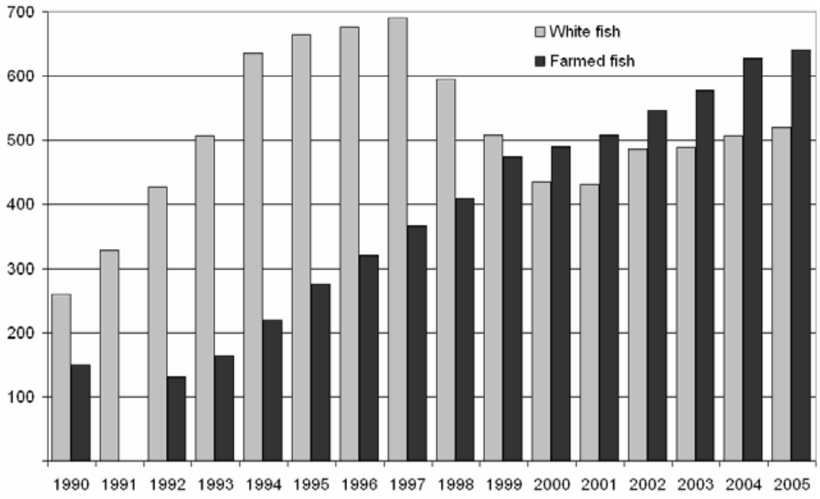

Figure 12 Farmed fish production and whitefish supply (in 1,000 tonnes), 1990–2005. Source: Directorate of fisheries and Statistics Norway

Due to the bankruptcy of the former fish farmers' sales organisation figures for 1991 is missing, since the uncertainty regarding production volumes were so high that official figures were not published. However, the graphic clearly shows that while the whitefish supply has fluctuated somewhat with an average annual supply amounting to about 500,000 tonnes, the farmed fish production (of salmon and trout) have increased steadily from about 150,000 tonnes in 1990 to nearly 650,000 tonnes (live weight) in 2005.

All these issues point to the scenario earlier described, that the traditional fish processing industry which utilised demersal fish is exposed to high degrees of uncertainty in the raw fish supply, mainly due to biological and regulatory causes. Then, as a new and pioneering industry emerges, due to new technology which achieves to control the biological production process of red fish, a possibility to assure supply is created, since farmed fish can easily enter as an input for existing firms. Even though the same products cannot be produced by farmed redfish as wild whitefish, it is obvious that such a shift in input would facilitate the uncertainty met in the input markets for wild fish.

Vertical integration towards the fishing fleet, we have argued, is one important strategy for controlling the most important input factor, even though the institutional barriers have limited and reduced the extent of implementing such internalisation of raw material supply. At the same time as firms in the fish processing industry have sought ways to overcome the inherent volatility in their raw material supply, a viable alternative raw material supplier have emerged by virtue of the fish farming industry. In fact, even if the embryonic period of this industry was carried out by small family businesses run by the entrepreneur in the 1960's and 1970's, several fish processing firms entered the business during the 1980's as many of the growth obstacles – especially at the hatchery and smoltification stage – were overcome. Though, considering the apparent benefits accruing from the potential uncertainty reduction, this new supply source entrance was not taken advantage of by nearly as many fish processors as one could have expected. Even today, Norwegian fish processing firms have only to a limited extent embraced farmed fish as an alternative raw material source, where the majority of firms utilising both wild and farmed fish are local producers of seafood products for the domestic market. The other large group of fish processing firms employing farmed fish in their production had their origin in fish farmers' deliberate downstream integration in order to safeguard its own raw material, which first and foremost process farmed fish exclusively.

Data, measurement and empirical hypotheses

We rely on financial data from the annual profitability study that has been carried out at Fiskeriforskning, which also includes structural information on the fish processing industry (Bendiksen, 2005). Since all operating firms are surveyed each year the data set is well suited for constructing panel data sets to investigate, and since the study provide financial statement – as well as production – figures each year, at both firm and industry level, it allows us to compare the performance in different strategic groups. As before we use financial key figures for our performance variable, in specific; Gross Profit Margin (GPM) and Return on Total Assets (RTA).

The analytical concept and utilisation of strategic groups stems from the disciplines of strategic management (McGee & Thomas, 1986; Cool & Schendel, 1988; Thomas & Venkatraman, 1988) and organizational ecology (Hannan & Freeman, 1977; Carroll, 1984). Miles & Snow's (1978) seminal treatment of "prospectors", "reactors" and "defenders" has perhaps been the most influential contribution within this stream of research. However, for our purpose, to compare the degree of vertical integration between different strategic groups is not straightforward since firms may compete in different end markets, have different historical development (as emphasised by the dynamic capabilities and evolutionary perspective) or for other reasons be in different phases of their life cycle. The meaning of strategic groups is the collection of firms in the same industry, which follow similar strategies (Porter, 1980: 129). However, the mere existence of strategic groups has been challenged, moreover criticised for lacking theoretical validity since it is developed as a theoretical bridge between strategic management and industrial organisation (Hoskisson, Hitt, Wan, & Yiu, 1999: 427). Barney & Hoskisson (1990: 190) assign the existence of strategic groups to the statistical artefacts of the cluster analytical procedures used to create groups. Hence, the existence of strategic groups rests on the researchers' presumptions. Also the predictive validity of strategic groups is doubtful since intra-industry mobility barriers are absent in many cases, and hence, group membership stability is missing (Wiggins & Ruefli, 1995). Here we disregard these deficiencies (without dismissing them entirely) and borrow from organizational ecology the distinction between "*specialists*" and "*generalists*", based on choice of raw material; whitefish, farmed fish or both. The distinction is fruitful for our purpose, but can be opposed on the grounds that wild and farmed fish do not appear within the same product markets – i.e. the producers do not *"…actively compete with each other by virtue of their investment in apparently similar distinctive assets, strategic resources and core competencies"* (McGee, Thomas, & Pruett, 1995: 257). The raw material usage typology of firms has also proved relatively stable over time without being exclusive membership borders.

In order to establish the level of upstream vertical integration in firms and the assigning them properly to their belonging strategic group, telephone interviews with the daily manager was conducted, where vertical integration issues – regarding both wild and farmed fish – were collected, together with additional enquiries to the profitability study on their raw material consumption. The interviews were conducted in the period September to November 2001, were the objective was to survey the situation in the industry in 2000 regarding raw material supply and vertical integration. In all, more than 110 managers within the fish processing industry were addressed in the survey, but due to non-response the final sample consisted of a total of 96 firms, of which 64 was addressed in 1998 as well.

The selection of firm samples was done in order to assure variation in vertical integration and raw material choice, as well as geography. For convenience and effort economising causes we took advantage of the sample used in the earlier study – and the knowledge to which we had. Analogous to our previous vertical integration measure, the questionnaire was designed in order to reveal firms' self sufficiency ratios in terms of raw material consumption, but in addition to what stemmed from vessels in which they had proprietary interests, we also sought to uncover the raw materials stemming from fish farms in which they were owners. Again we ended up with a continuous measure, well suited to test empirically the way uncertainty and life cycle stage influence the degree of vertical integration, and how vertical integration affects the performance of firms. The structural registers from the profitability study provide an opportunity to analyse the magnitude of firms in the total population that process farmed fish. This kind of information contribute to reveal the degree of specialisation in the industry, which is interesting in order to decide the level of differentiation and specialisation – a dimension emphasised within the resource-based view perspective (Amit & Wernerfeldt, 1995). Here, however, vertical integration is under scrutiny, to which ownership, in our view, is crucial.

When considering the performance implications of vertical integration, we also have the opportunity to discriminate between raw material sources to see whether some input sources are more productive to integrate vertically towards than others. Based on firms' raw material source/-s, three sub-sample strategic groups were derived:

Specialists 1 (**S1**): Firms whose production is based mainly on wild whitefish

Specialists 2 (**S2**): Firms whose production is based on farmed fish

Generalists (**G**): Firms producing from both wild caught whitefish and farmed fish

No simple rule of thumb exists which enables us to categorise whether industries are young, mature or declining. Tucker & Wilder (1977: 85) ascertains that *firm* size and *firm* growth rates are *"…more representative of Stigler's maturity concept"* than *industry* size and *industry* growth rate. The latter variables was utilised by Adelman (1955), who stated that young industries would grow rapidly while mature industries would be associated with slower growth. Månsson (2004) on the other hand, in his study of vertical integration and efficiency in the Swedish sawmill industry, exploits the degree to which the industry exports it's production – i.e. the level of global competition the industry is facing – to decide it's maturity, and to explain the small efficiency differences in his sample of sawmills – be they integrated or not. In our case, the share of export from the fish processing industry has always been large, also for farmed fish. In fact, even in the early 1980's, the share of farmed salmon that was exported was already about 90 per cent (Ministry of Fisheries, 1987).

Though, as illustrated in Figure 12, in the sectors we visit here, utilising farmed fish and whitefish respectively, the industry growth argument is in accordance with the first being young and the second mature. It could, however, be argued that fish products from wild whitefish is at the end of its life cycle, due to its rather lengthy history, but since the product markets for these product are still viable, and the demand for marine proteins – preferably with a 'green certificate' differentiating them from for instance farmed fish – we will claim that this industry is, if not at it's prime, still in its phase of maturity.

Additionally, one should be careful to brand an at least 30 year old industry a young industry. It supplies the market with products that existed earlier, but now wild caught salmon is replaced with salmon from a controlled biological production process. No doubt the fish farming industry is still growing and might not have reached its maturity yet, though there are no simple rules of thumb to use for deciding which age it should be labelled.

Our theory driven hypotheses are clearly adversative in this setting, since the raw material source connected with the greatest uncertainty in supply is not in any of the ends of the life cycle scale, but rather mature. Consequently, the two theory driven hypotheses produce contradicting expectations regarding the level of vertical integration towards the different input sources. Therefore, the contrast displayed by our hypotheses calls for testing these assumptions empirically. As a result, we have emphasised the uncertainty motive when presenting our set of testable empirical hypotheses. This is due to it's relevance in all the theoretical contribution we rest our research on – to some degree also within the life cycle treatment of vertical integration.

Following the uncertainty argument we propose the following empirical hypotheses:

EH 1: The share of fish processing firms having ownership shares in fishing vessels will be greater than the share of fish processing firms with ownership in fish farms

Ownership is in our view crucial for the concept vertical integration, but just as important is the flow of goods between the units linked by ownership. Accordingly, since uncertainty is greater in the traditional whitefish sector of the fish processing industry, we expect that:

EH 2: The share of supply stemming from fully or partly owned upstream units will be greater for those firms who process wild caught whitefish than those who process farmed fish

Since the main focus of this study is the impact of vertical integration on performance, we utilise the share of inputs from units in which the firm have proprietary interests to capture the level of vertical integration. We therefore hypothesise that:

EH 3: Vertical integration towards the raw material source is positively correlated with financial performance

Since we accentuate that uncertainty regarding input supply is the main argument for integrating vertically, it follows that the gains from successfully incorporating an upstream integration strategy will be larger for those with higher uncertainty in their raw material supply, than those whose raw material supply is stable. We therefore predict that

EH 4: The correlation between financial performance and vertical integration will be higher for firms processing wild whitefish than for firms utilising farmed fish in their production

To test these propositions we will employ the data mentioned earlier, and dependent on the results of the tests, we can suggest which one of the competing theoretical contributions that have the largest bearing in our business environment; uncertainty or industry life cycle. The tests follow below.

8.2.3 Findings

In order to test our first empirical hypothesis, the profitability study and it's overview over firms and structural ownership linkages was addressed. With 2000 as the year in question for this study, we find about 550 units in Norwegian fish processing industry, of which 456 were included in the annual profitability study (Bendiksen, 2001). Even though it is difficult to make clear distinctions what concerns raw material utilisation in this industry since many firms attend to more than one type of inputs, our mapping of the 456 active firms in 2000 showed the following approximate adoptions: About 50 per cent of the firms receive wild whitefish for production. This cover a wide spectre of production – from those who only pack fresh fish for export or production elsewhere, to highly sophisticated filleting and freezing plants. About 15 per cent of the firms produce seafood products from farmed fish only. Again, this is a highly heterogeneous group, covering a wide variety of production processes; from salmon slaughtering – packing fresh fish for export – to filleting, freezing and smoking factories. About 20 per cent of the firms attend to both whitefish and farmed fish in different proportions of inputs, while the remaining 15 percent are either fish canneries or firms that produce from pelagic species, shrimp or crabs.

When addressing the profitability study in 2000 and its accounts on cross ownership between the fish processing industry and fishing vessels and fish farms we find that 20 per cent of the firms in our industry have proprietary interests in fishing vessels, while the corresponding ratio of firms holding fish farm ownership shares is only 8 per cent. Hence, to the extent that we are able to control for all ownership shares in fishing vessels and fish farms, we can conclude that **EH 1** is confirmed. However, one should not be too categorical in this affirmation since we do not hold information about the full range of Norwegian fish processing firms. Additionally, we know for a fact that some ownership shares are held away from public registers due to illegality (cf. the Participation Act) and that some ownership arrangements are impossible to unveil from looking into public registers due to lengthy cross ownership chains. Though, when holding the figures from parallel studies at different times up against this finding it does confirm a tendency. For instance, in our 1997-vertical integration study, we concluded that about a fifth of all fish processing firms had – minority or majority – ownership shares in fishing vessels, where upstream vertical integration were more widespread among larger firms (Dreyer *et al.*, 1998). In fact, two thirds of the largest firms confirmed that they had proprietary interests in fishing vessels. In another study, where the fish farming industry in 2001 was under scrutiny (Dreyer, Bendiksen, Isaksen, & Sørensen, 2002), a mapping of cross-ownership between the Norwegian fish farming and fish processing industry revealed that 30 firms in the fish processing industry had direct ownership to fish farming firms. In all, these 30 firms had ownership shares in companies controlling 80 fish farming licenses, which constitute about 10 per cent of all fish farming licenses for salmon and trout. This clearly indicates and supports the confirmation of **EH 1**; that – in accordance with the uncertainty theorem – fish processing firms have to a larger extent exploited the chance to integrate upstream towards the fishing fleet rather that fish farming.

One striking observation when addressing the firms utilising farmed fish, is that they only to a limited extend process the raw material. About 80 per cent of all farmed fish is exported round with head, i.e. merely slaughtered and gutted, and sold cleansed without intestines. Some do however, process the farmed fish, for example by filleting and freezing, smoking or ‘ready-to-serve’ cutlets. Though, out of the 66 firms in 2000 who produced from farmed fish exclusively, nearly half of them were solely slaughtering and packing the fish before selling it. One reason for this was that in 2000 favourable export prices for round, fresh salmon lead to a reduced export of processed salmon and reduced profitability for processors that year due to higher raw material costs (Bendiksen, 2001). A quotation from one of the leading actors within the salmon processing industry can illustrate the forces at work and the situation splendidly: *“Our salmon filleting production line have never been as profitable as now, when we don’t use it and have stowed it away*[76]*”*. One reason being that processed Norwegian salmon was met with higher tariffs than unprocessed salmon when exported to European Union member states – our greatest ‘single’ market for seafood (62 per cent of total exports in 2006). As a consequence many fish farming companies established fillet production plants elsewhere in Europe to bypass this disadvantage.

When assessing the second empirical hypothesis we have displayed the descriptive statistics regarding number of firms and average level of vertical integration together with the results from a *t*-test on whether our strategic groups differ significantly with respect to vertical integration. The strategic group, for which descriptive statistics are enumerated in the appurtenant row, is expressed in bold types in the first column. Accordingly, in the last column, the *t*-test value is given for the test between the two groups denoted in the first column, whether vertical integration differs significantly between the two groups. Again, we

[76] Gerhard Alsaker, managing director in Alsaker Fjordbruk AS commenting the situation within salmon processing to ”Norsk fiskeoppdrett” (”Norwegian Aquaculture”) no 13/98, (own translation).

utilise an independent sample *t*-test, where the population standard deviations are assumed normally and symmetric distributed (assumed equal variance).

Table 10 Degree of vertical integration in – and between – three strategic groups in the Norwegian fish processing industry

Group of firms	*N*	*Vertical Integration*		*t -test*
		Mean	*St. dev.*	
S1 – S2	56	16.38	20.20	-10.43*
S2 – G	21	78.05	29.66	- 5.26*
G – S1	19	29.74	28.29	- 2.24**

*) Significant at a one per cent level ($\alpha = 0.01$).
**) Significant at a five per cent level ($\alpha = 0.05$).

From inspecting the third column of Table 10 we can establish that the whitefish group (S1) on average receive 16 per cent of their raw material supply from own vessels, that those processing farmed fish (S2) on average receive 78 per cent from own fish farms, while those firms who produce both wild caught whitefish and farmed fish receive on average 30 per cent from units they hold ownership interests in. Hence, our second empirical hypotheses (**EH 2**) which assumed a greater degree of vertical integration for whitefish processors, is rejected since Table 10 reveal an opposite correlation: that farmed fish processors have undertaken more upstream integration than those processing wild caught whitefish. The generalists fall neatly into this line between the specialists. They process from both raw material sources, and underline this contrariety. Another interesting feature displayed from Table 10 is the statistical significant difference in level of integration between our strategic groups (though weaker for the difference between the two groups producing wild fish). This means that the different groups have undertaken different adaptations towards the input source, where the farmed fish utilising firms are more vertically integrated towards their suppliers than the whitefish firms.

When inspecting the data, we find that ten of the 21 firms in the farmed fish group (S2) are self-contained with raw materials, while an additional group of five firms exists where the share of supply from own fish farms exceeds 70 per cent. In the whitefish group[77] (S1), the firm with the largest share from own vessels receive about 70 per cent from them in 2000. Among the whitefish processors, however, nearly half of the firms receive nothing from (or have no ownership interests in) own vessels. The ‘generalist’-group consists of very different firms with respect to raw material supply. While eight firms receive no farmed fish from own fish farms, another group of eight firms receive all their farmed fish from fish farms that they own. Three processing firms receive raw materials from both fish farms and vessels in which they hold ownership shares.

The next two hypotheses regard the profitability effect from vertical integration. For each of the strategic groups, as well as the total sample population, we regress the degree of upstream vertical integration on the two financial performance measures for the year 2000. The results are given in Table 11, where the regression coefficient (β), its standard deviation and the coefficient of determination (R^2) – which measure the fit of the model – are reported.

[77] The whitefish group (S1) was originally identical to the firms entering our previous study where 1997-data was utilised, but the added information on raw material supply reduced the number of firms in this group by seven. These were moved to the ‘generalist’-group since they handle farmed fish as well. Others were omitted due to bankruptcy in the intermediate period, or for altering their production towards pelagic species only.

Table 11 Vertical integration and performance in the Norwegian fish processing industry, 2000. Three strategic groups – depending on raw material use – and total sample

Sample		*Gross Profit Margin*			*Return on Total Assets*		
Group	*n*	*β*	*St dev*	R^2	*β*	*St dev*	R^2
S1	56	-0.009	0.039	0.001	0.075	0.099	0.010
S2	21	0.038	0.101	0.008	-0.040	0.124	0.006
G	19	0.085	0.056	0.119	0.036	0.131	0.004
All firms	96	0.052*	0.024	0.046	0.056	0.045	0.017

*) Significant at a five per cent significance level. (α = 0.05).

According to our third empirical hypothesis (**EH 3**) we should expect a positive relationship between vertical integration and performance. From Table 11 we see that our model – regardless of which financial performance measure we use – fits rather poorly to our data, since the determinant coefficient (R^2) is only able to explain 12 per cent of the models' variation at the most. Furthermore, our regression coefficients (β) take – in general – non-significant values, and in two cases the regression coefficients are negative. In the preceding study, we cautiously suggested a conclusion that vertically integrated firms (in the wild whitefish group) had higher profit margins, but not sufficient to achieve a satisfactorily yield on total assets employed. From the tests performed here for 2000 the opposite trend is exhibited: In the "whitefish only"-group higher levels of integration seem to lead to positive effects on the return on total assets, while the effect on profit margin is negligible but negative. It is hard to find a plausible explanation to this controversy in the two samples (1997 and 2000) but in both cases, the performance effects are weak and insignificant, pointing to poor covariation between the two. For the farmed fish group (S2) in 2000 we find the opposite effect of what we find for whitefish producers, while vertical integration for the 'generalists' seems to have a positive effect on both performance measures.

When pooling all firms in the industry – independent on which raw materials they utilise – we find a positive and significant (on a five per cent level) influence on gross profit margin from vertical integration. However, since the effect on return on total assets fails to appear significant, and since it seems awkward from aggregating the single group-wise effects, we are apt to ascribe this significance to the high number of observations, which more easily produce significant – but possible spurious – effects (i.e. large sample distribution theory).

In any case, the results exhibited in Table 11 are unable to confirm our hypothesised positive correlation between vertical integration and financial performance, hence we reject **EH 3**. The main conclusion to be drawn from the regression analysis is that there is seemingly no impact of vertical integration on performance within this industry, regardless which input is employed by firms, and which performance measure one chooses to use. Again we are left with findings that enter into the row of rather confusing empirical results when testing the effect of vertical integration on performance.

What remains then is to investigate whether our last empirical hypothesis (**EH 4**) is supported by our data. The task being to reveal whether whitefish processing firms incur a more positive effect from upstream vertical integration than farmed fish processors, which follows from the uncertainty theorem. Table 11 shows that there are no overall significant positive performance effects for the groups, and in fact, for the wild whitefish group (S1) the correlation between vertical integration and gross profit margin is negative. The correlation towards return on total assets on the other hand is positive while for the farmed fish group (S2) it is negative. These ambiguous and rather confusing results lead us to rejecting the latter hypothesis (**EH 4**).

However, to improve our tests, we expand the period and include the two previous years (1998 and 1999), in line with Casson's (1984) recommendations, where he underlines that studies of variation of vertical integration within an industry should be carried out over time. This test expansion will also embrace the utterly dynamic nature of this industry, and cover possible diverse developments in one or the other sector of this industry. We have earlier established that there are significant differences between the levels of upstream vertical integration between the groups. What remains then is to see whether the same differences exist when performance is under scrutiny, and whether the differences have the hypothesised direction. The test procedure presented in Table 12 follow the *t*-test statistics employed earlier, and again, the descriptive statistics (mean and standard deviation) in each row are connected to the group marked in bold in the first column, the *t*-test value (in absolute terms) corresponds to the tests between profitability measures in the stated two groups.

Table 12 Descriptive and test statistics for performance differences between strategic groups in the Norwegian fish processing industry[78]. 1998–2000

Year	Group of firms	*Gross profit margin*			*Return on total assets*		
		Mean	*St. dev.*	*t -value*	*Mean*	*St. dev.*	*t -value*
1998	**S1** – S2	4.93 %	5.3 %	1.73	21.01 %	19.3 %	**3.02***
	S2 – G	-0.67 %	13.7 %	0.16	0.46 %	27.3 %	1.14
	G – S1	-0.12 %	7.0 %	**2.86***	7.77 %	6.4 %	**4.41***
1999	**S1** – S2	-1.91 %	7.4 %	1.83	3.81 %	15.3 %	0.99
	S2 – G	3.28 %	12.1 %	1.07	8.63 %	20.2 %	0.50
	G – S1	0.29 %	3.7 %	1.69	6.25 %	7.8 %	0.89
2000	**S1** – S2	-2.25 %	5.8 %	**2.13****	2.25 %	14.8 %	1.40
	S2 – G	2.32 %	13.1 %	0.09	7.68 %	16.0 %	0.10
	G – S1	2.00 %	7.0 %	**2.63***	7.20 %	15.3 %	1.25

*) Significant at a one per cent level (α = 0.01).

**) Significant at a five per cent level (α = 0.05).

From Table 12 we see that a significant performance differences between the groups of firms in the period 1998–2000 fail to be recognised on a general basis: they exist for some years between some groups but are not persistent throughout the period. What seems to be the case is that we find significant performance differences between the whitefish group (S1) and the other two groups in 1998 and 2000. Between the two groups that produce farmed fish, no significant difference is found, and – surprisingly – the whitefish specialist group is more easily distinguished from the generalist group than from the farmed fish specialist group in the two mentioned years. From a general point of view, 1998 was one of the best years ever for the whitefish industry, at the same time as the profitability of those who processed farmed fish that year was low. The reason was increased input prices (for trout and salmon) and falling market prices for finished products (Bendiksen, 1999). In 2000, the opposite was the case, where the whitefish producers, due to lower quotas – inducing higher raw material costs – lead to considerably reduced profitability (Bendiksen, 2001).

[78] For convenience purposes we have merely adopted the same firms in groups from 2000 to be valid also in the two earlier years. That is also the case for their corresponding vertical integration scores. This can be a source of error if firms in the various groups in 2000 recently had altered their main raw material source, or if the degree of vertical integration on average were quite different from the information we obtained when addressing them regarding year 2000-levels. For convenience, means are stated as per cent. Correspondingly, belonging standard deviations in Table 12 are stated in percentage points.

When holding the findings in Table 12 up against the degree of vertical integration as the explanatory factor, the puzzle becomes complete. We have already established that farmed fish specialists (S2) are more integrated than generalists (G), which are more integrated than whitefish specialists (S1). When looking at profitability scores for the three strategic groups in 1998, we see that the findings are in accordance with our last empirical hypothesis, which predicted greater vertical integration performance correlation for the whitefish processors. This applies to both our performance measures but is more pronounced when return on total assets is in question. However, when inspecting the two subsequent years – 1999 and 2000 – the correlation is quite opposite, where farmed fish producers have the greatest profitability, and – as underlined – also the greatest levels of vertical integration. Taken together, these inter-year differences in our findings might have different possible explanations. It can imply that firm specific factors like vertical integration have less explanatory power to accounting for the profitability effects than industry-wide factors in firms in 'next-to-perfect' markets like we find in our setting. Firms in our industry compete in effective global markets, where the product margin variations between input and end markets might have greater impact on profitability than the way they organise their sourcing. Then analysing the relative profitability of strategic groups on industry level over time will be more influenced by general industry conditions, than firm specific sourcing arrangements. Another viable explanation can be that the benefits and performance effects of vertical integration are not easily distinguished in *t*-tests or single variable regressions, but that more variables should be included to check their relative influence on profitability. According to theory, the observation of high profitability in 1998 in the whitefish sector can hardly be explained by upstream vertical integration. First of all since this strategic group have relatively low degrees of vertical integration, but also since the benefits of upstream vertical integration would not primarily be realised in situations where the critical input factor is in abundant supply from independent suppliers. In these situations vessel ownership, for supply security reasons, would be less fruitful than in situations where supply was limited.

8.2.4 Discussion

The findings discussed above clearly indicate that the impact upstream vertical integration has on firms' financial performance in the Norwegian fish processing industry is negligible. Our study cover data from 2000 and the result prevails for firms basing their production on wild caught whitefish, farmed fish as well as those who utilise both raw material sources in their production. Hence, our findings seem to be valid regardless if firms are met with a highly fluctuating raw material supply (i.e. wild fish) or if they operate in an industry that can be characterised as young – as opposed to the traditional fish processing industry. Expanding our previous tests and refining our sample produce almost no additional knowledge to the vertical integration performance relationship in our setting. The firms do however vary significantly in their adaptation of upstream vertical integration, in which type of raw material source seems to have great impact. This is in line with the findings of Newman (1978) among others, pointing to the relevance of vertical integration as a mobility barrier based on sunk cost investments that should make strategic group membership affect profit rates (Bogner, Mahoney, & Thomas, 1998). In fact, the shares of supplies arriving from upstream units in which processing firms hold proprietary interests are considerably higher among firms utilising farmed fish than among those who process wild caught whitefish. Firms who process from both raw material sources place themselves neatly in between the other two what concerns vertical integration. These findings seem to support the life cycle theorem, whilst less support is found in favour of uncertain supply conditions as the main moderator for vertical integration.

Again we reject the idea that upstream vertical integration helps firms in the Norwegian fish processing industry to improve profitability. The reported missing link between vertical integration and performance is on terms with our previous attempt to establish such relationship in this industry. Our results also fall into the line of research within other industries, where scattered findings and no overall general effect can be identified.

Our attempt to divide the fish processing industry into strategic groups depending on the raw material consumption was fruitful in the way that we found significant different levels of vertical integration between the groups, and to some degree also different profitability relying on group membership. Even though the groups differ significantly with respect to financial performance, we found no performance effects based on the degree to which these strategic groups in our industry are vertically integrated towards their sources of supply. The inter-group difference is clearest between the wild fish group and the group of generalists. This is at odds with conventional wisdom where the largest differences should be found between groups with largest dissimilarities, but can be explained by the great variation in profitability in the S2-group, where farmed fish is being processed. The variation in profitability within the groups is substantial – as it is within the industry at a whole – which casts doubt on the adequacy of the groups we operate with. However, the argument Cool & Schendel (1997) point to in their analysis of the U.S. pharmaceutical industry also becomes coveted in our setting: Since profit variations exist both between and within strategic groups, the management firms' competitive position becomes just as important as group membership.

The traditional fish processing industry has not – to the expected degree – exploited the new input opportunity created by the emergence of the fish farming industry. The fish farming industry could have served as a potential input supplier, where new technology has made it possible to produce inputs without the uncertainty attached to the traditional raw material. When we in 2000 asked managers in the traditional fish processing industry why they had not grasped the opportunity to exploit this new input source and integrate towards the fish farming industry the answers were unambiguous. Opposite to our expectations, the reasons stated were not due to technical, institutional or competence barriers, but rather based on profitability consideration: Farmed fish had been a costly raw material in later years, as a result of high global demand for fresh farmed fish, and fish processing managers expressed reservation to employ this kind of raw material due to the high costs. This attitude calls for emphasis on performance and profitability when considering vertical integration.

A possible explanation to industry members' emphasis on profitability concerns when revealing their reluctance to undertake processing of farmed fish, can be detected when assessing the farmed fish markets. They work efficiently, with many and global actors, where profit creating market dysfunctions are already exploited by current actors. In this business environment, arbitrage possibilities are not easily identified by outside actors, which therefore show reluctance to enter. Since a license is required to start fish farming and this industry is characterised by high concentration, this form a considerable entry barrier to possible entrants from the processing industry, who want to avoid the unfavourable first hand prices determined in the global market.

Some definitional issues turn up as we turn to the different strategic groups and their inclination to undertake vertical integration as a means to secure supply. Whereas firms' integrating activities towards their suppliers in the two specialist groups can be denoted as a specialising strategy in order to secure supply, another argument can be put forward for the generalists. Their processing activities based on raw material from different sources of supply are just as well labelled a *risk diversifying strategy* since they, by enlarging the base of raw material, become less vulnerable to supply shortages in periods when the volume uncertainty is high. That is what Harrigan (1985a) denotes spreading risks and maintaining strategic flexibility. The risk might be substantial for firms when they become dependent upon others to achieve resources critical to them (Klein *et al.*, 1978). Vertical integration is in this light utilised to control their need for certainty. One of the firms in the generalist-group have even whale and pelagic species in their raw material base and – as mentioned – three of the firms in this strategic group have ownership interests in both fishing vessels and fish farms. The spread in diversification strategies among firms makes measurement difficulties an even greater problem than already described. Our use of strategic groups eases this problem.

Another discursive point, of definitional interest, deals with the way one treats and measures upstream vertical integration when farmed fish is under scrutiny. We have in this study ascertained that processors of farmed fish to a large degree are integrated towards the fish farming industry, and even more so than those processing wild caught whitefish. However, these findings are more easily elucidated when deciding the appurtenant level at which on should measure vertical integration. When addressing the industry, the level of farmed fish processing is rather modest since more than 80 per cent is exported unprocessed; farmed salmon is in general is exported fresh, gutted with head on. In fact, the majority of processing activities (filleting, smoking, freezing, etc.) that Norwegian farmed salmon undergoes is safeguarded by processing firms in import countries[79]. What we in fact observe is that the fish farming industry is vertically integrated downstream into the wholesales and exporting industry, and not nearly as heavy towards the processing industry. However, the rather few large firms that undertake salmon processing domestically are in fact heavily integrated. What we see, in general, is not that fish processing firms integrated towards the input source, but more often that fish farming units who have expanded into the processing industry to attend to their own production. So, while at industry level we have low levels of vertical integration when farmed fish processing is analysed, at firm level the degree is fairly high. Hence, what comes into sight is a new measurement problem. This illuminates the need for thorough knowledge to the industry under scrutiny (Joskow, 1988) since our impression of vertical integration influenced by the stage of the value chain at which we focus, and where measurement is carried out. And when vertical integration comparisons between strategic groups are carried out, we can end up with measuring ‘apples and oranges’. Hence, the outcome of such comparisons can be erroneous and conclusions spurious.

Another straining point regarding vertical integration and the fish farming industry pertains to which theoretical contribution one should emphasis and might be compared with the ‘egg or hen’-argument. In theory, uncertainty in the sourcing environment is emphasised as a major moderator to which firms should undertake vertical integration to maintain certainty in their supply conditions. Correspondingly we should expect higher levels of upstream vertical integration under conditions where uncertainty regarding inputs is highly present. In our case (where we compare farmed fish and whitefish processors), we find – contrary to theory – that the fish farming industry is more integrated, while the traditional whitefish processors has failed to seize the possibility to orient their input source towards farmed fish supply which to a lesser degree is uncertain. As a result, a greater degree of specialisation in the two branches of the fish processing industry with respect to raw material has taken place, even though – as we have shown – generalists utilising both input sources exist. However, despite our hypotheses contradicting findings (that uncertainty on the supply side seems to have less predictive power than the industry life-cycle argument) the uncertainty argument might very well be in force and can not be ruled out. The reason is that the high levels of vertical integration in the industry which processes farmed fish might very well be due to the

[79] In a special report (Anon., 2005), calculations show that out of 361,000 tonnes of farmed salmon (whole fish equivalents) exported from Norway to the EU in 2003, about 64 per cent (230,000 tonnes) were estimated to enter the EU processing industry, for smoking, filleting, or other processing purposes.

adaptations to former levels of uncertainty in this industry. In fact, what appears today as a source of supply, in which uncertainty is absent as compared to the wild fish industry, might very well have been achieved through high levels of vertical integration in the 'childhood' of this industry. And as a means of organising the production in this industry vertical integration has persisted throughout time for path dependency reasons. This in turn, also point at the potential for measurement problems in this highly dynamic setting, where advantageous potentials are quickly identified and attended to by actors in search for competitive advantages. Similarly, Porter (1979) assigns firm's advantages or disadvantages from historical development and industry structure changes to their underlying resources. In our setting then, the firms holding the most valuable resources will gain from the industry structure changes induced by the emergence of farmed fish as a potential raw material. Which valuable resources those were remain unveiled, but it is likely that the best firms in the generalist and farmed fish groups in 2000 possessed those resources as farmed fish penetrated the input market for fish processors. Though, our mapping in 2000 does not tell the history of the firms in the groups. Thirty years ago, there existed no farmed fish specialists, but for certain, many whitefish processors have cancelled their original group membership or expanded their raw material use also to include farmed fish.

One major finding from our exercise is – in line with the differentiation opinion of the resource-based view – that some firms in this industry experience a positive pay-off from upstream vertical integration while others – at the same time and subject to the same environmental factors – experience a negative reimbursement from this strategic sourcing method. Analyses like ours – at industry level, with firm level data on strategic groups – are, however, unable to capture firm specific factors that can help explaining why some vertical integrated firms succeed and others not. Our findings point in the direction of Rumelt's (1984) findings, that performance differences between firms are the results of different resource portfolios and different effectiveness of management response.

Another main conclusion is that relevant measures are essential to come to terms with the true level of vertical integration in the setting studied. We have noted that among those utilising farmed fish a considerable level of vertical integration is apparent on firm level, while on industry level, vertical integration is almost absent. This contributes to the ambiguous findings on the vertical integration performance relationship and set demands to the knowledge of the industry studied. But the puzzle remains: Do we still encounter a measurement problem?

An avenue for further investigations of vertical integration in the Norwegian fish processing industry ought therefore to address more closely the use of measures for vertical integration and the problems the use of measurement arises in research like this. Another potential for gaining more knowledge on the relationship between firm performance and vertical integration in this business landscape, will be to include firm specific explanatory factors that can help illuminating which resources are valuable for making a sourcing strategies like vertical integration successful. In our next research attempts, these remedies will be sought dealt with.

8.3 The impact of measurement and industry

In the previous research attempts reported here we have analysed the impact of upstream vertical integration on performance in the Norwegian fish processing industry. Contrary to theory – but in line with earlier empirical research – we find no co-variation between the degree to which firms are vertically integrated towards their source of input and their exercised financial performance. Despite the inherent uncertainty in the sourcing environment for firms utilising wild caught whitefish, the degree to which they are integrated towards the fishing fleet is modest, and also limited by industry regulations. However, our findings reveal no performance effects from vertical integration, neither over time, in younger we do not seem to identify any performance effects from such strategic action; not for the industry as a whole, not when assessed over a 15 years time period, and not when taking into account that the industry is also constituted by a younger branch attaining farmed fish with less degrees of uncertainty in supply.

In this section our previous findings are further elaborated and their implications are assessed with respect to similar research – from a methodological view. We thoroughly examine to what extent our findings are depending on the measures we utilise, and cautiously consider the applicability of our vertical integration measure weighed against other measures.

Our point of departure is again the relative unison recommendation from theory, that in sourcing environments where demand and volume uncertainty is great, upstream vertical integration could be a profitable strategic decision. Again we lean upon a multiple theoretical approach in line with recommendations from other researchers who have looked into the vertical integration performance relationship. Langlois & Robertson (1989: 361) state the following reason for utilising a multiple theory approach, in the hunt for explanations to the vertical integration activity in the U.S. automobile industry: *"An examination of the whole history suggests that no single theory always fits the facts perfectly. A complete explanation must combine specific theories in a way that is attentive to such factors as industry life-cycle, demand, economies of scale, and appropriability."*

From transaction cost theory we have learnt that full vertical financial ownership over adjacent value chain stages should enhance profits since inter-firm profit claims are eliminated (Mahoney, 1992) and vertical integration will minimise transaction costs when limited information is present and contracting between independent actors induces substantial costs (Medema, 1992). From the view of industrial organisation, vertical integration should lower firms' risks in markets with high external uncertainty in demand and volume. Especially so, when few transaction partners exist, then securing supply of critical inputs will increase profitability (Porter, 1980). Carlton (1979) points to the fact that a downstream producer has great incentives to integrate upstream in order to secure supply when markets are not cleared by spot prices and demand for inputs is uncertain. Strategic management, as it is based on managerial and organisational practice (Rumelt, Schendel, & Teece, 1991), and especially the resource-based view, gives no simple rules of thumb when and when not to integrate vertically. For each case, the actual situation and business environment must be taken into account (Balakrishnan & Wernerfelt, 1986), and scholars of this field have pointed to the possible cost disadvantages and fallacies accruing from a wrongfully implemented vertical integration strategy (Burgess, 1984; Stuckey & White, 1993; Collis & Montgomery, 1997). However, when the level of vertical integration is correctly adjusted to the resources possessed by the firm, and the firm is organised coherently to implement it correctly, profitability gains should be the outcome.

When we address empirical research on the vertical integration performance relationship, the relative uniform positive theoretical predictions can, however, not be found. In what follows, we briefly comment the results from an extensive literature review on the vertical integration relationship, from which we draw some conclusions relevant to our research. Then we present our research, where we test the vertical integration performance relationship in the Norwegian fish processing industry, based on different measures for vertical integration suggested in earlier empirical research. Finally the applicability the various measures for vertical integration are critically assessed, before we highlight the implications for management action and extended research.

8.3.1 Prior research on the vertical integration-performance relationship

In order to assess our prior research on the vertical integration performance relationship in the Norwegian fish processing industry we addressed critically earlier research on the topic to learn from others' practices. We therefore undertook a thorough literature review, searching for related enquiries in books and journals within our field of research. Results from this review are highlighted under Chapter 4 but will be briefly dealt with here as well. Table 3 (p. 44) sums up 12 studies[80] on the vertical integration performance relationship, with respect to the focal industry(-ies) in the studies, the theory on which the study rests (from our point of view), the findings on the co-variation reported in the studies and the measures of vertical integration and performance employed in the studies. The main features to be drawn from these earlier studies are the following:

First, when choosing samples and populations – in which the vertical integration performance relationship is examined – a large number of different settings are addressed. Further the level of analysis varies from a great many business units in multiple industries (Buzzell, 1983; D'Aveni & Ravenscraft, 1994) to a limited number of single industry firms (Edwards, Jackson, & Thompson, 2000) or even studies on industry level covering a large number of industries (Martin, 1986; Fan & Lang, 2000). Then to compare one study's results with another's becomes difficult.

Second, the measures used to capture both vertical integration and performance differ greatly from study to study. This is natural, of course, since measures utilised in industry-wide studies cannot easily be converted to studies on firm- or business unit level. The measures for vertical integration therefore vary from account based measures as the ratio of value added over sales (VA/S), self sufficiency ratios and subjective self report measures relative to competitors at firm level, to relative complex inter-industry input-output indices at industry level. Performance measures employed in the surveyed studies do not vary to the same degree, but also here researchers have employed different units of measurement. While most studies make use of traditional financial ratios like return on investments, return on assets, price cost margins and other easily obtainable key account figures from annual accounts, others again employ market value measures, stock ratings or subjective self-reported measures. Again, the use of different measures remains an obstacle when comparing the studies.

A third point of discrepancy in the reviewed studies of the vertical integration-performance relationship – and the most important one – is the difference in reported co-variance between the dependent and independent variable. As underlined earlier, some scholars find a positive relationship between vertical integration and performance, some find the correlation to be negative, while others again find that vertical integration have no or insignificant effect on the performance of firms (or industries).

The erudition to be drawn from the review of the empirical studies on the vertical integration-performance relationship, and the impression we were left with, unwind over several dimensions. First, it became clearer that vertical integration is a multidimensional construct. Its intention and content will depend on what real world phenomenon that is under scrutiny. Are we searching for explanations for its occurrence? Are we unfolding how business units, firms, companies, or even industries, avail themselves to undertake this strategy? Which direction does it take (upstream, downstream, or even both)? Do we by vertical integration mean the full acquisition of firms or activities in adjacent stages of the value chain, or more loosely connected vertical relationship as networks or alliances? This brings us to the next

[80] The studies were published in 11 different periodical journals in the period 1978–2002. The analyses cover a great variety of industries – both across and within the same study – and time periods as well as one year cross sectional data, from 1948 until 1997.

understanding from the literature review, namely that vertical integration is difficult to measure. Harrigan (1985a) enlighten this difficulty by pointing at four vertical integration dimensions: *degree* of vertical integration (input-/output ratios), number of *stages* in a production chain that the firm engages in, *breadth* (number of inputs that are integrated) and *form* of integration (ownership share in integrated activities).

An often utilised measure for vertical integration have been the ratio of value added to sales, under the assumptions that the more of the value added to the end product that is undertaken by the firms, the more vertical integrated it is – i.e. the firm undertakes many separable stages of production. The popularity of this measure is largely due to its availability, since the ratio is easily computed from financial statements. However, the 'value added over sales'-ratio is criticised for a number of reasons, one of them for being larger the closer one comes to the raw material. Additionally there is little congruence in researchers' treatments of the performance variable, which makes it more difficult to compare the rather ambiguous results from the studies on the vertical integration-performance relationship.

One particular problem occurring in studies which seek to address the vertical integration-performance relationship across multiple industries is the so-called industry effect: That attributes within one specific industry – for instance the performance experienced – might depend on the industry membership rather than managerial efficiency or firm specific factors like degree of vertical integration. The viewpoint stems from the industrial organisation's structure-conduct-performance paradigm (Porter, 1981) assigning profitability effects to the structure of the industry in which the firm competes. Industry effects on firm profitability have been acknowledged by a large number of researchers (see Dess, Ireland, & Hitt, 1990 for a review) and also for affecting strategic variables like for instance degree of vertical integration. Not only across industries, but also within industries, have performance differences been identified. This has lead to a focus on 'strategic groups', where industry member firms are classified in accordance with similarity in competitive strategies (Thomas & Venkatraman, 1988).

In this article, as well in the research carried out earlier, we have concentrated our tests on the vertical integration-performance relationship to the Norwegian fish processing industry. One of the reasons – and achievements – have been to avoid the measurement of performance effects for firms that operate in different industry settings, and thereby results created by inter-industry heterogeneity rather than the concerned strategic action we want to measure the effect of. Such across-industry variation can be wrongfully percepted as affecting the phenomenon under scrutiny (Casson, 1984). In the next section we construe our research design, derived from literature recommendations and experience gained from the review of previous empirical research on the vertical integration-performance relationship.

8.3.2 Research design

Again we want to test how upstream vertical integration in the Norwegian fish processing industry affects the performance of firms in this industry. That is our main objective. However, when assessing the real world existence of this business strategy phenomenon, measurement problems come into sight, especially regarding the choice of measure utilised to capture the true nature of the construct vertical integration. Another problem regards the measurement of performance, and additionally: How can we trust that the measure chosen assert itself at the firm level, and is not a result of the industry structure in question? The two subordinated goals of this work is therefore to compare and assess different measures for vertical integration when investigating its influence on firm performance, and implicitly to addressing the question on how to avoid the potential of an "industry effect".

Needless to say, we build or analysis on the work and findings reported in the studies noted above (Dreyer, Isaksen, & Grønhaug, 2001; Isaksen, Dreyer, & Grønhaug, 2002). That is, how an upstream vertical integration measure can be operationalised in a setting like the Norwegian fish processing industry, to capture the actual level of upstream vertical integration for firms operating here. Further, we include the notion of 'strategic groups' in this industry in order to establish how different determinants (i.e. primary uncertainty and/or industry age) motivate firms in this industry to undertake vertical integration. With these prerequisites accounted for we will utilise two different measures for both vertical integration and performance here to test for the impact of the first on the second.

The setting in which we undertake our study should be thoroughly accounted for above. In short we have a setting where primary uncertainty is highly present (Flaaten, Salvanes, Schweder, & Ulltang, 1998; Dreyer & Grønhaug, 2004) – especially among those processing wild fish – where the most important input fluctuates heavily with respect to prices, quality and volumes, due to seasonality, abundancy and meteorology among other factors. These fish processors have to a little degree integrated vertically towards their primary source of supply, in contrast to recommendations from theory, which considers upstream vertical integration as a meaningful strategy in order to secure sufficient supply or to reduce uncertainty (Carlton, 1979; Perry, 1982; MacMillan, Hambrick, & Pennings, 1986; Walker & Weber, 1987; Williamson, 1991a; Miller & Shamsie, 1996; Fan, 2000). Other industry members, processing farmed fish, have to a larger degree integrated towards their source of supply – a more stable source of supply than what is the case for wild fish. Further, firms in the traditional part of the industry – the wild fish sector – have to a limited extent ceased the opportunity to produce from farmed fish, which comes in more stable supply and has emerged the latter decades. Whether they have excluded farmed fish as a substitute for wild fish due to core competency definitions (Prahalad & Hamel, 1990; Reve, 1990; Kannan & Tan, 2002) or due to larger uncertainty levels in the early years of the aquaculture industry remains a puzzle. When asked, though, managers of fish processing firms state profitability considerations as the main objective for not including this raw material in their production (Dreyer *et al.*, 2002).

The Norwegian fish processing industry is a highly competitive setting, where the input market for fish have been referred to as 'next to perfect' (Ottesen & Grønhaug, 2005), due to trade conditions of multiple sellers of almost identical commodities. In our study, which evaluates the situation in 2000, the industry is comprised of about 550 firms, or – if actors are under scrutiny – about 470 since some actors own several firms. The industry exhibit great variation over several dimensions, where revenues are in the range of mNOK 1–1,500. However, the concentration is modest, since the 20 largest actors' revenues constitute less than half of the industry's revenues, while their share of employment constitutes about 40 per cent. Correspondingly, the Hirschman/Herfindahl index – whose values indicate some monopoly power (or moderate concentration) if above 0.1 – is only 0.025 in our industry (Bendiksen, 2005: 37)[81]. Additionally, there exist few entry barriers to this industry, while in the fishing, aquaculture or seafood export industry a license is needed to operate.

The present heterogeneity in the Norwegian fish processing industry also regards the level of vertical integration. In fact, different strategic groups display highly different levels of vertical integration, which will be demonstrated later. The imperative put forward by Joskow (1988: 111) that *"...good empirical work (...) requires that we know a lot about the characteristics of the firms and products that we are relying on in the empirical work*" is highly valid in this industry. His caution produces meaning when observing processing firms' degree of upstream

[81] For the part of the Norwegian fish processing industry, processing pelagic species, the concentration have been higher, but still moderate, taking values in the range of 0.10–0.17 (Bendiksen, 2002b).

vertical integration towards aquaculture. Then we are left with the impression that it is modest. The opposite is in fact true, though the direction of integration is the other way around since fish farmers themselves have established plants that attend to the farmed fish, while original processors only to a limited extent own fish farms.

Data and measurement

The data at hands, which we utilise in this research, stem from the profitability study for 2000. Additionally, we have employed data from the above mentioned telephone survey which were carried out in 2001 to establish our own 'self sufficiency' measure for upstream vertical integration in this setting in 2000. The survey sample was chosen in order to be representative, especially with respect to geography and – to some degree – raw material use. To have a representative sample with respect to size was abandoned due to our assumption that – especially within the wild fish sector – a certain size is required in order to have the resources necessary to integrate upstream. Further, our sample of firms was not representative concerning raw material use in the respect that it contained a much larger proportion of firms processing from both farmed and wild whitefish. The motive for this was to assure sample size requirements in order to perform executable and relevant statistical tests and also to include an interesting group from the view of sourcing policies.

The choice of data from one year only was done to narrow the time range to which comparisons should be made, since the availability of data is narrowed by the financial report period of firms. Another reason to limit the scope of the analysis is founded on the dynamic nature of vertical integration: This year's level of vertical integration could differ significantly from last years degree of vertical integration, especially when utilising measures that is subject to alterations over time. For instance vertical integration measures based on reported financial data (like the 'value added over sales' ratio) or 'flow of goods' ratios (like the self-sufficiency ratio) which may, or may not, change over – or even within – years.

The time constraint on one year – namely 2000 – for investing the vertical integration relationship makes it worthwhile to mention some industry characteristics and conditions for this special year regarding end markets and the first hand market for fish. According to the profitability study for this year (Bendiksen, 2001) the profitability in the traditional whitefish sector of this industry was influenced greatly by low end market prices for salted and frozen fish. Additionally, firms also suffered from reduced whitefish quotas (especially cod) which lead to increased first hand prices that year – resulting in reduced price margins and an overall low profitability for this branch. The market for Norwegian farmed fish was in 2000 prosperous and as market prices for farmed salmon reached a peak this year, farmed fish producers had high profitability. Farmed fish processors, however, struggled under high input prices which resulted in low profitability for this segment.

The data presented is the result of a telephone survey in 2001, where general managers in 100 Norwegian fish processing establishments were addressed regarding their upstream vertical integration strategies towards fishing vessels or fish farms in 2000. Coupled with data from the profitability study, we were able to assess the vertical integration-performance relationship in this industry. Due to various ways of organising production with respect to raw material use, we adopted the method of attack from Isaksen *et al.* (2002) where processors were divided into three groups dependent on inputs: whitefish processors, farmed fish processors and those processing both whitefish and farmed fish.

The measure for upstream vertical integration is the same as constructed earlier (Dreyer *et al.*, 2001), which capture the share of total inputs (fish) stemming from upstream units in which the focal firm has ownership interests; a 'self-sufficiency' ratio. However, since we do not require total or majority ownership in upstream units, due to institutional entry barriers in the fishing industry, upstream units might in many cases not be 'commanded' to supply the focal firm, ruling out self-sufficiency in these cases. What we consider is the voluntary cooperation between independent firms, where ownership interests can be deemed as relationship specific investments which can commit the actors to trade with one another.

Our measure then – the share from upstream units (SO) in which the firm holds proprietary ownership interests (both fish farms and fishing vessels) – is a continuous variable including most any vertical coordination relating to upstream ownership. Even if truncated at zero and one[82] and require ownership, our variable is in agreement with the methodological recommendations from literature (Blair & Kaserman, 1983; Frank & Henderson, 1992; de Koning, 1994; Peterson, Wysocki, & Harsh, 2001) to ensure continuity in the vertical integration variable. Based as it is on transfers which can be judged as *internal*, flows of goods between stages tied together through (common) ownership, it displays properties like MacDonald's (1985) MVI-variable[83]. Also, our variable for upstream vertical integration envelopes the main content of the self-sufficiency ratios employed by Levin (1981) and Edwards *et al.* (2000) which assesses the share of total inputs to the focal firm supplied by wholly owned subsidiaries. Additionally, our operationalisation covers fully at least two of the four dimensions emphasised by Harrigan (1984): *degree* and *form*. Our emphasis on the actual flow of goods between value chain stages, where ownership counter the flow of goods, makes it natural to label our variable as *use* of vertical integration: to what extent the ownership interests in adjacent upstream stage in the value chain appears into an actual stream of raw materials. From this point of view it becomes a natural and well suited measure for the setting studied, which incorporates the core of the concept *upstream vertical integration*.

In order to compare our measure for upstream vertical integration against other measures, the review of empirical literature on the vertical integration-performance relationship points to one particular candidate; namely the 'value added over sales ratio' (VA/S). The reason is plural facetted. First, the inter-industry flow of goods measure, based on macro input output tables, which is utilised by Martin (1986), D'Aveni & Ravenscraft (1994), Fan & Lang (2000) and Bhuyan (2002) can not easily be translated to a 'one industry setting' like the Norwegian fish processing industry. Since we do not possess data sufficient to compute the measures utilised by Maddigan & Zaima (1985), where industry level integration is projected to firm level, this measure is neither an alternative. Neither do we concentrate our interest to the flow of goods between different value chains; we rather focus on the intra value chain transactions of the first and second stage of our value chain. Second, our measure incorporate the most important dimensions of the self sufficiency ratios utilised by Levin (1981) and Edwards *et al.* (2000) and cover – in our view – the most crucial dimensions of Harrigan's (1984) measures. Third, since the vertical relationships under scrutiny here are not the likes of the vertical mergers studied by Chatterjee (1991) his measures are also abolished. Then the natural counterpart to hold our measure up against becomes the original construct for vertical integration proposed by Adelman (1955) and utilised by Vesey (1978) and Buzzel (1983) among others – namely the 'value added over sales'-ratio (VA/S).

[82] Nonintegrated fish processing firms – more correctly: fish processing units without ownership interests in upstream units – will take that value zero, while the value one is assigned to firms receiving all their inputs from subsidiaries. We do not assign values greater than one to firms, even though one could think of situations where firms sell excess upstream production. In the fish processing industry this might occur in seasons with high fishing pressure geographically – Lofoten during the winter season or Finnmark during the spring (Isaksen, Dreyer, & Rånes, 2003) – but over the year this will equalise.

[83] MVI = vertical integration restricted to the manufacturing channel; the share of industry shipments to manufacturing establishments that are directed internally, to the sellers establishments (MacDonald, 1985: 329)

One drawback of this VA/S-measure is its apparent connection to profitability – the dependent variable in our study. To liberate this measure from the possibility of tautological identities we also make use of a profitability adjusted measure (VA/S π-adj.) where profit is subtracted from both the numerator and the denominator of the VA/S ratio.

Another obvious deficiency when comparing our measure for upstream vertical integration (share of inputs from vessels in which proprietary interests are held) to 'value added over sales'-ratios (adjusted for profit or not) is the bias our measure has on upstream vertical integration, whereas the other variables measure the total vertical integration of the firm in its value chain. The difference is that the VA/S-measure incorporates also downstream integration – a feature disregarded in our treatment of the phenomenon. This source of error in our comparison might hurt our results tremendously. However, two circumstances moderate the potential erroneous effect from the comparison: First, the degree to which downstream integration is undertaken in the Norwegian fish processing industry is quite modest. Many processors hold an export license but utilise it to a minor degree since sales are sourced out to 'professional' seafood exporters. A second supportive reason for comparing our variable with the 'value added over sales' ratio is rooted in one of the most noted critique against this ratio. The setting under scrutiny here is the two first stages of the seafood value chain. Several scholars[84], when assessing the 'value added over sales' ratio in empirical work, have claimed that this measure will be sensitive to where in the value chain the measurement is undertaken. Especially, they claim, this measure will be sensitive for the proximity to the raw material source, and that it therefore will be greater in case of backward than forward integration. Then the effects on this measure from upstream integration will – all other equal – will supersede the nominal effects from downstream integration.

The measurement of performance is relatively straightforward since market based measures (like Tobins *q*, abnormal returns, etc.) that give future-oriented considerations of organisations' ability to change (Keats & Hitt, 1988) are disqualified in this setting. The reason is that shares in firms operating in this industry only by exceptions are subject to stock market transactions, hence, we lack data on the market value of firms. The choice between account-based measurers and self-report data was settled in favour of the first mentioned due to the availability and objectivity of such measures. Again we utilise the key figures *gross profit margin* (GPM) and *return on total assets* (RTA) which means the ratio of pre-tax net profits to sales, and the yield of the total capital employed (independent of funding) respectively.

8.3.3 Findings

Our first task was to map how the different segments of the Norwegian fish processing industry spread on the variables of interest here: To what degree the segments were vertically integrated and the average profitability for the year in question. For vertical integration purposes we wanted to map the average values on our own upstream integration measure as well as the value added over sales (adjusted for profits or not). In Table 13 the statistical means (in percentage) for the three groups of firms – as well as the total sample – is provided.

[84] See for instance Martin (1986) as well as Adelman (1955) in his original proposition of using this as a measure for vertical integration.

Table 13 Statistical means for groups of fish processing firms on the vertical integration (SO, VA/S, π-adj. VA/S) and profitability (GPM, RTA) variables

Industry segment	*Share from upstream units (SO)*	*Value added over sales (VA/S)*	*Profit adjusted value added over sales (π-adj. VA/S)*	*Gross profit margin (GPM)*	*Return on total assets (RTA)*
Whitefish (n=55)	17 %	16 %	15 %	- 1.8 %	4.4 %
Farmed fish (n=18)	76 %	26 %	23 %	2.6 %	9.9 %
Both inputs (n=18)	29 %	20 %	17 %	2.9 %	10.1 %
Total (N=91)	31 %	18 %	17 %	0.0 %	6.6 %

The groups we operate with here are the same as the specialist- and generalist groups utilised earlier (Isaksen *et al.*, 2002). However, the groups deviate from the ones reported earlier, with respect to number of firms. The reduction of the group sizes was carried out after a comprehensive inspection of the data at hand, where outliers were identified and excluded from our samples, especially to fulfil the model requirements for the OLS-regression – especially concerning skewness[85].

Table 13 shows, with clarity, that regardless which vertical integration measure we use, the farmed fish group is the most integrated – with the 'generalists' ranging second and the whitefish group the least. This is in concurrence with the earlier findings and shows that the degree to which firms are vertically integrated in our industry probably is – at least partly – determined by the raw material they utilise in their production. When profitability is under scrutiny, both measures show that – for 2000 – processing of farmed fish was – on average – more profitable than whitefish processing, and that those who processed both farmed fish and whitefish achieved slightly higher yields than the farmed fish specialists. However, these tendencies are weak, and further testing is needed to establish such a relationship. The average overall yield from total assets (RTA) in our firms in 2000 (6.6 per cent) was about the same as for the total of Norwegian on shore industry that year (6.7 per cent according to Statistics Norway, (2003b)). Related to the rest of the fish processing industry's return on total assets (4.4 per cent according to Bendiksen, 2001) our sample had a slightly better profitability.

If we inspect the *t*-values from testing whether the group means differ significantly from one another[86], we find – at five per cent significance level – that:

- ✓ The whitefish firms differ significantly from the farmed fish firms on all the vertical integration measures. However, between these two groups, none of the performance measures reveals significant differences.
- ✓ The whitefish firms differ significantly from the 'generalist' firms with respect to vertical integration, but only when value added over sales is assessed. Looking at profitability then, the two groups differ significantly, but only when measured by gross profit margin.
- ✓ The farmed fish firms and the 'generalist' firms differ significantly only with respect to our measure of vertical integration.

[85] We are grateful to one of the NOFOMA-reviewers for the pointing this out to us.
[86] The tests were performed with SPSS+, Pearson's correlation tests – where variance assumptions (equal or not) were decided from Levene's test for equality of variances.

No other significant differences beyond the mentioned are found in our data for 2000. Summing up then; significant results where found in six out of 15 tests, where the groups seem to differ more in terms of vertical integration than in profitability. Additionally we find more often differences between the whitefish and the farmed fish group (three times) than between whitefish and generalist firms (two times) or farmed fish and generalist firms (once).

When assessing the utilised measures, we find a high degree of correlation in between them, as shown by Table 14.

Table 14 Pearson's correlation matrix for measures utilised (N=91).

	SO	*VA/S*	*π-adj. VA/S*	*GPM*	*RTA*
Share from own upstream units	1	0.46**	0.38**	0.22*	0.16
Value added over sales		1	0.94**	0.23**	0.23*
Value added over sales profit adjusted			1	0.28	0.19
Gross profit margin				1	0.82**
Return on total assets					1

*) Significant on a 0.05 level (2-tailed).
**) Significant on a 0.01 level (2-tailed).

Table 14 displays that the used measures are to a large degree correlated. The greatest correlation is found between the two 'value added'-based vertical integration measures, where the Pearson correlation coefficient (0.944) show that they are close to identical. A main reason for this is that out of the 91 sampled firms in 2000, 43 had negative profits (whitefish firms being overrepresented)) which naturally was not adjusted for in the profit adjusted measure. Further we see from Table 14 that the two profitability measures are significantly and highly correlated, but also that most other measures are significantly correlated – in fact in seven out of 10 possible cases. The measure that is the least correlated with the others is the yield of assets (RTA), while value added over sales (VA/S) is significantly correlated with all other measures. However, it is not our objective here to put forward a multivariable regression model to explain the most possible variation in profitability based on the three vertical integration variables. Rather, we want to explore which of the vertical integration variables that are best suited to explain the inherent variation in profitability. The strength of the linear relationships of zero-order correlation coefficients in between all dependent and independent variables are not of our primary interest. However, before we proceed, a closer inspection of the variables is needed to assess their adequacy within the statistical assumptions of an OLS-regression model. Table 15 exhibit descriptive statistics concerning the variables, for the whole population.

Table 15 Descriptive statistics for the variables (SO, VA/S, VA/S π-adjusted, GPM and RTA)

Variable	*Mean*	*Std. Error*	*Median*	*Minimum*	*Maximum*	*Skewness*[87]	*Kurtosis*
SO	0.3076	0.0349	0.20	0	1	0.836*	-0.508
VA/S	0.1844	0.0104	0.17	0	0.48	0.945*	0.833
VA/S (π-adj.)	0.1674	0.0097	0.15	0	0.43	0.945*	0.948
GPM	0.0003	0.0082	0.00	-0.17	0.30	0.982*	3.326*
RTA	0.0659	0.0123	0.06	-0.17	0.44	0.664*	0.805
					Std. Error	0.253	0.500

Table 15 displays the mean and its standard error, the median, maximum and minimum values that our variables take. Additionally we have included the skewness and kurtosis of the variables, since these features are decisive for the normality properties of our variables. Perfect normal distributions would obtain skewness and kurtosis values of zero, but is rather uncommon in social sciences. However, in large samples (more than 200 observations) skewness will not make substantive difference in the analysis (Pallant, 2001).

As can be seen from the second last column, the skewness values reported from the SPSS computations are found significant for all five variables – i.e. the values exceeds the double standard error[88]. However, Byrkit (1987: 75) acknowledges

Pearson's Index of Skewness: $I = \frac{3(\bar{x} - \text{Median})}{\text{Std.error}}$

as the correct operator for deciding whether distributions are significantly skewed or not. *"If this index takes a value greater than 1 (or less than –1) the data is significantly skewed and the mean and standard deviation are not valid measures of central tendency and variability respectively*" (op.cit). Byrkit questions Pearson's own rule of choosing 1 and –1 as cutpoints and adds: "*If I is not zero, there is some skewing; the only question is how much is too much."* Following Pearson's index, none of the variables we employ are determined *significantly skewed*, taking values from 0.01 (VA/S) to 0.97 (SO), all being positively skewed.

The kurtosis values are within reasonable levels (two times its standard deviation) for all variables except for the gross profit margin where this level is exceeded. While the negative kurtosis for our vertical integration measure (SO) indicates a distribution with heavy tails, the other variables are distributed with peaks greater than in standard normal distributions. Especially for the gross profit margin where the histogram show that about half the firms have a gross profit margin within the range of +/– 3 per cent.

As mentioned the kurtosis and skewness of the data are decisive for the normality of the distribution. The tendency displayed here, especially the skewness of the variable distributions, questions the fundamental assumption of normality. This is underlined when we test for normality. In SPSS, the computation of the *Kolmogorov-Smirnov* test and the *Shapiro-Wilk* both return test statistic values for all variables, except for return on total assets, that suggests violations to the normality assumption. Further tests amplify this suspicion. For instance, both the *Jarque-Bera* test[89] (Gujarati, 1995: 143) and the *z*-test[90] (Hair Jr.,

[87] Even though all of our variables are found skew by SPSS (a skewness value greater than twice the standard deviation), the computed Pearson's index of skewness is within acceptable limits for all variables.

[88] For our vertical integration variable, $\text{Skewness}_{SO} = 0.836 > 2 \times \text{Std.error}_{\text{Skewness}} = 2 \times 0.253 = 0.506$

[89] $JB = N\left(\frac{\text{Skewness}^2}{6} + \frac{(\text{Kurtosis} - 3)^2}{24}\right)$ which follow the chi-square distribution with 2 degrees of freedom.

Anderson, Tatham, & Black, 1995: 66) return values for all variables (in the range of 15–57 and 2.59–3.82 respectively) that are inconsistent with normality. Again, return on total assets is the one with the lowest score. However, inspecting our plots (box plots, normal probability plots and plots of the actual deviation of the scores from a straight 'normal probability' line) and outliers gave no further reasons for concerns, therefore, we continued as if our data were normally distributed. In other words, no data transformation procedures were undertaken[91] here. That does not mean that variable transformations or other normality assuring procedures was unnecessary, but rather that test results from statistical procedures that require normally distributed data in light of our 'sins of omission'.

What remains is to test for the covariation between vertical integration and performance – i.e. explore the vertical integration-performance relationship in our industry. For that purpose, six regressions models, of the form $Y = \beta_0 + \beta_1 X + E$, were considered and coefficients estimated within Ordinary Least Squares. Our dependent variables (Y) were GPM or RTA, and our explanatory variables (X) were SO, VA/S or π-adjusted VA/S. Hence, our vertical integration measures were separately regressed on our profitability variables, and in Table 16 test statistics (constants, unstandardised regression coefficients[92] and R-squared) are provided for all six tests.

Table 16 Test statistics. Separate regressions of vertical integration against profitability in 2000. Constants, unstandardised coefficients (β), R^2 and p-value. N = 91

Dependent	*Independent*	*Constant (β_0)*	*β_1*	*R^2*
Gross Profit Margin	Share from own (SO)	- 0.016	0.052*	0.049
	VA/S	- 0.043*	0.236**	0.089
	VA/S (π-adjusted)	- 0.004	0.024	0.001
Return on Total Assets	Share from own (SO)	0.048**	0.058	0.027
	VA/S	0.017	0.268*	0.051
	VA/S (π-adjusted)	0.062*	0.024	0.000

*) Significant correlation at a 0.05 level (2-tailed).
**) Significant correlation at a 0.01 level (2-tailed).

When reviewing the findings reported in Table 16, the most striking results are the extremely low explanatory power of our models (R^2), together with rather low regression coefficients (β) – except for the 'value added over sales' measure. None of our six models are able to explain more than nine per cent of the variation in profitability in our sample – while the model with the least explanatory force is unable to explain any of the variation (profit adjusted value added over sales regressed on return on total assets). This is in line with Wensley's (1997) claim, that no single variable can account for more than 10 per cent of the variation in business performance since measurement problems are highly present when financial

[90] $z\,value = \frac{\text{Skewness}}{\sqrt{6/N}}$ which follows a z-distribution, and the desired significance level (+/-2.58 if α =0.01).

[91] Following Hair Jr. *et al.* (1995) one procedure to reduce the flatness of our distributions (our kurtosis-problems) is to use the inverse of our variable (1/X). To reduce the negative skewness (in SO) a square root transformation could have been used, or we could have undertaken a logarithm transformation of the positively skewed variables.

[92] Unstandardised regression coefficients were found adequate since here only one explanatory variable enter each regression model. Hence, the standardisation (*z*-values) assigned to coefficients, for instance when variables take scales and units of measurement, will produce no extra information in our case, except from distinguishing them from the constants (β_0's)

performance measures are used and, in addition, the complexity of business success determinants is huge. Another point of concern is the fact that in studies of market share effects on return on investments, ratios are used, where measurement errors can create problems in both denominators and numerators. He concludes (p. 77; in a rejoinder in the same volume) that: *"…in strategy situations the variance nearly always matters more than the mean!"*

As a consequence then, it is not surprising that our regression models produce explanatory power in a thrifty manner, since many explanatory variables undoubtedly are left out. High explanatory power from cross section data analyses like ours are exceptional rather than the rule. In his attempt to reveal the profitability effect in different food manufacturing industries from forward integration, Bhuyan's (2002) regression results showed that the latter had a negative effect, while including eight other IO variables (market concentration, location, productivity, R&D, advertising, capital intensity, domestic demand and import competition) in his regression equation. From his standardised beta coefficients, his forward vertical integration variable was found to have the sixth largest influence of the nine variables, in a regression which explained nearly 36 per cent of the inherent variance in industry profitability (measured by a price cost margin index).

The most notable regression coefficient in our simple two-variable models is found when 'value added over sales' is regressed against gross profit margin, where a unit increase in value added over sales will increase gross profit margin with 24 per cent. This is also the model which explains the largest portion of the variance in gross profit margin. However, as documented by a number of scholars, the 'value added over sales'-measure can be shown to be positively correlated with profits[93]. Then, it is under influence by other factors than vertical integration, which very well may lead to spurious results when regressed against profit. An indication for this can be detected when assessing the results on performance when profit is subtracted from this measure (i.e. regressing the 'profit adjusted value added over sales'-measure on the profitability measures). That model is – interestingly – unable to explain any of the inter-firm profitability variance, and, hence, the significance of the model with value added over sales is deteriorated and made insignificant when profit is deducted from that variable. What we believe to see here is exactly the effect from regressing profit on profit, which – when deducted from both denominator and nominator of the value added measure – leaves us with no explanatory power since the R-squared shrinks to null, and regression coefficients are decimated. What fortifies this impression is the fact that nearly half of the firms experienced deficits in 2000, which for those cases makes the two 'value added over sales'-variables equal..

It is also worth noticing that the constant – in the case of gross profit margin – are all negative, while positive in the case of return on total assets. When return on total assets is under scrutiny, the constant is significant in both cases where our explanatory variable is not, hence, the regression line is better suited as a horizontal line in the two dimensional plane.

The two remaining models then include our own upstream vertical integration measure, which assesses the degree of inputs stemming from upstream units where the focal firm have ownership interests – i.e. the ratio of 'own' supply over total inputs. In the earlier research reported above this vertical integration measure have exercised insignificant influence on whitefish processing firm's profitability, though while the effect on gross profit margin in

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[93] See for instance Arthur R. Burgess comment to Buzzel (1983) in Harvard Business Review (May/June 1983, p. 194–96), where he shows that the 'value added over sales'-measure for vertical integration is has a positive correlation with return on investments (ROI), and therefore is subject to tautological entities which in regression analysis give rise to the discovery that *profit equals profit.*

1997 was negative, the effect on return on total assets seemed to be positive (Dreyer *et al.*, 2001). When assessing profitability effects in 2000, also including processors of farmed fish, the opposite effects, still insignificant, however, were found for whitefish processors. For farmed fish processors, vertical integration had a positive influence on gross profit margin while negative on return on total assets. For those processing both whitefish and farmed fish, vertical integration seemed positive on both performance measures (Isaksen *et al.*, 2002). Here, the overall effect on the profitability of fish processing firms from integrating vertically upstream – without the discrimination on which input they utilise – is positive on both performance measures. Though, the effect is minor (small correlation coefficients, where from a unit increase in vertical integration only 5–6 per cent will be offset on performance) and only significant in case of gross profit margin. This result can, when held up against the earlier findings, be interpreted in favour of upstream vertical integration when sourcing conditions are problematic. From 1997 to 2000 Norwegian cod quotas fell by 50 per cent, resulting in an excess demand for fish. From an input security point of view, one can easily imagine the value of 'controlling' steady suppliers of inputs under scarcity. In 1997, when whitefish was in excess supply, the value of conserving financial capital in vessel equity must have been less for fish processing firms. However, the results reported here can not easily be compared with those from 1997 since we here have included also firms that are integrated towards and/or utilise fish from the fish farming industry. The forces in effect that influence profitability may actually be induced by those in our sample having qualitatively different working conditions in force. Further, the possibility that our data deviates from the normality criteria also justify a cautious treatment of the findings. That we have to relax on the significance level to regard our finding significant emphasise this caution. Our conclusion will therefore fall into the line of earlier findings: The effect of upstream vertical integration on performance is diffuse and difficult to evaluate coherently.

8.3.4 Discussion

"What came first: the egg or the hen?" This rather evolutionary puzzle also underpins the background for considering how strategic changes in organisations impact their outcome as measured by performance (Parnell, 1998). This intriguing question can also be related to our research where we have tried to measure the impact of vertical integration on performance in the Norwegian fish processing industry. Could it be that the question rather should be directed the other way around? That firms obtaining superior results and succeed in outperforming their competitors, or industries where supernormal profits are obtained, create the financial power and autonomy necessary to bring about the ability to invest in adjacent value chain stages? Or is vertical integration carried out for tax reasons (since internal transactions can be carried out at favourable transfer prices for avoiding direct taxes like VAT) or to create barriers to entry for competitors? These alternative tautological explanations should be further elaborated in the mission to set the vertical integration-performance puzzle straight.

In our setting, this alternative tautological explanation could in fact be the case. In our sampling strategy we even assumed a minimum size for vertical integration to be undertaken by firms in the whitefish sector towards fishing vessels. Therefore in 1998, which was the most prosperous year in the Norwegian whitefish processing industry for decades, we interviewed general managers of the largest fish processing firms. The answers they gave us revealed that about 68 per cent of the firms had proprietary interests in fishing vessels. Further, 58 per cent of the managers considered the importance of such ownership to be more important for the future and 85 per cent considered increasing their investment schemes in the fishing industry. Five years later, in 2003, as the reported study was expanded with farmed fish processors and undertaken, such optimism was not recognised among the managers of the same firms, at least not to the same extent. However, the managers with control over the largest fishing vessel ownership portfolios were also the ones who expressed the greatest contentment with upstream vertical integration. This underlines the path dependency view (Swamidass & Newell, 1987; Hunt & Morgan, 1996; Greener, 2002; Schilling & Steensma, 2002) where the choices of vertical integration towards the fishing fleet becomes a strategy interlocked in time, which may serve as great exit barriers for the firm, when environmental changes induce a flexibility penalty to this kind of strategy.

Understanding the use of vertical integration in the Norwegian fish processing industry is neither straightforward nor easy as underlined earlier, since there are the multiple ways to organising the buyer-seller relationship, and firms constituting this industry vary to large degree. Whereas many businesses have spent a lot of money in minority share holdings in fishing vessels, others attend their relationship with raw material suppliers by quite other means. One alternative often observed is by offering local vessel owners loans when they contract vessels, with an underlying tacit agreement that tie the landings to the lender when feasible. As stressed by Williamsson (1991b: 84): *"Debt, equity, leasing, etc., are more than financial instruments. They are also instruments for governance."* In this way they can partly secure their need of fish through 'operational understandings' with the fishing vessel owner, evading the responsibility following ownership and equity investments. A number of managers emphasised that fishing and vessel ownership should be left to those who managed best, and then they – on their hand – could concentrate on what they knew best; namely fish processing. This specialisation mentality was, naturally, noted more often by those who had avoided vertical integration and had no plans of engaging in the fishing industry.

Other fish processing firms – and their representatives – maintain their relationship to fishermen by placing plant premises at the fishermen's disposal (for carrying out on shore related business like baiting, lodging and mending the fishing gear), while others again merely by ways of a common understanding of what is best for the local community, agrees tacitly on serving each other. The point is, as elegantly noted by Fine & Hax (1985: 32), that *"(t)he crucial element of success of integrating operations is not ownership, but management and co-ordination of the series of processes"*.

Methodologically, some comments to this research should be added. As demonstrated in the literature review, numerous ways of measuring vertical integration exists. Here we have restricted our study to a single industry and utilised three measures for vertical integration. Despite our main conclusion, that the vertical integration-performance relationship remains a puzzle, our results indicate that this relationship is sensitive for the measures chosen to test the relation. Measures that easily can be applied in different settings are often based on data from financial accountings. As performance measures often origin from the same source, statistical validity is weakened since we meet multicollinearity problems. Here we manage this problem by applying a measure for vertical integration based on production volumes rather than financial figures. Our conclusions regarding the vertical integration-performance relationship are not altered by using account based measures of vertical integration, which indicates a high level of internal validity when applying different measures for vertical integration at firm level.

The external validity is, however, at stake since the sample scrutinised here is collected from the same industry, at one single year. The choice of industry was made for isolating and disregarding the potential industry effect, since the firms entering the analysis all face the same external conditions[94]. However, since our findings are based on the situation at only one

[94] This does not mean, of course, that we do not acknowledge the difference in sourcing methods between whitefish and farmed fish processors. Quite opposite – that is exactly the variation we seek in our model.

point of time, some variation can be lost. As underlined earlier, vertical integration is a highly dynamic concept, which makes comparisons over years both time and resource consuming when trying to assess the true degree of vertical integration among firms. In an earlier attempt of enlightening the vertical integration-performance relationship, where the concept was differently operationalised and only fish freezing plants and their dependency of industry owned wet fish trawlers in the period 1977–1992 were analysis, the findings did not either indicate any direct effect between vertical integration and profitability (Dreyer *et al.*, 2001).

Since about one third of the firms in our sample states a share of input factors from subsidiaries to be zero, our operationalisation of vertical integration violate the requirements for the normal distribution, on which the ordinary least square regression procedure relies. This skewness problem could not have been avoided or reduced by variable transformation of any kind. One way of avoiding this could be to omit the 'zeros', which would have reduced our sample severely. Not to mention that it would imply that we refused to see the choice of *no* vertical integration as part of the manufacturing strategy of a huge number of firms in this industry. A test where we distinguished only between integrated and non-integrated firms did not produce any extra explanatory force. Neither did it do so when we omitted the 'zeros'. Therefore we have chosen to present our material 'as is'. The group of 'zeroes' can also be argued to consist of two strategically different firms: One group that have deliberately chosen to use the market for transactions and another group willing and wanting to integrate vertically, but lacking the financial capability to do so. A way to separate these two groups of unintegrated firms would be recommendable for refining our findings in future research.

Our findings, however, support Harrigan's (1986a) conclusion that degree of vertical integration should be measured at firm level instead of industry level when assessing the impact of vertical integration on performance. As demonstrated here, the conclusions concerning this relationship are sensitive for which level the studies are undertaken and what measure for vertical integration is used, i.e. whether firm or industry level is employed or whether the vertical integration measure is based on financial data or on product flows. Hence, we recommend applying measures of vertical integration developed at firm level that do not origin from financial statements when analysing the vertical integration-performance relationship, to avoid potential spuriousness in regression results. Further, we recommend that measurements for vertical integration are thoroughly grounded in the production and setting studied, in order to capture the industry specific features relevant for this strategic choice. However, recommending industry – or even value chain stage – specific measures, even if increasing internal validity, limit the external validity and application of the same measurements in different industries. Our choice of measure would prove insufficient and unsatisfactorily as a measure for vertical integration in other parts of the Norwegian food sector, say – the dairy or meat preparation and preservation industry – where a monopsonistic structure prevails.

A relevant question for future research is whether the vertical integration-performance relationship is sensitive also for the way performance is measured. Our literature review revealed that several measures of performance had been applied in previous studies of this relation. According to conceptual models internal pricing strategies between adjacent stages in the value chain are crucial for where profit is directed – and detected – in firms' financial statements. This indicates that in order to better understand the ambiguous findings in studies of the vertical integration-performance relationship, we need to apply different measures of performance when assessing this relationship, which remains to be elaborated further.

Holding the findings reported here up against our previous results, reveals that we by no means have found a solution to the upstream vertical integration-performance puzzle in the Norwegian fish processing industry. Despite the fact that we have assessed the relationship in a longitudinal design, we have included several sectors of economic life within our industry with regards to raw material, we have explored and assessed how various theoretical predictions influence the relationship, and we have employed various measures for vertical integration and performance to reveal their ability in this testing environment. And the verdict seems to be the same: Vertical integration seems to have little or no impact on the profitability experienced by firms in the industry. Even when excluding the industry effect by choice of design the explanatory effect on performance from vertical integration is increased. But regardless of our findings, the real economic landscape under scrutiny in our study is composed by firms that to various degrees are vertically integrated and to various degrees succeed, prosper and survive in this competitive environment. And subject to the same external environmental forces, some of the vertically integrated firms are highly successful and found among the top performers consecutive years in our industry, while other vertically integrated firms are found struggling fiercely every year in order to avoid bankruptcy, at the bottom performance level. How can this be explained?

Our models, where firm level upstream vertical integration in our industry is set out to explain the performance differences, are proven unsuccessful. In fact, neither of our attempts have been able to produce robust results on which influence vertical integration have on financial performance in the Norwegian fish processing industry. At the best, they have revealed tendencies – not significant however – in line with theoretical predictions. Real world observations support these findings, as the industry in question is constituted with firms that have undertaken vertical integration to different degrees. The paradox is that if vertical integration was exceptionally profitable, every firm would seek to employ this opportunity and, as more and more firms undertook it, the value of this strategy would erode. What we see is that the economic actors accommodates to their uncertain supply in different ways and with different rate of success.

This unsolved puzzle leaves us with an imperative to explore which other features than the mere degree of internalised product flow to explain how vertical integration can become a competitive advantage for firms in our industry. In line with the theoretical predictions from the resource-based view of the firm, it seems like other factors can be more decisive for the outcome of this strategic method of procuring inputs; namely firm specific factors – or resources – which helps the firm to create or uphold their competitive advantage from upstream vertical integration.

In the next section we comply with the proposal from the resource-based view of the firm regarding the need for empirical research (Barney, Wright, & Ketchen Jr., 2001), by exploring how firm specific resources and capabilities can generate competitive advantages. Especially how different firm portfolios of such resources and capabilities make firms undertake direct opposite strategic manoeuvres with respect to sourcing strategy in this setting, and still succeed from their action.

8.4 How to secure supply? Market exchange or vertical integration

For every firm working under the ‘input-throughput-output’ paradigm it is essential to secure critical raw materials needed in production. When firms operate in turbulent settings where uncertainties are prevalent over many dimensions, this becomes crucial for firm survival. One from theory often recommended strategy to secure supply has been by means of upstream vertical integration; internalising supply rather than procuring by arms length transactions.

One expected outcome from internalising sourcing transactions is lower costs and increased profits since it replaces haggling with outsiders over prices and volumes with internal governance and authority, which presides the intra-firm flow of goods between business units. When inspecting the empirical literature, however, a clear positive relationship between upstream vertical integration and performance can not be unveiled, as shown in the sections above. Where some report a positive performance effect from vertical integration, others point to no significant effect or even the opposite – that vertical integration negatively affects firm performance. These contradicting findings from study to study have been explained differently. One reason often pointed at has been different settings firms operate under and that various empirical environments produce this correlation discrepancy. Another reason raised has been found in the critique against inter-industry studies, where firms in different empirical settings are compared. There, researchers are unable to isolate the effect stemming from vertical integration from other influential characteristics in the firms' environments, which of course vary when several settings are under scrutiny. Others again have criticised the measures employed for not capturing the true content of vertical integration. A last plausible explanation is the influence of firm specific factors on firm performance – for a long time recognised as influential for the creation and development of sustainable competitive advantages (Nelson & Winter, 1980; Rumelt, 1991; Mauri & Michaels, 1998; Yeoh & Roth, 1999; Hawawini, Subramanian, & Verdin, 2003). Within this branch of research, the search for profitability driving factors is carried out beyond the traditional structure-conduct-performance paradigm of industrial organisation theory. Empirical studies on the effect of firm specific factors on performance have to a limited degree been present in previous research. In this paper we try to broaden our already gained insights on the vertical integration-performance relationship by assessing how firm specific resources influence this relationship.

From our point of view, where the Norwegian fish processing industry is under scrutiny, real life observations expose that firms undertake vertical integration to different degrees and with different degrees of success. In fact, while operating in the same business environment, some integrates vertically while others choose to rely on arms length transactions to procure their inputs in the face of external uncertainty. Further, from our proximity to the primary data source for revealing firm performance in our industry, we find that some unintegrated firms and some vertically integrated firms – embedded in the same industrial context – perform equally well, and are found among the top performers in this industry for a number of years. Conventional studies of the vertical integration-performance relationship do not usually address this artefact. Moreoften, models – like the ones we have operated with earlier – where vertical integration as the independent variable is set out to explain performance as the dependent, are unable to shed light on this paradox, which underlines the need to search for alternative and additional explanations of firm performance than only the degree to which firms procure their inputs in-house. However, new insights into this paradoxical finding can show important to improve decisions concerning organisational design aimed at securing efficient supply of critical inputs.

Our models, which try to disclose the effect of vertical integration on performance, and empirical analyses of the vertical integration-performance relationship, have shown unable to produce any precise findings on the correlation in-between the variables. Both our variables – and the value they adopt in our setting – exercise too much variation, to pertain significant findings in the industry we set out to explore, which disables us from arriving at a valid conclusion on the vertical integration-performance relationship.

The quest remaining then is one where we set out to enhance our understanding of the observed paradox – that unintegrated as well as highly integrated firms are found among the top level performance firms in our industry over a series of years. The research presented here therefore set out as a theory-driven exploratory study, where possible explanatory factors –

obviously omitted in past research – are sought identified from a longitudinal case-study research design. The 'promising' classes of factors, from which candidates to expand our knowledge were identified, were in advance identified to be within *unique firm specific factors* and the notion of *flexibility* as an obvious alternative to vertical integration. Striking challenges remain regarding these features, since when addressing such factors, the need for detailed firm level data must be weighed against the need for external validity. Further, a severe claim on detailed firm specific data is essential in order to recognise firms' resource position and unique doing, which favours the case-study research design.

The following sections present our attempt to enlighten this paradox. First, a quick view of relevant theory for our research problem is portrayed, in which the pursue of competitive advantages is emphasised together with arguments for arranging the research in a case-study design. The section ends out in some theory-driven working hypotheses to be further elaborated. Then, the research methodology is presented, with weight on the setting and data at hand, and rounded off with the empirical hypotheses expected from theory. These hypotheses are tested in the subsequent section, where the findings are presented, before we draw some conclusions regarding theoretical implications and managerial practice at the end.

8.4.1 Theory

The leading fields of research within the strategic management perspective have addressed competitive advantages as firms' success in their respective product markets. The way firms decide to procure their inputs and govern their relationships with suppliers have been analysed and regarded as a central problem in their quest for competitive advantages (Porter, 1980; Hayes & Wheelwright, 1984). Walker (1988) emphasises that cost leadership become complemented as the only way to success when price is not the only characteristic consumers appreciate in their search for provision of their needs. Product differentiation, where products deviate from the attributes of competitors' products, can then secure a profitable market niche. This is valid in most markets where products are not totally homogenous and customers value product characteristics like quality, reliability and other distinctive features in addition to price. The strive for competitive advantages can be crowned with success either through cost benefits or safeguarding market opportunities. In order to benefit from *sustained* competitive advantages, the firm have to perform three tasks (Rumelt, 1987): First, the firm must distribute an equitable proportion of the above normal profits to trading partners in order to maintain its competitive advantage. In other words, if competitive advantages are enjoyed, some of it should be shared with the firm's trade partners in order to secure the advantage achieved. Second, since above-normal profits will evade if value-creating assets can be replicated by competitors, these assets must be protected from imitation. Then if these assets are held mutually between suppliers to the firm and the firm itself, these relational assets should be sustained by maintaining the relationship. Third, if product differentiation is the source of the advantage, controlling the interface between product and customer (distribution, marketing and service) becomes crucial to stress the product's valuable attributes effectively and to prevent them from eroding in face of competitors. Hence, the attention shown to sourcing issues is more likely to be belittled than overstated (Welch & Nayak, 1992).

As shown earlier, there exists an extensive literature regarding the choice of organisational design, and we have emphasised transaction cost economics, industrial organisation and the resource-based view of the firm as the most influential ones in the treatment of the 'make-or-buy' decisions. Amit & Schoemaker (1993: 38) explicate one of the differences between the theoretical perspectives in the following manner: *"Whereas Industrial Organization economics often looks outside the firm to explain sustained superior performance (...) the source of rents according to the resource perspective is internal."* Put in a similar manner, the transaction cost perspective attaches the acquisition of superior rents to the efficiency of the governance model chosen to govern transactions.

Scholars within these fields of research have all accentuated uncertainty as one critical dimension the choice between market transactions and in-house procurement. Environmental or primary uncertainty have been emphasised as moderators of organisational structure when the firm seeks to secure critical inputs (Ottesen & Grønhaug, 2003). Volume uncertainty – i.e. the unpredictability of future supply – is found to have a cost raising effect when supply is contracted with external sources instead of procured internally (Anderson & Schmittlein, 1984; Walker & Weber, 1984). Levy (1985) found that firms in the presence of higher levels of asset specificity and environmental uncertainty were more apt to internalise production, i.e. integrate vertically, in accordance with Helfat & Teece (1987) who concluded that backward vertical integration would significantly reduce the risk of the sourcing firm, and hence reduce capital costs. Towill & McCullen (1999) stated clearly that the supply chain that best can reduce uncertainty is likely to be the one that will improve it's competitive position the best.

However, despite these justifications of vertical integration in the face of uncertain environments, there is a lack of theoretical uniformity, since the internalisation of previously independent suppliers also bears with it some additional costs which easily can surpass the benefits. One potential drawback is the loss of organisational flexibility when sudden changes oppose the firm (Dreyer & Grønhaug, 2004), another is the potential of increased production costs due to different capacity levels in integrated stages of production (Stuckey & White, 1993). While an independent firm – procuring its input in an open market – can adjust its purchases to the adequate in-house capacity, a vertically integrated firm may be prevented from this market based capacity alignment if the in-house supplier is unable to generate the inputs needed or create inputs in excess of the focal stage capacity. Then, open market procurements are preferred, as long as the open market possibility exists. In many situations, the upstream market alternative is the supply chain bottle-neck; highly uncertain or even non-existing, which makes vertical integration a compelling alternative for securing inputs.

Increased overhead costs from managing different technologies, different control- and incentive systems as well as different types of employees may also influence the cost structure of the vertically integrated firm negatively. Further, flexibility might be lost due to rigidity established by "in-locked" single suppliers, reducing the ability for advantageous technology changes or market price reductions. On the other hand, such shortcomings can be inverted to gains by focusing on income side advantages: integration can absorb margins earlier awarded non-integrated firms and also reduce transaction costs and taxes imposed on transactions with former trade partners; now in-house suppliers (Hayes & Wheelwright, 1984).

The 'market or hierarchy' dichotomy reveals the encompassment of a great variety of organisation forms. Sole ownership and proprietary rights are but two of several ways to achieve vertical integration advantages, and further, perfect markets only exist by exceptions. Moving along the great variety of organisational forms, integration is increased at the expense of autonomy (de Koning, 1994). Along the vertical relationship continuum we find a variety of organisational forms and contractual cooperation as alternatives to vertical integration that can bring about the desired capabilities and sufficient control without carrying the investments and costs of full ownership over adjacent stages in the value chain.

In this perspective, industrial networks can serve as an adequate alternative to vertical integration, where the manufacturer obtains specialised inputs from external suppliers. Then, "*…(t)he manufacturers maintain ongoing contacts with these suppliers; they train them, provide equipment and know-how, and otherwise invest in the relationship. Suppliers also invest in assets that allow them to produce inputs to buyers' specifications. Typically,* *manufacturer-supplier relationships are not exclusive; buyers have several suppliers for each input, and suppliers have several clients."* (Kranton & Minehart, 2000: 571). Networks may serve as a basis for contractual co-operation and an intermediate state between pure market transactions and vertical integration, especially favourable for the manufacturing firms when uncertainty prevails in the demand for input factors. Then, in the absence of authority to guide the adjacent stages in a vertically integrated chain, trust is the organisational glue in such networks, which clearly affects the terms of trade between actors.

Firm boundaries are, however, dynamic, and former organisational adaptations to supply can become outdated as fundamental conditions, of technological or environmental character, changes (Afuah, 2001). When decision makers choose the appurtenant level of vertical integration within firm boundaries, a thorough evaluation of which organisational structure constitutes the most efficient generation and exploitation of knowledge should be undertaken. Given that managers are *"…intendedly rational but only limited so"* (Simon, 1957: xxiv), identical firms might end up with different conclusions depending on how in-house resources are evaluated by the manager and/or management team. The dynamic and path dependency of firm boundaries are underlined by Black & Boal (1994: 146) with respect to firm specific resources when they state: *"The specific combination* (of resources; my insertion) *for any firm will be a result of the firm's history, (and thus its existing set of firm resource factors), a firm's strategy, and the degree to which the firm's strategy fits the external environment, especially in regard to its competitors."* They also claim that uncertainty must be taken into account when resources are under study, since managers' task of identifying resources that can offer a potential competitive advantage becomes very difficult in the face of uncertainty (Aragón-Correa & Sharma, 2003).

When holding together the theoretical recommendations on when and when not to integrate vertically the complexity and anomalousness is striking. Furthermore, the empirical findings on the vertical integration-performance relationship are unable to draw an exact conclusion, as results are not unambiguous. To our surprise, flexibility is by and large omitted when scholars search for alternative explanations to this irregularity. Especially, since flexibility has been accentuated as a highly valuable characteristic within firms in the face of environmental uncertainty, it places a premium on the firm's ability to react to changes in its setting (Hill & Hoskisson, 1987). An important and intended purpose of upstream vertical integration is to control and reduce the variations in critical supply. An alternative strategy then is flexibility, which aims at adjusting to unpredictable changes as smoothly as possible. Empirical studies which search for candidates among rival explanations to vertical integration have been missing so far (Klein, 2005), and – from our point of view – flexibility constitute one such competing explanation. It should be noted, that when pursued, the two strategies put different requirements on firms' capabilities and resources. Flexibility comes in multiple forms depending on which uncertainties the firm meets in its environment (Dreyer & Grønhaug, 2004). The ones which are relevant in order to handle input fluctuations or to secure critical inputs are volume flexibility, financial flexibility, and input flexibility (i.e. to what extent the firm may apply multiple – and alternative types of inputs to utilise its production capacity).

Firm specific factors like the resource portfolios and capabilities under control by the firm are not easily identified from financial statements or public records and ready to use as explanatory factors in regression models. Sample or population studies, covering a great number of firms in one or more industries, are unable to attach micro level firm specific features to their explanatory model, since these, in general, are only detectable through detailed firm level analysis. For the purpose of revealing firm specific factors, case studies, where a limited number of firms are under scrutiny, are the best means. The relevance in research of the 'make-or-buy' decision is emphasised by Harrison *et al.* (1991) who recommend a focus on firm specific factors rather than strategy types (i.e. strategic groups) since it will enable researchers to better explain firm performance. The demand for case studies has been advanced from a number of scholars within organisational research, and important representatives of organisational theory have advocated the need for case studies. Williamson (1985: 105) call for more detail in the application of transaction cost economics to real world organisational design, and Coase (2005: 38) states clearly that in the need for more empirical work to illuminate the *"...interrelationships which govern the mix of market and hierarchy"*, to which the main obstacle is *"...the lack of available data on contracts and the activities of the firm"*. Further, Loasby (1986) have also stressed the need for case studies when analysing organisational design, together with Joskow (1988: 111) who prepare the ground for case studies by precluding inter-industry studies from good empirical work.

The discussion above reveals a variety of aspects that may influence which is the most effective form of organisation to secure critical supply under turbulent conditions. Real world observations from the Norwegian fish processing industry reveal that firms utilising quite opposite sourcing strategies – i.e. vertical integration and what seems like arms length transactions[95] – are equally successful. This makes it appealing to subscribing to the idea of equifinality[96], i.e. that there is no *one* solution that is the best one for all, but rather, that the derived goal may be achieved in multiple ways. Accordingly, not only industry factors, but also firms specific characteristics, capabilities and resources need to be included to improve our understanding of the vertical integration-performance relationship (Leiblein & Miller, 2003). Surprisingly few contributions have focused on firm specific factors as a moderator when explaining the "make-or-buy" decision (Coles & Hesterly, (1998) serve as an exception) – a research design with heavy demands on detailed data. As a point of departure, case studies like our – meeting the severe claims on data – can be a way of overcoming these major challenges. However, the research design utilised here serves as 'scratching the surface' of the firm specific resources and capabilities. A thorough mapping would require a much more detailed and in-depth scrutiny at firm level.

Working hypotheses

Based on the discussion above we advance three theoretically deducted "working hypotheses" (**WH**). These working hypotheses represent "hunches" or ideas which will guide, without dictating, our effort to gain insights into the apparent ambiguous vertical integration-performance relationship.

WH$_1$: The same performance level can be reached by various organisational designs, (i.e. we subscribe to the idea of equifinality)

WH$_2$: Firm specific factors (resources) – almost neglected in past research – may contribute to our understanding of adequate organisational sourcing structure which enable firms to cope in turbulent environments

WH$_3$: In the face of turbulent environments, flexibility and vertical integration serve as alternative strategies to cope with uncertain supply conditions

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[95] The use of the notion 'arms length transactions' here cannot be interpreted literally since, of course, when repeatedly doing business with suppliers a relationship is inevitably built. As eloquently put by Jacobides & Hitt (2005: 1212): *"But the market is really an organizational interface, behind which is another firm."*

[96] According to Gresov & Drazin (1997: 404) the concept **equifinality** implies that: "*...the final state, or performance of an organization, can be achieved through multiple different organizational structures even if the contingencies the organization faces are the same.* [It] *thus imply that the strategic choice or flexibility is available to organization designers when creating organizations to achieve high performance. (...) The possibility of multiple, equally effective designs to support a given strategy undermines the predictive value of the contingency approach."*

In the next section we will elaborate further on the research design which we employ in this study, with emphasis on the setting, data and the case study approach we utilise. The research design section is brought to a conclusion by transforming our working hypotheses into more easily observable empirical hypotheses, which remain for testing in the subsequent section.

8.4.2 Research design

The exploratory study undertaken here, to further enlighten our knowledge on the vertical integration-performance relationship, can be seen as a natural prolonging of our earlier studies, where the tests of the effect of upstream vertical integration on performance merely underlined the indecisiveness from past research.

There exist obvious impeding drawbacks when utilising case-studies as the mean of attack in organisation studies, especially the limited opportunity to generalise findings from the observed unit(s) to other units. However, case studies comprise a research design, which elegantly enable researchers to perform in-depth analysis of complex phenomena over a narrow sample of units. Case studies can be very useful in explorative research, where the gained insights into problems can in turn be studied as research hypotheses (Frankfort-Nachmias & Nachmias, 1992). In our case, by narrowing the analysis to only two firms which have organised their relationship to suppliers in quite contrary manners but still perform equally well, we hope to reveal the vertical integration-performance relationship even further through the evaluation of so-called firm specific factors. And even if findings in studies like our are not directly transferable to other firms (hence, limited external validity) the cumulative evidence from several case studies can point to theoretical consistencies, or inconsistencies (Klein, 2005). Like Simon (1992: 1504) expresses his discontent to economists' unjust treatment of case studies as methodological point of attack in a book review: *"Although case studies are only samples of one, such samples are infinitely more informative than samples of none, and we must devise a methodology for using them. Barnard's work demonstrated that valid hypotheses are much more likely to emerge from direct, intimate encounter with organisations than from speculation."*

Again, the setting under scrutiny is the Norwegian fish processing industry, which we earlier have proved to be one with uncertainty highly present in the sourcing environment. This industry comprises a link in the seafood value system between the biological resource and the consumers, where several structural factors may motivate for vertical integration. As underlined by Dreyer (1998) and Ottesen & Grønhaug (2003) among others, managers of fish processing firms are exposed to an almost stochastic supply of the most important input factor; namely fish, due to the risky environment surrounding this biological resource (seasonality, quality, abundancy, and others).

Uncertainty is also prevalent in the other end of the value system, where prices and output can fluctuate heavily. It has been claimed that vertical integration can be beneficial in such situations (Carlton, 1979; Walker & Weber, 1987; Williamson, 1991a; Miller & Shamsie, 1999). In a setting like ours, upstream vertical integration towards the fishing fleet, in order to achieve control over the most important input factor is claimed to be a meaningful strategy to reduce uncertainty and to secure a sufficient supply. Our setting also consists of firms which to a varying degree have undertaken upstream vertical integration towards the supply side – be it fishing vessels or fish farms – where most firms are small or medium sized, and the industry is characterised by low concentration.

The populations of firms in the Norwegian fish processing industry can by means of the profitability study (Bendiksen, 2005) be studied longitudinally. Case study design is often mistaken as 'one-shot', posttest only design (Yin, 2003: 20), used in controlled environments within social and clinical sciences. This view is strongly opposed by Cook & Campbell (1979: 96-7) who accentuate – among other things – that modern case study approaches are disparate to one-shot posttest only, since the design is more complex with more than one dependent variable at one time and with responses at different levels. Our approach to the problem is a two firm, detailed case study with longitudinal qualities, since the firms chosen have been identified among the top performers in our industry throughout the last decade. We will argue that the lengthy perspective in our choice of firms ensures a longitudinal assessment in an industry where the yearly birth and death rates of firms ('turnover') are substantial. The two cases we concentrate on belong both to the fish filleting firms. This is a branch of the fish processing industry where the reduction of firms has been the greatest in the period in question. Bendiksen (2006) show that there has been a 60 per cent reduction in number of firms in the period 1995–2005, where 21 firms are 'lost' from the original population.

As noted, the selected firms have proven to be among the best financial performing firms within the industry for several years. Interestingly, for our aim, the firms have chosen to organise their sourcing policies – in order to secure supplies – differently. One firm (Firm A) is highly vertically integrated, i.e. it owns several fishing vessels which supply the firm with most raw materials. The vessels in question are– in Norwegian standards – rather large, fishing demersal species (whitefish) with trawl The other firm (Firm B) has never owned fishing vessels, and purchase all the needed raw material in an open fresh fish market. Both firms are located in the same region, produce the same type of products (fillets) and rely heavily on the same input factor – demersal fish (mainly cod, saithe and haddock, but to some degree also redfish, catfish, halibut, and others). Despite the fact that the fish filleting industry is the most labour intensive branch of this industry, raw materials are the most important input and cost component, with about two thirds of total costs. And the two firms we have chosen to study have succeeded in a turbulent industry, due to above normal returns – which in turn have given them the opportunity to pursuing their leading edge strategy. Our mission then is to identify the key factors within the firms – if any – which can help explain this apparent success, despite their different procuring strategies.

The design chosen is well suited for a detailed study of the impact of the vertical integration-performance relationship, and the case study design open for measuring firm specific resources and their impact on this relationship. As both firms perform well, our design gives the opportunity for testing predicted strengths and weaknesses, as reflected in the literature, of the two organisational forms contrasted here. A major weakness facing the case study is the risk of poor external validity (Cook & Campbell, 1979). Here we try to overcome this critique by comparing our findings at firm level to industry averages for all the variables applied. Additionally, the longitudinal design strengthens the external validity as far as time is concerned and opens for statistical tests of differences in factors between two firms. However, the design chosen here, where the firm specific factors regarding the sourcing strategy of two successful firms are assessed, can help identify factors explaining the success of the firms, which in turn can result in addressing these success factors in hypothesis testing.

Data and measurement

In order to reveal as much data as possible relating to the input procurement in these two firms, Norges Råfisklag – the northernmost sales organisation, who is the compulsory mediator in every first hand transaction of fish (farmed fish and pelagic species excluded) in the geographic region in question – provided us with detailed data over all contracts between buyers and sellers of fish in 2002. Our data therefore cover most of all fish purchases to these firms for the year in question[97]. The information concerning raw material flow gave us the opportunity to create measures for the firms regarding season profile, volumes received and prices paid for the different species, as well as the number of suppliers they received fish from.

In addition to the detailed data on the raw material supply, primary and secondary data on production and information from financial statements were collected for the two firms, as well as for the branch (i.e. fish filleting firms) average. In order to capture the level of upstream vertical integration, the raw material flow and the profitability, detailed data on firm level was necessary. For this purpose the profitability survey in the fish processing industry (Bendiksen, 2005) was used. The very detailed data allow us to capture the various variables under scrutiny in an adequate way, allowing for conducting comparisons between the two firms, but also against the industry average.

In addition to the secondary data on profitability and raw material supply, we carried out semi-structured interviews with the managers of the firms, focusing on how they cope in order to secure their supply of raw material. We also collected information from financial statements published by the firms, and also from the press or other relevant sources. In order to capture the competitive position of the firms we studied, we compared the return on total assets (RTA) for several years at firm level in the population. Both Firm A and B have every year been among the top 25 per cent of the population with regard to return on total assets, within a period of the last ten years (1993–2002). This corresponds well with our most incumbent design criteria, which was to ensure that the compared firms both benefited from (sustainable) competitive advantages, yet differing with respect to sourcing strategies. The observation of two firms, with opposite sourcing strategies in the same setting, are at stake with Towill & McCullen's (1999: 86) conclusion that *"(t)he supply chain which best succeeds in reducing uncertainty and variability is likely to be most successful in improving it's competitive position"*. In our example, firms organise their supply chain by quite opposite organisational designs, but with the same degree of success – an effective argument for the idea of equifinality within sourcing strategies.

Above we have argued that the choice of appropriate degree of vertical integration is a complex decision exceeding the pure dichotomy between to 'make or buy' or 'use or sell'. In Dreyer, Bendiksen, Iversen, & Isaksen (1998) the state of vertical integration in the Norwegian fish processing industry was examined to a greater detail. One of the main problems encountered there, as well as in most studies of vertical integration (Spiller, 1985), regards how to establish the state of vertical integration in a heterogeneous industry like this. One problem solving measure is the degree of self-sufficiency, i.e. how much of the main input stem from controlled affiliated businesses, which – from our view – effectively depicts and captures the true level of vertical integration. This is a relative measure, ranging from zero to one, where non-integrated firms receive zero, and firms who receive all their inputs from controlled units are given the value one. Our measure corresponds with the recommendation from the theoretical literature (Blair & Kaserman, 1983; de Koning, 1994; Baumol, 1997; Peterson *et al.*, 2001) and with measures used in other empirical research (Levin, 1981; MacDonald, 1985; Edwards *et al.*, 2000; Jacobides & Hitt, 2005), which recommends treating vertical integration as a continuous variable.

Based on these data we have developed various measures of relevance for the present research purpose, which will be elaborated under the heading *Empirical hypotheses* below. In Table 17

[97] Eventual raw material transmissions between these firms and other fish processing firms represent a potential flaw in our figures.

we have displayed various characteristics for the two firms (Firm A and B) – as well as the average for the total industry in 2002.

Table 17 Key characteristics of the two firms studied (Firm A and B) compared to population average in 2002

Variable	*Firm A*	*Firm B*	*Branch average*
Vertically integrated	Yes	No	n.a.
Gross profit margin (%)	0.4	1.3	– 6.8
Return on total assets (%)	1.7	6.9	– 2.1
Equity share of assets (%)	37	48	27
Number of employees	146	67	64
Total revenues (mNOK)	147	123	113
Total assets (mNOK)	170	42	78
Supply (raw fish volume in tonnes)	8,600	6,900	6,500

The differences between the two firms – apart from their vertical integration decision – can be easily assessed from Table 17, and compared to the industry average. The industry average is, however, not assessed from the total industry population, but is rather the average values collected and computed from firms within the same branch as the two focal firms, stemming from a special data inquiry on the profitability study (Bendiksen, 2003). As such, the industry is defined as the 14 firms filleting and freezing demersal fish in 2002, operating over the whole year. This is – as mentioned before – the segment in the fish processing industry which, traditionally, has been the most vertically integrated towards the fishing fleet, as a consequence of political guidance in the post-WWII era and the rebuilding of the North Norwegian fish processing industry. Dynamic progress and the altered structure in the fish processing industry, as well as in the fishing industry, have contributed to a segment of firms which to varying degree is vertically integrated. Firms in this segment are relatively large (as compared with others in the Norwegian fish processing industry) and apply a labour intensive production technology, to which a stable flow of inputs is needed to avoid costly production abruptions.

The table clearly reveals that Firm B performs better than Firm A in 2002, when both gross profit margin and return on total assets is assessed, and also regarding solidity. Firm A is, however, undoubtedly larger than Firm B in terms of raw fish supply and employment, but also in terms of revenues and total assets. Firm A is considerably larger than the industry average, while Firm B is closer to the average. Both firms perform better than the industry average. This description of the relationship between the firms and the belonging industry segment has, even if linked to 2002 here, been relatively stable the preceding ten year period.

In the next section, our empirical hypotheses are deducted from the previously stated working hypotheses.

Empirical hypotheses

In order to examine our tentative working hypotheses (**WH$_{1\text{–}3}$**), a set of testable empirical hypotheses (**EH**) was derived, addressing various firm characteristics, which in theory are accentuated as important moderators for upstream vertical integration. Our empirical hypotheses deal with input control, input price, supplier relationship, flexibility, cost structure and efficiency. Despite their basis in theory, from the streams of literature briefly reviewed above, we shall not underestimate the influence from our beliefs and knowledge regarding the motives for and consequences of being vertically integrated or not in this industry.

According to the literature on the vertical integration-performance relationship, a major advantage for firms, which are vertically integrated towards their source of supply, is that they are in a position where they are able to control the flow and price of input – due to their control over their sourcing partner - independent of the market situation. To study this assumption we have first mapped the monthly supply of raw material to our two firms during the last three years (2000–2002). Fluctuation in supply is measured by applying a random walk model where volume in the previous period (t - 1) is applied to predict volume in the current period (t). This model is tested in an OLS regression analysis, where the squared regression coefficient ($\mathbf{r}^2$) measures the fit of the model. Thus, high $\mathbf{r}^2$ indicate low fluctuations and stable supply. Based on our review of literature we predict to find the following relationship:

EH$_1$: Raw material supply fluctuations are higher in Firm B than in Firm A ($\mathbf{r}_\mathbf{A}^2 > \mathbf{r}_\mathbf{B}^2$)

Another assumed advantage for the integrated firm is the avoidance of market forces. Under periods with supply shortage market forces would press up prices, resulting in increased input costs for the procuring firm. For the upstream vertically integrated firm then, secured supply from own subsidiaries would imply inputs to lower prices than non-integrated firms. Additionally, theoretical literature indicates that non-integrated firms, due to lower capacity costs, are in a position where they can apply the market and the price mechanism as an important tool in order to secure input. Both arguments indicate that Firm B pays more for its input than Firm A. In order to test this hypothesis we have mapped the average monthly prices for cod **(P)**, i.e. the most important and valuable species, paid by Firm A and B to test if a price difference exists. Along with these arguments and our literature review we predict that:

EH$_2$: Firm B pays a higher price for its input than Firm A ($\mathbf{P_A} < \mathbf{P_B}$)

Transaction costs related to the securing of critical inputs are assumed to be lower in integrated than non-integrated firms due to control of input and fewness of suppliers. Non-integrated firms, however, must put resources in searching the market for new suppliers and invest in supplier relationships, also to maintain the existing. We hypothesise that Firm B incur greater transaction costs than Firm A. Rather than to investigate the real transaction cost level of experienced by the firms, we have utilised the level of vertical integration in order to investigate this proposition. Hence, we measure the degrees to which the firms receive supply from own vessels (**O**), i.e. a self sufficiency ratio, and also map the number of suppliers (**S**) for each of the firms in 2002. Accordingly, we predict to find that:

EH$_3$: Firm A is to a higher degree supplied from own vessels than Firm B ($\mathbf{O_A} > \mathbf{O_B}$)

EH$_4$: Numbers of suppliers are higher for Firm B than for Firm A ($\mathbf{S_A} < \mathbf{S_B}$)

According to transaction cost theory, asset specificity is the main reason for integrating vertically. Thus theory predicts that a vertical integrated organisation is expected to perform better, by being highly specialised when it comes to processing inputs from own suppliers. Firms operating in the open input market, however, must to a higher degree have technology that is less vulnerable for specific suppliers or sources of supply. Additionally, the ability to process input from different sources will be an advantage for a non-integrated firm in their struggle for securing supplies. In this raw material market input-specificity can be measured as the mix of different species in supply, and in order to depict this specific source of relationship specific assets, we have mapped the level of the most important species in the supplies (**C**), namely cod. Another dimension of specificity relates to the technology the suppliers make use of for catching fish – a dimension having impact on fish quality, fish size, as well as the mix of species in the catches. To measure this dimension, we have mapped the level of supplies from the most important fishing gear (**G**). Accordingly we predict:

EH_5: Firm A is more specialised in supplies, (i.e. fish species), than Firm B ($\mathbf{C_A > C_B}$)

EH_6: Firm A is more specialised in supplies, (i.e. fishing gears), than Firm B ($\mathbf{G_A > G_B}$)

Vertical integration is associated with ownership and control. Vertically integrated fish processing firms tend – in contrast to non-integrated firms – to own fishing vessels. It seems reasonable to assume that firms owning fishing vessels would buy catch mainly from their subsidiaries/vessels. As such the share of landings to a firm stemming from so-called "loyal" recurring vessels (**L**), (i.e. fishing vessels delivering at least 15 per cent of their total catch, and landing catch to the firm at least two out of the last five years) should be higher for vertically integrated firms[98]. Thus we can hypothesise that:

EH_7: The share of total landings to the firms from recurring "loyal" vessels is higher for Firm A than Firm B ($\mathbf{L_A > L_B}$)

It seems reasonable to assume that vertically integrated firms with fishing vessel ownership, have – to the extent possible – invested in the vessels most suitable for securing supply, and buy the catch from the vessels in which they have invested. For fish processing firms, the costs associated with raw material supply are also influenced by the number of landings ($\mathbf{L^{\#}}$), since for each landing, costs accrue and time is consumed due to contract writing, unloading, and other harbour activities. Hence, the more numerous the landings are, the higher are the associated costs. Adequate supply security through vessel ownership can therefore effectively reduce costs. Since non-integrated firms do not possess such supply security "buffers", and have to rely on open market transaction, we expect that[99]:

EH_8: The number of landings will be higher for Firm B than for Firm A ($\mathbf{L^{\#}_A} < \mathbf{L^{\#}_B}$)

Further, according to **EH_4**, **EH_6** and **EH_8**, one can expect the average volume per landing of the vertically integrated firm to outweigh the average volumes per landing ($\mathbf{L^{kg}}$) to the non-integrated firm. The two firms studied here are highly volume dependent, since they pursue a manufacturing strategy to which production disruptions are harmful due to high fixed costs (Tannous & Mangiameli, 1993). Potential integration candidates would therefore typically be vessels that could bring ashore high volumes. From the hypothesised limited number of vessels supplying the integrated firm, and therefore small number of transactions, we also should expect that

EH_9: Average volume per landing for Firm A should outweigh that of Firm B ($\mathbf{L^{kg}_A} > \mathbf{L^{kg}_B}$)

A major disadvantage facing the vertically integrated firm is capacity costs, following from great investments in co-specialised production facilities. In literature this is a feature applied to explain poor performance among vertically integrated firms, since changes in the sourcing environment are not easily met by an inflexible specialisation strategy. In order to study this aspect we have examined financial statements and the capacity costs reported, i.e. sum of financial cost and depreciations related to total income (**CC**). Based on our discussion we predict to find:

EH_{10}: Firm A has higher capacity cost (as share of revenues) than Firm B ($\mathbf{CC_A > CC_B}$)

[98] Despite our proposition that vertically integrated firms will to a larger degree be served by loyal (i.e. owned) vessels, a successful pursuit of a networking strategy by procuring firms will involve a loyalty to greater extent than pure market based transactions. However, when networks and alliances are addressed, the authority utilised by owners must be replaced by other coordinating incentives – like for instance prices – creating benefits for suppliers as well.

[99] This argument also support **EH_3** and **EH_4** regarding transaction costs.

Vertical integration is an often proposed strategy in order to reduce uncertainty. In our sourcing environment, it can be argued that a firm can not organise itself away from the heaviest form of uncertainty – the primary, "state of nature", uncertainty stemming from biology, climate or fish abundance variations. Therefore the uncertainty problem can be turned around, namely, how the firm should handle the inevitable uncertainty it faces in its supply environment. Literature within strategic management often relates uncertainty to flexibility (Dreyer & Grønhaug, 2004). If Firm B is viewed upon as a firm succeeding in coping with uncertainty, the question becomes whether non-integrated firms are more flexible than vertical integrated firms. Above we have predicted that Firm B is more flexible when it comes to the ability to turn broader sources of supply – i.e. fish species and landings from different fishing gears – to account. Flexibility, however, comes in many forms. For instance we expect Firm B to have a different portfolio of firm resources than Firm A. In order to be flexible in the supply market Firm B also needs financial flexibility to a higher degree than Firm A. To analyse this we have examined the cash-position, i.e. working capital (**WC**), possessed by firms, and predict:

EH_{11}: The proportion of working capital to revenues will be higher in Firm B than in Firm A (**$WC_A < WC_B$**)

Another argument related to flexibility regards the nature of assets. According to theory the flexible firm should be more able shift the production in cases where demand or raw material supply vary, hence, assets possessed by the flexible firm should be applicable in several usages. As a proxy we utilise the proportion of fixed assets to total assets (**FA**) collected from the balance sheet, and expect to find a smaller proportion of the assets in Firm B tied up in fixed assets. This effect should be amplified by the fact that Firm A has ownership in vessels, which – if not registered in the balance sheet as share holdings – is a fixed asset. Hence:

EH_{12}: Firm A has a higher proportion of fixed assets to total assets than Firm B **($FA_A > FA_B$)**

In order to understand better the vertical integration-performance relationship it is also important to inspect how the chosen approach to secure supply impact over-all costs and value creation. A major question thus remains: Do successful vertical integrated firms experience favourable cost advantages? So far we have predicted that vertically integrated firms have advantages when it comes to prices paid for input, and disadvantages as far as capacity cost is concerned. But what about working force efficiency. A glance at Table 17 indicates that Firm A has relatively more employees related to total income than Firm B. This may relate to an often mentioned theoretical consequence that vertical integration often leads to less efficient organisation, due to the lack of market pressure and bureaucratisation (Mahoney, 1992). In order to test whether this in fact is what we see here, we have developed a measure for working force efficiency, i.e. total revenues related to total wages (**IW**). According to the perspective that vertical integrated firms are less efficient than firms competing in an open market, we predict that:

EH_{13}: Firm A has less total income related to wages than Firm B (**$IW_A < IW_B$**)

Another interesting question arising from the theory relates to whether vertically integrated firms are in a better position to add value to their products (Adelman, 1955). In literature it is claimed that vertical integrated firms have an advantage in controlling quality in the input-throughput-output paradigm (Porter, 1985), resulting in market advantages. In order to test this assumption we have measured value added in the firms, i.e. total income per kilo raw material (**IKG**). Hence, for each kilogram of input supplied, Firm A, should – by virtue of their vertically integrated manufacturing strategy – be able to secure a higher value added to their output. Hence, we predict that:

EH_{14}: Firm A create higher income per kilo raw material than Firm B (**$IKG_A > IKG_B$**)

Then, a total of 14 empirical hypotheses (**EH_1** through **EH_{14}**) are elaborated, which to our knowledge should help enlighten the vertical integration-performance relationship. In the proceeding section we test our empirical hypotheses, by utilising the variables described above (**r^2**, **P**, **O**, **S**, **C**, **G**, **L**, **$L^{\#}$**, **L^{kg}**, **CC**, **WC**, **FA**, **IW**, **IKG**). There the findings will be presented and evaluated before some concluding remarks are given in the last section.

8.4.3 Findings

In 1998 we carried out a survey within the Norwegian fish processing industry in order to establish the level to what degree firms had undertaken upstream vertical integration (Dreyer *et al.*, 1998). When addressing the managers on their vertical integration conduct we were met with a huge variety of answers. The managers of the two firms – which to a greater detail are under scrutiny here – gave us the following answers, when asked about the importance of ownership in fishing vessels:

Manager of the vertically integrated firm:

"Greatest possible control over the raw material supply have always formed a substantial part of our corporate philosophy, that is why the extent of vessel ownership is relatively high in our firm."

Manager of the non-integrated firm:

"One of our prioritized areas has been to nurse a good relationship with the local fleet. It would have been best if operating vessels were done by those who know it the best. Then we could have concentrated on what we know best; namely processing."

These answers, together with other stated attitudes towards vertical integration, made us conclude that ambiguity prevails in this industry regarding how managers esteem the role of upstream vertical integration.

As noted above, from Table 17, both Firm A and Firm B are in front among the firms in this population with regard to financial performance. Here we focus on different factors that can help us to understand how Firm A and Firm B achieve their competitive position in spite of the fact that they organise their input securing activities completely different. In Table 18 we have portrayed a short version of our empirical hypotheses (**EH_1–EH_{14}**), the main variable under scrutiny, values for Firm A, B and industry average, together with the direction of the findings compared with our hypotheses (i.e. a plus sign when in accordance with the hypothesis in question, or a minus sign when opposite). Our findings are concluded based on data for 2002, though similar analyses for previous years yield very much the same results.

Table 18 Variables, empirical hypothesis and results

EH	Variable	Empirical hypothesis	Firm A	Firm B	Industry Average	Direct-ion
EH_1	Input control	Raw material supply fluctuations are higher for Firm B than in Firm A ($r^2_A > r^2_B$)	0.31	0.23	0.35	+
EH_2	Pricing	Firm B pays a higher price for its input than Firm A ($P_A < P_B$)	10.86	10.99	11.04	+
EH_3	Vertical integr.	Firm A is to a higher degree supplied from own vessels than Firm B ($O_A > O_B$)	80 %	0 %	n.a	+
EH_4	Network	Numbers of suppliers are higher in Firm B than in Firm A ($S_A < S_B$)	10	170	124	+
EH_5	Specialisation	Firm A is more specialised in supplies, i.e. fish species, than Firm B ($C_A > C_B$)	63 %	75 %	76 %	-
EH_6	Specialisation	Firm A is more specialised in supplies, i.e. fishing gears, than Firm B ($G_A > G_B$)	100 %	36 %	55 %	+

EH	Variable	Empirical hypothesis	Firm A	Firm B	Industry Average	Direct-ion
EH_7	Network	'Loyal' vessels share of total landings is higher for Firm A than Firm B ($\mathbf{L_A > L_B}$)	93 %	76 %	68 %	+
EH_8	Network	The number of landings will be higher for Firm B than for Firm A ($L^{\#}_{A} < L^{\#}_{B}$)	212	1,972	684	+
EH_9	Network	Average volume per landing is higher for Firm A than for Firm B ($\mathbf{L^{kg}_{A} > L^{kg}_{B}}$)	40,500	3,500	n.a	+
EH_{10}	Capacity cost	Firm A has higher capacity cost than Firm B ($\mathbf{CC_A > CC_B}$)	2.4	2.6	6.6	-
EH_{11}	Flexibility	Firm B has a higher proportion working capital than Firm A ($\mathbf{WC_A < WC_B}$)	12.9	47.5	26.9	+
EH_{12}	Flexibility	Firm A has a higher proportion of fixed assets than firm B ($\mathbf{FA_A > FA_B}$)	69.0	44.1	54.4	+
EH_{13}	Productivity	Firm A has less total income related to wages than firm B ($\mathbf{IW_A < IW_B}$)	3.31	6.25	5.89	+
EH_{14}	Productivity	Firm A creates higher income per kg raw material than Firm B ($\mathbf{IKG_A > IKG_B}$)	17.1	17.7	17.3	-

The numbers in Table 18 are distributed over correlation coefficients (in $\mathbf{EH_1}$), averages (in $\mathbf{EH_2}$ and $\mathbf{EH_9}$–$\mathbf{EH_{14}}$), percentages (in $\mathbf{EH_3}$, $\mathbf{EH_5}$–$\mathbf{EH_7}$ and $\mathbf{EH_{10}}$–$\mathbf{EH_{14}}$), and counts (in $\mathbf{EH_4}$ and $\mathbf{EH_8}$). We test the empirical hypothesis by comparing the scores for Firm A and B respectively, and the last column reveals whether the findings are in accordance with the hypotheses (+) or not.

Inspecting Table 18 reveals that Firm A is confronted with less fluctuation in supply than Firm B (note that a high $\mathbf{r}^2$ corresponds with low fluctuations since last months supply is able to predict a large portion of this months supply), i.e. $\mathbf{EH_1}$. This finding is within the predicted direction. However, for both firms the fluctuations are somewhat higher than the industry average. This might be due to the fact that variations are larger in Finnmark than in other areas where firms are situated, though, we have to bear in mind that for the industry we have added up fluctuations for several firms illustrating the fluctuations if we only had one firm. A proper way to compare our firms to the fluctuation among the other firms would be to conduct the same analyses in every firm and then compute the average of every $\mathbf{r}^2$. This is, however, beyond the scope of our analysis. The results in Table 18 indicate that if there were only three firms in this population, the fluctuation in the third firm ('Industry') would also be rather high. Looking at input control then, our results indicate that the vertically integrated firm is able to reduce the fluctuation to some degree by controlling the activity of their own vessels.

The findings regarding hypothesis $\mathbf{EH_2}$ show that Firm B pays – as predicted – somewhat higher prices than does Firm A. These results confirm the value of avoiding the market through vertical integration, and are in accordance with theoretical predictions. What is further shown is that both our firms pay prices that are somewhat lower than the industry average. Again, this might mirror area specific pricing strategies, since first hand prices in Finnmark, traditionally have been lower than in other areas of Norges råfisklag. A third explanation could have been that our firms buy fish from vessels using gears that bring ashore low price species, sizes or qualities, but as we will come back to under our treatment of $\mathbf{EH_5}$ and $\mathbf{EH_6}$, this is not the case.

Inspection of $\mathbf{EH_3}$ and $\mathbf{EH_4}$ show overwhelming support for the stated hypotheses, as 80 per cent of supply to Firm A comes from own vessels, while this fraction for Firm B was zero. This finding is tautological since Firm B does not own any vessel. More convincingly, however, as an explanation for network relationship is the much higher numbers of suppliers to by Firm B than Firm A. An interesting observation is also that the number of suppliers providing Firm B with raw materials is substantial higher than the industry average. A potential explanation might be that Firm B has more relationships – and is more competent in utilising and nursing these contacts – which can help explaining the higher performance than the industry average. Holding this up against the control of in-house suppliers as in Firma A, this might be what Bowersox & Dröge (1989: 69) refer to as: *"A strategic alliance among leading edge firms offers a substitute for vertical integration."* In other words, Firm B – and its competitive position in this industry – might be explained by its relationships to the fishing vessels, which in turn might be excellent performers in their industry.

The test of $\mathbf{EH_5}$ gave a result contrary to what we expected, since Firm B seemed to be more specialised, with regards to cod as the main species, than Firm A. In fact, Firm A exhibit a substantial lower specialisation than the industry average, to which Firm B is approximately equal to. However, by extending the most valuable species to also including the second and third most important species (i.e. saithe and haddock in addition to cod, Firm B exhibit less specialisation than Firm A, as corresponding figures are 96 and 99 per cent respectively[100]. When taking the findings for $\mathbf{EH_6}$ into consideration, which are in the expected direction, we can conclude that Firm A is to a higher degree specialised than is Firm B. An interesting finding is also that Firm B is substantially less specialised than the industry average with respect to the gear used to catch the fish. This may probably contribute to explaining why Firm B performs better than the industry average. This is in accordance with what leading population ecologists predicts; that in turbulent environments generalists will oust other organisational forms, whilst under more "fine-grained" conditions specialists will have their advantages, (Freeman & Hannan, 1983). Firm A, which has succeeded with their upstream vertical integration strategy, serves as an example of such specialists.

The empirical hypotheses $\mathbf{EH_7}$–$\mathbf{EH_9}$ all deal with the landings to the firms and, as can be seen from Table 18, the findings are consistent with the proposed hypothesises. Firm A – the vertical integrated one – receives more from loyal vessels ($\mathbf{EH_7}$), have fewer landings during 2002 ($\mathbf{EH_8}$) and receive on average much more fish per landing ($\mathbf{EH_9}$) than does Firm B. More interestingly is it, however, that Firm B has a more stable portfolio of suppliers than the industry average, even though the numbers of landings are considerably higher. This indicates that firm B is an attractive customer for fishing vessels, and is able to uphold its appeal.

When addressing $\mathbf{EH_{10}}$ the result shows that Firm A has somewhat lower capacity costs than Firm B, contrary to what we expected. It is even more surprising that both Firm A and Firm B have substantially lower capacity costs than the industry average. Keeping capacity costs low and stable are predicted to be beneficial when it comes to utilisation of both capacity and flexibility in a turbulent supply market. Thus, our findings support this prediction and indicate that low capacity costs are an important driver for firm performance in this setting.

The test results from $\mathbf{EH_{11}}$–$\mathbf{EH_{13}}$ all reveal findings in the expected direction, i.e. Firm B (the non-integrated firm) has a higher portion of working capital ($\mathbf{EH_{11}}$), less portion of fixed assets ($\mathbf{EH_{12}}$), higher income related to wages ($\mathbf{EH_{13}}$), than do Firm A. Probably more important is that both firms in these respects perform better than the industry average, which contribute to explain the firms' favourable performance situation.

[100] One reason for this finding can be found within Norwegian fisheries management plans. The cod trawlers controlled by Firm A are every year allotted an individual quota for all the three mentioned species. In order to maximise the value of landings, every quota every should be fished, and hence, landed to Firm A. Firm B, operating in the open first hand market for fish, is to a larger degree capable – even though instructed to buy all species in a catch if first agreeing to let a vessel land – control the composition of landings by it's relationship to fishing vessel owners.

For $\mathbf{EH_{14}}$, on the other hand, findings reveal that earnings per kilogram raw material are lower for Firm A than for Firm B, as well as lower than the industry average. At this point, we can not subscribe this contradictory finding to the phenomenon that vertically integrated business units suffer losses in competitiveness due to lack of market orientation. It can not be attributed directly to our findings, as we have no indication that Firm A suffer from bureaucratic tendencies. Our expectancy failed to be accounted for in our data, even though Firm A adds higher value to their inputs than Firm B, higher costs in Firm A more than balance this advantage since Firm B performs better at the bottom line (see the performance measures in Table 17).

Finally, regarding the findings, one can not fail to note that a major difference between Firm A and B is revealed when looking into the capital structure. In Firm A, most of the capital is tied up as fixed assets. Firm B has a greater proportion of its capital as equity and working capital, indicating higher financial flexibility. Compared to the rest of the population, both firms' high equity share demonstrates a history of well performing. One major explanation for the competitive position of Firm B seems to be high flexibility, both when it comes to input sources and cash position. In this setting these firm specific resources seem valuable.

8.4.4 Discussion

The reported findings deserve some additional comments. Our outset emphasised the paradox that two firms in the same setting – each choosing opposite organisational designs in order to cope with highly turbulent input supply conditions – obtain superior performance. Based on theoretical contributions illuminating the vertical integration-performance relationship we advanced three working hypothesis (**WH**), further specified into a set of 14 testable empirical hypotheses (**EH**). In testing these propositions we found support for all, but three of the empirical hypotheses. The probability for this result by chance (following the binominal distribution where $p = 0.5$ and $n = 14$) is $P(B \geq 11) = 0.006$ indicating that the applied theory really possesses predictive validity.

Our earlier research attempts (presented earlier) have been unable to isolate any performance effects from vertical integration in our industry. Here the two firms under scrutiny– one highly vertically integrated, the other not at all – both perform substantially better than the industry average. To enlighten this anomaly, our findings will be elaborated further.

Our findings reveal advantages and disadvantages coupled to both organisational designs for securing critical supply in a turbulent market. For example, it is observed that the vertically integrated firm achieved less input fluctuations and paid less for critical inputs than did the non-integrated firm, following the predictions from theory. At the same time the non-integrated firm was observed to compensate its disadvantages towards the integrated firm by a higher degree of flexibility, allowing it to handling unpredicted changes without suffering productivity losses. These findings assert our explanations that the crucial role in order to achieve competitive advantages is not necessarily how one organises the procuring activity, but rather, that the firm in question possesses the resources and capabilities necessary in order to succeed from the choice of organisational form. This argument is in line with Amit & Schoemaker (1993: 38-9) emphasis on identifying the strategic value of a firm's resources and capabilities as the crucial role of managers, where the value increases the more difficult they are to buy, sell, imitate or substitute. They use tacit organisational knowledge and trust between management and the labour force as an example of invisible assets that cannot easily be copied by competitors. By manager's different abilities to identify such strategic assets, 'discretionary managerial decisions on strategy crafting' is created. As a result then, firms will differ in their ability to create competitive advantages, and hence, firm performance, since the perception of the external environment and internal resources differs between decision makers (Segal-Horn, 2004). We will claim, that the non-integrated firm visited here, possesses such qualities, which is utilised in the relationship with suppliers in order to assure supply, and – in the long run – to protect the firms competitive advantage. As underlined by the manager of firm B in a newspaper portrayal focusing on the success of his firm, who – quite sensational for this part of the fish processing industry – had delivered positive results for 15 consecutive years[101]: *"Our firm is rather boring, and performs well due to conservative investments and a marvellous stable labour force."* The quotation can serve as an example on the manager's (and owner's) priority-assignment on financial flexibility (no investment is undertaken unless proved profitable) and his emphasis on a stable, well qualified, working force.

Essential then in explaining the competitive advantage experienced by firms is the resources and capabilities which are of great strategic value to the firm. According to Grant (1991) the difference between resources and capabilities lies in the interaction between them. He claims that few resources are productive on their own, but become productive when coupled with other resources. A capability then is how a bundle of resources is able to perform a specific activity. Then, resources are the basis for capabilities and capabilities are the source of competitive advantages. In our approach then, it can be claimed that Firm A and B – each possessing different resources – have utilised this to the best of the firm by creating valuable capabilities through the co-operation and co-ordination of the resources, which in turn give rise to competitive advantages. This is in line with Jacobides & Hitt's (2005: 1212) argument that: *"…even in an environment where primary resources are homogeneous, different organizations are likely to display significant variations in processes, leading to differences in productive capability."* They further claim that it is the differences in productive capabilities, and their distribution along the value chain, which in turn can lead to governance choice – and vertical scope – choice choices. In our setting, Firm A has developed capabilities from their valuable assets in terms of fishing vessels and production facilities tailor made to exploit their self-sufficed raw material. Firm B has exploited the best of an internal labour force resource to develop skills that have proved valuable in maintaining flexibility in face of highly uncertain external environments. The different adjustments Firm A and Firm B make to the same external environment also underline the trade-offs existing between efficiency and flexibility, where the managerial choice has been between *controlling* or *adapting to* the uncertain contingencies. Like Lau (1996: 11) suggests: *"...flexibility might ultimately be the key to enhancing a firm's competitive ability. While uncertainty can be a threat to some firms, it provides opportunity to those with higher degrees of flexibility."*

Our research design and detailed data on firm level reveal several weaknesses related to the two ways of organising the procurement of inputs. The vertical integrated firm suffers from losses in productivity and high capacity costs, while the market oriented firm suffers from high transaction costs and is more exposed to volume and market price fluctuations. However, both firms' performance, which is superior to the industry average, indicates that they manage to utilise advantages and avoid major disadvantages from their choice of sourcing strategy and, hence, their organisational form. As illustrated in our findings, Firm A manage to avoid high capacity cost although being vertically integrated, while Firm B manage to combine high flexibility with productivity, (as underlined by the rejection of $\mathbf{EH_{14}}$).

A key result, which can be derived from the findings in this investigation, is that vertical integration and flexibility are alternative strategies to cope with turbulent environments. More precisely, vertical integration is applied as a means to reduce imposed fluctuations, while flexibility is applied to adjust to the turbulence encountered. This key finding is important and

[101] Fiskaren, 4. July 2003 – my translation.

essential for better understanding the mixed empirical findings concerning the vertical integration-performance relationship in past research and illustrates the need for bringing in firm specific resources when assessing the relationship. If both strategic moves can prove equally efficient as organisational responses to primary uncertainty, then this variability in sourcing strategy helps enlighten our models' limited capability to explain performance effects from only one eligible strategy.

By exploiting the idea of "equifinality", together with flexibility as an alternative to controlling the environmental turbulence by means of vertical integration, we contribute to a better understanding of the confusing findings in earlier research – at least in the industry under scrutiny. If equifinality is present, it becomes obvious that our attempts to explain performance heterogeneity merely from the view of theory on vertical integration will fail. Further, the mixed findings from investigations on the vertical integration-performance relationship become more feasible. The existence of manufacturing firms with different strategies competing in the same market with success is clearly an indication of equifinality (Miller, 1988a; Lau, 1996). A main conclusion from our study then, is the support for the idea of equifinality, i.e. that the same performance effects can be achieved in several ways. Additionally, we conclude that success of the chosen strategy not only depends on industry specific factors, but also require that firm specific factors or resources are adequately taken into account and properly exploited. And in line with the conclusion made by Harrison *et al.* (1991) we find the focus on firm specific resources to be more fruitful than strategy types when analysing the effect on firm performance from 'make-or-buy' decisions.

The research design chosen here has proven to be valuable when it comes to develop further knowledge concerning pros and cons of vertically integrated firms as well as for creating better understanding of the confusing empirical findings when it comes to the vertical integration-performance relationship. Despite the usual case-study disclaimer on external validity, our findings exhibit improved validity by the way the two firms are compared to the rest of the firms within the industry, and the quasi-longitudinal timeframe of our study (as assured by our choice of cases). However, our study is based on detailed information from only two firms within a specific setting. Further studies, utilising similar designs in other settings, will enhance the understanding of how firms organise and act to secure critical input in turbulent supply markets – a challenging task for research in both strategy and logistics.

Both firms pursue apparently successful strategies. The strategies followed are probably formed by earlier strategic choices and resource endowments, and thus reflect that they both are taking firm specific, as well as industry specific, conditions into account. To pursue a strategy successfully requires insights and competence. The fact that both firms apparently are successful indicates that they are competent in pursuing – and benefiting from – their chosen strategies. Moreover, because more than one strategy proves successful, it also favours the principle of "equifinality", i.e. more than one approach can be appropriate to become successful. This simple, yet complex reality can be hard to comprehend completely. Here we have assigned the success of two firms to the different capabilities possessed by the firms. However, we fear that only a small part of the inherent complexity of the capabilities and resources possessed by the firms are unveiled. Revealing the whole story and ascribing the performance effects to their direct causes would require a much deeper analyses, and even then we might fail to obtain the causality all together.

9 EVALUATION

This section summarises the research presented and starts with an outline of its purpose. The synopsis is divided according to the different articles, with emphasis on the progress and continuity of the work. In addition the main findings from each study are given. The contributions from this study to theory, research methodology and managerial practice are assessed. A discussion of the study's limitation follows, before some suggestions for future research is given.

9.1 Purpose of the study

The objective for this thesis, as stated in Chapter 1, was to study empirically the performance effect from upstream vertical integration in the Norwegian fish processing industry. Additionally, the following sub-goals were addressed: to map the motives at work for upstream vertical integration in this setting; to assess and develop a reasonable measure for fish processing firms' upstream vertical integration; and to explore whether alternative options to upstream vertical integration exist for firms in this setting. The research executed here takes form of an empirical investigation – an often neglected, but coveted, area of research regarding vertical integration. The need for empirical studies within vertical integration has been stressed by major theoretical proponents, with perhaps Ronald Coase in front. In his view, the theory of the firm – from an industrial organisation perspective – is without any empirical basis, since the growing abstraction of the analysis within "blackboard economics" does not call for any detailed knowledge of the actual economic system. He further notes that the firm's role in this theory comes out as a 'black box', which he finds: *"…very extraordinary given that most resources in a modern economic system are employed within firms, with how these resources are used dependent on administrative decisions and not directly on the operation of a market",* (Coase, 2005: 32-3). The complexity of the concept vertical integration and the lack of good measurements are often accused for the scarcity of empirical studies.

The research presented here aims to remedy some of the limited efforts made earlier. The empirical assessment of vertical integration on financial performance we provide represents a closer investigation of the theoretical predictions to one specific setting. In our case: the Norwegian fish processing industry. When inspecting previous empirical research on the vertical integration-performance relationship not only ambiguous finding are revealed, but also problems related to research design and methodology, which clearly influence the lack of unambiguousness in overall findings. Studies vary substantially over a series of dimensions. First, when held up against each other, investigations are conducted in vitally dissimilar settings, between which the effect of vertical integration on performance may vary. This danger is especially present in studies were multiple industries enter the samples, and overall performance effects from vertical integration are assessed. Hence, possible industry specific effects are disregarded. Secondly, different studies carried out measurements of vertical integration on different levels; while some take business unit vertical integration into consideration, others undertake an industry or firm level perception of the phenomenon. In addition the direction of integration scrutinised vary – either upstream (backward), downstream (forward) or both. A third point of deviation in earlier studies is the measures used to establish the degree of vertical integration. These vary from highly sophisticated input/output matrixes, where the flow of goods between industries or firms are assessed, to subjective self report measures, where respondents state the firm's degree of vertical integration relative to their competitors. Also 'the value added to sales ratio', collected from financial statements is employed to depict the state of vertical integration within firms. Additionally, performance measures vary almost to the same extent, though; traditional financial key figures (like return on investments, assets or sales) are the ones most often used.

Our attempt pursues and extends the ambiguous findings in earlier research by analysing our interpretation of vertical integration within one setting, for thereafter analysing the results against theoretical predictions and earlier findings. By narrowing the analyses to *one* specific transactional environment (i.e. the Norwegian fish processing industry's procurement of its most important input) we avoid the potential influence of the 'industry effect'. Simultaneously we gain greater control on the knowledge required in order to study the complexity of the phenomenon. Under the assumption that industry specific factors influence firm's propensity to integrate vertically, this limitation eases the knowledge requirement for testing theories, since the quality of empirical work is related to the knowledge of the firms and products under scrutiny (Joskow, 1988). The complexity of vertical integration becomes more feasible and manageable, which contribute to a simplification of methodological challenges – how to measure vertical integration – when it is linked to one empirical setting only, in which all firms are under influence of an identical transactional environment. We also limit ourselves to exploring only upstream integration – seen from the view of the fish processing firm as the focal stage, towards their suppliers (the fishing fleet or aquaculture industry) – which helps avoiding erroneous conclusions due to value chain stage confusions.

Fundamental for the choice of vertical integration in our setting is the inherent uncertainty in supply, stemming from a variety of sources, but most of all, and severest, appearing from pure 'state of nature' causes like fish abundance, accessibility, weather conditions and stock size fluctuations. The structure in the first hand market for fish – with many buyers and sellers in the input market for an almost homogeneous product – can be characterised as 'near' perfect (Ottesen & Grønhaug, 2005), in which absent uncertainty, the reason for upstream vertical integration would diminish. The argument follows from atomism in both ends of the transaction (only exceptionally fish processing firms are sole demanders for fish within specific geographical markets) where bargaining power is absent. Then, if no uncertainty was present, prices should be set after marginal cost consideration, which should make vertical integration needless[102] if efficiency gains could not be obtained. Our setting is relatively uniform where a high degree of supply uncertainty surrounds firms' upstream transactional environment. In other words we address a turbulent setting, in which theory predicts a profitable outcome from upstream vertical integration.

Our work leans mainly upon three theoretical perspectives: Transaction cost economics, industrial organisation and strategic management (especially the resource-based view of the firm). Regarding the 'make-or-buy' decision, the points of view brought forward by these vary. Within transaction cost economics, the transaction is the unit of analyses, while industrial organisation concentrates on the characteristics in the competition arena. Strategic management emphasises the role of leadership in the emergence and sustainability of economic rents, while the resource-based view utilises the features (value, rarity, imitability) and role of firm resources and capabilities – and the way they are organised – for firm's competitive advantages. In addition, where the contingency view accentuates optimal strategy choices lead by the setting in which the firm operates, the resource-based view emphasises the premises possessed by the firm in order to succeed from a chosen strategy in a given setting.

[102] See for instance Arrow (1975) who shows that when initial conditions are competitive and uncertainty exists in the upstream supply (price), the only incentive to buy the upstream firm is derived from the uncertainty argument.

By combining theoretical perspectives – as proponent scholars suggest – we hope to exploit the complementarities between them, and by that, extend the understanding of the phenomenon under scrutiny.

9.2 Research summary

The research presented consists of four different papers – all covering different aspects of the vertical integration-performance relationship within the Norwegian fish processing industry. Hopefully the chronological process of the works has brought some holism to the research task, where the sum of the parts should outweigh the partial contributions separately. Below, the papers are presented chronologically, emphasising the findings and the governing idea of the research flow.

9.2.1 The art of vertical integration – profitability considerations

In our first paper we hypothesise a positive relationship between the two variables, due to the uncertainty in our industry's supply side. Further, due to theory predictions regarding uncertainty in a turbulent supply environment, we expect firms who have integrated vertically in our industry (backwards towards the fishing fleet) to obtain competitive advantages. In order to test our proposition we first utilise a longitudinal approach, where trawler landings represent our vertical integration variable and performance is measured by whether the firm is a 'survivor' (best economic results in a 16 years period) or a 'failure' (bankruptcy during the same period). Additionally, a cross sectional design is utilised for the year 1997, where another, more precise, context specific measure for vertical integration is developed – the percentage of total raw material supply stemming from fishing vessels in which the firm have ownership interests – and performance is measured by standard financial key figures; gross profit margin and return on total assets. While the first sample is a total population study, the latter is the results from a telephone survey carried out on a sample of the 75 largest firms within the geographical limits of the largest Norwegian fish sales organisation (Norges Råfisklag).

Tests for correlation between the two variables, and OLS regressions are carried out (with vertical integration as the independent and performance as the dependent variable), but demonstrate no significant effects from the degree of upstream vertical integration on financial performance. Some tendencies can, however, be read from our tests, showing a slightly positive covariation between degree of vertical integration and gross profit margin, while negatively related to return on total assets. Cautiously interpreted, this points to slightly higher pretax profit margins for vertically integrated firms, but not sufficient so as to compensate for the additional investments made in fishing vessels. Hence, the adequate performance measure should incorporate the capital tied up in adjacent value chain stages, in order to reveal the yields from total investments.

Our results confirm the mixed findings in earlier research. Further, despite the models' lack of explanatory power, our research design displays promising qualities for exploring the vertical integration-performance relationship. Our context specific measure is well suited for covering most dimensions of upstream vertical integration (see Harrigan, 1983b) and by limiting the setting under scrutiny to cover only upstream integration undertaken by Norwegian fish processing firms we increase the feasibility for detailed and exhaustive interpretation of circumstances and findings. Our findings' emphasis on managers' enthusiasm – and partial accomplishment – to integrate vertically in order to secure supply, reveal that it did not necessarily help them in achieving favourable performance. This points to a potential underestimation of the investments and managerial challenges required, and, at the same time, exaggerated performance impact expectations (Stuckey & White, 1993). The findings suggest an inherent duality in our data, since some integrated firms perform well, others not, at the same time as well performing firms are just as likely found among those without ownership interests in the fishing fleet.

The motive for vertical integration in our first paper is the input market uncertainty, where the industry scrutinised process seafood from wild caught whitefish only. However, different theoretical contributions suggest different motives for vertical integration, and a relative lately emerged, still growing, sector of the Norwegian fisheries industry – the aquaculture industry – has to an ever increasing ratio supplied the fish processing industry with raw materials not nearly as burdened by uncertainty. In the second paper we expand the setting studied to also include firms processing farmed fish. Again we explore the vertical integration-performance relationship in the fish processing industry, and test different theoretical predictions by discriminating between firms, based on their raw material utilisation.

9.2.2 Vertical integration towards different raw material sources

Industry age and uncertainty are in theory underlined as important moderators for firms' propensity to integrate vertically. According to the uncertainty argument, firms operating in uncertain sourcing environments should integrate the most; while Stigler's life cycle hypothesis summons that vertical integration should be the greatest in younger industries. Though, when applied in the Norwegian fish processing industry the different theoretical arguments give contradictory recommendations. Processors of wild fish should be the most integrated according to the uncertainty argument, while farmed fish processors, utilising the younger supply chain, should be the most integrated according to the industry life cycle hypothesis. The reason is that those processing wild whitefish are part of the oldest input supply channel at the same time as they have the input source surrounded by the greatest uncertainty. Fish farming is in this comparison a relative new industry[103], whose supply is denoted by biological control, hence, less uncertainty. Despite the intrinsic theoretical dichotomy presented here, we put emphasis on the uncertainty argument (as we did in our previous paper) and hypothesise, by utilising firms' choice of input, that the degree of upstream vertical integration should be higher among firms utilising wild fish than by those who process farmed fish.

By utilising the concept of *strategic groups* – specialists and generalists (one or two raw material sources, respectively) – we test our propositions and find that those who process farmed fish are in fact the most integrated towards their supply source. The wild fish processors are the least vertically integrated while those firms who utilise both sources in production fall neatly in line between the two specialist groups with respect to vertical integration. Thus, our findings can to some degree be interpreted in direction of support for the industry life cycle argument. The groups of processors are found significantly different with respect to vertical integration, but when held up against financial performance we find – again – no significant correlation on an overall basis. Only for some years, and between some of the groups (farmed fish specialists, wild fish specialists and generalists producing from both inputs), significant correlations are found. The correlation coefficients take, however, different signs, making it hard to give a comprehensive explanation. Hence, an unambiguous performance effect from vertical integration is ruled out also within this research design.

[103] Both Harrigan (1985c) and Tucker & Wilder (1977) claim that commodities are in the later stages of their life cycle. Here, however, farmed fish is to a greater extent than wild whitefish a commodity, if measured by the ratio of unprocessed goods exported to total exports. Though, as a historical fact, the aquaculture industry is the younger one – and so is the processing industry founded on farmed fish production.

Another bundle of results appears as we look closer into the two branches of seafood processing. The aquaculture industry has emerged as a result of new technology which has enabled biological production under controlled conditions, and reduced uncertainty. The processing firms who exploit farmed fish are much more a result of fish farmers who have set up own processing plants to attend to their own and other fish farmer's production, than processing firms' fish farm acquisitions. Hence, what we see are examples of fish farmers' downstream integration activities, rather than fish processors' upstream integration. The opposite integration direction, as shown by the examples, is of great importance when interpreting our findings, since backward and forward integration along the value chain poses different challenges to the firm (Rothaermel, Hitt, & Jobe, 2006). When fish processing firms acquire fish farms, still keeping their wild fish raw material source utilised, the activity can just as well be seen as an example of a *diversifying* strategy (Harrigan, 1986a) as one where the aim is to bring uncertainty under control. The lesson to be learnt from these cases, where vertical integration is considered ulterior to the 'make-or-buy' decision or undertaken for additional possibilities, is the need for conscious management in order to harvest potential synergies, since the acquired capabilities can be far beyond the core business.

Further, when performance is attended to, our findings support the resource-based view, where vertical integration is considered a differentiation issue: some firms succeed in their pursuit of competitive advantages from vertical integration, while others fail to exploit the potential benefits. This conclusion makes it necessary to include other firm specific factors when searching for critical success factors explaining the profitable use of vertical integration in our setting. The resources and capabilities needed to succeed from farmed fish processing deviates probably from those that warrant success when processing wild fish.

The way of assessing the degree of vertical integration can also produce spurious deductions if not precision is assured. Here, the farmed fish processors can serve an example. When addressing export statistics, we find that about 80 per cent of exported salmon are made up by whole fresh fish, not processed to a greater extent than gutted and packed. This indicates a modestly integrated industry, an argument that is intensified when assessing the level of upstream integration from the processors of farmed fish. However, the reality is in fact a high degree of integration, since most of the farmed fish processing firms are erected by fish farmers. Additionally the aquaculture industry has integrated further downstream into the seafood wholesale and export industries, as well as in salmon processing plants abroad. Hence, a new measurement problem must be addressed, which underlines the value of a narrow setting under scrutiny when a stringent analysis is wanted. The inherent differences between the two branches, regarding both uncertainty and the spread and direction of vertical integration, advocates that the two branches would be easier explored if addressed separately, again underlining the importance of taking the industry effect into account.

One research topic, pronounced in this paper, is the treatment of measurements for vertical integration and the findings' sensitivity for which level the measurement values are obtained. Held together with our first paper, the lack of systematic findings on the vertical integration-performance relationship makes it incumbent to ask whether our measures and design are able to reveal the prescribed effects in our setting, or whether they are, in fact, of temporal character or non-existing. In our third paper these issues are addressed and further elaborated.

9.2.3 The impact of measurement and industry

Measurement problems are crucial in all empirical studies of vertical integration and have been accused for being the primary reason for the limited number of studies carried out. In fact, there exists no single measure for measuring vertical integration, which the major stream of researchers has agreed upon reflects the salient level of measurement. The most utilised measure for vertical integration in studies of its impact on performance has been the value added over sales ratio; sometimes adjusted for profits, other times not. In this paper we first carry out a literature review on empirical research on the vertical integration-performance relationship, before critically assessing the various measures utilised to mirror the degree of vertical integration. Tests are performed on the vertical integration-performance relationship comparing our measure of vertical integration to the most utilised measure in similar veins of research. The differing performance measures are also critically assessed.

Our upstream vertical integration measure is a self-sufficiency ratio, often used in studies of commodity industries like oil and food. Nevertheless, it is difficult to comprehend the exact degree of vertical integration in our industry due to multiple ways of organising the buyer-seller relationship. Where some fish processing firms invest in minority equity shares in fishing vessels, others manage their supplier relationships by lending vessel owners loans to buy vessels or give them disposable rights to their premises for storing their gears or access to baiting centrals. In the latter cases, our vertical integration measure will take the value zero, even though such action undoubtedly helps creating and sustaining relationships distinguished by reciprocity between buyer and seller, which in turn impacts the raw material flow.

We utilise our earlier approach to the fish processing industry – discrimination between specialists and generalists – and test, by utilising the different vertical integration measures (self-sufficiency ratio, value added over sales and profit adjusted value added over sales), their impact on the performance measures gross profit margin and return on total assets. We find that the vertical integration-performance relationship is sensitive to the vertical integration measure chosen. The results point to a high level of internal validity, since all measures point in the same direction. However, in accordance with our earlier results, our measure for vertical integration can only to a very limited extent explain the inter-firm difference in profitability in the Norwegian fish processing industry in 2000. On the other hand, the ratio of value added to sales is positively correlated with profits. However, we deem this measure to be under influence by other factors than vertical integration, since when deducting profits from numerator and denominator, it loses its explanatory force, (R-squared shrinks to nothing, and the coefficients are decimated). One potential reason is the value added over sales measure's close correspondence to the performance ratio it is meant to describe, collected as both variables are from firms' financial statements.

From theory we know that the value added over sales ratio also incorporates forward integration undertaken by firms. We have earlier argued that the level of forward integration is modest in our industry, at least for those processing wild fish. Further, upstream integration will influence this measure more severely since it increases the closer to the raw material extraction integration takes place (Adelman, 1955). However, applied on the same firms, it will probably differ substantially from our measure for upstream integration

Our measure, on the other hand, is met with other methodological deficiencies. For instance, a large group of firms obtain the score 'zero' on our measure. Some might be involved in quasi-integration, as noted above, but do not obtain a positive value since they do not own vessels. Second, some vessel ownership arrangements are (counterintuitively) insufficient to obtain the fish wanted. Additionally, we know from our survey that the group of zeros is constituted by two different firm groupings with respect to attitude towards vertical integration: One group who opposes vertical integration as a potential strategy for securing inputs, and another who is very positive to vertical integration but does not possess the financial resources necessary to invest in fishing vessels. Further, our measure is a static measure, linked to the ownership and raw material situation in one single year, while vertical integration can be viewed upon as a dynamic concept, where our measure too would exercise considerable temporal variation dependent on quotas, fish abundance and vessels' propensity to deliver to the owner. Neither does it give a concise answer to which stage of the value chain the 'owner' of the vessel prioritises with respect to profit maximisation, hence, at what level are transfer prices set, and where will profitability be realised – which of course will influence performance of the fish processing firm.

Again we comment on the industry effect, and draw attention to Harrigan's (1986a) advice that vertical integration measurements should be undertaken at firm – not industry – level. As noted earlier, despite the homogeneity assurance from viewing the fish processing industry alone, by distinguishing between those processing wild whitefish and those processing farmed fish we accrue problems when trying to draw conclusions regarding vertical integration with validity for both branches.

All three preceding papers show results pointing to the same conclusion: that degree of upstream integration is unable to explain inter-firm financial performance variations. The effect on financial performance is in fact negligible, in some cases positive while negative in others. However, any significant influences on performance fail to appear (except for particular years for special industry segments – like those who processed both wild and farmed fish in 1998). Hence, our research models do not produce significant results. This conclusion makes it necessary to point to alternative explanations why the proposed effect from vertical integration on performance does not appear. A promising expansionary path for research has implicitly been proposed already, pointing at the fact that some non-integrated firms in the same sourcing environment achieve profit rates not worse than vertically integrated firms, at the same time as vertically integrated firms also experiences low yields.

One intention with strategy choice is to separate distinctively from competitors in order to achieve competitive advantages. If the chosen strategy is easily imitated then the value of the strategy is easily dissolved. Our results do not deviate much from the mixed findings in earlier empirical research as we find no effect on performance from being vertically integrated, even when controlling for the 'industry effect' by limiting our studies to one industry. The appropriate question stemming from this thought is whether we either should conclude that theory has its limitations or that we in our analyses have forgotten something fundamental? (It is conspicuous from the low explanatory power our models exercise that variables contributing to explaining performance have been omitted.) Our findings set the theoretical predictions in a strange light, since firms with sourcing strategy choices aside from vertical integration proves equally successful in the same transactional environment. What can then explain this equifinality between different sourcing strategies?

Penrose (1959) draws attention to the fact that firms' resource portfolios are heterogeneous, hence, firms possess different resources and capabilities. Within the resource-based view, in order to pursue a specific strategy successfully, some basic qualifications are necessary. If the firm do not possess the basic resources needed for pursuing a specific strategy – regardless how well adjusted it is to the setting in question – the outcome will not necessarily be better than what competitors obtain. Inter-industry or multiple industry studies fail to control for firm specific qualifications for choosing one strategy over the other. In our last paper this weakness is sought remedied by carrying out a case study between two successful firms in the same transactional environment: one firm that is the most integrated toward the fishing fleet in the studied setting, and another that is unintegrated. The apparent equifinality is illuminated by incorporating firm specific resources in our analysis of strategy success.

9.2.4 How to secure supply? Market exchange or vertical integration

The background for this study was the discontent with the lack of statistical significant results from our increasingly improved, theoretically derived tests of the vertical integration-performance relationship. Further, the observed heterogeneity in our industry concerning sourcing strategy and the consequential performance outcome called for a new turn. Here we address the observed equifinality, where different strategies turn out equally effective.

The approach to the problem takes form of a longitudinal 'quasi'-case study methodology. Longitudinality is ensured by the choice of firms under scrutiny: Two firms, diametrically opposed with regards to sourcing strategy, but both belonging to the top financial performers in our setting for the last decade, enter our analysis. The theoretical perspective pursued is one where we look at firm's choice between adapting to, and trying to control the uncertainty inherent in the setting. In this way, the interesting feature becomes what resource portfolio the firm possesses. This can in turn support the strategy chosen. Here we utilise the resource-based view of the firm, a perspective well suited for firm level investigations, which is poorly exploited in earlier studies of the vertical integration-performance relationship. Theory-driven empirical hypotheses are derived from all three perspectives (transaction costs, industrial organisation and the resource-based view), and tested by utilising primary and secondary data on production, landings statistics and cost- and income statements at firm level.

The papers presented earlier revealed that firms use different strategies to succeed and survive in this turbulent input environment. While some by upstream integration seek to control the uncertainty they are subject to, others try to find a best possible way of organising their activities *given* the uncertain supply they face. Hence two strategies are visible in this input market: controlling uncertainty or adapting to it. The two firms under scrutiny here are individually exponents of these diverse strategies. Both experience and harvest from their success, and display the pros and cons from both ways of organising input supply. This is in fact the equifinality we address. It creates an empirical explanatory problem when we try to force the total population into a two dimensional 'strategy-performance' model in which the strategy variable takes values relating to only one strategic choice; i.e. vertical integration. There seems to exist multiple strategies that successfully can be exploited in this environment: both adaptation to, and control of uncertainty. In our previous work, these opposite strategies have been forced into the vertical integration variable – taking either high (control) or very low (adaptation) values – which in our model are assumed as degrees of one strategy only, which can have contributed to the lack of statistical significance in our results.

The dichotomy between adaptation and control is especially challenging theoretically and can help explaining the lack of explanatory power when modelling the vertical integration-performance relationship. Vertically integrated firms might display a good fit according to the predictions made by Porter's (1980) analysis of industry and competition. They might even be well adjusted pursuant to the governance alignment transaction cost economics prescribes from transactional attributes. However, the uniform impression becomes vague by the presence of vertically integrated firms that fail to harvest the potential benefits in our setting, at the same time as there are firms that accrue top financial performance without this organisational mode towards their suppliers. Whilst the vertically integrated firm obtains lower input fluctuations and pay less for input than the other, the unintegrated firm compensates its disadvantages by greater flexibility. And whilst the integrated firm suffer from productivity losses and high capacity costs, the unintegrated firm is exposed to high transaction costs and supply fluctuations, challenging its capacity utilisation.

An intriguing and fruitful explanation can be found by looking at firm resources. The successful implementation of vertical integration can be explained by companionship of internal resources which subserve this strategy. Such resources can help collecting the prescribed benefits (securing supply, increased bargaining power, reduced transaction costs, etc.) and avoid the drawbacks (increased overhead, unevenly balanced inter-stage production, loss of competitive pressure, etc.) from integrating vertically. Investments in particular assets to serve the firm – in our case; fishing vessels – can, according to Harrigan (1986b), impose a danger for strategic inflexibility, and especially so under volatile demand or in 'unsettled' industry structures. For firms operating without ownership bindings towards the fleet, the parallel challenge will be to take advantage of the benefits from a more flexible form of organisation at the same time as they avoid the disadvantages. Benefits accrue since flexible firms are able to meet different uncertainties in the environment in the best possible manner (Dreyer & Grønhaug, 2004), which must be balanced against the potential efficiency deficiencies of the adaptable firm. The trade-off between flexibility and efficiency is visible, where substantial transaction costs and productivity losses can be two potential disadvantages for flexible firms. This trade-off is sophistically discussed by Langlois (1986: 20-1): *"One implication of this tradeoff is, in effect, that efficiency is not an absolute concept: it can't be defined independently of the organisation's environment. A firm in a very rapidly changing environment may have very bad transaction-cost properties but be far more efficient – far better able to survive – than a relatively less flexible organizational structure with good transaction cost properties in equilibrium. (...) In any event, it's far from clear that one can't do comparative-institutional analysis in a way that accounts for these dynamic considerations. Most current analyses do seem to assume that the criterion for the organization's survival is efficiency in the allocation of resources rather than flexibility or something like it."*

The fact that at least two sourcing strategies can lead to financial success in this input market leads us to subscribe to the principle of equifinality. Though, the success of a chosen strategy does not merely depend on industry and transactional factors, but also require that firm specific factors (resources and capabilities) are adequately taken into account, and exploited, in a properly manner. In order to establish which firm resources that are the most valuable, further explorative measures have to be undertaken, preferably at firm level.

9.3 Implications

The main objective throughout this thesis has been to explore the vertical integration-performance relationship empirically in the Norwegian fish processing industry. The findings summarised above serve as contributions to existing knowledge within this field of research, partially limited to the setting in question. Beneath, the contributions from our research are assessed, regarding the implications for theory and method, as well as for managerial practise.

9.3.1 Theoretical implications

Within our line of research, we have employed a multi-theoretical approach, where the main building blocks are collected from transaction cost economics, industrial organisation and the resource-based view of the firm. Each and every of the theoretical contributions add expanded understanding to the vertical integration-performance relationship, hence, the three perspectives can be deemed complementary. While transaction cost economics accentuate the transactional features – especially asset specificity – under which hierarchical governance can bring about efficiency gains, industrial organisation – and specifically Porter's (1980) analysis of the competitive situation – is suitable for identifying and determining under which conditions (i.e. in which industries and settings) vertical integration can prove beneficial for the individual firm. Crucial factors for success within this latter framework are bargaining power and market structure. Having covered the transaction and industry level by these two approaches, the resource-based view of the firm – and especially the heterogeneity of firm's initial stock of productive resources – gives important and valuable contributions to understand firm's premises to succeed from a chosen strategy. A firm-level approach helps bridging the gap between the transaction and industry level of analysis. All three perspectives accentuate the trade-off between efficiency and flexibility, which makes vertical integration as one extreme among many competing strategies along the vertical relationship continuum, where open market operations are in the other end of the scale.

The choice of using a multi-theoretical approach was straightforward inasmuch as no single all encompassing theory exists, covering the multifaceted concept of vertical integration; an accommodation recommended by major proponents of all three perspectives. The different levels of analysis in the theoretical approaches chosen here serve as complementary angles of attack to the phenomena of vertical integration. This argument is of great importance since an effective utilisation of the different theory's complementarities can contribute to a better foundation for understanding 'real world phenomena' like ours, than one theory alone can. For instance, the resource-based view can form a plausible and additional explanation to where efficiency arguments in industrial organisation and transaction cost economics has been criticised for not taking into account the human motivation behind the 'make-or-buy' decision. Since exchanges only exceptionally start from a 'tabula rasa', the outcome of contract negotiations might very well be 'flawed' by established structures and relationships in the transactional environment which can inhibit efficiency. Transaction cost analyses can, according to Argyres & Liebeskind (1999: 49), be improved by taking into consideration *governance inseparability* – i.e. the influence of past governance choices on the possible governance a firm can adopt in the future. From our point of view, the resource-based view of the firm and its emphasis on firm resources and capabilities can help to bridge this gap, and produce relevant explanatory contributions, including the relevant *"...set of historically determined constraints."* (*op. cit.*, p. 60), especially when capabilities are of a relational sort. Hence, the resource-based view remedies the other perspectives' lack of emphasis on the social nature of organizational life.

In our research the important distinction between flexibility and efficiency is set by whether the firm chooses to adapt to the existing uncertainty in the sourcing environment (i.e. the input market for fish) or if it chooses to follow a proactive strategy in order to bring the prevailing uncertainty under control by the firm. The trade-off involves either flexible adjustments to an uncertain supply, or a choice of vertical relationships designed to bring the uncertainty under control. The success of the strategy chosen then is to a large extent dependent on the supportive ability of firm's specific resources. Hence, the resource-based view of the firm becomes an important addition to the efficiency based recommendations from contingency theory and transaction cost economics.

An appealing and theoretically challenging finding from our research is the principle of equifinality. The existence of two competing sourcing strategies, enabling firms to successfully coping with high uncertainty within the same transactional environment, which – if properly aligned – might bring about competitive advantages, contests existing theoretical precision. First, within transaction cost logic, the correct organisational arrangement is one which aligns transactional features and modes of governance, and maximises efficiency. When transaction costs are minimised, best possible outcomes are generated and, correctly aligned firms will outperform those that are not. A scenario pointing at multiple optimums are not in accordance with transaction cost theory, when the economic agents (on the procurement side) faces similar transactional features[104]. Even though empirical research have

[104] An exception here might be that one of the firms, *ceteris paribus*, nurses his supply relationships with greater levels of trust (hence; lower levels of opportunism) which makes hierarchical governance needless. However, within the same market (or economic system) the opportunism (or the anticipation of opportunism) should not vary among businesses (Williamson, 1991a; 1993). At the heart of this theory lies asset specificity as the crucial decision maker on governing mode for transactions.

supported transaction cost theory predictions, especially as the motives for vertical integration, little empirical research have been accomplished within this perspective on the final outcome from correct alignment of transactional properties and governance mode (David & Han, 2004). The efficiency of the chosen governance mode have to our knowledge, not been compared to other governance modes within the same setting. There seems to be a need for theoretical work within this field, accentuating the comparative efficiency of different governance modes, and empirical work that can help establish the effect of the correct governance alignment given the transactional properties. Whith respect to the latter, of importance for studies like ours, a clearer advice on how to measure the effect of a successful vertical integrated firm, say from the financial accounts, would be beneficial for future attempts.

Second, industrial organisation[105] emphasises that strategy efficiency is contingent to the industry structure. According to Miller (1988b), in environments with the least uncertainty and change, a cost leadership strategy will be best suited since scale economies are obtainable and control measures can be utilised. Consequently, a product (or market) differentiation strategy is more appurtenant in unpredictable environments, and best supported by cooperative arrangements. Our findings suggest, in accordance with Murray (1988) and Hill (1988), that not only are the strategies combinable, but the theory also lack explanations on *how* the strategies should be implemented by firms. Industry structure does not necessarily dictate one optimal strategy. In our case it seems fair to conclude that the firm has to choose among at least two competitive strategies which are able to produce profitability above industry average. Additionally, we can not exclude the existence of hybrids between the two that might be equally successful. The important question then becomes which of the two strategies the firm should choose among, with competing ways of organising for handling uncertainty, and, on what grounds the adequate strategy should be chosen. This is clearly an issue for further theory development.

Relevant to the theoretical implications of our research is also the outcome from choosing a competitive strategy. Whatever strategy a firm embraces, the goal of its operations is to prosper and succeed – at least to survive. In our data we find failures as well as successes, survivors as well as perished firms. What we lack is a closer prescription from theory on how to link success or failure of firms, to the choice of strategy. In our research, the strategy in question was vertical integration (potentially expanded to including a flexibility strategy, implicitly assuming low or no level of vertical integration) in order to meet the uncertain supply in the input market. The outcome was measured by profitability, or success or failure of firms. The contingency view and its proponents, argue that the *"…appropriateness of different strategies depends on the competitive settings of the businesses"* (Hambrick & Lei, 1985: 765). The most influential individual environmental[106] contingency variables are proposed to be industry age, user sector (consumer or industrial), product differentiation, technological change, concentration rate, purchase frequency and others (*op. cit.*). In our last paper we address two firms operating under the same environmental contingencies, which experience success with adversely different strategies regarding the procurement of input, hence: strategy equifinality.

A promising angle of attack to find a remedy to this weakness seems to be found by combining the contingency and the resource-based view of the firm. Since the illustrated

[105] Porter's (1980; 1985: 11) generic strategies – cost leadership and product differentiation (and focus; a sub-strategy of the first mentioned) – serves here as the most prominent proponent: *"Cost advantage and differentiation in turn stem from industry structure"*.

[106] Hambrick & Lei (1985: 768) also point to a second class of contingency variables, covering firms' strategic positions – relatively fixed in the short run – that includes market share, vertical integration and brand image.

strategies are of opposite natures with respect to the countering of supply uncertainty – one focusing to govern and control uncertainty, the other on adjusting to the inherent uncertainty – their first order objectives are also different. Thus, the effect of the strategy must be measured up against what it is meant to achieve. In the end, the salient point is bottom line profitability at the end of a period. For this financial account effect to appear it is necessary in day-to-day operations that the strategy in question is able to achieve its operative goals: either that the firm is able to achieve stable and adequate supply according to its capacity, or that the manufacturing interface is able to adjust to supply variations. For a vertical integration strategy, success can be measured inasmuch as the ability of internal supplies to secure stable supply, reduce transaction costs, and/or contribute to low production costs. For a firm to successfully adjust to an uncertain supply, the ability to shift production in accordance with the input obtained becomes incumbent. A further challenge with this strategy will be to keep transaction costs as low as possible, in which a possible solution can be that the authority governing transactions in vertically integrated concepts, is replaced by trust between the buyer and seller. A successful pursuit of a flexibility strategy rests on totally different areas of business than a control strategy where vertical integration is utilised. From a cost perspective, the vertical integrated concept often require high fixed costs that have to be distributed on high production batches in order to follow a low cost strategy, while in the flexible firm, the rule would be lowest possible fixed costs, where the means of production – facilities, equipment as well as employees – possess the greatest possible capabilities to adapt to altering manufacturing situations. Common for both strategies is, however, a balancing of the production and transaction costs against the income potential of the products, where avoiding the disadvantages of the chosen strategy is as important as harvesting the benefits.

Our conclusion, which supports the view of equifinality is also interesting from a methodological point of view. Alternative strategies which can bring about the same performance effects as the ones suggested from vertical integration proponents, should guide researchers to look closely and carefully into alternative explanations when assessing single variable strategy-performance regressions. Reality is seldom able to be forced into two-dimensional explanatory models. Even with the loss of simplicity, a real world phenomenon is more effectively explained by more than one variable. Related to this is the imperative to include firm specific factors to increase the ability of evaluating the choice of strategy. As underlined by the resource-based view, the choice of strategy is, and can, not be done in a vacuum: It must build upon the firm's abilities, not as an isolated decision based on the environmental characteristics and theory predictions. Barney *et al.* (2001: 632) narrow the analysis to governance choices, and state: *"In much the same way as dynamic capabilities identified by Eisenhardt and Martin (2000) that have become institutionalized as 'best practices' often cannot, by themselves, be a source of competitive advantage, it seems unlikely that corporate governance, by itself, can be a source of competitive advantage. However, experience suggests that some firms are much more skilled in how they implement otherwise common governance devices, and that these skills may be heterogeneously distributed across firms."*

Barney's point is that individual's – as well as firms' – abilities to analyse uncertain transactions, and transactional environments, are unevenly distributed, and therefore differ. In the same manner, capabilities required to comprehend and implement governance mechanisms also differ between firms and individuals. Therefore, a closer inspection of firm capabilities can possibly reveal whether the firm possesses the underlying resources needed for a successful strategy pursuit. A capability mapping can also be utilised in arrears of the strategy choice, to control for – and direct – which capabilities were essential (or missing) for the success (failure) of the chosen strategy.

9.3.2 Methodological implications

The empirical nature of this thesis raises many methodological issues to be dealt with. How we have met these obstacles, together with an assessment whether or not our methods are suitable angles of attack in this kind of research is presented below.

Introductorily an appraisal of the stepwise research procedure carried out here is entitled. Our pursuit of extended knowledge on the vertical integration-performance relationship in the Norwegian fish processing industry has followed the pattern of a natural incremental process, where findings from one research attempt have been critically assessed and extended in the next. From the first rather universal test of upstream vertical integration's influence on performance in our industry, to the last paper – exploring the success factors from two adverse sourcing strategies – the learning process and knowledge development have been immense. My firm belief is that corresponding research processes can turn out equally informative and instructive also for other scholars within other disciplines. The consistency and continuity have, at least in my eyes, proved beneficial in our research.

First of all, empirical studies of vertical integration are critically restrained due to serious measurement problems. How should one define vertical integration in empirical studies, especially when the traditional dichotomous variable (vertically integrated or not) is insufficient to reveal the many dimensions of the concept? We have developed a context specific variable for upstream vertical integration, built on to what degree firms are self-supported with their most crucial input. Our measures are computed from a record of physical stock variables, i.e. the ratio of fish supply from vessels in which the firm holds proprietary interests, to total fish supply, which deviates from the traditional financial account based 'value-added over sales'-measure. It is a favourable property when examining the effect of vertical integration on financial performance, since the 'value added over sales' measure is related to often cited financial key figure ratios, which can create spurious results in statistical tests. However, the setting under scrutiny is – for almost every firm – one in which there is only one salient input factor; namely fish. Other settings might rely on two or more equally important input factors, which make the transfer of our operationalisation to other industries not straightforward. Further research should address how this kind of measurement problems could be addressed in an agreeable manner.

Secondly, our approach, where we isolate the study to one specific setting, is one which avoids the industry effect, incumbent in many empirical studies where the sampling includes firms from multiple industries. Comparing vertical integration policies, and their effect on performances, across different settings induces generalisation problems since the forces at work – motivating for vertical integration and making vertical integration profitable – are different from setting to setting.

A third point of interest is the level at which we perform our studies. We have assessed the degree to which firms in our industry are upstream vertically integrated. Vertical integration is in fact a firm (or business unit) level phenomenon, where the 'make-or-buy' decision is taken autonomously by the manager or management team, if not dictated from a concern superstructure. Industry level records of vertical integration will reflect the aggregate firm level degree of vertical integration. Without neglecting the role and influence of industry structure and other environmental factors on vertical integration, we claim that of greater importance is that of firms' experience, and emphasis, rather than sectorial macroeconomic aggregations. Thus, at least when performance effects are under scrutiny, vertical integration should be assessed at firm level. Also since vertical integration decisions most often are induced by firm specific strategy considerations (Eckard Jr., 1979; Harrigan, 1986a). This claim becomes even more eminent when direction of vertical integration is under scrutiny. As we have shown to be the case here, a quick glance at the processing of farmed fish could lead to the conclusion that this part of the industry is very modestly integrated, since about 80 per cent of the production is exported unprocessed. However, when looking at firm level integration, a majority of fish farmers are integrated towards the wholesale and export industry, while only some find it worthwhile to integrate towards the fish processing industry. The direction vertical integration takes within the farmed fish sector is principally downstream: even though some fish processing firms have found it appropriate to integrate upstream towards the fish farming industry – either for supply assurance or product diversifying strategies – the most common direction of integration within this value chain is one where fish farmers integrate downstream, by setting up processing plants handling own production (or; bypassing this stage for exporting unprocessed farmed fish).

The lack of significance in our findings regarding the vertical integration-performance relationship also point to the need for refining our regression models, in which also our measures for financial performance should be assessed more closely. An alternative strategy could be to include other measures for performance as dependent variable, for instance to include gains that typically are predicted from vertical integration theories. A variable often noted is the reduction of uncertain supply, but also others, like price variability, quality control, risk and transaction cost reduction, serve as strikingly potent. Further, the effects of vertical integration as a strategic measure should be evaluated on a long-term basis, since the outcome from an enduring sourcing decision like this, do not necessarily materialise within the limits of an annual report's time-span (as is what most financial key figures reflect). A last straining point to be made here is to keep attention to which link in the integrated value chain profitability is allowed to be realised. Tax and transfer price regulations might influence the managerial preferences – a condition which will influence the outcome of regressions where financial performance is the dependent variable, and the focal stage does not reflect the appropriate one. For instance, in an analysis of the delivery conditions levied on Norwegian cod trawlers (Dreyer *et al.*, 2006) we state that throughout the lifetime of the regulatory scheme, vessel owners' emphasis on profitability has travelled from the processing sector to the harvesting sector. The reason is that international division of labour and technology development – combined with low profitability in the processing industry at the same time as fishing policy regulations have made exclusive fishing rights a scarcity factor – have lead to a shift in the profit focus for integrated concepts.

Even though vertical integration decisions are hard to reverse, they are not irreversible, and should therefore be reflected by measures that are of dynamic nature. Our attempts to evaluate the vertical integration-performance relationship longitudinally bear in themselves a long-term approach by assessing both variables over years, but still we feel the need for refinements of such variables to be added when assessing dynamic concepts like vertical integration and performance as real world phenomena. One promising approach would be to further utilise the *relative* performance of firms, relative to the total population, throughout a series of years, as an approximation to the longer term sustainable competitive advantage.

Our empirical findings have many impacts on methodology. The main challenge occurs from the conclusion that there seems to be present a state of equifinality in the choice of strategy, and that the proper strategy choice does not necessarily lead to positive performance effects. We have demonstrated that some of the vertically integrated firms in our industry – despite the contingent motives which favour such a strategy – fail to harvest the expected financial benefits. Possible reasons can be that they have chosen the right strategy but at the wrong point in time, or they lack the resources to successfully implement the strategy correctly. We have shown that opposite strategies have proven successful at the same time. Altogether this undermines a clear positive vertical integration-performance relationship, and points to the need for other (and more) variables to explain how vertical integration can produce positive performance effects. This emphasises the value of the resource-based view of the firm, which visualise the potential of expanding the contingency view by incorporating firm specific factors. This might increase the value of the chosen strategy, when it is correctly aligned to the external environment. However, an increased emphasis on firm specific resources put greater claims on data, since firm level explanatory variables can be difficult to measure. This kind of variables might deviate substantially from traditional variables in strategic research collected from financial accounts: they might not even be identified from secondary data sources like the accounts and be of a nature not complying with the financial year/period, but rather accumulated over years of experience. Our research design have limited ability to allowing for variables of this kind, and even in our last attempt – the case study – only approximations to such valuable firm resources are taken into consideration. To enable a thorough exploration of valuable firm resources for successful implementation of vertical integration, an improved and more advanced research design is needed.

An alternative research design which could advance the understanding of the vertical integration-performance relationship in our setting and the value of firm specific factors for the success of vertical integration is proposed as follows: Since we know the firm population, the degree to which the firms have undertaken vertical integration and have detailed data from financial statements and landing statistics, a fruitful approach would be to perform a case study in which two vertically integrated firms enter; one successful and one failure with respect to financial performance. According to our earlier findings we expect that this design can reveal the deviations of interests between firms who are successful in their strategy pursuit and those who are not. Further, we believe this variation not only to be prominent in the cost and income flows depositing from successful or unsuccessful strategic choices, respectively, but can help determining which firm specific resource portfolios can be considered beneficial in this strategy pursuit. A measure for relative performance in our setting, stating the firm's competitive position, could prove beneficial for the salient way of selecting firms for a thorough case study research. In order to take account of the resources needed for a successful vertical integration strategy pursuit, a close attention should be paid to the firms for a period of time – say; at least five years in order to open for inter-year changes. This proposed research design also creates potentials for developing account based measures for beneficial resources. By comparing firms' cost and income data with the resources characterised as being of strategic importance, variables with implications also for transaction cost analyses and valuable for industrial economics can be identified. Developing measures in correspondence with the theory prescriptions – for instance for bargaining power, transaction frequency, and others – can appear as promising and comforting for further empirical research on the vertical integration-performance relationship within these perspectives.

9.3.3 Managerial implications

Strategy has, according to Jones (2004), two 'audiences': those who study strategy, and those who perform strategy. Hopefully, the findings reported here will have some bearings also outside the academic world, though perhaps limited to managers within the setting studied.

One lesson to be learnt in from this research corresponds with the recommendations from other researchers within the field of both scholars and practitioners (Burgess, 1984; Stuckey & White, 1993), namely that *there exist no simple rule of thumb on when and when not to vertically integrate*. The potential drawbacks from integrating vertically seem just as numerous as the proposed advantages. Our findings are unsatisfactorily inasmuch as we are unable to explain performance differences from the degree of firm level upstream integration. One possible explanation is that the benefits from integrating vertically are perceived and accounted for elsewhere than within the financial statements of the firm. For example that the quality control of the products procured internally gives room for advantages further down the value chain, or that a stable supply of raw material enables the firm to avoid product disruption, and thus, keep a stable workforce.

When addressing vertical integration from a multiple theoretical viewpoint, we find that for this strategy to be the right answer to the 'make-or-buy' decision it must not only be the right response to the *why*-question, but also to the questions of *where* and *when*. Even if the circumstances in which the sourcing takes place are in accordance with the theoretical predictions that motivates for vertical integration, temporal or industry specific conditions might alter the conclusions. The sourcing environment visited here is characterised by a fluctuating supply caused by natural variations. Upstream vertical integration towards the fishing fleet, as an advantageous assurance strategy when supply is in shortage, can in the longer run be turned to an inconvenience if supply is abundant and the value of vessel investments 'shrinks'. In a similar manner, since the extraction of natural resources is typically a highly regulated activity, industry specific conditions – and in particular – regulatory amendments, may turn pros into cons.

The transaction cost economising effect from vertical integration is obvious, however, within this sourcing environment, regulations limits this achievement considerably. Especially due to the 'price floor regime', under which a transfer price between in-house units can not be set. Normally, and particularly in recent years, first hand prices between vessels and processors have been set above the minimum price. It has been claimed that vertical integrated companies in our setting have implied a subsidisation of the fish processing firms since they avoid the market forces at work. When transfer prices in vertical integrated companies are set below what the vessel could have achieved from offering their catch elsewhere, not only does it endanger the loss of inter-firm competitive pressure, but, perhaps more severe; intra-firm incentives deteriorate. Then, since the remuneration of the vessel crew follows an old-fashioned – but still efficient – share cropping agreement where fishermen's payment is a fixed share of the vessel's net income, the vertically integrated concept stands in danger of loosing its vessels' crew to other, independent vessels. When turning the argument the other way around it is easily seen how the management of the processing firm might lack information and skills to exploit the vessel in a best possible manner, which in return might endanger the efficiency of the vessel, and, hence, the remuneration of it's owners as well as the crew.

Our suggested equifinality explanation has also some managerial implications. The point to be made is that firms in the face of a highly uncertain sourcing environment can choose from two distinct angles of attacking the inherent uncertainty. One strategy is proactive, where the uncertainty is attempted brought under control, for instance by ways of vertical integration, while the other is by adapting the firms' activities to fit the uncertain supply. In the latter case organisational flexibility becomes a key factor to succeed. The strategy chosen will in turn have enormous impact on the organisational structure. When first chosen, an uncertainty controlling strategy will be more interlocking than an uncertainty adaptation strategy, and will require heavier capacity investments. Also, a controlling strategy will typically lead to more specialisation and make the firm more vulnerable when the sourcing environment undergoes changes, while the organisational structure of a firm adapting to uncertainty must be one that can exercise sufficient agility and flexibility in order to cope with the fluctuations at the supply side – in both shorter and longer term.

In order to make the right decision regarding adaptation or control of uncertainty, a thorough examination of the supply situation is needed, especially regarding the firm's competitive position in the market for raw materials. But just as important as a mapping of the external environment is a thorough examination of the resource portfolios internal to the firm. Then, the chosen strategy should build upon the firm specific qualifications in order to match the competitive situation in its industry. There are benefits and drawbacks associated with both strategies. In order to succeed from its choice of strategy, the firm should adjust their operations to maximise the benefits and limit the potential drawbacks. As underlined in our last paper, the benefits for a vertically integrated firm are coupled with the avoidance of fluctuating raw material supply while the drawbacks can be connected with heavy investments which reduce it's financial flexibility. From our point of view, different firms possess different resources and capabilities, and thereby the premises for succeeding from upstream vertical integration in our setting are unevenly distributed among firms. Hence, some firms would – depending on their firm specific resources – be better off by pursuing a strategy which emphasises adaptation to uncertainty. For a firm following an uncertainty adaptive strategy, cultivating the benefits will – among other things – imply emphasis on nursing the suppliers in order to avoid the disadvantages stemming from high transaction costs. Then, the key to success is found within the triangular *strategy*, *environment* and *firm specific resources*, where the fitness of the strategy depends upon both the sourcing environment and the firm specific resources.

Obviously, this thesis has been disconnected from any objective regarding policy advice. Hence, the intention is not to give any policy recommendations and our conclusions should be carefully assessed before taken into account for any advice in that respect. As explained earlier, the fishing industry is highly regulated, also regarding the opportunity for fish processing firms to integrate upstream. In that respect, the Participation Act limits majority ownership in fishing vessels to active fishermen. Our results give no advice in direction of neither liberalising nor curtailing that right. Industrial organisation economists have been occupied in analysing the social welfare effects from market power considerations in the wake of vertical integration. Etgar (1978), for instance, show that when inputs are scarce, firms tend to integrate upstream in order to deny potential entrants the access to the raw material. The industry structure visited here is in sense atomistic, which makes market power considerations redundant. However, an ever increasing structuring effort, taking place both at sea an on shore, can create market power disturbances – especially in limited geographical first hand markets for fish – potentially damaging to competition. From a social desirability viewpoint, and especially in the view of consumers, the seafood product market is by and large a global one, distinguished by the existence of a great many substitutes, where Norwegian processors only exceptionally can exert market power. Fish of Norwegian origin, processed in China and imported back, where it is found portion packed in freezing compartments in our supermarkets to highly competitive prices, can serve as an example of the global division of labour and competitive situation for the Norwegian fish processing industry.

Another experience from the Norwegian fisheries industry of importance for the vertical integration practice here can be drawn from the technological development. In the clip fish sector, i.e. firms processing salted dry fish, the diffusion of frozen fish utilisation in production have made firms less dependent on fresh fish. Together with the development and instalment of freezing technology on board in (large) fishing vessels, this have made vertical integration redundant in the struggle against uncertain supply, since the emergence of neutral frozen fish storage plants, and the supply available there from, to a large degree have made upstream vertical integration obsolescent. But not completely since some clip fish processors are dedicated in utilising fresh fish only in their production.

Within this line of reasoning there are substantial knowledge to be learnt from the aquaculture industry. If feeding and storing technology successfully leads to a larger scale biologic production of wild fish species like cod, a substantial part of the supply uncertainty facing fish processing firms can be reduced. Also capture based aquaculture, where wild caught fish is stored in sea pens side by side the processing unit, can constitute a major source of reduced supply uncertainty, given that technology and regulations in near future allow a streamlining of fish stored alive until time of production. This can have great influence for manufacturing of fresh seafood products to our most important single market – the EU. Fresh seafood products to our closest markets have been awarded the role as our most promising export article and as the origin of potential competitive and comparative advantages (see for instance Ministry of Fisheries, 2005).

9.4 Limitations of the study

Our research proved unable to detect an overall significant relationship between upstream vertical integration and financial performance in the Norwegian fish processing industry – neither a positive nor a negative effect. The wide range of statistical testing provided here makes the overall finding nearly irrefutable, and as such our results do not contribute much to remedying the ambiguousness in earlier research on this relationship. Whether the lack of significant results in the scrutinised relationship is due to systematic or random errors of measurement is hard to assess. We feel confident that the data sources utilised are the best at hand and is in proportion to the purpose of the study. We can not, however, reject the possibility that vertical integration has bearings on financial performance, even though no such relationship could be established from our attempts. The lengthy and detailed discussion of theory, industry and findings has pointed to the potential advantages and disadvantages from upstream vertical integration in this setting. In this manner, we have thoroughly accounted for possible reasons why the correlation between our two variables failed to appear in our research – a result also obtained in earlier empirical studies.

Our study's main limitation is related to the rather narrow setting under scrutiny – the Norwegian fish processing industry. This has great bearings for the external validity of our results, which implies that our findings are generalisable only to a limited extent. The reasons are many. One is that our empirical material is very detailed and extensive, which can be difficult or unfeasible to obtain from other industries. In the same manner our study is hard to compare with studies from other industries since the setting under scrutiny here has its distinctive characteristics, regarding legal framework, industry structure, the nature of the input, etc., which make comparisons to other industries artificial or odd. However, the methodological and theoretical considerations made here have bearings also outside our industry and could be utilised in other industries for other time periods.

Our findings are reliable in the sense that other researchers who would try retesting, with the same test procedures, on the same data, would reach the same conclusions.

Another point of interest when assessing the limitations of our study is the construct validity. As underlined earlier by researchers, the absence of a unified method of measuring vertical integration has been the most important bottleneck, responsible for a limited range of empirical research in this field. From our point of view, the operationalisation and construction of our contextual vertical integration measure cover the most prominent sides of the phenomenon, and it includes the view of the concept as a continuum – from free market operations in one end of the scale to full vertical integration in the other. However, our measure is solidly rooted in the context studied, which makes transferability to other industries difficult, for many reasons: other industries might have none or more than one, salient input factors and supply conditions might be characterised by stability and little uncertainty, or they might face the greatest uncertainty in the demand for their products.

In our surveys we addressed the top managers in fish processing firms. Parkhe (1993: 803) refer to the dangers from basing organisational research on the findings from the top level management only, since the perception of organisational phenomena can vary between different members of the organisation at different hierarchical levels. The operationalisation of our upstream vertical integration measure is, however, objective – in the sense that it will not be altered by asking different firm representatives – and therefore relatively immune for this potential critique. However, the subjective perceptions of managers on the future value of being vertically integrated do not escape scot-free from this potential drawback. Though, the scores allotted to firms on our variable have been critically assessed against other statistical sources, and detailed industry knowledge possessed at our institute. Beneath some limitations of our measure are discussed.

First, our measure of vertical integration (share of total fish landings to the processing firm stemming from vessels in which the firm had proprietary interests) was a self-reported measure and managers' response could have been influenced by a social desirability bias. In order to avoid random measurement errors within this variable we mapped each firm's total purchase of fish and coupled it with the vessel ownership database to the best of our knowledge. However, no great divergences from the self-report figures were identified; hence the latter was adapted for our use, even if the answers to some degree were coarse approximations to the true level of landings from own vessels, since managers might have been unprepared when stating their answers over telephone conversations.

Secondly, our measure's emphasis on the raw material flow at the cost of ownership share in vessels, might have overestimated the true level of vertical integration. It is reasonable to believe that a firm can exercise larger control over a fully owned vessel than over one in which it holds only a minor equity position. Hence, the obtained raw material flow from vessels of the latter kind might mirror the nature of the fishery the year in question (i.e. the fish vessel owner's operational plans) rather than the influence from one business unit over the other, and the fish processing firm's ability to direct the flow.

A third observation regards the measure's ability to incorporate inter-year fluctuations in raw material supply. Our measure takes values between 0 and 1 (in fact between 0 and 100 per cent), but as Ohanian (1994) draws the attention to, a firm who's upstream subsidiaries deliver more raw material than it needs itself, can obtain values greater than one on a self-sufficiency ratio like our. This is the case for some vertically integrated companies on Iceland. In Norway we expect excess supply from own vessels to be of a seasonal character, i.e. that the processing firm in periods receives more fish than necessary which is sold to others, or when the fish landed is of a character that is improper for the firm's ordinary production.

A fourth moment regards the assignment of value on our measure to those firms who declare that they own no vessels and therefore receive nothing from own vessels. This group of 'zeros', as noted earlier, constitute a major problem to our regression models, as displayed by the poor measures of fit. We have argued that this group in reality consists of two types of firms: one group of firms which from a strategic point of view has rejected upstream vertical integration as the suitable way of organising their sourcing, while yet another group of firms, that are willing to integrate, 'unintentionally' falls into this category since they are unable to finance acquisitions of fishing vessels.

The characteristics mentioned above clearly points to the danger of a tautological explanation to the forces in work in our setting. Our hypothesised relation is that upstream vertical integration has an impact on firm performance in our setting. We expected it to be a positive one, but our models are also open for the opposite effect. However, the causality could easily be turned the other way around; that in order to integrate vertically towards the fishing fleet a firm needs financial resources. And if funding is not awarded from existing owners, creditors, or others, a sound financial performance is needed to undertake this kind of capital investments. Hence, a plausible tautological explanation is present in our research design.

To some degree the upstream vertical integration undertaken is made out of historical regulatory causes, since some of the fish processing firms' right to own trawlers where allotted them from the government as part of the plan for North-Norway in the rebuilding of the industry after World War II. The authorities' intention was to *"...reduce the uncertainty in raw material supply and strengthen profitability in order to secure employment in the fish processing industry"* (Dreyer *et al.*, 2006: 8, my translation). Only a minority of firms were awarded such fishing rights. These firms were to a large degree so-called "corner-stone businesses" in rural coastal areas, which served as sole demanders of fish and/or labour within their areas. Today, some 30-50 years later, the allotted fishing rights have turned out to be highly critical assets and a valuable resource thanks to the political legitimacy once upheld. As such, trawler ownership appears today as a resource which is valuable, rare and limitedly imitable, unachievable for those who were not granted this resource in the first place. Then, the experience gained over time from the co-operations of trawlers and processing firms should – at least for some of the favoured firms – constitute competencies important for their competitive position. Most firms with assigned trawlers have, of course, renewed their fleet in the time passed since the original investment was made. However, seen up against the capital needed today for a vessel investment (with fishing rights) the capital bindings are very modest, and for some of these vertically integrated firms, lengthy depreciations have made the values entering the balance sheet to deviate substantially from the true value of the vessel. For firms that were not favoured by these exemption clauses in the Participation act (firms without assigned trawlers with fishing rights) who have made their vessel investments after the market for fishing quotas and rights appeared (early in the 1990's) the investment burden were much heavier. For that reason a 'flexibility' strategy can appear as reasonable for those cautious risk averse firms with an adaptive conduct towards uncertainty, and limited funding. To some degree, however, these firms have – at least to the same extent as the vertically integrated firms – turned out successful, as clever and with valuable knowledge to the turbulent setting in which they operate.

In the traditional vertical integrated concept, i.e. large fish filleting plants with trawlers, vessels have been accused for cross-subsidising the processor, since fishing in general have turned out more profitable than fish processing. The important question raised by this allegation is where – within the integrated concern – the gains are realised, i.e. whether trawlers are allowed to maximise fish prices or the processor is allowed to minimise input prices. In our examination this have not been an issue, though, the possibility for cross-subsidisation and the various methods of organising the ownership in vessels (own subsidiary firms, share holdings, etc.) will of course affect the results when assessing the role of vertical integration upon performance in constellations like these. And also here the transfer pricing policy between the units – at which prices the fish is allocated to the upstream producer – will influence the bottom line profitability for the processing firm. In our original telephone survey, managers in vertically integrated firms were asked at which prices the exchanges took place, to which an overwhelming majority of those who had own vessels paid more than the minimum price set by the sales organisation. Only one firm paid the minimum price, while 53 per cent paid a 'market price' and the rest had a pricing scheme which were somewhere in between the market price and the minimum price. But, as noted correctly by one of the managers, the minimum price set by the sales organisation is meant to reflect the processing sector's earning capability in the major export markets (Isaksen & Iversen, 1998). However, processing firms' pricing policy of fish seems to incorporate the need for market based exchanges to uphold the competitive pressure and to maintaining incentives on board the vessels.

Despite all the mentioned limitations of this study, the knowledge brought forward is – in our eyes – valuable for better understanding the relationship between vertical integration and performance. Our findings are supported by theory and earlier empirical research. However, vertical integration is a complex topic in organisational research and to some degree also controversial, starting from the original question: what exactly is vertical integration? Our contribution is not a general prediction on when vertical integration is profitable, but rather to establish a sound way of measuring upstream vertical integration within our setting and pointing to the difficulties, drawbacks and potential advantages from pursuing this strategy. Further our research have benefited from a multiple theory approach and shown its usefulness where only one theory is unable to explain the complex real world phenomenon at hand. In future studies, however, we feel the urge for a greater emphasis on which resources that can constitute an advantage for firms pursuing an upstream vertical integration strategy. When including these resources in our last paper, we only scratched the surface of the firms' resource portfolios by measuring such resources from landing statistics or financial accounts. Hence, our measures for firm resources are, in sense, superficial and weak.

9.5 Suggestions for further research

The traditional option – market exchange or vertical integration – are but two possible alternatives available to the firm (Zaheer & Venkatraman, 1995). Our research approach follows to some extent this dichotomy, even though our measure for vertical integration is a continuous one, enabling it to capture hybrid organisational forms as well. For instance when addressing the processing firms who attend to wild fish, we found no one relying solely on own supplies – hence only tapered integration were carried out. Within this framework we have sought to establish success in consequence of vertical integration, but our mixed findings reveal the same ambiguity as earlier studies have shown. Isolating the setting under scrutiny to only one industry did not help producing significant performance effects from vertical integration. However, in our case study approach, evidence in accordance with theory predictions was highly present.

The lack of congruence between our hypothesised relationship between vertical integration and financial performance and the real world findings necessitate alternative explanations. We have, as a remedy to this challenge, pointed out arguments which illuminate the absent correlations. It remains to suggest alterations in future research approaches that will help produce further understanding to this complex relationship.

One promising avenue for further research follows from the resource-based view and its emphasis on firm specific resources. We found no significant overall performance effects from vertical integration in our setting, but argued that in order to succeed from a vertical integration strategy a favourable portfolio of firm specific resources should be held by the firm. As an alternative to our total population sampling, it could prove beneficial to narrow our firm sample to only those who have followed a vertical integration strategy, in order to study which firm resources seems favourable for succeeding with this strategy. The history of the Norwegian fish processing industry displays just as many failures as successes, and many firm skeletons are the direct consequence of misalignment of the 'make-or-buy' issue. A mapping of why vertical integration strategies went wrong in this setting might be of greater importance than just acknowledging that it does not automatically lead to success. The angle of attack can be both longitudinal and cross-sectional. Where the first takes into consideration the death rates observed in some sectors of the industry, the second can be utilised to explore the differences between successful and failing firms. For instance, it is within the most common vertical integrated concept in our industry we find the greatest descaling in number of firms the latter 20 years (Bendiksen, 2006). These large plants have derived so great benefits from their political legitimacy – as large employment providers in rural district as well as sole demanders of fish – and from banks and other financing institutions due to heavy debt burdens, that they often turn up again after bankruptcies as restructured firms, often with the same owners (Dreyer, 1998). An explorative study of vertically integrated firms, aiming at identifying the factors responsible for successes and failures, respectively, could be of great help for research as well as for managerial practice.

Another possibility for mapping the pros and cons concerning upstream vertical integration in this setting is related to our approach where the performance values were assigned to firms based on their relative competitive position over a consecutive period of years. This attempt could be further developed where the mapping is computed on the total population, and held up against their relative intensity to internalise supply. Other reanalyses on the vertical integration-performance relationship could also improve our knowledge, not only through the way we compute our measure for vertical integration, but for performance as well. This could also include incorporating more sophisticated statistical analyses – beyond OLS-regression models.

As noted, the performance measure could be more closely related to the expected advantages from vertical integration (like quality control, production continuity and information transfer) to relate the yields more directly to the theoretically proposed benefits. Such an objective adjusted relationship mapping might help explain the fundamental assumptions ahead of the strategy pursuit – among them the appropriate firm specific factors needed in order to succeed from a competitive strategy inducing upstream vertical integration.

The promising results from our case study approach call for this research design in future studies of the vertical integration-performance relationship as especially helpful when the potential revelation of competing strategies within the same transactional environment is analysed. Another appealing feature with the case study approach is to enlarge our knowledge of the firm specific factors at work – contributing to the success or failure of chosen firm strategies – and enable researchers to map such resources and capabilities accordingly.

Within this line of research follows a more accurate description of fish processing firms' various ways of organising their relationship towards the fishing fleet. In our operationalisation of the vertical integration measure only ownership in fishing vessels, or vessel owning firms, was considered. However, our survey revealed that a number of competing motives for integrating upstream in this transactional environment exist, and with the motives, various ways of governing the relationship with the fishing fleet. While some managers accentuated that the reason for fleet investments was based on a supply security motive, and correspondingly; uncertainty reductions, others announced the reasons to be of a more social character. To some extent fish processing firms entered the upstream stage in order to keep 'for-sale' vessels located in their original geographic area, or to help or enable local fishermen to renew their vessels or obtain new or used vessels. Of course, these motives can not be regarded independently from the motive to secure raw materials to the firm. Further, while some firms invested in fishing vessels ownership shares, others rendered subordinated loans to fishermen without the concurrent codetermination following from equity shares. As mentioned, other fish processing firms upheld their relationship with the fishing fleet or acquired new suppliers by offering favourable services beyond the price of fish, like bait stations, lodging, electricity and freezing opportunities. This point to the fact that motives at work in our setting are of a complex and multifaceted kind, and that managers' perceptions of these situational and environmental attributes, and the solutions they call for, vary greatly.

Vertical integration – by means of ownership shares in fishing vessels – constitutes only one of a large number of ways to establish and maintain the relationship between the two adjacent stages in this value chain. Like the favourable bargaining positions towards suppliers without the costs of ownership within *quasi*-integration, the use of loans to the fleet will most often also establish such a long-term dependency situation, at least when it is obvious to the borrower (i.e. vessel owner) that the loan is granted for other purposes than the pure business terms and interest earnings alone. Such conditions within the vertical relationship sphere deserve a closer inspection than the treatment given here, and are interesting not only from the view of industrial organisation and the resource-based view. In fact, the use of equity as a means of project financing is granted considerable weight within transaction cost economics. Williamson (1988a) draws clear parallels between vertical integration and corporate finance, where the choice of 'make-or-buy' has its counterpart in the decision to use 'debt-or-equity' to support individual projects. Thus, in the choice between debt or equity in project financing, debt act like outside procurement, while the use of equity is parallel to internal supply in the 'make-or-buy' decision. He further proposes, following transaction cost efficiency logic, to use equity as financial instrument only under circumstances when asset specificity is great. A closer investigation on the choices fish processing firms make regarding their attachment to supplying vessels – also with respect to utilised financial instruments – would help understanding the complex issue of vertical integration (or rather – according to Frank & Henderson, (1992); vertical organisation or coordination).

A last point to be made here regards the setting and the external validity of this study. An important remaining is to inspect whether our findings are generaliseable for other manufacturing firms in other settings. Similar investigations could be undertaken in other competitive arenas. The most obvious expansion path appears to be other Norwegian food producing industries. However, since most other Norwegian food industries are based on agricultural products – for which the regulatory framework, nature of operations and market structures deviates to a large degree from the ones we see within the fish processing industry – or domestic consumption (brewing, baking), one should, introductorily, look for other candidates. In that respect the Norwegian – or even Nordic or Scandinavian – wood, wood product and pulp and paper industries, based as they are on a natural renewable resource, sail up as promising candidates. These are industries for which there exists valuable literature to build on (Globerman & Schwindt, 1986; D'Aveni & Ilinitch, 1992; Ohanian, 1994; Murray, 1995; Månsson, 2004; Svendsen, 2005). The transferability of our measure for vertical integration and the research design must, of course, be critically assessed with respect to the industry set under scrutiny. One major conclusion from our work is exactly that the measures and methodology employed needs to be aligned with the transactional setting under scrutiny, in which a continuous contextual measure of vertical integration has proved promising, together with a multiple theory approach.

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APPENDIX

CONTENTS

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 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, 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.

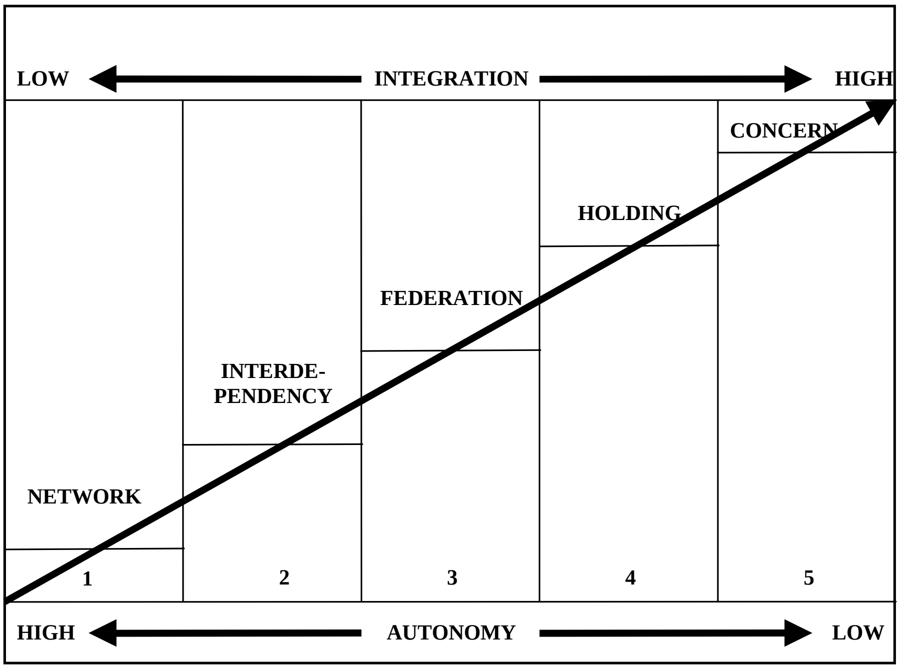

Figure 1 Vertical integration as a continuum (de Koning, 1994)

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 Råfisklag[1]. 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 adressed.

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.

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[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 attendet 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 sample[3]. 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.

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

[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 five[4]. 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
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

Year	All firms	Only freezers
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.

[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 ladder[5]" 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 interviewed[6]. 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 where 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.

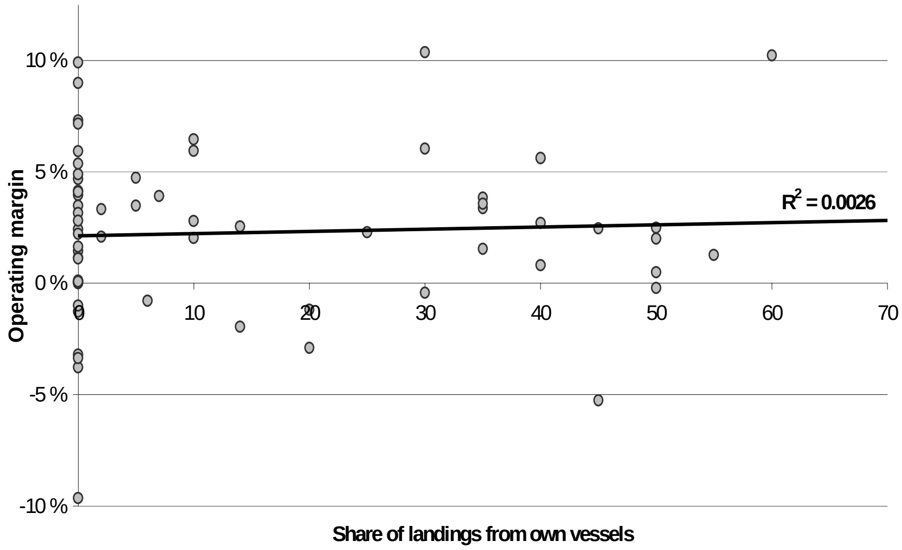

Figure 2a Plot diagram on operating profit margin (OPM) and degree of VI among Norwegian fish processing plants in 1997

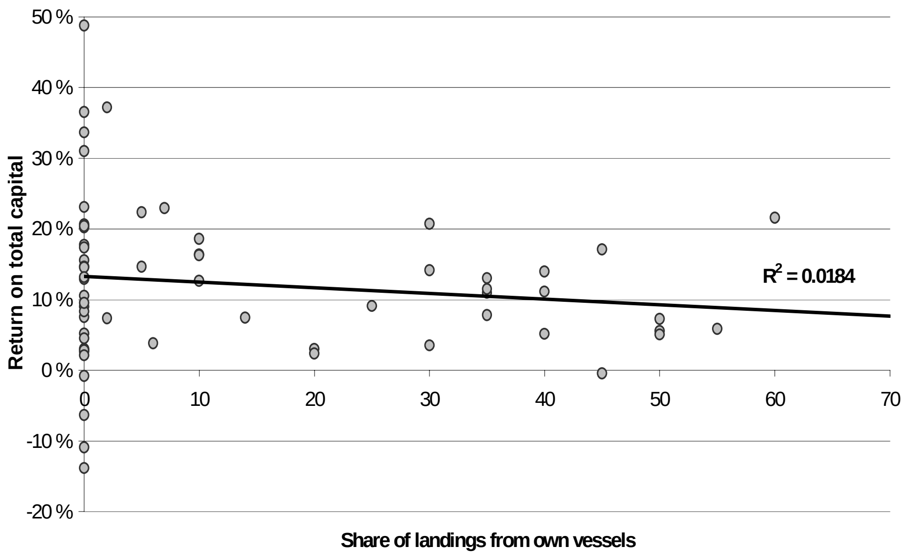

Figure 2b Plot diagram on return on total capital (RTC) and degree of VI among Norwegian fish processing plants in 1997

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 <u>not</u> 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.

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VERTICAL INTEGRATION TOWARDS DIFFERENT SOURCES OF RAW MATERIAL

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ABSTRACT

Vertical integration (VI) is a frequently applied strategy to secure adequate and timely supply believed to influence firms' performance. Empirical findings are, however, so far inconclusive. It has been suggested that the ambiguous results may be due to factors such as variations in uncertainty developments in the industry studied. This paper develops two theory-driven hypotheses related to primary uncertainty and industry age (life cycle) respectively. The hypotheses are tested within the Norwegian fish processing industry, a research setting characterised by variety in both uncertainty and age. We find that the traditional part of the industry, which demonstrate a greater element of primary uncertainty, has to a larger extent than the younger processing industry, which utilises farmed fish, employed VI as a strategic tool in securing the raw material supply. Further, VI seems to have minor impact on performance in both young industries and industries exposed to high degree of "state of nature" uncertainty.

***Key words**: Primary uncertainty, industry age, vertical integration and performance*

1. INTRODUCTION

Firms need adequate and timely supply of input factors to operate effectively. This follows from the input – throughput – output paradigm which states that firms' value creation is brought about by transforming input factors into valuable products and services offered in the output markets. If the market for input factors was "perfect", supply would be no problem and input factors bought in the market. The input factor market may, however, be imperfect, e.g. consisting of one or a few suppliers only. The market for input factors may also be imperfect due to various types of environmental uncertainty (see Sutcliffe & Zaheer, 1998 and Miller & Shamsie, 1999 for recent reviews). One type of environmental uncertainty is what Sutcliffe and Zaheer denotes "primary uncertainty", i.e. uncertainty related to "state of nature". For example, some firms depend on input factors where the supply is almost stochastic, which has attained limited attention in earlier. Here we make an effort to remedy this neglect in the past.

Vertical integration (VI) is a frequently applied strategy to secure adequate and timely supply, assumed to influence firms' performance. Empirical research is, however, so far inconclusive as some studies report positive co-variation between degree of VI and performance, some no relationship while other report negative co-variation between VI and performance (Buzzel, 1983; Stuckey & White, 1993; Dreyer *et al*., 2001).

In this study we report findings from a study on VI towards two dissimilar sources of raw material – farmed and wild fish. The industry studied is the Norwegian fish processing industry. The degree of VI towards these sources is explored, and the impact on performance is reported. Thus our focus is on upstream supply with fish processing as the focal industry. Our findings indicate that fish farmers have integrated downstream and built their own processing plants. Traditional fish processors, however, tend to integrate upstream towards the fishing fleet rather than towards fish farms, and produce next to no farmed fish. We propose different explanations for this development, and discuss how our results may contribute to explain the ambiguous empirical findings reported in the VI literature. In addition we propose explanations to how primary uncertainty may influence VI as well as how to secure supply when such uncertainty is persistent.

2. VERTICAL INTEGRATION

Vertical integration implies that transactions are conducted internally instead of using the market. VI has received considerable attention in research literature, mainly because it is a frequently implemented strategy in many firms and industries. Vertical integration relates to imperfect markets, because under the condition of perfect competition it (VI) has no place. In explaining VI, three perspectives dominate: Transaction cost economics, industrial organisation and strategic management.

The transaction cost economics approach (TCE) provides a coherent framework for investigating the determinants of VI (Coase, 1937; Williamson, 1971, 1975 and 1985). Arrow (1969) defines transaction costs as being *the cost of organising the economic system*. Minimising costs that arise, due to transaction specific investments and uncertainty, impact greatly the way production is organised. Transactions are classified according to whether they take place within the firm or are conducted across markets. The market alternative becomes hazardous in recurring exchanges involving transaction specific capital when information is incomplete. In such cases the firm provides a suitable alternative since common ownership of physical capital discourage opportunism among owners, and is the basis of efficient information transfer and long-term ties in the firm and between its employees. In terms of vertically related production processes, the firm will integrate when the transaction costs outweigh internal costs of management (Coase, 1937; Levy, 1985).

According to the industrial organisation (IO) perspective, VI is a valuable instrument in creating competitive advantage. Porter (1980) argues that the strategic purpose of VI is to utilise different forms of economies, (combined operations, internal control and co-ordination, information, avoiding the market, and stable relationship). Additionally, Porter argues, as do Pfeffer & Salancik (1978), that VI is an important device for reducing external uncertainty and securing supply of critical input.

The resource-based view of the firm (RBV) approaches VI as mainly a differentiation issue (Wernerfelt, 1984; Ramanujam & Varadarajan, 1989; Miller & Shamsie, 1996), and focuses on firm specific resources prior to - and after - integration. To have the potential of sustained competitive advantages firm resources must be valuable, rare, imperfectly mobile, and nonsubstitutable (Barney, 1991).

The three perspectives have different foci. TCE emphasises that vertically integrated firms may have lower costs than do firms utilising the open market. IO emphasises VI as a strategy to achieve competitive advantages and concentrate on industry specific competitive environment as a major moderator on VI impact on performance. The RBV focuses on firm specific resources, stating that VI is a complex and costly strategy.

An often-used typology within organisational ecology is the distinction between “specialists” and “generalists” (Hannan & Freeman, 1977; Carroll, 1984), or other strategic groups. This applies also within some fields of strategy literature (McGee & Thomas, 1986; Thomas & Venkataraman, 1988). Miles & Snow (1978) distinguish between "prospectors", "reactors" and "defenders", where the first mentioned on their continuous search for market opportunities generate changes and uncertainty in the industry. Comparisons between strategic groups when VI is concerned are not straightforward, as different firms may compete in different markets, have different historical development and be in different phases of their life cycle. In an earlier paper (Dreyer *et al*., 2001) we discuss measurement problems in greater detail, and propose ways to overcome them, (i.e. VI as a continuous variable according to de Koning (1994)).

In later years, a greater interest is taken to Industrial Network Theory, outlining the significance of networks as basis for contractual co-operation and as an intermediate state between pure market transactions and VI. As many manufacturers invest in links to external sellers from which they buy specialised inputs, networks are formed (Kranton & Minehart, 2000). This becomes visible, when in demand for input factors uncertainty prevails. Afuah (2001) states that *firm boundaries are dynamic, not static*, and that technological changes can outclass former organisational adaptations to supply (i.e. VI, alliances or market transactions), as supply conditions shift the rationale for the firms. The "in-house" or "through market" decision is made on account of which makes the most efficient generation and exploitation of knowledge (*op. cit.*).

Another theory development in how to explain the "*make or buy*" decision is by the means of *trust*, and it's role in transactions between buyer and seller. Trust, together with other explanatory forces in this relationship, clearly affects the terms of trade between economic actors. From being cited in support of "tacit collusion", trust is now regarded crucial in situations with great behavioural risk, (see Dulsrud (2001) for a recent review).

Although conceptual issues concerning VI have received much attention, predictions of VI and its impact on performance within an industry are rather equivocal.

It has been suggested that factors such as industry structure, degree of uncertainty, and product life cycles may impact both the degree of VI, and on the relationship between VI and performance (Hennart, 1982; Stuckey, 1983; Martin, 1986; Joskow, 1988). However, few studies have tested such assumptions empirically. This paper report an effort to do so, in an industry environment where firms are heterogeneous in terms of both operational control (i.e. stage of the value chain) as well as age and degree of uncertainty.

3. HYPOTHESES

According to the research literature, structure and turbulence in firms' competitive setting affect the degree of VI (Pfeffer & Salancik, 1978; Balakrishnan & Wernerfelt, 1986; Stuckey & White, 1993). When uncertainty is at stake, firms cultivate either VI or market based transactions as strategies for organisation structure (Masten, 1984; Williamson 1991). According to Pfeffer & Salancik (1978) a firm in an open system will have to secure vital resources that enter the production process. When such resources are external, this uncertainty has to be controlled, and VI is one - and often implemented - strategy in this sense. Miller & Shamsie (1999) point out that environmental state uncertainty (cf. primary uncertainty) spurs product variety and may induce firms to new product innovations and broader market scope. Balakrishnan & Wernerfelt (1986) concluded in their analysis that great environmental uncertainty would invoke VI as strategy to avoid this. However, if the uncertainty was of technological nature, the end result would be the opposite. Based on this literature we hypothesise that:

H1: Degree of VI towards raw material is positive correlated with the degree of uncertainty in raw material supply

Industries are created and they develop. Over time they move through stages from being emergent, to growing, maturing and declining (see e.g. Porter (1980)). According to the life cycle theorem (Stigler, 1951; Adleman, 1955; Tucker & Wilder, 1977; Langlois & Robertson, 1992) VI will be adapted to a larger extent among firms in young industries, while the level of VI will decrease as the industry develops. More specific, in a fast growing industry the providers of input factors will not grow rapid enough to satisfy the needs of the producers, which in time will generate a necessity to integrate upstream (Adleman, 1955). Thus, our second hypothesis:

H2: Degree of upstream VI in young industries will be higher than in more mature industries

In the next sections design and data chosen in order to test these hypotheses will be described.

4. RESEARCH DESIGN

Our study is limited to a single industry with the firm as focus. A prime reason for focusing on one industry only is to eliminate for the so-called industry effect, i.e. variation across industries that may affect the phenomenon to be explained, as recommended by Casson (1984). Joskow (1988) recommends that all studies of VI must be based on industry specific knowledge of firm structure, production and products in the analysed setting. Our motive is to establish a relationship between degree of VI and performance. Literature reviewed suggests both industry age and uncertainty as heavy moderators of the effect of VI on performance. Thus, this is operationalised through the firms' choice of input factors. This is our conceptual model. The chosen population must therefore meet two prerequisites to allow for testing the stated hypotheses. First, the firms within this industry must have access to alternative sources of raw material. Second, the industry studied must consist of firms that are heterogeneous as far as VI towards the alternative raw material sources is concerned, in order to account for the needed variation in degree of uncertainty, supply and stages of historical development. These are the variables we have limited our study to. An industry meeting these claims is the fish processing industry in Norway, which we study here. Moreover, data at firm level is needed to test the first hypothesis.

4.1. Setting

The industry studied has evolved over many hundred years, and has based its production on catches at sea. The last twenty years, however, a new alternative source of supply has emerged on the raw fish market - namely farmed fish. Uncertainty in supply from farmed fish is far less compared to the traditional harvesting of wild fish.

The traditional processing industry is exposed to high levels of uncertainty in supply of raw material, due to seasonal harvesting where biology, abundance and markets matter (Dreyer, 1998). Therefore, downstream VI towards the fishing fleet is considered an alternative strategy for controlling the most important input factor (Dreyer *et al.*, 2001). Institutional barriers, i.e. legislation securing vessel ownership to active fishermen, have, however, to some extent reduced implementation of this strategy.

Fish farming is a rather young industry in Norway. The emerging of this raw material source has taken place at the same time as traditional processing industry has sought ways to overcome its volatile raw material supply. Farmed fish could enter this production process with few institutional or technological obstacles. Though, instead of exploiting this new input factor in the traditional fish processing industry, fish farmers have integrated downstream by establishing processing plant for this raw material alone. Here we try to shed some light over this apparent puzzle.

4.2. Data

As argued above, the industry is well suited for testing our hypotheses. The data originate from "Driftsundersøkelsen i Fiskeindustrien", a yearly, ongoing profitability survey (Bendiksen, 2001). Since the same companies are surveyed each year, the data allows for the construction of a panel data set. The survey provides the main accounting and production figures at firm and industry level, and allows for comparisons of performance among different strategic groups. The data is well suited for developing continuous measurements on degree of VI. Available performance measures for every firm also makes it possible to map the firms' relative competitive position every year. Additionally, telephone interviews were conducted with general managers in the industry, focusing on VI issues towards both wild and farmed fish. The telephone interview data was collected in order to test empirically the way uncertainty and stage of life cycle impact the degree of upstream VI, together with the impact of VI on performance. The shorter life span of fish farming compared to wild catches also allows for testing of the life cycle hypothesis.

4.3. Measurements

As recommended in literature, we have emphasised the need for continuous measurements of VI adjusted to the industry studied (Eckhard, 1979;

Martin, 1986; de Koning, 1994). We also analyse the magnitude of firms in the total population that process farmed fish, in order to study structural issues in the population, like specialisation and division of labour. However, this only captures the differentiation dimension of VI as emphasised in the RBV. Therefore, ownership is incorporated as a crucial dimension of VI, and two measures of ownership are constructed, i.e. share of processing plants owning fishing vessels (**VI1**) and share of processing plants owning fish farms (**VI2**). A third dimension is to what degree the processing plants are supplied with raw material from units they own. The next two variables therefore capture the share of total raw material supply stemming from vessels or fish farms where the processing plants have proprietary interests, in order to establish systematic differences in adaptation of VI between the strategic groups: **VI3** measures the share of supply from own vessels, and **VI4** captures the share from own fish farms.

Our data include financial statements, and are well suited for measuring financial performance. To assess performance we have applied two financial key figures: the rate of EBT (Earnings Before Tax) to turnover and Return on Total Capital (RTC).

4.4. Empirical hypotheses

Due to different levels of underlying uncertainty in the two distinct raw material bases we predict the degree of VI to be higher towards wild fish than farmed fish (see H1). On the other hand, wild fish has been available to the processing industry for ages, while farmed fish has only been available for a few decades. According to the life cycle theorem a higher degree of VI towards farmed fish than towards wild fish can be predicted (c.f. H2). This contradiction emphasises the need to test this empirical. The setting and design chosen here allows for comparing the importance of the two theorems. In proposing our empirical hypotheses we have emphasised the uncertainty theorem, and accordingly we predict:

EH1: VI1 to outweigh VI2

EH2: VI3 to outweigh VI4

Important parts of our study focus on the impact of VI on performance. In order to test this we apply the variables VI3 and VI4 to capture levels of VI. We predict that the impact of VI will be as argued earlier, i.e. that degree of VI is positively correlated to economic results, and that among those processing wild fish, VI towards the fishing fleet occur more often than farmed fish processors integrating towards fish farms. Our empirical hypotheses concerning impact on performance are:

EH3: There is a positive correlation between VI and performance

EH4: The correlation between economic performance and VI is higher towards wild fish than towards farmed fish

Another test, made possible by our data, is to analyse performance among different adaptations to different sources of supply. Three strategic groups will here be compared – **Specialist 1**; **S1** (i.e. process only wild fish), **Specialist 2**; **S2** (i.e. process only farmed fish) and **Generalist**; **G** (i.e. process both farmed and wild fish). In this way we are able to incorporate and refine our findings further on strategic groups.

5. FINDINGS

In the year of 2000 there was about 550 fish processing units in Norway. The number of producers included in the annual profitability study was about 450, due to lacking account figures, varying company constellations, etc. With regards to raw material, about 60 % of the firms make use of caught whitefish, 20 % farmed salmon or trout and about 5 % both wild and farmed fish. The remaining firms utilise pelagic species or crustaceans (mainly shrimp). As about 80 % of all farmed fish are exported round, only 36 % of those who handle farmed fish process the fish further than merely slaughtering and packing. In the following we treat those who process both wild and farmed fish as a distinct strategic group (**G**), when testing the empirical hypotheses.

To test our first hypothesis, two empirical hypotheses were specified (EH1 and EH2). Inspecting our data show that proprietary interests in fishing vessels are employed to a higher degree than in fish farms, (**VI1>VI2**). Of all the units in the industry, 20 % has ownership in fishing vessels, while only 8 % own shares in fish farms. Hence **EH1** is confirmed. In addition, three firms have proprietary interests in both fishing vessels and fish farms.

Table 1 shows that the group S1 receives on average 16 %, S2 78 % and G 30 % of their annual raw material supply from vessels and fish farms they own. Hence **EH2** is rejected, as wild fish processors do not obtain more raw materials from VI units than those processing farmed fish, (**VI3<VI4**). Another conclusion is that there is a significant difference in degree of VI between the groups, as shown by the *t-value* in the last column of Table 1.

Table 1 Degree of VI in – and between – three strategic groups; S1 processing only wild fish, S2 processing only farmed fish and G processing both farmed and wild fish

t-test	**VI**			
	N	Mean	St.dev	t-value
S1 – S2	57	16.087	20.137	-8.85*
S2 – G	21	78.048	29.661	-5.27*
G – S1	19	29.737	28.287	-2.30*

*) Significance level < 0.01

Table 2 reports the test results from the impact of VI on performance within the industry, i.e. test **EH3** by means of the three strategic groups. By taking the above information into account, Table 2 also indicates that there is seemingly no impact of VI on performance within this industry (between **VI3** and **VI4** and EBT/Turnover and RTC). This conclusion holds for all groups and both performance measures. Hence, **EH3** is rejected.

Table 2 VI and performance in strategic groups

Sample	EBT/Turnover			RTC		
	β	σ	R^2	β	σ	R^2
S1 (n=57)	-0.012	0.001	0.002	0.064	0.098	0.008
S2 (n=21)	0.038	0,101	0.008	-0,040	0.123	0.006
G (n=19)	0.085	0.055	0.119	0.036	0.131	0.004

As fish processing firms operate in an utterly dynamic setting, as well as we have argued for a life cycle approach to the problem, we expand our test for a series of three years. Table 3 reports the test results from whether differences in performance among the three strategic groups are present for the years 1998-2000. This in order to secure validity in our findings through testing for a subsequent series of years *between* the groups, and to comply with the recommendations of Casson (1984) that studies of variation of VI within an industry should be carried out over time.

Table 3 Degree of VI and influence on performance in strategic groups, 1998-2000

t-test		EBT/Turnover			Return on Total Capital		
		Mean	Stdev	t-value	Mean	Stdev	t-value
2000	**S1** – S2	-0.0217	0.058	-1.51	0.0249	0.148	-1.29
	S2 – G	0.0232	0.131	-0.10	0.0768	0.160	-0.10
	G – S1	0.0200	0.070	-2.36*	0.0720	0.153	-1.17
1999	**S1** – S2	-0.0191	0.074	-1.83	0.0381	0.153	-0.99
	S2 – G	0.0328	0.121	-1.07	0.0863	0.202	-0.50
	G – S1	0.0029	0.037	-1.69	0.0625	0.078	-0.89
1998	**S1** – S2	0.0493	0.053	1.73	0.2101	0.193	3.02*
	S2 – G	-0.0067	0.137	0.16	0.0046	0.273	1.14
	G – S1	-0.0012	0.070	2.86*	0.0777	0.064	4.41*

*) Significance level < 0.01

As can be seen from Table 3 no overall significant differences in performance between the strategic groups can be found even when the period study was enlarged. However, an exceptional good year in the white fish (**S1**) branch in 1998 leads to significant better results in this group than among generalists (**G**) that year. Significant better than those who only process farmed fish (**S2**), as well, when return on total capital is in question. Further tests on these relationships reveal that changes in margins at product level imply heavier impact on performance than VI.

6. CONCLUDING REMARKS

Our findings indicate that the impact of VI on performance is minor both in young industries and industries with heavily fluctuating supply of raw material. The spread and degree of VI seems to be highest in the youngest part of the industry (i.e. farmed fish) and lowest in the oldest part (i.e. wild fish), that processes from the most volatile raw material source. The direction of VI varies, as downstream VI dominates in the young and stable supply industry, whilst upstream VI dominates in the old and uncertain supply part. These findings support the life cycle theorem, whilst less support is found for the uncertainty theorem.

This study has emphasised the importance of focusing on how to measure VI. In the setting studied we have demonstrated high degree of VI at firm level among the farmed fish processors. However, when focusing on VI at industry level, we observe that most of the farmed fish are sold unprocessed to foreign actors, and that the fish farming industry is severely integrated towards the wholesales market. This indicates low degree of VI at industry level, but high degree of VI among the few existing processors of farmed fish in Norway. Further, it emphasises the need for thorough knowledge to the industry studied, as measurements on different stages in the value chain – even at different industry levels – can result in spurious regressions and, hence, wrong conclusions.

Our findings give support to the RBV focus on VI as mainly a differentiation issue. Although the older part of the fish processing industry were given the opportunity to integrate towards a new and stable raw material source, our findings indicate that they did not seize this possibility. In stead, history indicates that the industry has separated into two directions: one specialising in processing wild fish and the other farmed.

Additionally the RBV may also contribute to a better understanding of the contradicting empirical results concerning impact of VI. Obvious, some firms experience positive pay-off from VI, while other, in the same setting and period of time, experience negative pay off from VI. This indicate that in order to obtain a better understanding of the impact of VI on performance, the portfolio of other firm specific resources must be included in further studies of this impact.

An indication of new directions of further research on VI might be found among the answers given by top managers in the established processing plants on the question why they did not take the opportunity to integrate towards farmed raw material. According to them this was not connected to technical, institutional or competence barriers, but rather to profitability concerns. Due to high prices on raw material and strong global competition on farmed fish, the profits among farmed fish processors, as shown in Table 3, has been rather low and for long periods losses have been substantial in this part of the industry. This indicates the need for focusing on profitability concerns when considering VI.

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VERTICAL INTEGRATION AND PERFORMANCE

The Impact of Measurements and Industry

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ABSTRACT

Vertical integration (VI) is a frequently applied strategy in order to overcome market imperfections and thus enhance firms' performance. Empirical findings from past research, however, show mixed results. Positive, negative - as well as nonsignificant - covariation between VI and performance has been observed. Closer inspection of empirical findings also shows 1) that the covariation between VI and performance varies across industries and 2) that different measures have been applied in different studies.

This paper reviews findings reported related to the vertical integration - performance relationships (covariation). To examine the strengths and weaknesses of the various measures we control for the so-called "industry-effect" by applying various measures of vertical integration in <u>one</u> industry setting - the Norwegian fish processing industry. In doing so a unique data set from a panel of firms containing detailed information about performance indicators and vertical integration is applied. Our findings show variations in the VI-performance link across measures and firms. The applicability of the various measures is critically assessed – and managerial implications highlighted.

Key Words: Vertical integration, performance, measurements, fish processing industry

1. INTRODUCTION

Vertical integration is believed to create different economies and thereby influence performance positively, when applied under conditions characterised by market failures, e.g. substantial transaction costs, demand variability, high market uncertainty. However, when reviewing literature on vertical integration, findings with regard to performance effect are not unequivocal. Here we attempt to shed some light over this puzzle, by the means of a closer inspection of measurements controlling for the industry effect. Our primary objective is to examine the performance of an industry, consisting of multiple firms, and where vertical integration (VI) is applied to a varying degree. We therefore attempt to examine to what extent the implementation of varying degree of vertical integration influence financial performance, from not integrated at all to fully integrated. In addition, we will focus on some problems regarding choice of measurements, and also discuss how the industry effect tend to alter conclusions in studies like our.

The essence of the phenomenon vertical integration can be decomposed to one economic entity's possession of successive stages in the input-throughput-output paradigm, i.e. the value chain from raw material to consumers. A suitable question can be why adjacent stages of production, which could have been undertaken by separate firms, are governed within the boundaries of one firm? The answer is concealed in the weighted cost comparison between market exchanges and internal resources. Within the field of logistics the presence of vertical integration have been given explanatory force when assessing reduced transportation costs and lowered cost structures (Copacino, 1999), and can be viewed as an alternative to supply chain management (Ellram, 1991). VI is therefore an often addressed topic when buyer-seller relationships are investigated (see e.g. Bowersox and Droge, 1989, Caputo and Mininno, 1996, Heriot and Kulkarni, 2001, Hingley, 2001, Mixon Jr. and Upadhyaya, 1994, Smith, 1993, Spina and Zotteri, 2001)

Several problems arise when trying to assess the performance effects from firms integrating vertically into adjacent stages of the value chain. First, measurement problems exist regarding both VI and performance: How do we capture the true nature of VI on one hand, and on the other hand financial performance of firms (and industry). Second, when trying to isolate this effect: How do we know that what we measure assert itself at the firm level and is not a product of the industry structure in question? In this paper we offer some suggestions to how these problems can be dealt with, by employing different measurements for VI and performance, and thoroughly analysing the environment in which firms are situated. We also report findings from a study carried out in the Norwegian fish processing industry, where firms' upstream VI towards the fishing fleet was assessed, and compared with the financial outcome of their businesses.

The rest of the paper is organised as follows: the next section give a short review of theories helping to explain the persistence of VI as well as their predictions on performance effects. We also provide a review of earlier empirical studies on the VI-performance (VI-P) relationship. In section 3 we present our data and the setting studied, before we in section 4 give our analyses and results. Included, of course, is a critical assessment of our findings, where managerial and methodological implications are highlighted.

2. VERTICAL INTEGRATION – APPROACH

Vertical integration has attracted researchers' interest for decades, if not centuries, going back to Adam Smith and the division of labour, brought forward by Young (1928), and Stigler (1951). In *neoclassic theory* co-ordination between separate organisations – even in the presence of bounded rationality and opportunism – will be governed by a market system rather than managed internally within a firm. In the early work of Coase (1937), which has been revitalised and 'illuminated' by Chandler (1962) and Williamson (1971) among others, the boundaries of the firm was ascertained in light of transaction costs. The transaction costs explanation was grounded by the shortcomings of exploiting the market for allocating resources between adjacent stages in the value chain. This in turn gave firms motives for 'making' instead of 'buying' and 'using' instead of 'selling'. Transaction costs being merely *"…the cost of organizing the economic system"* (Arrow, 1969), and *"…there would be no reason for business firms to exist if (…) we could foresee the future perfectly and there were no costs in negotiating and renegotiating long-term contracts"* (Azzam and Pagoulatos, 1999; p. 10).

2.1. Three theoretical approaches

In an earlier paper we have argued that three perspectives dominate the analysis of VI (Dreyer *et al.*, 2001) – namely *transaction costs economics* (TCE), *industrial organisation* (IO) and *strategic management* (SM), as do Chatterjee (1991). Other scholars have emphasised different perspectives: TCE and property rights (Woodruff, 2002), TCE and imperfect competition/neoclassical approach (McFetridge, 1999), TCE and market power (MacDonald, 1985), TCE and demand variability (Carlton, 1979; Lieberman, 1991), while others again stress industrial development and historical change (Desai and Mukherji, 2001; French, 1989). Theories can be viewed upon as explanations, and different theories capture partly different aspects of the phenomenon under scrutiny. Here we are applying elements from theories that – for the best of our knowledge – capture the actual phenomenon. One single general theory might indeed not be able to provide a compact explanation of VI (Joskow, 1988). Langlois and Robertson (1989; p. 361) concluded in their study of VI in American automobile industry: *"An examination of the whole history suggests that no single theory always fits the facts perfectly. A complete explanation must combine specific theories in a way that is attentive to such factors as industry life-cycle, demand, economies of scale, and appropriability."*

Transaction costs economics (TCE) have received considerably attention in explaining the existence – and effects – of VI. It is frequently applied to document the outcome regarding the vertical structuring of production (Shelanski and Klein, 1995). In particular, the arguments of asset specificity, which refers to the existence of significant transaction-specific sunk costs (Whyte, 1994), and uncertainty (Balakrishnan and Wernerfelt, 1986) are given considerably power to explain the occurrence of VI. Another distinctive variable is small-number exchange conditions, i.e. few transactors on both sides of the market (Caves and Bradburd, 1988; Frank and Henderson, 1992). TCE also predicts that organising transactions internally, through VI or other forms of vertical coordination, creates economies that make it profitable as long as *"…costs of transacting over market outweighs internal costs of management"* (Levy, 1985; p. 439). In its 'purest' form, i.e. vertical financial ownership, VI enhance profits since inter-firm profit claims are eliminated (Mahoney, 1992). This strategic decision is then a transaction-cost-minimising response to the limited information and the cost of contracting (Medema, 1992).

Within the field of *industrial organisation* (IO) economics, the primary determinant of VI is market structure – or rather *asymmetric* market structures (Chatterjee, 1991). This school of thought has traditionally been preoccupied with VI when focusing on barriers to entry (Aghion and Bolton, 1988), raising rivals costs (Salop and Scheffman, 1987) and foreclosure (Hart and Tirole, 1990; Salinger, 1988). According to this theoretical perspective VI can constitute a valuable instrument to create competitive advantages, either by utilising different economies (combined operations, internal control and co-ordination, information, avoiding the market, and stable relationship) or merely by reducing external uncertainty or securing supply of critical input (Porter, 1980). According to the IO perspective VI should lower firm's risk in markets with demand and volume uncertainty, which consist of few actors, increasing the profits for those applying the VI strategy.

Within the field of *strategic management* (SM) multiple approaches have been applied to ease managerial processes in situations with high uncertainty. The SM-approach is heavily grounded in managerial and organisational practice (Rumelt *et al.*, 1991). According to Chatterjee (1991) and Chatterjee *et al.* (1992) SM has so far been the sparsest and most inconsistent one of the three streams of research into VI. However, the resource-based view of the firm (RBV), in emphasising creation of heterogeneous, valuable and rare combinations of resources giving rise to competitive advantages that are hard to imitate (Barney, 1991; Wernerfelt, 1984), have contributed to improvements in our understanding of VI (Mahoney, 1992). The RBV approach implies, however, that there are no simple rules of thumb on when, and how to apply VI. For every VI decision the actual situation must be taken into account (Balakrishnan and Wernerfelt, 1986), requiring thorough and detailed analysis of the actual situation and context.

These theoretical fields, together with contributions from scholars within these, form the basis of the following analysis. TCE provides insights on the benefits of VI. IO explains how the competitive setting makes VI a valuable strategy and how to elaborate adequate VI measures. SM and the RBV emphasises the importance of internal resources when implementing VI and how complexity and internal barriers can make VI a costly strategy. Though, first we will present a synopsis of the empirical work concerning the relationship between VI and performance.

2.2. Empirical findings on the VI-performance relationship

The way various explanatory factors affect financial performance is an often-addressed topic within several disciplines. Within traditional economics where perfect competition prevails, firms within an industry are supposed to be identical, where price- and quantity decisions are the only strategic choices. Meeting the same demand, such firms would in the long run exhibit average profits, and hence, an analysis of inter-firm differences would give no meaning, as long as market failures do not consist (Yao, 1988).

Researchers from various disciplines have addressed the VI-P relationship puzzle empirically. The point of departure of the conducted studies differs, but to some degree they tend to coincide methodologically. Usually the impact of one or more explanatory factors on performance is estimated by using some statistical procedure(s) keeping other factors constant. The findings must be treated critically as measurement of performance inhibit potential shortcomings (e.g. performance is unstable, it is surrounded by causal complexity and data used are retrospective (March and Sutton, 1997)).

A useful point of departure for assessing past empirical research related to the VI-P relationship is the meta-analysis by Capon *et al.* (1990). This analysis include 320 empirical studies from disciplines mentioned above, stemming from journals, books, proceedings, dissertations and working papers during the period from 1921 to 1987, where financial performance is the dependent variable. The authors identify 15 studies in which VI (forward or backward) is utilised to examine its effect on financial performance. Several studies use multiple tests, and in 69 cases a positive relationship between VI and financial performance are reported, while 35 reported a negative relationship. Summing up, these studies show a positive relationship (covariation) between VI and performance. However, when distinguishing between industries and businesses (business units), the findings become highly mixed. Thus, the aggregated findings obviously need closer examination.

So far the great majority of the studies on VI and performance has been conceptual, while empirical studies have been relative few. From the limited number of empirical studies one can also conclude that the issues in question have concentrated on transaction costs, foreclosure, and causes for VI, rather than on the effects of VI on performance (Bhuyan, 2002). In the following sections, the specific empirical studies, dealing directly with the VI-P relationship, will be scrutinised. Table 1 sums up the characteristics and findings in some studies investigating the VI-P relationship. None of them entered Capon *et al.*'s (1990) meta-analysis.

Table 1 Studies investigating the VI-performance relationship empirically

Source	Focal industry	Co-variation	Measure	
			Vertical integration	**Financial performance**
Vesey (1978)	PIMS (1971-74)	+/-	VA/S (profit adjusted)	ROI
Levin (1981)	U.S. oil industry	0/+	Self sufficiency (crude oil and refinery)	(Net income + financial costs) / sales
Buzzel (1983)	PIMS (1,649 business units)	+/-	-VA/S (adjusted for investment and profit) -Relative VI (interview)	Mainly ROI
Maddigan and Zaima (1985)	Random sample of 45 firms	-/+	Maddigans (1981) VIC measure	ROA
Harrigan (1986)	192 firms in 16 industries, 1960-81 (SBUs)	+/-	Several (degree, breadth, stages and form)	Successful vs. unsuccessful
Martin (1986)	288 U.S. industries	+/-	Back- and forward integration. Input Output tables	Price cost margin = VA adjusted for labour and capital costs / sales
Chatterjee (1991)	116 vertical mergers (1962-79)	+/-	Actual merger (FTC) compared with firms in the same industry (SIC)	Cumulative abnormal return in market value (shares)
D'Aveni and Ravenscraft (1994)	3,185 manufact. lines of business	(+)	Internal flow of goods relative to external	Operating revenue over total sale
Edwards *et al.* (2000)	U.S. Oil Companies	+/++	Share of own production	Standard and Poor's stock rating
Fan and Lang (2000)	About 500 industries	- -	Vertical relatedness (Rumelt) – input transfer between industries	Excess value = firms actual value over imputed value, (market value)
Bhuyan (2002)	U.S. food manu-facturing industry	-	Input-Output matrix (Davies and Morris, 1995)	Price cost margin: (total sales – tot. costs)/tot. sales

Table 1 reveals that findings regarding the VI-P relationship are rather ambiguous. The table also shows that a number of various measures have been applied, for both VI and performance. In addition, the numerous settings and periods studied have to a large extent varied. Regarding the studies included in Table 1 we also want to emphasise the following.

Based on the proxy measure first suggested by Adelman (1955) Vesey, (1978; p. 11) defines VI as: *"the ratio of value added to sales, with both numerator and denominator adjusted for profits."* (E.g. value added divided by sales, VA/S). He measures profitability by the return on investments (ROI), and uses the PIMS database with about 600 businesses from 100 companies. He finds that high degree of VI is not always the most profitable, that backward VI is more profitable than forward, and that VI, in the business climate at that time, was the third most profit influencing factor, after market share and business climate.

Buzzel (1983) also employ the VA/S measure (adjusted for net profit and 20% of investments) and the PIMS database, where he utilised data covering 1,649 business units in the manufacturing industries. He also used a relative measure for VI, obtained by asking managers whether their line of business or company were more or less VI than competitors. Profitability was (mainly) measured by means of ROI, and he found that either very low or very high levels of VI yields above-average rate of return. Further, that ROI declined consistently over the whole range of VA/S for producers of raw and semifinished material and that for the relative VI measure, ROI was slightly enhanced from backward VI.

The justification for using VA/S as a measure for VI was the assumption that it would increase as firms integrated vertically, forwards and backwards, when transactions were carried out within instead of across firms (Davies and Morris, 1995). Several authors have pointed at many shortcomings of this measure. For instance Maddigan and Zaima (1985), as a direct answer to Buzzel's study, asserts that that VA/S will be higher at earlier stages of production, and that more profitable firms, or firms with relatively higher labour and capital productivity, will tend to score higher on this measure. Maddigan and Zaima, by comparing Maddigan's (1981) vertical industry connections (VIC) to the VA/S indices on a random sample of 45 firms' return on assets (ROA), found that the two drew the opposite conclusions. While VA/S again showed that the extreme levels of VI were the most profitable Maddigans VIC index suggested that moderate levels of VI would induce the greatest profitability.

The arguments against VA/S for being higher the closer the firm is to the raw material source have been conspicuous. Others have criticised the measure for being more sensitive for backward than forward integration (Martin, 1986), that it does not reflect the choices firms make about coordinating potentially separable economic activities (Caves and Bradburd, 1988), and also when measured at individual enterprises it becomes sensitive for multiplant backward integration (Levy, 1985). An additional objection is that it does not capture the firm's partial consolidation of control through contracts and other agreements (Frank and Henderson, 1992).

The VIC index introduced by Maddigan (1981) – which relies on national input-output tables (Leontief, 1951) and information on the industries in which a firm operates with the average share of these industries' production – has also been met with criticism, arguing that it fails to account for partial integration within an industry (Levy, 1985), and that it is a firm level index and therefore not feasible on the industry level (Davies and Morris, 1995). Henderson (1994) also criticises this measure of VI for only including industries in which the firm has a 100 per cent ownership, and thereby omitting what Blois (1972) calls 'quasi-vertical integration (i.e. control through partial ownership).

Levin (1981), in relating VI and profitability in the U.S. oil industry (43 companies in the period 1948-72), introduces "self-sufficiency" as a measure of VI. Self-sufficiency is the quotient of crude oil production divided by the sum of crude oil production plus refinery runs, which will be 0 for unintegrated refiners and 1 for unintegrated crude oil producers. Balanced integration, he states, will be given the value 0.5. Profitability is measured by net income plus interest payments divided by total revenue. Levin finds that this is not affected by the degree of VI towards crude oil or refinery production but VI helps reducing the variation in profits over time. He identifies considerable variation in the self-sufficiency ratio for most firms over time, and that this evolutionary approach does not reveal any trends in neither more nor less VI.

Harrigan (1986), in underlining the many faces of VI, states that it is a multidimensional construct. She distinguishes between *degree*, *stages*, *breadth* and *form* of VI and identifies successful and unsuccessful firms from in-depth interviews with 192 firms in 16 industries in the period 1960-81. *Degree* of VI was measured by the percentage of internal purchases (backward VI) and sales (forward VI), and *form* of VI was measured by the ownership percentage in the venture. Her main findings were that involvement in many integrated stages couldn't be sustained with the same success throughout the industry's entire span of life and that VI was indeed a costly strategy. VI should therefore be adjusted to changing conditions.

Martin (1986) constructs an input-output table measure of the average industry (backward and forward) vertical integration, varying between 0 (no VI) and 1 (full VI) and tests it within the limits of a structure-conduct-performance model. Profitability is measured by a price cost margin, and he finds that the effect of VI on profitability is complex: depending on whether one integrates *into* the industry or *out of* the industry. Some time it's positive and sometimes its negative, which supports a 'case by case' approach when VI is contemplated.

Chatterjee (1991) studies 116 U.S. vertical mergers from 1962 to 1979 and compares them with firms in the same industry. He measures profitability by cumulative abnormal return (stock market measure) and finds that target firms gain about 20 per cent while the acquiring firm have next to no effect on profit. His findings support those of the IO literature in the way that advantages through VI are greatest when the acquiring firm operates in concentrated markets, while target firms where in competitive markets, so that mergers leads to increased market power.

D'Aveni and Ravenscraft (1994), in their study of 3,185 manufacturing business lines, use internal flow of goods relative to external as a measure of VI. Operating revenues over sales was their performance measure, and they report that VI units displayed marginally better profitability than nonintegrated business lines in the same industry, after controlling for economies of scale and scope. However, VI units had higher production costs (especially backward vertically integrated units), but economised through other cost components (R&D, advertising, administrative and general expenditures).

Another study examining the VI-P relationship in the U.S. oil industry is presented by Edwards *et al.*, (2000). They regard VI as the share of production coming from own crude oil extraction (i.e. backward VI) and share of refinery runs shipped through own pipelines (i.e. forward VI). Profitability is measured by the company's stock rating of Standard and Poor's *Stock Guide*. Observing two distinct separate time periods – 1972 and 1992-94 – they find that crude oil production strongly enhances performance, while pipeline integration shows a weak positive effect despite an efficient market with many independent pipeline companies. Further, the average level of integration fell between the early 1970's and 1990's and larger oil companies remain the most integrated.

The only study using Rumelts diversification strategies (Rumelt, 1974) is Fan and Lang (2000). The authors apply commodity flow input-output tables to capture interindustry and intersegment vertical relatedness and complimentarity. They find that vertical relatedness is, on average, associated with poor performance. Complementarity, on the other hand, is positively correlated with firm value, as measured by excess value.

Bhuyan (2002) examines how the impact from vertical mergers in U.S. food manufacturing industries affect profitability, simultaneously controlling for industry characteristics like productivity and competitive conditions. His VI measure is based on input-output tables and the earlier work by Caves and Bradburd (1988), MacDonald (1985) and Davies and Morris (1995), while net industry profit - computed as a price cost margin - serves as proxy to performance. Bhuyan finds that VI negatively affects profitability, which he explains by the failure of vertical mergers to creating differential advantages for the integrated firm.

Another study, which do not enter Table 1, is Shin (2001) who examines the impact of information technology (IT) spending on performance. He finds that this has a significant effect in vertical *dis*integrated (as measured by the inverse of VA/S) firms when performance is measured by net profits (not ROE or ROA).

Noting the recommendations from other researchers we emphasise the suitability of the measures to be applied. In accordance with Harrigan (1986; p. 538): *"…to be useful to managers, measures of VI should not be made at the industry level […] Some measures should be at the 'firm' level, some measures should look at relationships between business units, and others should incorporate comparisons with how competitors use vertical integration."*

When summing up the empirical work on the VI-performance relationship, we find that:

- ✓ VI is a multidimensional construct
- ✓ VI is difficult to measure
- ✓ Results from different studies are difficult to compare
- ✓ Findings on the VI-P relationship is ambiguous

Another measurement problem arising in attempts trying to establish the VI-P relationship, is how to measure performance. In past empirical studies multiple measures have been applied, including accounting measures providing the operating performance – giving an indication of past and present organisational adoption – and market based performance measures (Tobin's *q*, abnormal return, etc.) – giving a future-oriented consideration of organisations ability to change (Keats and Hitt, 1988). They concluded (p. 526): *"Performance is a difficult concept, both in terms of definitions and measurement."*

Here we address the measurement problem and the way application of different measures impact on the VI-P relationship. To focus on this problem we have chosen to avoid the potential industry effect by focusing on a single industry. Based on the review on how VI have been measured in previous studies, we intend to include several measurements, adopting them to this specific setting, and inspecting to what degree the VI-P relationship alter when different measures are applied.

3. TESTING THE VI-PERFORMANCE RELATIONSHIP

In order to test the relationship between VI and performance some prerequisites must be met by the data applied. We have in earlier studies focused on various concepts regarding VI in the Norwegian fish processing industry: In Dreyer *et al.* (2001) we explored ways to overcome difficulties in carrying out empirical studies on the impact of VI on performance. Especially how to operationalise VI in such a setting by designing a measure that captures the actual 'level' of VI in this particular industry. In Isaksen *et al.* (2002) we further investigated the state of VI in this industry by means of finding the determinants for integrating vertically – primary uncertainty in the industry and/or the industry age. Trading on these two studies this research stream will here be further developed by trying to establish the proper way to measure VI and performance. In this section we elaborate the setting more thoroughly, present our research design before elucidating which measures to use for testing the impact from VI on performance.

3.1. The Norwegian fish processing industry

Some basic requirements must be met in order to explore the effect from VI upon performance. By limiting our study to the Norwegian fish processing industry we will argue that the following needs are met: First, we need a competitive setting in which the units studied are motivated to integrate vertically. Second, the industry must be composed of firms that vary in degree of VI, and third, detailed data at firm level must be available in order to measure performance and degree of VI.

By limiting our study to the Norwegian fish processing industry we apprehend a link in the seafood value chain, situated between the resource and the consumers, in which several structural variables motivate for VI. As underlined by Dreyer (1998) and Prochaska (1984) among others, managers of fish processing firms are subject to an almost stochastic supply of the most important input factor; namely fish. Uncertainty is also persistent in the other end of the value chain, where prices and output fluctuate heavily. In the literature this has been emphasised as a situation bringing about needs for VI by several authors (Carlton, 1979; Fan, 2000; MacMillan *et al.*, 1986; Miller and Shamsie, 1999; Perry, 1982; Walker and Weber, 1987; Williamson, 1991a). In our setting uncertainty differences among firms also emerge as some rely on wild caught fish – with the risky environment surrounding this biological resource (seasonality, quality, abundancy, meteorology) – while others processing farmed fish have more stable supply. Therefore upstream VI towards the fishing fleet or aquaculture industry, in order to achieve control over the most important input factor is a meaningful strategy to reduce uncertainty or to secure a sufficient supply. Even though farmed fish, as a more stable source of supply, has emerged the last decades, firms in the traditional part of the industry have only to a limited extent ceased the opportunity to take advantage of this. The reason why is hard to grasp, as this raw material source easily could be implemented as a substitute in complementary production processes. However, firms defining their core competencies (see e.g. Kannan and Tan, 2002, Reve, 1991) might have contributed to this exclusion of farmed fish, together with persistent high uncertainty levels in the emerging stages of this industry's life-cycle (c.f. Isaksen *et al.*, 2002).

Another feature descriptive of this industry, which also makes VI an attractive strategy, is the age of the industry (cf. Stigler's (1951) life cycle hypothesis). One can divide the industry in a young and an old component, the young being those which most important input factor come from aquaculture and the older being those relying on caught wild fish. According to this hypothesis, firms in young and fast growing industries are expected to integrate backwards in order to secure important input factors. As the industry matures the need for VI diminishes, until it in the last stages of the industry life cycle again increase (Langlois and Robertson, 1989; Tucker and Wilder, 1977). The difficulty remains, however, to determine whether those relying on while caught fish as the most important input factor are to be considered a mature or an old industry. This, however, do not reduce the feasibility of integrating vertically towards the raw material source.

That the Norwegian fish processing industry in fact is a very competitive setting remains to be elaborated a bit further. In 2000, 550 firms were found in this industry (limited to those processing fish for consumption, i.e. NACE code 15.2), with total revenues in the range of mNOK 1 to 1,500, averaging mNOK 25, and with about 25 per cent utilising farmed fish. Some companies in the industry are present, forming large entities of the industry, which reduces the number of 'actors' to about 470. However, the concentration in the industry must be said to be modest, where the revenues of the 20 largest actors constitute less than half of the industry's revenues, and employ about 40 per cent of the employees in it. At firm level the same ratios would be 25 and 20 per cent respectively. The Hirschman/Herfindahl index is about 0.025 (Bendiksen, 2001) indicating very low concentration. In addition, few barriers to entry exist in this industry although on first hand (fishing vessels and fish farms) a license from the Government is required in order to start in business. Some effective barriers also exist when integrating backwards towards fishing vessels, as the legislation call for majority owners to be registered fishermen. Some historical industrial factors have, however, given fish processing firms sole ownership to a fleet of wet fish trawlers, that to some degree have been sole suppliers of fish to these firms. These firms have been the losers in terms of long time profits in the period 1993-2001 (Bendiksen, 2002) and the number of plants have been reduced. All this pointing at an industry characterised by heterogeneity, concerning both number and size of firms, together with choice of input.

Secondly, the industry must consist of firms that vary in degree of implemented VI. We have earlier argued that the choice of appropriate degree of VI is another than the pure dichotomy between to 'make or buy' or 'use or sell' (Dreyer *et al.*, 2001). In Dreyer *et al.* (1998) the state of vertical integration in the Norwegian fish processing industry is examined to a greater detail, where one of the main problems appearing is how to establish the state of VI in an heterogeneous industry like this. The recommendation, when attacking the supply side, is a firm level approach, where one assesses the level of self-sufficiency, i.e. how much of the main inputs stem from controlled affiliated businesses. By applying such an approach one ends up in a relative measure, rating from 0 to 1, where unintegrated firms, i.e. those receiving no inputs from firms in upstream stages that they own (partly or full) receives 0, and fully integrated firms, i.e. where all fish entering the production process come from affiliated units, are given the value 1.

As underlined by (Casson, 1984), limiting our study to one industry overcomes the difficulties occurring as variations across industries are mispercepted as affecting the explained phenomenon. However, variations within the same industry – especially when heterogeneity is exceedingly present like here – may also be difficult to account for. For instance, industry attributes in the Norwegian fish processing industry might give the impression of an industry in which vertical integration only appear to a minor degree. One such feature is the fact that out of a total production about 90 percent is exported, of which a large share is semi-finished products and raw material entering production and distribution processes abroad, i.e. leaving it to the market. Another feature can be found among processors of farmed fish, i.e. salmon. While domestic fish processing firms utilising salmon only to a limited extent own fish farms, thereby making the impression of a minor degree of vertical integration, the opposite is in fact true, as aquaculture firms on their own have set up plants to process the farmed fish. In this way, the imperative made by Joskow (1988)[1] on thorough knowledge to the industry studied, becomes a necessity in order to comprehend what influence specific dependent variables. And in this particular industry, we find processing firms totally integrated towards their raw material base by means of common or sole ownership to their supply source, which stock the firm with all their needs, together with firms exclusively exploiting the market to secure their inputs.

The third claim when carrying out a study like this is the need for detailed data at firm level, from which the standing regarding both VI and profitability can be depicted. At our hands is a 'state of art' database – "Driftsundersøkelsen" – which has been surveying the profitability and structure of the Norwegian fish processing industry on an annual basis since 1977, (Bendiksen (2002) and earlier years). In this, the same companies are observed each year, giving us the opportunity to construct time series as well as panel data sets. By the means of this source we have earlier presented analyses establishing the dynamic VI-P relationship by borrowing from organisational ecology and making 'survivors' and 'failures' a relevant proxy for long term profitability in this competitive setting (Dreyer *et al.*, 2001). In addition, general managers of a representative sample (geography, size, raw material use) of firms in the industry was interviewed, enabling us to construct another - not account based - measure of VI.

3.2. Measures of VI and performance

As noted above, our constructed measure of VI (supply share from own, SO) captures the level of inputs from subsidiaries, i.e. firms (fishing vessels or fish farms) in which the focal firm has proprietary interests in (majority or minority). It is a continuous measure including most vertical co-ordination (as recommended by Blair and Kaserman, 1983; de Koning, 1994; Frank and Henderson, 1992; Peterson *et al.*, 2001), as long as ownership is involved. It displays properties like MacDonald's (1985) measure, based as it is on internal transfers between stages tied together through (common) ownership, and Levin (1981) and Edwards *et al.* (2000) self-sufficiency ratio. And, interestingly, it includes two of the four dimensions brought forward by (Harrigan, 1984), namely *degree*, i.e. ratio of input from subsidiaries over total input, and *form,* i.e. the ownership level. Adding up, this measure can be labelled *use* of VI that is to what extent the ownership interests in adjacent stages is materialised into actual flow of goods. In our opinion, this is a well-suited measure for the setting studied and incorporates the core of the concept called vertical integration.

When comparing it to other measurements applied in the literature, the most obvious and reasonable counterpart would be the 'Value Added over Sales' (VA/S) measure. In order to liberate it from the apparent connection to profitability, profits are subtracted in numerator

[1] *"[G]ood empirical work aimed at testing theories (…) requires that we know a lot about the characteristics of the firms and products that we are relying on in the empirical work."* (Joskow, 1988, p. 111)

and denominator. Holding the two measures together one deficiency comes forth: While our measure only reveals upstream VI, value added to sales also embodies effects from downstream integration, i.e. towards the customers. However, in the setting studied here, which in fact is an export industry where as much as 90 per cent is exported, many firms hold an export licence, though for many holders (as with ownership of fishing vessels) this licence is only to a minor degree utilised and sales are set out to 'professional' exporters/sales organisations.

Measuring performance is relatively straightforward, as market based measures are disqualified since shares in firms in this industry are not subject to market transactions, i.e. a well functioning stock exchange. Therefore account-based measures have to be applied, where we use return on investments (ROI), i.e. the yield of the total capital employed, independent of funding, and profit margin (PM), i.e. the ratio of pre-tax net profits to sales, that is what is left to profits from total sales.

3.3. Data

When approaching the VI-P relationship of the Norwegian fish processing industry, a decision must be made on which year comparisons should be based on. As mentioned before, the dynamic nature of VI (see e.g. Langlois and Robertson, 1989) makes it necessary to limit the scope of our analysis. In 2000 we conducted a survey among 100 general managers in the industry, establishing the firm specific state of backward VI in this setting. Together with account data from *"Driftsundersøkelsen"* (Bendiksen, 2001), we have appropriate information to assess the VI-P connection in this setting.

When assessing the state of VI and overall performance in 2000, some industry characteristics should be mentioned. Among other factors, the traditional white fish industry struggled with low prices in the markets for frozen and salted fish at the same time as quota reductions led to an increase in the first hand prices. For this segment the overall profitability was low in 2000. The market for farmed fish, especially salmon, reached its peak in 2000 when looking at market prices, and this branch was attended with high profitability. The processing of salmon, however, was still connected with low profitability. The various ways to organise the processing activity of salmon within the firm boundaries makes it necessary for us to distinguish between groups of processors. We have therefore isolated those who process a) only white fish, b) only red fish (e.g. salmon and trout) and c) both red and white fish. Descriptive statistics follows from Table 2 beneath.

Table 2 Statistical means for groups of fish processing firms on our variables

Industry segment	SO	VA/S	VA/S (π-adj)	ROI	PM
White fish (n=55)	17 %	16 %	15 %	4.4 %	- 1.8 %
Red fish (n=18)	76 %	26 %	23 %	9.9 %	2.6 %
Red & white (n=18)	29 %	20 %	17 %	10.1 %	2.9 %
TOTAL (N=91)	31 %	18 %	17 %	6.6 %	0.0 %

Computing Pearson's correlation tests reveals that the whitefish and redfish groups significantly differs in terms of all three VI-measures, while red fish and the combined white/red fish only differ in terms of SO. The whitefish and the combined white/red fish group differ significantly in terms of profit margin. In addition, all the VI measures are significantly correlated to each other, where VA/S and the profit adjusted VA/S – due to 46 firms with negative profit, and therefore not adjusted – are almost perfectly correlated (0.944 on a one-percent level). It seems like the measures used are capturing some of the same phenomenon. Further, Table 2 exhibits that firms utilising farmed (red) fish on average are more integrated than those processing white fish, and that they are more profitable. Even though the tendency is weak, it seems as if the 'generalists' – producing both white and red fish – are the most profitable. The average ROI for this industry is about the same as for the total of Norwegian on shore industry (6,7 per cent in 2000).

Before carrying out a regression of the level of VI to performance, we have to examine the data more closely than merely establishing the means of the distributions. In Table 3 we present some key statistics to our variables for the whole population (N=91).

Table 3 Descriptive statistics for our five variables

Variable	Mean	Std. Error	Median	Minimum	Maximum	Skewness[2]	Kurtosis
SO	0.3076	0.0349	0.2	0.0	1.0	0.836*	-0.508
VA/S	0.1844	0.0104	0.17	0.0	0.48	0.945*	0.833
VA/S (π-adj.)	0.1674	0.0097	0.15	0.0	0.43	0.945*	0.948
PM	0.0003	0.0082	0.0	-0.17	0.3	0.982*	3.326*
ROI	0.0659	0.0123	0.06	-0.17	0.44	0.664*	0.805
					Std. Error	0.253	0.500

One critical feature in our data is the occurrence of negative profits in 43 cases, which aligns and equals VA/S and profit adjusted VA/S. In addition, the extent to which firms are not vertically integrated – as captured by our variable SO – also brings about more careful treatment. In fact, about one third of our firms has no ownership in the upstream industry and are given the value null on this variable. Therefore the median of SO is only 0.2, even though firms can be found all along the range from null to one. These problems will be dealt with to a greater extent under chapter 4.1/4.2 when the validity of our findings is assessed.

[2] Even though all of our variables are found skew by SPSS (a skewness value greater than twice the standard deviation), the computed Pearson's index of skewness (see Byrkitt, 1987; p. 75) is within acceptable limits for all variables.

4. RESULTS AND CONCLUDING REMARKS

To test for covariation between VI and performance, the OLS regression is applied for the variables mentioned, where profitability is the dependent, and VI the explanatory variable. In Table 4 test statistics from regressing the three VI variables on the two profitability variables are reported.

Table 4 Test statistics: Regressing (OLS) VI against profitability

VI measure	Profitability measure	β	R^2	P-value
Share from own (SO)	Return on Investment	0.058	0.027	0.121
VA/S		0.268	0.051	0.031*
VA/S (π-adj)		0.024	0.000	0.856
Share from own (SO)	Profit margin	0.052	0.049	0.035*
VA/S		0.236	0.089	0.004**
VA/S (π-adj)		0.024	0.001	0.793

*) Indicates significant effect at 5 per cent level
**) Indicates significance at 1 per cent level

The main findings from Table 4 is that VI – as measured by either share from own affiliates, value added over sales and profit adjusted value added over sales – can only to a very limited extent explain the inter-firm differences in profitability in the Norwegian fish processing industry in 2000. At the most, only nine per cent of the total variation is explained, which arises when value added to sales is regressed against profit margin. What does seem to influence the profitability, however, is the ratio of value added to sales. As noted by several authors, one major weakness attached to this measure is that it is positively correlated with profits, i.e. it is under influence by other factors than VI, leading to spurious results when regressing it against profit. This is in fact what we believe to see here. When regressing VA/S against profit margin (which is the regression given highest explanatory power), we merely state that pre-tax net profit should equal a constant multiplied by the value added, which in fact should hold since profit should be strongly correlated to value added. When deducting profits from both numerator and denominator, this measure loses it's significant explanatory force, R-squared shrinks to nothing, and the coefficients (β) are decimated.

What is left then is our own measure, which seems to have a significant – though neglectable – effect on profitability as measured by profit margin. When performance is measured by return on investments, the effect is the same but not significant. Applying this measure in another sample using data from 1997 (Dreyer *et al.*, 2001) we found that VI had reverse – though non-significant – effects on the two measures for profitability. At that time, VI seemed to increase profit margins, while return on investments (ROI) was affected contrarily. That could be given the explanation that VI brought about positive profitability effects, but not sufficient enough to give a reasonable return to the additional funding required when obtaining proprietary interests in upstream supply units. Here the effects from VI (as measured by all three measures) go in the same direction for both performance measures.

4.1. Concluding remarks

One intriguing question often noted is this: What came first: the egg or the hen? This rather evolutionary puzzle also underpin the background for considering how strategic changes in organisations impact their outcome as measured by performance (Parnell, 1998), and hence, also when measuring the impact of VI on performance like we do. Could it be that firms obtaining results outperforming their competitors, or that industries where supernormal profits are obtained, creates financial power and freedom to bring about the ability to invest in strategic changes like VI? For tax reasons or to create barriers to entry for competitors? Such a tautological explanation must be evolved further.

In our setting, this could in fact be the case. In 1998, the most prosperous year in the Norwegian fish processing industry for decades, we interviewed general managers of the largest fish processing firms in Norway, of which 68 per cent had proprietary interests in fishing vessels, 58 per cent considered the importance of such ownership to be more important for the future and 85 per cent considered increasing their participation in the fishing activity. Five years later, such optimism would hardly be recognised among the same managers, at least not to such an extent.

The use of vertical integration in this industry is not an easy thing to comprehend, due to the multiple ways to organising the buyer-seller relationship, and the variety in firms operating here. Whereas many businesses have invested heavily in minority shares of fishing vessels (sole ore majority ownership is prohibited by law) others attend the buyer-seller relationship by other means. One way is by offering local vessel owners loans to contract vessels, with an underlying tacit agreement that tie the landings to the lender when feasible. As stressed by Williamsson (1991b), p. 84: *"Debt, equity, leasing, etc., are more than financial instruments. They are also instruments for governance"*. Others maintain their relationship to fishermen by placing plant premises at their disposal (for carrying out on shore related business like baiting, lodging and mending the fishing gear), while others again merely by ways of a common understanding of what is best for the local community, agrees tacitly on serving each other. As noted by Fine and Hax (1985), p. 32: *"The crucial element of success of integrating operations is not ownership, but management and co-ordination of the series of processes"*.

4.2. Implications

Although we have restricted our study to a single industry, there is, as demonstrated in the literature review, numerous ways of measuring VI. Our results indicate that the VI-performance relationship is sensitive for measures chosen to test the relation. Measures that easily can be applied in different settings are often based on data from financial accountings. As performance measures often origin from the same source, statistical validity is weakened since we meet multicollinearity problems. Here we manage this problem by applying a measure on VI based on production volumes rather than financial figures. Our conclusions regarding the VI-P relationship was not altered by using account based measures of VI, which indicates a high level of internal validity when applying different measures of VI at firm level.

The external validity is, however, at stake since the sample scrutinised here is collected in the same industry at one single year. The choice of industry has been undertaken to isolate and disregard the possible industry effect and the firms entering the analysis all face the same external conditions. However, since our findings are based on the situation at only one point of time, some variation can be lost. As underlined earlier, VI is a highly dynamic and heavily varying concept, which makes comparisons over years both time and resource consuming when trying to assess the true degree of vertical integration among firms. In an earlier analysis, using a different operationalisation of the concept, where only fish freezing plants and their dependency of industry owned wet fish trawlers in the period 1977-1992 entered the analysis, the findings indicated no direct effect between VI and profitability in this segment (Dreyer *et al*., 2001).

Due to the fact that one third of the firms state a share of input factors from subsidiaries to be zero, our operationalisation of VI violate the requirements for the normal distribution which the OLS relies on. Transforming the variable in one way or the other would not reduce the problem. One way of avoiding this could be to omit the ‘zeros’, which would have reduced our sample severely. Not to mention that it would imply that we refused to see the choice of VI strategy from a huge number of firms in this industry. A test where we divided only between those who were integrated and those who were not, gave no extra explanatory force. Neither did it do so when we omitted the ‘zeros’. Therefore we have chosen to present our material ‘as is’. Since the zero group can be argued to consist of two strategically different firms – one group choosing to use the market for transactions and another wanting to integrate vertically but lacking the financial capability – a way to separate these two would be recommendable for refining our findings in future research.

Our findings, however, support Harrigan’s (1986) conclusion that degree of VI should be measured at firm instead of industry level when assessing the impact of VI on performance. As demonstrated here, the conclusions concerning this relationship are sensitive for studies based on measures at different levels, i.e. at firm level and industry level.

Thus, we recommend applying measures of VI developed at firm level that do not origin from financial statements when analysing the VI-P relationship, to avoid possible spuriousness in regression results. Based on our findings we also recommend developing measures that are adapted to the production and setting studied. This recommendation may, however, limit the external validity and application of the same measurements in different industries.

A relevant question for future research is whether the VI-P relationship is sensitive also for the way performance is measured. Our literature review revealed that several measures of performance had been applied in previous studies of this relation. According to conceptual models internal pricing strategies between adjacent stages in the value chain are crucial for where profit is directed in firms’ financial statements. This indicates that in order to better understand the ambiguous findings in studies of the VI-performance relationship, we need to apply different measures of performance when assessing this relationship, which remains to be further elaborated.

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HOW TO SECURE CRITICAL SUPPLY? MARKET EXCHANGE OR VERTICAL INTEGRATION

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ABSTRACT

Securing critical input is assumed important, particular for firms embedded in turbulent settings. Vertical integration, i.e. internalising functions and value creating activities instead of acquisition through market exchanges, is often proposed as a rational organisational design to secure essential supply, i.e. a key challenge in logistics. Vertical integration implies that supply is handled within, rather than outside, the boarders of the firm.

Empirical studies regarding the vertical integration performance relationship (VIP) yield, however, rather confusing findings. The mixed findings have been explained in different ways, for example variations in empirical settings. It has long been recognised that firm specific factors may influence performance. However, inspecting the recent literature reveals that surprisingly few studies have examined this empirically.

This paper represents an effort to enlighten our insights regarding firm specific factors' impact on the VIP-relationship.

Here, two firms embedded in the same industrial context are examined in a longitudinal study, applying both secondary and primary data-sources. The two firms have chosen to organise differently to secure critical input: one firm is vertically integrated, while the other utilises the market to acquire the needed input. However, both firms are high performers in the actual industry. Our findings may be seen as an example of equifinality, i.e. there is no single best way of organising economic activities, rather that "the best way" depends on a variety of factors including firm specific resources. Implications for theory development regarding vertical integration versus alternative strategies for securing input, as well as managerial implications are highlighted.

Key Words: Raw material supply, Organisational design, Firm specific resources, Equifinality, Fish processing industry

1. Introduction

This paper departs from the observation that some firms embedded in turbulent environments integrate vertically, as predicted from the research literature, while other firms mainly use the market to secure critical inputs. Improved understanding of this apparent paradox is important for several reasons. First, past research yields mixed findings regarding the relationship between vertical integration and performance (i.e. the VIP relationship). Several explanations of the rather mixed and confusing findings have been advanced without being able to arrive at a satisfactory one. Second, the surprising observation that vertically integrated as well as non-integrated firms embedded in the same industrial context can perform equally well may indicate that factors left out in most studies examining the VIP relationship are important. Further insights regarding the stated paradox is important to improve decisions concerning organisational design aimed at securing efficient supply of critical input, i.e. a key challenge for firms' logistics, influencing their performance. Within the field of logistics the presence of vertical integration has been claimed to be a key explanatory factor when assessing reduced transportation and management costs, and can be viewed as an alternative to supply chain management (Ellram, 1991). Further, high levels of vertical integration in the supply chain can realise logistics benefits unattainable for stand-alone organisations, (Ross, 1998).

To enhance our understanding of the observed paradox, a theory-driven exploratory study is conducted, by identifying possible explanatory factors obviously omitted in past research. Two classes of factors are identified as "promising": *unique firm specific factors*, together with *flexibility* (as an alternative to vertical integration). Studies of theses factors are challenging when it comes how to balance the need for detailed information at firm level and need for external validity. Here, a longitudinal study encompassing two firms is conducted. One firm is vertical integrated, the other not. They are both embedded in the same industrial context, i.e. the Norwegian fish processing industry, and belong to the group of best performers in the industry during the last decade. In order to recognise the two firms' resource position and their doing unique and very detailed firm specific data are required.

The paper is organised as follows. In the next section we give a brief review of literature relevant for our research problem. Thereafter we argue for the research methodology chosen, the setting under study and the data applied for our purpose. In section four we develop a set of empirical hypotheses derived from theory, which are tested and analysed in section five. Finally we give some implications for theory development and managerial issues together with some concluding remarks.

2. Literature review

The literature dealing with market operations versus hierarchical in-house organisation is extensive. To secure critical input – a major logistic challenge – scholars tend to explain choice of organisational structure by the level of uncertainty in the supply conditions, i.e. *environmental* or *primary* uncertainty (Ottesen & Grønhaug, 2003). Here we briefly address three perspectives contributing to explain the existence of vertical integration of firms. We do so because elements from these perspectives will be applied in our effort to understand the problem under scrutiny.

First, and perhaps the perspective that most explicitly addresses this problem, is the **contingency view** – as reflected in various Structure-Conduct-Performance models. Porter (1980) is probably the one that has had the greatest influence in advancing this perspective. According to this view vertical integration can help to reduce external uncertainty, and thus create competitive advantages, e.g. by allowing acquisition of critical input, reducing costs by avoiding the market, by combining operations in the value system, by increasing internal control and co-ordination, by sharing information and by creating stable relationship.

Second, and the first one to explicitly address vertical integration is the **transaction cost economics** perspective originating from the early work of Coase (1937), and further developed by Williamson (1971) and others. According to this perspective the firm may under specific conditions, e.g. to safe-guard transactions decide to bypass the market and resort to hierarchical modes of organising its economic activities. As such, the vertical integrated firm may economise transactions through improved control and reduced market uncertainty. The mere existence of vertically integrated firms suggests that operating in competitive markets induces costs above zero. Within this stream of research the structure of vertical relationships is explained on basis of variations in the importance of asset specificity, uncertainty, product complexity, and degree of repeated purchase activity (Joskow, 1988).

A third perspective to explain the existence of vertical integration is the **resource based view** of strategic management. This stream of research gives no particular rule of thumb as to when it is profitable to integrate vertically, but rather emphasise the need for thorough examination of pros and cons of the actual situation when the integration decision is to be evaluated. According to the resource based view firms may create a competitive advantage by utilising heterogeneous, valuable and/or rare resources that are difficult to imitate (Barney, 1991). In contrast to the other two perspectives the resource based view does not content that vertical integration will be effective in reducing environmental risk. In contrast, authors subscribing to this perspective even claim that vertical integration may enhance risk and may even increase risk compared to market operations (Chatterjee *et al.*, 1992). According to this approach, the ability to profit from vertical integration is strongly related to firm specific resource (Leiblein & Miller, 2003).

The above theoretical contributions, however, all identify both gains and drawbacks from integrating vertically as compared with open market transaction. Recommendations regarding when and when not to integrate, however, are ambiguous. This coincides with findings from the empirical literature on performance effects from vertical integration. Most empirical studies have, however, concentrated on issues like transaction costs, foreclosure, and causes for vertical integration, rather than on performance effects from hierarchical organising. Researchers representing all three perspectives have analysed the VIP relationship. Some report positive covariance between vertical integration and performance (D'Aveni & Ravenscraft, 1994; Edwards *et al.*, 2000), some find that vertical integration have indecisive or no impact on performance (Harrigan, 1986; Chatterjee, 1991), while still others find that vertical integration and performance is negatively correlated (Fan & Lang, 2000; Bhuyan, 2002).

The way vertical integration affects firms' external uncertainty has also been studied. Helfat & Teece (1987:49) found that: "*If vertical integration reduces a firm's exposure to uncertainty (...) there are theoretical and empirical reasons for believing that its cost of capital will be lower than otherwise. In a competitive market these savings will tend to be translated into lower product prices…"* They found that the risk of the acquiring firm was significantly reduced when integrating backwards. Lubatkin & O'Neill (1987) found, however, an insignificant change in profitability, while Levy (1985) reported that firms with higher levels of asset specificity[1] and environmental uncertainty were more apt to integrate vertically. Walker & Weber (1987) found that high levels of volume uncertainty significantly influenced firms' decisions whether to make or buy production components. According to Towill & McCullen (1999:86) *"The supply chain which best succeeds in reducing uncertainty and variability is likely to be most successful in improving its competitive position"*, entering the stream of researchers underlining uncertainty reduction as a source for competitive advantages.

Vertically integrated firm may also be exposed for increased production costs due to different capacity in integrated stages of production (Stuckey & White, 1993). While a "free" firm can adjust its open market purchases to the adequate in-house capacity, a vertically integrated firm might be prevented from doing so. Such imbalances may give rise to inefficiencies that increase costs. The cost structure of a vertically integrated firm may also be influenced by increased overhead costs from managing different technologies, different control- and incentive systems as well as different types of employees. Needed flexibility might be lost because of rigidity established by "in-locked" single suppliers reducing the ability for advantageous technology changes or market price reductions. On the other hand, such shortcomings can be inverted to gains by focusing on income side advantages: Integration can absorb margins earlier awarded from non-integrated firms and may as well reduce transaction costs and taxes imposed on transactions with former trade partners, now in-house suppliers (Hayes & Wheelwright, 1984).

The 'market and hierarchy' dichotomy reveals – after closer inspection – the encompassment of a great variety of organisation forms. Sole ownership and proprietary rights are not the only ways to achieve vertical integration advantages and the perfect markets only exists by exceptions. Moving along the great variety of organisational forms – from vertical integration at one end to open market transaction at the other – it is observed that autonomy is lost as integration increases (de Koning, 1994). Along this continuum we find a variety of organisational forms and contractual cooperation, relation or equity based alliances (Peterson *et al.*, 2001), analogous to what de Koning depicts as network, interdepency, federation, holdings and concern. Pure spot market operations are seldom utilised by industry actors. Some form of relational contact among the market participants is usually present. Utilising long term contracts, joint ventures, minority equity investments, licensing agreements, and other alternatives to vertical integration can bring about the desired capabilities and sufficient control without carrying the investments and costs of full ownership over adjacent stages in the value system.

In such a perspective, industrial networks can serve as an adequate alternative to vertical integration, where the manufacturer obtains specialised inputs from external suppliers. "*The manufacturers maintain ongoing contacts with these suppliers; they train them, provide equipment and know-how, and otherwise invest in the relationship. Suppliers also invest in assets that allow them to produce inputs to buyers' specifications. Typically, manufacturer-supplier relationships are not exclusive; buyers have several suppliers for each input, and suppliers have several clients."* (Kranton & Minehart, 2000:571). Networks may serve as a basis for contractual co-operation and an intermediate state

[1] *"Asset specificity refers to the existence of significant transaction-specific sunk costs, which are durable non-redeployable investments in transactions that thus have little use or economic value outside the buyer-supplier relationship"* (Whyte, 1994: 288)

between pure market transactions and vertical integration, especially favourable for the manufacturing firm when uncertainty prevails in the demand for input factors. Such networks rely heavily on *trust* in transactions between buyer and seller, which clearly affects the terms of trade between actors, (see Dulsrud (2002) for a review).

Afuah (2001) asserts that *firm boundaries are dynamic*, and that technological changes can outdate former organisational adaptations to supply (e.g. vertical integration, alliances or market transactions), as supply conditions change. The 'in-house' or 'through market' decision should also be based on the evaluation of which makes the most efficient generation and exploitation of knowledge, thus firms might end up with different conclusions depending on their evaluation of in-house resources.

In our effort to understand the ambiguous findings – and explanations regarding the VIP relationship – to our surprise – flexibility as an alternative strategy to vertical integration is seemingly missing. Important intended purposes of vertical integration are to control and reduce variations in critical supply. An alternative is flexibility, aiming at as smoothly as possible to adjust to unpredictable changes. It should be noted that the two strategies put different requirements on firms pursuing them. Flexibility comes in several forms, relevant to handle input fluctuations or to secure critical inputs, e.g. volume flexibility, financial flexibility, and input flexibility (i.e. to what extent the firm may apply multiple – and alternative types of inputs to utilise its production capacity).

Our discussion above reveals a variety of aspects that may influence what is the most effective organisation form to secure critical supply under turbulent conditions. From this also follows that we subscribe to the idea of equifinality[2], i.e. there is no one solution that is the best one for all, but that the derived goal may be achieved in multiple ways. Accordingly, not only industry factors, but also firms specific characteristics and resources need to be included to improve our understanding of the VIP relationship (Leiblein & Miller, 2003;). Surprisingly few contributions have focused on firm specific factors as a moderator when explaining the "make-or-buy" decision (Coles & Hesterley (1998) serving as an exception), to a large degree based on the heavy demand for data. As a point of departure, case studies like our – meeting the severe claims on data – can be a way of overcoming these major challenges.

Based on the above discussion we advance three "working hypotheses" (**WH**), i.e. "hunches" or ideas to guide, but not dictate our effort to gain insights into the apparent ambiguous VIP relationship.

WH$_1$: The same performance goal may be reached in several ways, (i.e. we subscribe to the idea of equifinality)

WH$_2$: Firms specific factors (resources) – almost neglected in past research – may contribute to our understanding of adequate organisation for firms to cope in turbulent environments

WH$_3$: Flexibility and vertical integration are alternative strategies to cope in turbulent environments

[2] According to Gresov & Drazin (1997:404) the concept **equifinality** means that:"*...the final state, or performance of an organization, can be achieved through multiple different organizational structures even if the contingencies the organization faces are the same.* [It] *thus imply that strategic choice or flexibility is available to organization designers when creating organizations to achieve high performance. (...) The possibility of multiple, equally effective designs to support a given strategy undermines the predictive value of the contingency approach."*

3. Research methodology

In this section we report the research methodology underlying our empirical study. We first describe our research design, and then we report our choice of setting, followed by description of data.

3.1. Research design

To study our research problem we need variation in organisational forms for well performing firms operating in the same industry. Also, to capture turbulence longitudinal data are needed.

Here a longitudinal study of a population of firms, i.e. the Norwegian fish processing industry was conducted. Two firms were chosen for detailed case studies. The selected firms have proven to be among the best financial performing firms within the industry for several years. Interestingly for our aim of the study, they have chosen to organise differently in order to secure supplies. One firm (A) is vertically integrated, i.e. it owns the fishing vessels which supply the firm with most raw materials. The other firm (B) has never owned fishing vessel, and purchase all the needed raw material in an open market. Both firms are located in the same region, produce the same type of products and rely heavily on the same input factor – demersal fish. In fact, even though this is the most labour intensive branch of this industry, raw materials are the most important input and cost component, with about two thirds of total costs. Our data cover most of all purchases of fish to these firms for the years in question

The design chosen is well suited for a detailed study of the impact of the VIP relationship, and the cases studied open for measuring firm specific resources and their impact on this relationship. As both firms perform well, our design gives the opportunity for testing predicted strengths and weaknesses, as reflected in the literature, of the two organisational forms contrasted here. A major weakness facing a case study is the risk of poor external validity. Here we try to overcome this critique by comparing our findings at firm level to industry averages for all the variables applied. Additionally, the longitudinal design strengthens the external validity as far as time is concerned and opens for statistical tests of differences in factors between two firms.

3.2. Setting

The Norwegian fish processing was chosen as our research context. We did so, because this industry comprises a link in the seafood value system between the biological resource and the consumers, where several structural factors may motivate for vertical integration. As underlined by Dreyer (1998) and Ottesen & Grønhaug (2003) among others, managers of fish processing firms are exposed to an almost stochastic supply of the most important input factor; namely fish, due to the risky environment surrounding this biological resource (seasonality, quality, abundancy, meteorology). Uncertainty is also prevalent in the other end of the value system, where prices and output fluctuate heavily. It has been claimed that vertical integration can be beneficial in such situations (Carlton, 1979; Walker & Weber, 1987; Williamson, 1991; Miller & Shamsie, 1999). In a setting like ours, upstream vertical integration towards the fishing fleet, in order to achieve control over the most important input factor is claimed to be a meaningful strategy to reduce uncertainty and to secure a sufficient supply.

The Norwegian fish processing industry is a very heterogeneous industry. The number of firms is relatively high, (within NACE code 15.2 the number in 2002 was 520). Most firms are small or medium sized, and the degree of concentration is very low, the Hirshman/Herfindahl index was 0.025 in 2001, (Bendiksen 2001).

By limiting our study to one industry we control for "industry effect", i.e. elimination of outside factors due to industry that may covary with organisational arrangement. However, variations within the same industry – especially when heterogeneity is high as here – may also be difficult to account for. Here we try to remedy this by including firm specific factors. In this way, the imperative made by Joskow (1988)[3] on thorough knowledge about the industry studied, becomes crucial.

Above we have argued that the choice of appropriate degree of vertical integration is a complex decision exceeding the pure dichotomy between to 'make or buy' or 'use or sell'. In Dreyer *et al.* (1998) the state of vertical integration in the Norwegian fish processing industry was examined to a greater detail, where one of the main problems encountered was how to establish the state of vertical integration in a heterogeneous industry like this. One measure is degree of self-sufficiency, i.e. how much of the main input stem from controlled affiliated businesses. This is a relative measure, ranging from 0 to 1, where non-integrated firms receive 0, and firms receiving all their inputs from controlled units are given the value 1. This corresponds with the recommendation from the theoretical literature (Mahoney, 1992; de Koning, 1994; Peterson *et al.*, 2001) and from measures used in other empirical research (MacDonald, 1985; Edwards *et al.*, 2000).

3.3. Data and measurement

Detailed data at firm level, to capture vertical integration, raw material flow and profitability, are necessary. For this purpose "Driftsundersøkelsen", a "state of art" database, which has surveyed the profitability and structure of the Norwegian fish processing industry on an annual basis since 1977, (Bendiksen, 2001) has been used. Data for the same firms each year, give us the opportunity to construct time series as well as panel data sets. The very detailed - and annual - data allow us to capture the various variables under scrutiny in an adequate way.

In addition to this data, we have carried out semi-structured interviews with the managers of the firms focusing on how they cope in order to secure their supply of raw material. We also collected information from internal and external financial statements published by the firms. Information concerning the firms in the press and other sources was also collected. We also collected detailed information concerning raw material flow into the firms regarding; season profile, volumes and prices of different species and number of suppliers.

Based on these data we have developed various measures of relevance for the present research purpose (see section 4).

In order to capture the competitive position of the firms studied we calculated Return of Investment (ROI) for several years at firm level in the population. Both Firm A and B have been among the top 25 per cent with regard to ROI every year within a period of the last ten years, which corresponds to one of our design criteria. Table 1 shows various characteristics for the two firms – as well for the total industry in 2002.

[3] *"[G]ood empirical work aimed at testing theories (...) requires that we know a lot about the characteristics of the firms and products that we are relying on in the empirical work."* (Joskow, 1988:111)

Table 1: Key characteristics of the firms studied compared to population average in 2002

Variable	**Firm A**	**Firm B**	**Industry average**
Vertical integrated	Yes	No	-
Return on Investment (%)	1.7	6.9	-2.1
Equity (%)	37	48	27
Number of employees	146	67	64
Total revenues (mNOK)	147	123	113
Total assets (mNOK)	170	42	78
Volume raw fish (tonnes)	8,600	6,900	6,500

Inspection of Table 1 reveals that Firm A is larger than Firm B, while the size of Firm B is approximate the same as the average among the firms in the setting. Both firms performed better than the industry average. The last ten years, this relative picture, both regarding size and performance, has been very much the same as illustrated in Table 1.

4. Empirical hypotheses

To examine our tentative, working hypotheses, a set of testable empirical hypotheses (**EH**) were derived. The empirical hypotheses are derived from our working hypotheses and are also theory-based on the streams of literature briefly reviewed above.

According to the literature on the VIP-relationship, a major advantage among vertical integrated firms is that they are in a position where they are able to control the flow and price of input independent of the market situation. To study this assumption we have mapped the monthly supply of raw material during the last three years. In order to measure fluctuation in supply we have applied a random walk model where volume in period (*t-1*) is applied to predict volume in period *t*. This model is tested in an ordinary linear regression analysis, where the regression coefficient ($\mathbf{r}^2$) measures the fit of the model. Thus, high $\mathbf{r}^2$ indicate low fluctuation. Based on our review of literature we predict to find the following relationship:

EH$_1$: Raw material supply fluctuations are higher in Firm B than in Firm A ($\mathbf{r}_\mathbf{A}^2 > \mathbf{r}_\mathbf{B}^2$)

Another assumed advantage for the vertical integrated firm is avoidance of the market, implying that it can secure its supply at a lower price than non-integrated firms. Additionally, the literature indicates that non-integrated firms, due to less capacity cost, are in a position where it can apply price as a tool in order to secure input. Both arguments indicate that Firm B pays more for its input than firm A. In order to test this hypothesis we have mapped the average monthly prices for cod **(P)**, i.e. the most valuable species, paid by Firm A and B and tested if there are any differences in prices. According to these arguments and our literature review we predict that:

EH$_2$: Firm B pays a higher price for its input than Firm A **($\mathbf{P}_\mathbf{A} < \mathbf{P}_\mathbf{B}$)**

Transaction costs related to the securing of critical inputs are assumed to be lower in integrated than non-integrated firms due to control of input and few suppliers. Non-integrated firms, however, must put resources in searching the market for new suppliers. In order to investigate this proposition we have measured the degree to which the firms receive supply from own vessels (**O**), i.e. a self sufficiency ratio. We have also mapped the number of suppliers (**S**) for 2002, and we predict to find:

EH$_3$: Firm A is to a higher degree supplied from own vessels than Firm B **($\mathbf{O}_\mathbf{A} > \mathbf{O}_\mathbf{B}$)**

$\mathbf{EH_4}$: Numbers of suppliers are higher for Firm B than for Firm A $\mathbf{(S_A < S_B)}$

According to literature asset specificity motivates for vertical integration. Thus a vertical integrated organisation is predicted, in order to perform better, to be highly specialised when it comes to processing input from its own suppliers. Firms operating in the open input market, however, must to a higher degree have technology that is less vulnerable for specific suppliers or sources of supply. Additionally, the ability to process input from different sources will be an advantage for a non-integrated firm in their struggle for securing supplies. In this supply market input-specificity can be measured as the mix of different species in supplies. We have mapped the level of the most important species in the supplies (**C**), namely cod. Another dimension of specificity relates to the technology the suppliers make use of for catching fish - a dimension that both impact on quality, size of fish and mix of species. In order to measure this dimension, we have mapped the level of supplies from the most important fishing gear (**G**). According to literature on asset specificity we predict that:

$\mathbf{EH_5}$: Firm A is more specialised in supplies, (i.e. fish species), than Firm B $\mathbf{(C_A > C_B)}$

$\mathbf{EH_6}$: Firm A is more specialised in supplies, (i.e. fishing gears), than Firm B $\mathbf{(G_A > G_B)}$

Vertical integration is often associated with ownership and control. Vertically integrated firms tend – in contrast to non-integrated firms – to own vessels. It seems also reasonable to assume that firms owning vessels would buy catch mainly from their subsidiaries/ vessels. As such the share of landings to a firm stemming from so-called "loyal" recurring vessels (**L**), (i.e. fishing vessels delivering at least 15 per cent of total catch, and landing catch to the firm at least two out of the last five years) should be higher for vertically integrated firms. Thus we can hypothesise that:

$\mathbf{EH_7}$: The share of total landings from recurring "loyal" vessels is higher for Firm A than Firm B $\mathbf{(L_A > L_B)}$

It seems reasonable to assume that vertically integrated firms with their own vessels both buy the catch from these vessels and that they to the extent possible invest in vessels suitable to secure supply. For fish processing firms the number of landings ($\mathbf{L^{\#}}$) to secure adequate supply influences costs, and the more landings the higher the costs. Because non-integrated firms don't have the "buffer" to secure supply we expect that:

$\mathbf{EH_8}$: The number of landings will be higher for Firm B than for Firm A $\mathbf{(L^{\#}_A < L^{\#}_B)}$

Further, according to $\mathbf{EH_4}$, $\mathbf{EH_6}$ and $\mathbf{EH_8}$, one can expect the average volume per landing of the vertically integrated firm to outweigh the average volumes per landing ($\mathbf{L^{kg}}$) to the non-integrated firm. Firms studied here are highly volume dependent. Potential integration candidates typically would be vessels that could bring ashore high volumes. From the hypothesised limited number vessels supplying the integrated firm, and therefore small number of transactions, we also should expect that

$\mathbf{EH_9}$**:** Average volume per landing for Firm A should outweigh that of Firm B $\mathbf{(L^{kg}_A > L^{kg}_B)}$

A major disadvantage facing the vertically integrated firm is cost of capacity. In the literature this is a factor applied to explain poor performance among vertical integrated firms. In order to study this aspect we have examined the financial statements and capacity costs reported, i.e. sum of financial cost and depreciations related to total income (**CC**). Based on our discussion we predict to find:

$\mathbf{EH_{10}}$: Firm A has higher capacity cost than Firm B $\mathbf{(CC_A > CC_B)}$

Vertical integration is a strategy often proposed to reduce uncertainty. On the other hand, the problem can be turned around, how to handle uncertainty. In literature uncertainty is often related to flexibility. If Firm B is viewed upon as a firm succeeding in coping with uncertainty, the question becomes whether non-integrated firms are more flexible than vertical integrated firms. Above we have predicted that Firm B is more flexible when it comes to ability to differentiate to broader sources of supply. Flexibility, however, comes in many forms. For instance we expect Firm B to have a different portfolio of firm resources than Firm A. In order to be flexible in the supply market Firm B also needs financial flexibility to a higher degree than Firm A. To analyse this we have examined the cash-position, i.e. working capital (**WC**), and predict:

$\mathbf{EH_{11}}$: Firm B has a higher proportion working capital than Firm A $\mathbf{(WC_A < WC_B)}$

According to our arguments related to flexibility, we also expect to find that less proportion of the assets in Firm B tied up in fixed assets (**FA**):

$\mathbf{EH_{12}}$: Firm A has a higher proportion of fixed assets than firm B $\mathbf{(FA_A > FA_B)}$

In order to understand better the VIP-relationship it is also important to inspect how the chosen approach to secure supply impact over all costs and value creation. A major remaining question is thus; do successful vertical integrated firms have cost advantages? So far we have predicted that vertical integrated firms have advantages when it comes to prices paid for input, and disadvantages as far as capacity cost is concerned. But what about working force efficiency. A short glance on Table 1 indicates that Firm A has relatively more employee related to total income than Firm B. This may relate to an observation often mentioned – that vertical integration often leads to less efficient organisation. In order to test this we have developed a measure for working force efficiency, i.e. total income related to total wages (**IW**). According to the perspective that vertical integrated firms are less efficient than firms competing in an open market, we predict that:

$\mathbf{EH_{13}}$: Firm A has less total income related to wages than firm B $\mathbf{(IW_A < IW_B)}$

Another interesting question arising from the debate related to the VIP relationship is whether vertically integrated firms are in a better position, when it comes to value added activity. In the literature it is claimed that vertical integrated firms have an advantage in controlling quality resulting in a market advantage. In order to test this assumption we have measured value added in the firms, i.e. total income per kg raw material (**IKG**). Here we predict:

$\mathbf{EH_{14}}$: Firm A create higher income per kg raw material than Firm B $\mathbf{(IKG_A > IKG_B)}$

Letting $\mathbf{EH_1}$ through $\mathbf{EH_{14}}$ serve as our empirical hypotheses, utilising the variables as described above, we conduct our analysis as accounted for in section 3.1.

5. Findings

We start the presentation of our findings by quoting the answers given by two top managers when asked about the importance of ownership in fishing vessels:

Manager of a vertical integrated firm:	***Manager of a non-integrated firm:***
"Landings from own vessels are a necessity to survive. Control over landings is a 'must' to secure long-term planning and with that; profitability."	*"We don't feel competent to invest in the fishing fleet. As auction markets steadily grow and improve we can pay a substantial 'mark-up' rather than tying capital to vessel investments."*

Inspections of the reported answers show that ambiguity regarding the role of vertical integration prevails in this industry. Table 2 reports findings from the testing of our empirical hypotheses - **EH_1** to **EH_{14}**. Our findings are based on data for 2002, though similar analyses for previous years yield very much the same results. As noted above, both Firm A and Firm B are in front among the firms in this population with regard to financial performance. Here we focus on different factors that can help us to understand how Firm A and Firm B achieve their competitive position in spite of the fact that they organise their input securing activities very differently.

Table 2: Variables, empirical hypothesis and results

EH	Variable	Empirical hypothesis	Firm A	Firm B	Industry Average	Direction
EH_1	Input control	The fluctuations in supply of raw material are higher in Firm B than in Firm A **($r^2_A > r^2_B$)**	0.31	0.23	0.35	+
EH_2	Pricing	Firm B pays a higher price for its input than Firm A **($P_A < P_B$)**	10.86	10.99	11.04	+
EH_3	Network	Firm A is to a higher degree supplied from own vessels than Firm B **($O_A > O_B$)**	80 %	0 %	n.a	+
EH_4	Network	Numbers of suppliers are higher in Firm B than in Firm A **($S_A < S_B$)**	10	170	124	+
EH_5	Specialisation	Firm A is more specialised in supplies, i.e. fish species, than Firm B **($C_A > C_B$)**	63 %	75 %	76 %	-
EH_6	Specialisation	Firm A is more specialised in supplies, i.e. fishing gears, than Firm B **($G_A > G_B$)**	100 %	36 %	55 %	+
EH_7	Network	The share of total landings from 'loyal' vessels is higher for Firm A than Firm B **($L_A > L_B$)**	93 %	76 %	68 %	+
EH_8	Network	The number of landings will be higher for Firm B than for Firm A (**$L^{\#}_A < L^{\#}_B$**)	212	1,972	684	+
EH_9	Network	Average volume per vessel is higher for Firm A than for Firm B (**$L^{kg}_A > L^{kg}_B$**)	40,500	3,500	n.a	+
EH_{10}	Capacity cost	Firm A has higher capacity cost than Firm B **($CC_A > CC_B$)**	2.4	2.6	6.6	-
EH_{11}	Flexibility	Firm B has a higher proportion working capital than Firm A **($WC_A < WC_B$)**	12.9	47.5	26.9	+
EH_{12}	Flexibility	Firm A has a higher proportion of fixed assets than firm B **($FA_A > FA_B$)**	69.0	44.1	54.4	+
EH_{13}	Productivity	Firm A has less total income related to wages than firm B **($IW_A < IW_B$)**	3.31	6.25	5.89	+
EH_{14}	Productivity	Firm A creates higher income per kg raw material than Firm B **($IKG_A > IKG_B$)**	17.1	17.7	17.3	-

The numbers in Table 2 are correlation coefficients (**EH_1**), averages (**EH_2**, **EH_9**, **EH_{10}**, **EH_{11}**, **EH_{12}**, **EH_{13}** and **EH_{14}**), percentages (**EH_3**, **EH_5**, **EH_6** and **EH_7**), and counts (**EH_4** and **EH_8**). We test the empirical hypothesis by comparing the scores for Firm A and B respectively, and the last column reveals whether the findings are in accordance with the hypotheses (+).

Inspection of Table 2 reveals that Firm A is confronted with less fluctuation in supply than Firm B, i.e **EH_1**. This finding is in the predicted direction. However, for both firms the fluctuations are somewhat higher than the industry average. Though, we have to bear in mind that for the industry we have added up fluctuations for several firms illustrating the fluctuations if we only had one firm. A proper way to compare our firms to the fluctuation among the other firms would be to conduct the same analyses in every firm and then compute the average of every **r^2**'s. This is, however, beyond the scope of our analysis. The results in Table 2 indicate that if it was only three firms in this population, the fluctuation in the third firm (Industry) also would be rather high. Looking at input control, our results indicate that the vertical integrated firm is able to reduce the fluctuation by controlling the activity of their own vessels.

The findings regarding hypothesis $\mathbf{EH_2}$ show that Firm B pays – as predicted – somewhat higher prices than does Firm A, and also that the prices for both firms are somewhat lower than the industry average. These results confirm the value of avoiding the market through vertical integration, and are in accordance with theoretical predictions.

Inspection of $\mathbf{EH_3}$ and $\mathbf{EH_4}$ shows overwhelming support for the stated hypotheses, as 80 per cent of supply came from own vessels, but this fraction were zero for Firm B. This as such, is almost tautological as Firm B does not own any vessel. More convincing, however is the much higher numbers of suppliers used by Firm B than Firm A. An interesting observation is also that the number of suppliers used by Firm B is substantial higher than the industry average. A potential explanation might be that Firm B has more contacts – and is more competent in using these contacts – and thus the higher performance than the industry average. This might be what Bowersox & Dröge (1989:69) refer to as: *"A strategic alliance among leading edge firms offers a substitute for vertical integration."*

Inspection of the findings for $\mathbf{EH_5}$ shows a result contrary to what we expected. However, by extending the most valuable species to also including saithe and haddock – in addition to cod - Firm B exhibit less specialisation than Firm A, as corresponding figures are 96 and 99 per cent respectively. When also taking the findings for $\mathbf{EH_6}$ into consideration, which are in the expected direction, we can conclude that Firm A is more specialised than is Firm B. For the latter hypothesis an interesting finding is also that Firm B is substantial less specialised than the industry average. As such this may probably contribute to explaining why Firm B performs better than the industry average. This is in accordance with what leading population ecologists predicts; that in turbulent environments generalists will oust other organisational forms, whilst under more "fine-grained" conditions specialists will have their advantages, (Freeman & Hannan, 1983).

The empirical hypotheses $\mathbf{EH_7}$ - $\mathbf{EH_9}$ all deal with the landings to the firms and as can be seen from Table 2, the results are in the hypothesised direction. Firm A – the vertical integrated one – receive more from loyal vessels ($\mathbf{EH_7}$), have fewer landings during 2002 ($\mathbf{EH_8}$) and receive on average much more fish per landing ($\mathbf{EH_9}$) than does Firm B. More interestingly is it, however, that Firm B has a more stable portfolio of suppliers than the industry average, even though the numbers of landings are considerably higher.

Inspection of $\mathbf{EH_{10}}$ shows that Firm A has somewhat lower capacity costs than Firm B, contrary to what expected. Even more surprising is that the both Firm A and Firm B have substantially lower capacity costs than the industry average. Low capacity costs are predicted to be advantageous when it comes to utilisation of both capacity and flexibility in a turbulent supply market. Thus, our findings support this prediction and indicate that low capacity costs are an important driver for firm performance in this setting.

Inspection of $\mathbf{EH_{11}}$-$\mathbf{EH_{13}}$ reveal that all are in the expected direction, i.e. Firm A has a higher portion of working capital ($\mathbf{EH_{11}}$), less portion of fixed assets ($\mathbf{EH_{12}}$), higher income related to wages ($\mathbf{EH_{13}}$), than do Firm A. Probably more important and equally interesting is that both firms in these respects perform better than the industry average, which contribute to explain firm's performance.

For $\mathbf{EH_{14}}$, on the other hand, findings reveal that earnings per kg raw material are lower for Firm A than for Firm B, as well as lower than industry average. We can at this point, not subscribe this contradictory finding to a particular phenomenon, rather than referring to the literature predicting that vertically integrated business units might suffer losses in competitiveness due to lack of market orientation. This however cannot explain away that our prediction failed to be accounted for.

A major difference between Firm A and B is revealed when looking into capital structure. In Firm A most of the capital is tied up as fixed assets. Firm B has a higher proportion of its capital as equity and working capital, indicating higher financial flexibility. Compared to the rest of the population, both Firm A and B demonstrate a history of well performing by their high equity. One major explanation for the competitive position of Firm B seems to be high flexibility, both when it comes to input sources and cash position. In this setting these firm specific resources seem valuable.

6. Discussion

The reported findings deserve some additional comments. Our outset emphasised the paradox that two firms in the same setting – each choosing opposite organisational designs in order to cope with highly turbulent input supply conditions – obtain superior performance. Based on theoretical contributions illuminating the VIP relationship we advanced three working hypothesis (**WH**), further specified into a set of 14 testable empirical hypotheses (**EH**). Support for all, but three of the empirical hypotheses was found. The probability for this result by chance is $\mathbf{P}(B \geq 11) = .006$, ($p = .5$ and $n = 14$), indicating that the applied theory really possesses predictive validity.

To understand our puzzle, i.e. how both the integrated as well as the non-integrated firm in our study perform substantially better than the industry average we need to return to the reported findings.

Our findings reveal that both firms have advantages and disadvantages rooted in their organisational design for securing critical supply in a turbulent market. For example, it is observed that the vertically integrated firm achieved less input fluctuations and paid less for critical inputs than did the non-integrated firm – also as predicted from theory. At the same time the non-integrated firm was observed to compensate its disadvantages by higher degree of flexibility, allowing for the handling of unpredicted changes without suffering losses in productivity.

On the other hand our design and data reveal several weaknesses related to the two ways of organising – also predicted by literature. The vertical integrated firm suffer from losses in productivity and high capacity costs, while the market oriented firm suffer from high transaction costs and is exposed for huge fluctuations in volumes and market prices. However, both firms perform superior compared to the industry average, indicating that they manage to utilise advantages and avoid major disadvantages of the organisational form chosen. As illustrated in our findings, Firm A manage to avoid high capacity cost although being vertically integrated, while Firm B manage to combine high flexibility with productivity, (as underlined by the rejection of our $\mathbf{EH_{14}}$).

A key finding from our investigation is that vertical integration and flexibility are alternative strategies to cope with turbulence. More precisely, vertical integration is applied as a means to reduce imposed fluctuations, while flexibility is applied to adjust to fluctuations encountered. These findings are important for a better understanding of the mixed empirical findings concerning the VIP relationship in past research and illustrate the need for bringing in firm specific resources when assessing these results.

Can these contradicting findings be explained? Obviously not if we only take the theoretical contributions on the VIP-relationship into account. But by utilising the idea of "equifinality" together with the exploitation of flexibility as an alternative to controlling the environment through vertical integration, we contribute to a better understanding of the confusing findings regarding the VIP-relationship. A main conclusion from our study is the support for the idea of "equifinality", i.e. the same performance effects can be achieved in several ways. Additionally, we conclude that success of the chosen strategy not only depends on industry specific factors, but also require that firm specific factors or resources are adequately taken into account and properly exploited.

Our research design chosen has proven to be valuable, both when it comes to enlighten further knowledge concerning pros and cons of vertically integrated firms as well as better understanding of the confusing empirical findings when it comes to the VIP relationship. The validity of our findings is improved by the way the two firms are compared to the rest of the firms within the industry and the timeframe of our study. However, our study is based on detailed information from only two firms within a specific setting. Further studies, utilising similar designs in other settings, will enhance the understanding of how firms organise and act to secure critical input in turbulent supply markets – a challenging task for both strategic and logistic research.

Both firms pursue apparently successful strategies. The strategies followed are probably formed by earlier strategic choices and resource endowments, and thus reflect that they both are taking firm specific – in addition to industry specific conditions – into account. To pursue a strategy successfully requires insights and competence. The fact that both firms apparently are successful indicates that they both are competent in pursuing – and benefiting from – their chosen strategies. Moreover, because more than one strategy proves successful, it also favours the principle of "equifinality", i.e. more than one approach can be appropriate to become successful. This requires, however, that in addition to industry specific factors also firm specific factors must be adequately taken into account and exploited. This simple, yet complex reality, can be illustrated by the words of the top manager in Firm B, cited from a portrayal in a newspaper after his firm had – quite sensational for this part of the fish processing industry – delivered positive results for 15 consecutive years:

"Our firm is rather boring, and performs well because of conservative investments and a marvellous, stable workforce."

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