NEW PATHS IN THE RAW MATERIAL FLOW

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Abstract. The Norwegian fish processing industry is an old industry and organising of production has been solved by fishing vessels catching fish and selling it fresh directly to processing plants located on shore close to the richest fishing areas. During the last decade an increasing part of the catch has been frozen on board. This change in supply, from fresh to frozen fish, has triggered investments in new cold storage plants along the Norwegian coast. These changes are about to change the entire market for raw materials and also the fish processing industry itself. Technological changes among the suppliers have created a totally new competitive position for the processing plants. In the new competitive setting one of the most valuable resources among the processing plants, i.e. a location close to fishing areas, is devaluated. The bargaining power to the local processing plants is decreased mainly because new entrants have achieved easier access to the local raw material market.

Keywords: Raw material flow, globalisation and fish processing industry

1. INTRODUCTION

The stability of the competitive environment characterising the 60's and 70's has been replaced by increasing uncertainty. Product life cycles are becoming shorter, customers change their preferences faster, and competition has become increasingly fiercer. Important driving forces behind these developments are, for example, factors such as ongoing globalisation of economic activities and rapid developments in modern information technologies. These changes have also had major impact on where firms choose to organise and locate different parts of their activity.

The setting chosen for this study is the fish processing industry in Norway. This is an old industry organised in a value chain consisting of a harvesting part (i.e. fishing vessels) that supplies the fish processing plants on the coast shore with fish. The products that are processed are mainly consumed abroad. The raw fish has to be conserved fast in order to secure the quality of the products. Traditionally fish processing plants have solved this problem by locating their plants close to the richest fishing areas. Thus, the production has been organised by fishing vessels catching fish and selling it fresh directly to the processing plants located on shore close to the fishing areas.

The last decade, however, an increasing part of the fleet has been rebuilt or replaced by newer vessels where the catch is frozen onboard. This change in supply, from fresh to frozen fish, has triggered investments in new cold storage plants along the Norwegian coast where many of these vessels now discharge their catch. These plants do not buy or process the catch, but offers services like discharging, storing and forwarding of the fish to the vessels customers.

These changes, involving new logistic challenges for the traditional buyers (i.e. the fish processing industry) is about to change the entire market for raw materials (i.e. raw fish), and also the fish processing industry itself. This paper describes the changes in raw material flow and the impact these changes have had on the competitive position of the traditional processing industry.

The paper is organised as follows. In the next section we focus on how production of fish is organised, where the processing plants traditionally have been located, and where the new storage plants have been established. Then we describe the roles different actors have played in implementing a new path for the raw material flow. The paper then continues by analysing how well the new path performs both regarding volumes and prices. In the last section the findings are summed up and implications are discussed.

2. LOCATING THE PROCESSING ACTIVITY

How to organise and where to locate firms is considered a difficult strategic issue that is important in order to cope and prosper (Porter, 1980; Williamson, 1985; Peteraf, 1993; Barney, 1996; Miller & Shamsie, 1996). The geographical location of a fish processing plant in the traditional value chain has a set of parameters that are essential. One is closeness to rich fishing areas. This is connected to the need for speed in production in order to secure product quality. Another is to minimise the transportation cost among fishing vessels. A third is to maximise time for fishing activity among the vessels. Based on these arguments the value of the geographical location will change if new technology is implemented in the vessels that makes it possible to slow down the speed in production, i.e. the raw material can be stored onboard without quality losses. Such innovation will also change the bargaining power among the actors in the raw material market in favour of the vessels.

If such a technology is implemented onboard the vessels, a successful location will be characterised by other factors than closeness to rich fishing grounds. For instance access to more potential buyers will be one. In order to secure this the locations will have to include well-developed infrastructure, both regarding discharging/storage and well developed transportation services to new potential buyers. Another important feature of a successful location is ability to offer essential services to vessels – like fuel, technical support, transportation of staff etc. A location that is able to balance the old key factors and additionally include the new factors will have a competitive advantage in the new competitive setting. In the last decade several cold storage plants have been built in order to exploit new possibilities created.

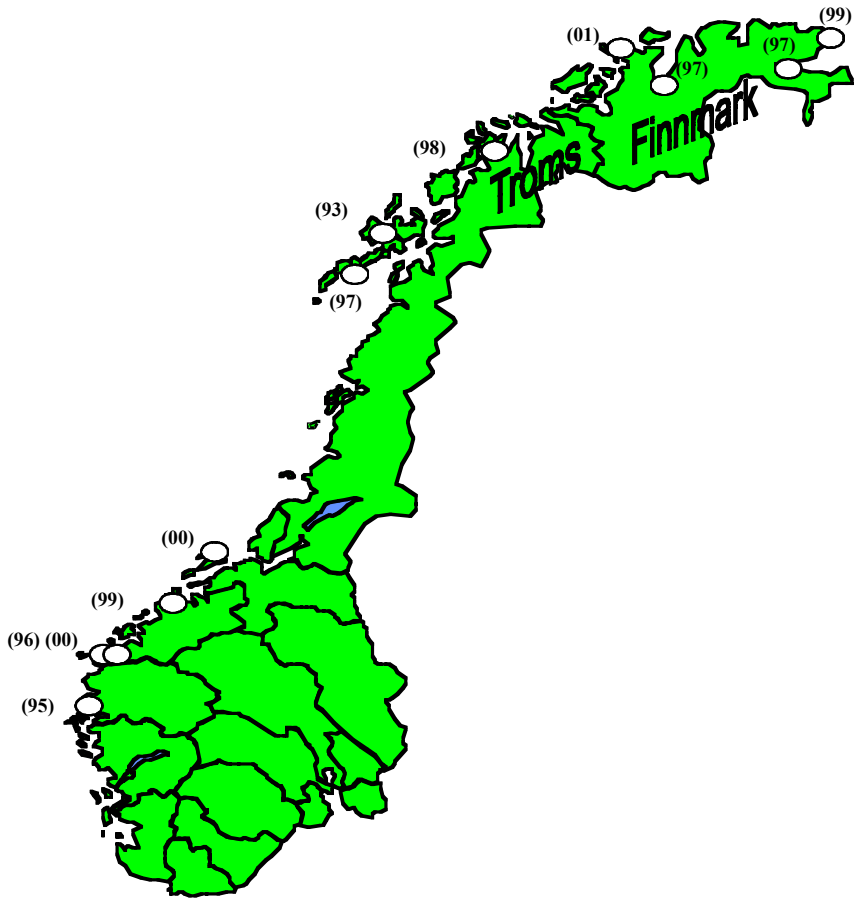

Figure 1 Location of new cold storage plants in Norway the last decade.
(The year the plant has been built in parentheses.)

On the map we have included the year the plants have been built, and we can see that all the new plants have been built during a short period of 5-6 years. This storage capacity adds to the slack in capacity for storing already existing among the traditional processing plants. The volumes of fish and fish products stored in these plants have continuos grown in the period studied.

To illustrate the locations chosen for the new storage plants we will focus on a specific region. The region is Vesterålen, and a map of the region Vesterålen is presented in Figure 2. We have chosen this region because it is one of the firsts of the new generation storage plants established and it has been a success both regarding to volumes and prices on the raw material flowing through the plant. Another reason is that the main conclusions regarding location of the storage plants versus processing plants is the same regardless what region we choose. As can be seen it includes both location of processing plants and storage plants. It also illustrates the main roads in the region.

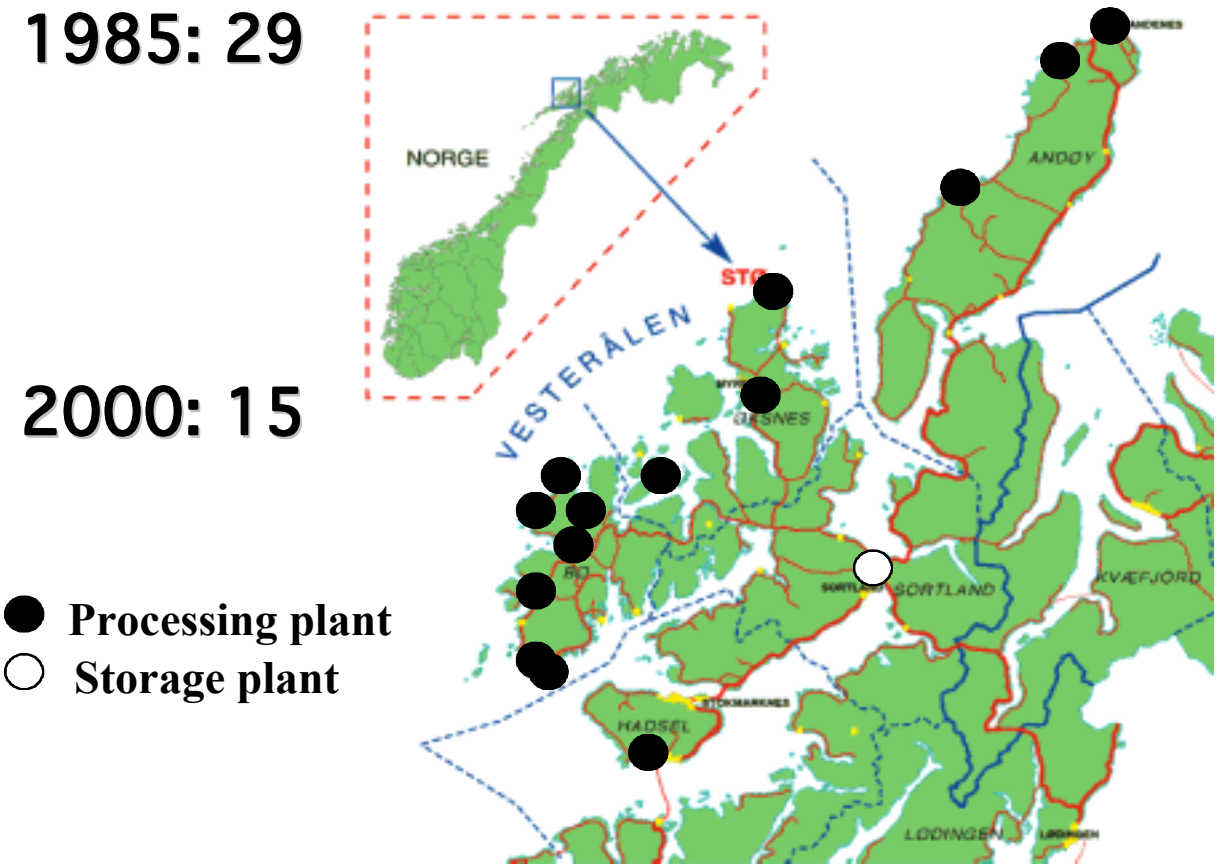

Figure 2 Location of traditional processing plants and the new storage plant in Vesterålen.

The map illustrates that the traditional processing plants are located on the shore close to the rich fishing areas outside of Vesterålen. In the period from 1985 until 2000 the number of fish processing plants has decreased from 29 to 15. The major change in the structure in this region, however, is the establishment of a storage plant in the region. This plant was established in 1993 and in fact the first among the new generation of storage cold plants. The plant has from day one been a success. As can bee seen from the map it was located in a part of the region where there have not been located any traditional processing plant before. The chosen location does not have any advantage if we consider closeness to the fishing areas important. But if we look at the transportation infrastructure in the region, this is obvious a reasonable localisation for a storage plant. From this location it is possible to serve the local processing plants with raw material. However, most important is the possibility of serving buyers outside the region. The location balances the need for combining closeness to rich fishing areas and infrastructure to serve potential new buyers outside the region.

3. OWNERSHIP

In order to analyse the process in establishing an alternative market place for raw material, we have studied the ownership of the new cold storage plants. The owners of the local fish processing plants, we predict, are not interested in putting many resources into establishing these plants. On the other hand, the owners of fishing vessels in general, and in special the owners of vessels that have implemented new technology for processing and storage onboard, will eager to establish an alternative market. In Table 1 we have summed up the strategic positions to the owners in the new storage plants. We have categorised the owners of the storage plants into seven groups;

- Vessel owners that have implemented new storage technology onboard (1)
- Vessel owners that have not implemented new storage technology onboard (2)
- Fishermen's sales organisation (3)
- Owners of processing plants outside the region (4)
- Owners of local processing plants (5)
- Transportation companies (6)
- Public authorities (7)

We have chosen to account for ownership by the fishermen's sales organisation because we consider storage plants as an important strategic asset in order to strengthen the bargaining power of the fishermen. We have also mapped the degree of ownership in the storage plants among processing firms located outside the region. This is because new paths for raw material flow may help these actors in entering new raw material markets. The next strategic group of owners we have accounted for is the local processing plants. We predict that they will not play a major role in establishing infrastructure that will weaken their bargaining power and lower the entry barriers for new competitors. We have also included the transportation companies as a group in our mapping of ownership because we predict they will be in a position of increasing their market and have key knowledge to offer. The last group is public authorities that will be interested to attract new activity to their community.

Table 1 Ownership in the new cold storage plants established from 1990-2000.

	Ownership category						
Plant	1	2	3	4	5	6	7
A			X			X	
B			X		X		X
C		X					X
D						X	X
E			X			X	
F						X	
G						X	
H						X	
I						X	X
J						X	
K						X	
L						X	
TOTAL	**0**	**1**	**3**	**0**	**1**	**10**	**4**

As can be seen from the table there is one main actor in establishing these new cold storage plants – transportation companies. In 10 out of 12 plants there is one or more transportation companies involved through ownership. Additionally it is shown in the table that this strategic group is the only owner in six of the plants. The table also shows that the fishing vessels are only marginal involved in establishing these plants, and this involvement is often indirectly through the fishermen's sales organisation. On the other hand, it is shown that also local processing firms have played a marginal role in building and managing these plants. A part from the transportation companies, the results in the table indicate that public authorities are frequently involved in establishing these plants.

4. CHANGE IN RAW MATERIAL FLOW

The success of a storage plant is, as mentioned earlier, that the fishing vessels get access to new customers outside the region they are landing their catch. Similarly, the new cold stores have enabled these customers access to new suppliers, bypassing the existing plants where all the catch used to be landed. If not sold immediately after catch or landing, the fishing vessels also can choose to store their catch in the plants hoping to achieve a better price later. The possibility for the vessels to sell a specific catch to more then one customer, and likewise for the customers to buy a specific part of a catch, and necessarily not a whole catch, is also an explanation for the success of the new cold stores. The traditional processing plants will thus have to pay the same price or higher, corresponding to the prices established in the new channel, to attract landings from the fishing vessels now landing their catch at the new cold stores.

The rise of the cold storage plants indicates that this new path of raw material flow has been able to compete on price with the traditional processing plants. It also indicates that it has successfully made it possible for new customers, located outside the region, to buy raw material inside regions where the storage plant is located.

The growth in storage capacity and the slack in storage capacity among the traditional processing plants indicate that the new way of organising the value chain has some competitive advantages compared to the traditional way of organising different activities. We have argued that if this new organisation form is a success, this has to be materialised through higher prices and growth in volumes distributed through this path.

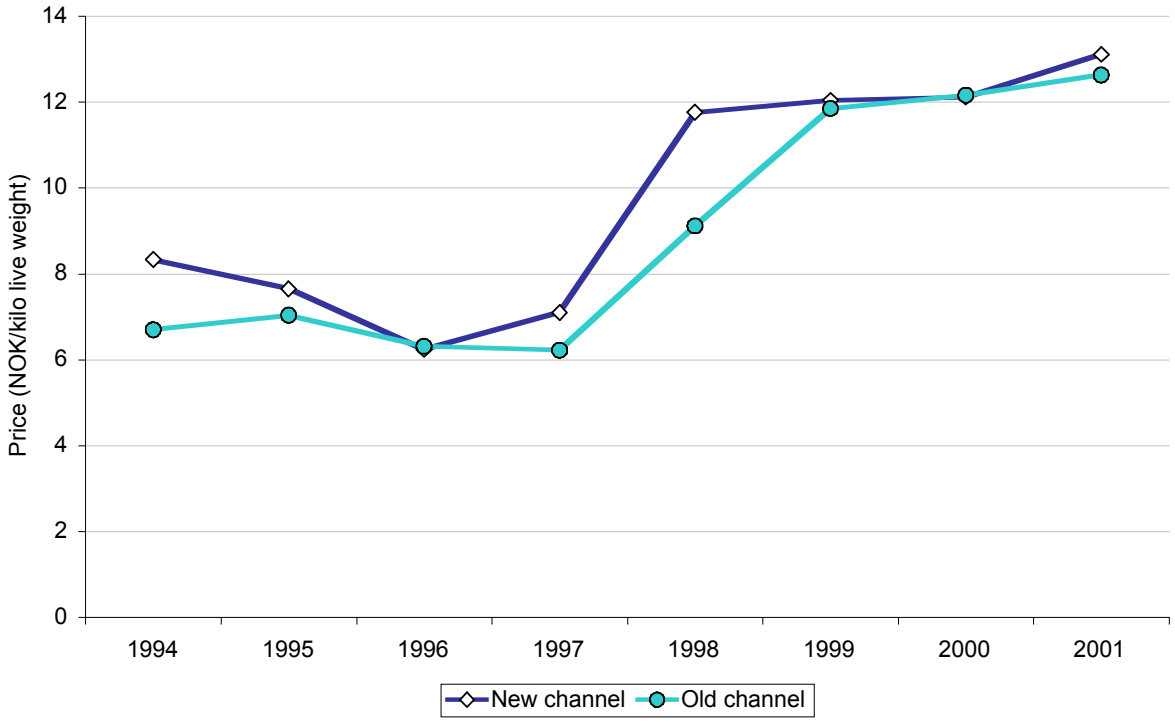

Figure 3 Average prices on cod achieved by selling through storage plants (new channel) and direct to processing plants (old channel)

In Figure 3 we have plotted the average price on cod (i.e. the most important species) in the two channels the last few years. As can be seen from the figure the price on cod landed at the cold stores has been significantly higher some years, and with a price premium of almost 30 percent in 1998. The difference has seemingly been blurred in the last three years, but this seems to be a result of differences in the average size of the cod sold through the two channels. While about 40 percent of the cod sold through the old channel were in the largest size category in 2001, only about 15 percent of the cod sold through the new channel were in the same size category. The main reason for this is the difference in the composition of the catch sold in the two channels. The price on cod is strongly dependent on the size of the fish; fish in the largest size category achieved a price premium of 25 percent in 2001 compared with fish in the next size category. Corrected for size our figures suggest that there

still is as significant difference in prices in the two channels, with a price difference of between 10 and 25 percent in the years 1999-2001 in each size category for vessels landing their catch at the new cold stores.
We have also studied prices on other species and different fish sizes and the conclusion is unambiguous – the prices are higher on fish sold through storage plants than directly to the processing plants. The results confirm that vessels that have invested in new technology for storage onboard achieve a higher price for their catch than if they sold it fresh in the traditional channel. This is a surprising result, taken into account that the catch is frozen onboard, while the alternative way of organising the production consists of fresh raw material. But we have earlier in the paper argued that this is not connected to consumer preferences, but rather to increased competition as barriers for new entrants to this market are lowered through the new channel.

Another indicator of the success of the new way of organising the production is the increase in volumes flowing through the new storage plants. Table 2 confirms that the new pathway of raw material has been a success as far as volumes and percentage of total landings are concerned.

Table 2 Annual volumes of raw material flowing through the new cold storage plants.

	1998	1999	2000	2001
Fish and shellfish landed at cold stores (1.000 metric tons, live weight)	75	142	165	193
- of this processed	15	36	31	48
- of this unprocessed	60	106	134	145
Percentage of all fish and shellfish landings	11 %	22 %	28 %	34 %

We have divided it into two groups – unprocessed and processed. The processed material is to a large degree frozen fillet, while the unprocessed material is gutted fish frozen without head or shellfish. The volumes are presented as live weight. All the raw material flowing through the new path is frozen but is processed in different degree. In the next figure we have illustrated the composition of the material being stored at the new plants. As can be seen from Table 2 there has been a continuously growth in both categories, and about 34 percent of all catch landed in northern Norway is now landed at the new cold stores.

Another question, arising from our findings, is which part of the fishing fleet has chosen to deliver their landings through this new channel. In Norway, and particular in the ground fish sector, there has been an increase of landings from Russian vessels. In order to study closer the sources of the raw material following the new path, we have categorised the raw material according to the land of origin of the vessels. The results of this approach are presented in Figure 4.

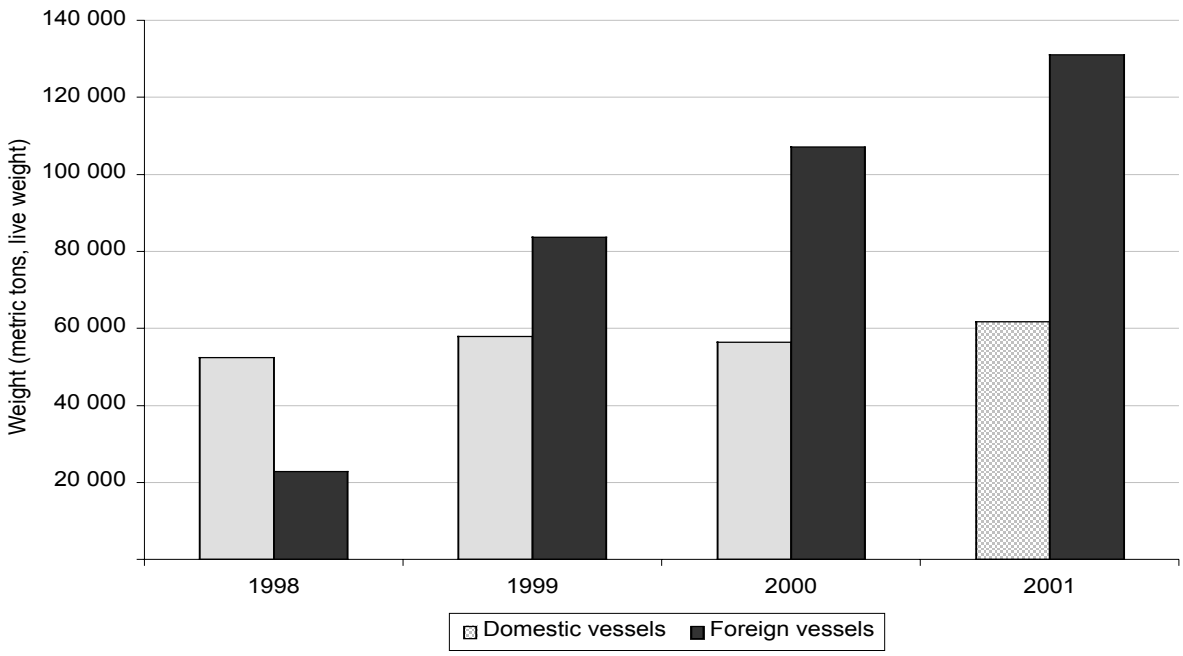

Figure 4 Volume of fish and shellfish landed at the cold stores by vessel nationality

(Volumes converted to live weight)

As can be seen from the figure, the amount of fish and shellfish landed by Norwegian vessels has not changed much the last three years, while there is as strong growth of fish and shellfish from the foreign fleet (i.e. Russian vessels). For both vessels groups one must take in consideration the significantly cut in quotas from 1998 to 2000.

Our findings also reveal that there has been a dramatic change in degree of processing on board in the Russian fishing vessels the last decade. Most of the fish from this fleet was landed fresh and unprocessed until 1995, and has been an important source of raw material for the Norwegian fish processing industry. Since 1995 there has been a continuous change towards both more freezing and processing on board, as can be sees in Figure 5. This development has been possible due to investments in new fishing vessels and implementing of new processing technology on old vessels.

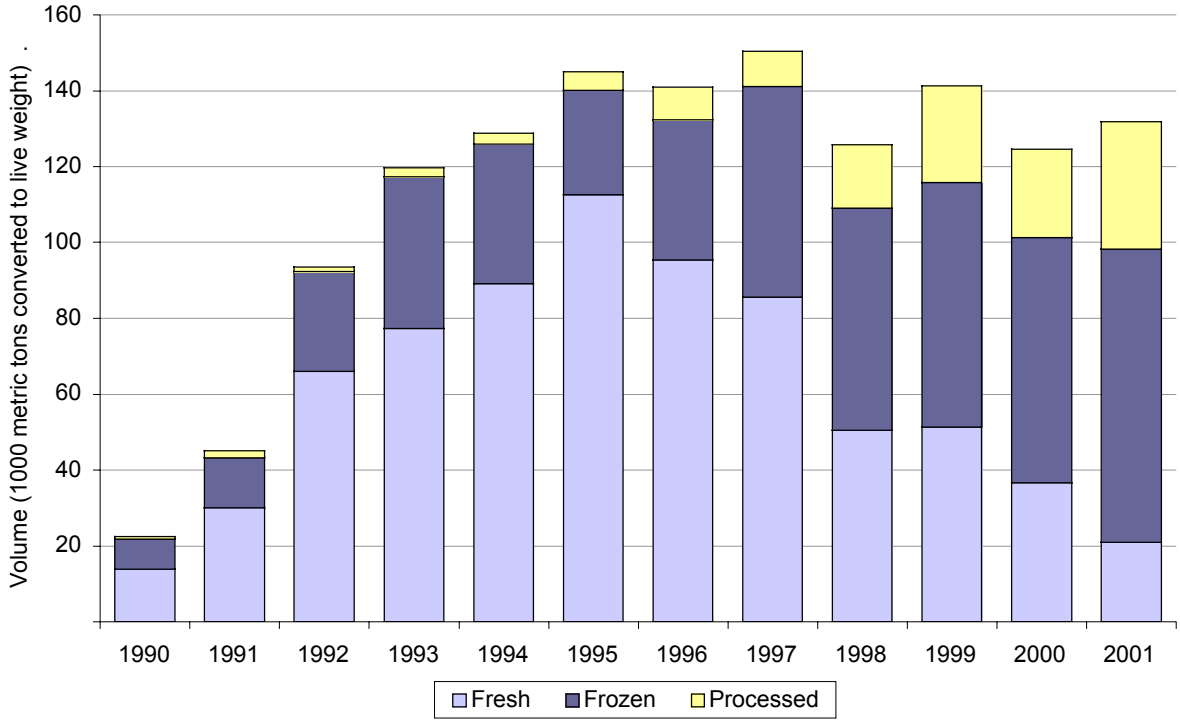

Figure 5 Landings of cod from Russian vessels to Norwegian processing and storing plants.

We have argued earlier that the success of the new path is connected to entrance of new and global actors in the local raw material market. To test this argument we have studied where the raw material landed at the new cold storage plants are transported and where the buyers are located. Such studies are quite complex and costly. Thus, we will focus on the results from an intensive study of the flow of raw material from the storage plants in Troms and Finnmark Counties in 1999. As can be seen from Figure 1, five of the new storage plants are located in this area. The results from our study of the raw material flow are presented in Figure 6.

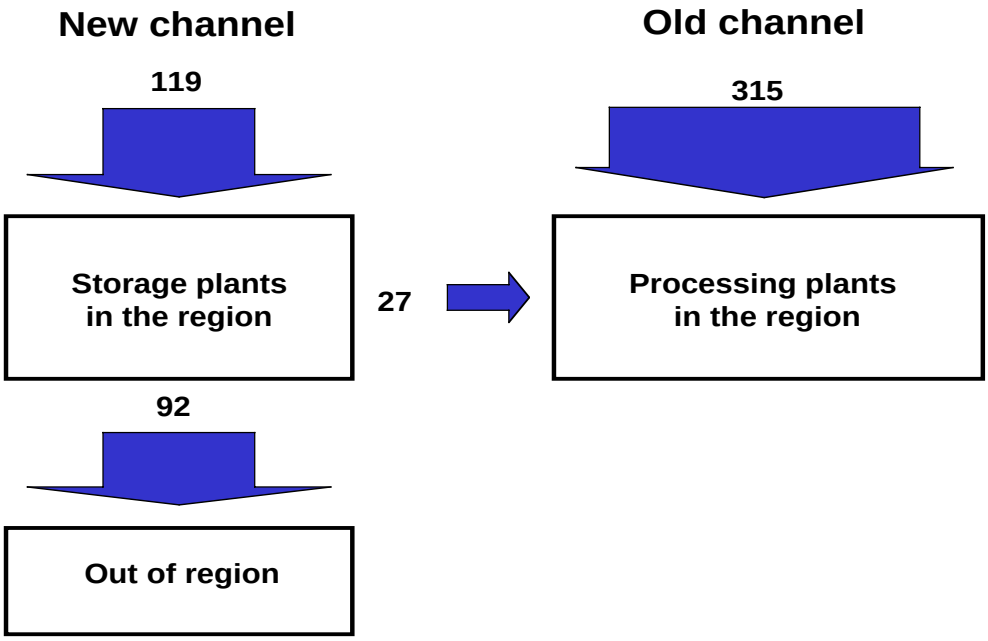

Figure 6 Raw material flows (thousand metric tons) in the new and old channel in Troms and Finnmark counties in 1999.

As can be seen, most of the raw material that flows through the cold storage plants is sold out of the region. Only 22% of the total volume are sold to local processing plants. Another important finding is that the new channel has become an important path for the raw material flow. 27% of the total landings in this region followed the new channel in 1999. The latest numbers indicate that this success has been continued, and according Table 2 more than one third of the total landings was sold through this new path.

5. CONCLUSIONS

Our findings confirm that implementation of new technology has had a major impact on raw material flows and the organisation of production in the Norwegian fish processing industry. The change in landings, i.e. from fresh fish to frozen raw materials, created a new possibility in implementing a new channel for distribution of fish by establishing cold storage plants. These companies were located in areas with well-developed infrastructure rather than in areas close to rich fishing areas. The implementation of new technology and the priority given in where to locate the new cold storage plants changed the bargaining positions in the local raw material market. New entrants, located outside the region, where given easier access to this raw material, while the traditional processing plants experienced that their competitive advantage, i.e. being located close to the fishing areas, crumbled.

The success of the new market place is confirmed by a tremendous growth in volumes and through the prices achieved the last decade. Our study indicates that it was the transportation companies in co-operation with local public authorities that played the major role in establishing this new channel for raw material flow. In this initial phase the processing plants and the fishermen played a marginal role in building and managing the new cold storage plants.

For the existing fish processing industry in the region this development has enforced new strategic decisions. One is whether to invest in processing equipment for processing of frozen raw materials or not. Some processors have decided to exploit the use of fresh raw materials only as a selling point.

Our findings have some implications as far as methodology and theory is concerned. First of all, technological innovations may start a process as Schumpeter (1934) named “creative destructions”. Such processes may, as illustrated in this case, change the competitive position in different part of the chain (Hunt, 1997). Often, as illustrated here, an innovation is implemented in one part of the value chain, and the consequences might be devastating for other parts of the chain. In parts of the literature there is an ongoing discussion on if “creative destructions” are implemented by external changes (Burns & Stalker, 1961; Stinchcombe, 1965; Hannan &

Freeman, 1977, 1989) or by proactive actors within the industry (Thompson, 1967; Porter, 1980; Jauch & Kraft, 1986). This study gives support to both approaches as proposed by for instant Hunt & Morgan (1995) and Priem & Butler (2001). Here we report a process that are a combination internal actions, i.e. vessel owner investing in new technology, and entrance of new and external actors, i.e. transportation companies building new logistic systems.

This study also contributes to a better understanding of globalisation processes. In our case the value chain, and the competitive position of different parts of this chain, is changed mainly due to new logistic systems and reduction of transaction cost within the chain. This open for lower transport cost and increasing global competition, making it easier to implement a global sourcing strategy.

The resource-based view (RBV) of the firm has been developed in order to understand why some firms achieve competitive advantage. The model is based on the observation that some firm resources are heterogeneous and immobile. To have potential of sustained competitive advantage firms' resources must have four attributes: They must be valuable, rare, imperfectly mobile and non-substitutable (Penrose, 1959; Wernerfelt, 1984; Barney, 1991; Peteraf, 1993). RBV has received much attention the last decade. However, one major challenge facing the perspective is to contribute to a better understanding of when and how a resource, or a bundle of resources, becomes valuable. Priem and Butler (2001) denominate this as the "black-box"-problem. Our study confirms the need for integrating RBV to contingency theories. The results from our study also confirm the need for implementing a dynamic view, as proposed by Priem and Butler (2001), on the value of firm specific resources. The results presented here indicate that technological changes among the suppliers created a totally new competitive position for the local processing plants. In the new competitive setting one of the most valuable resources among the processing plants, i.e. a location close to fishing areas, was devaluated. The bargaining power of the processing plants was decreased mainly because new entrants achieved easier access to the local raw material market.

Our approach and results also indicate the necessity to take into account that actors have different strategic positions in order to understand how, where and when resources on the firm level become valuable. For instance, our results indicate that it was the transportation companies that implemented the infrastructure needed to create a new market for raw fish. This implementation in fact strengthens the value of licenses to fish among the vessels. At the same time the value of the geographical location close to the rich fishing areas among the processing plants was decreased.

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