100% FISH

From Sea to Land:

Increased Inland Processing of Groundfish in Iceland

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Summary

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Groundfish processing in Iceland has increasingly moved from sea to land in recent years. This is evidenced by a change in the fishing fleet composition and landed catch. Since 2010, the number of freezer trawlers has decreased by 43% and the portion of landed cod by freezer trawlers has gone down by 9.5%. Furthermore, four wet fish trawlers have been added to the fleet and the fleet's portion of landed cod has increased by 9%. This development in groundfish processing stems from several sources, but chiefly from the incentive of greater economic efficiency, viz. higher prices for fresh fish as well as lower labor costs (relative to revenue) and higher EBITDA of vertically integrated companies. Other major contributing factors in this progression include a resource tax and technological advancements.

Increased Inland Processing

Over the last few years, groundfish processing in Iceland has moved from freezer trawlers to inland facilities. While the reasons for this change are manifold, the main impetus has come from increased economic efficiency in the form of higher prices for fresh fish products and lower labor costs. Other contributing factors include a resource tax or fishing fee on the fishing industry and technological advancement.

This paper examines the reasons behind the shift in setting for groundfish processing in Iceland and how it has manifested itself. To this end, several indicators are analyzed, including the evolution of the composition of trawler types, landed catch by vessel type, and type of landed catch (fresh or frozen). Emphasis is placed on comparing these indicators for freezer trawlers and wet fish trawlers. Other similar vessel and boat categories are also considered when relevant. The analysis incorporates a bottom-up analysis of three different types of business operations in the fishing industry: a freezer trawler company, a wet fish trawler or longliner company, and a vertically integrated wet fish operation. An attempt is also made to assess the implications of increased inland processing for the fishing industry and fish utilization, both locally and worldwide.

A Tale of Two Trawlers

Two main types of trawlers operate in the fishing industry: freezer trawlers and wet fish trawlers. Wet fish trawlers generally go out to sea for five to seven days. Their processing involves bleeding, gutting and chilling the fish before landing. Freezer trawlers, on the other hand, go out to sea for a few weeks, process the catch on-board and land the product frozen, ready for export or domestic consumption. Statistical data for their operations is readily available.

Apart from these two types of trawlers, there are other types of fishing vessels, mostly boats for catching fresh fish. These include longliners of various sizes, seine boats, and smaller boats (using handlines). Statistical data for the operations of vessel types other than trawlers is unavailable. It is, however, available based on vessel size categories, measured in gross tons (GT): less than 10 GT, 10 to 200 GT, and greater than 200 GT. This categorization is provided by Statistics Iceland in the statistical series “Profitability in fishing and fish processing,” published annually.

It should be noted, for the purposes of the following analysis, that vessels greater than 200 GT in size are comparable to wet fish trawlers. They catch fresh fish and the bulk of their fleet consists of longliners and a few seine fishing boats.

Factors of Change

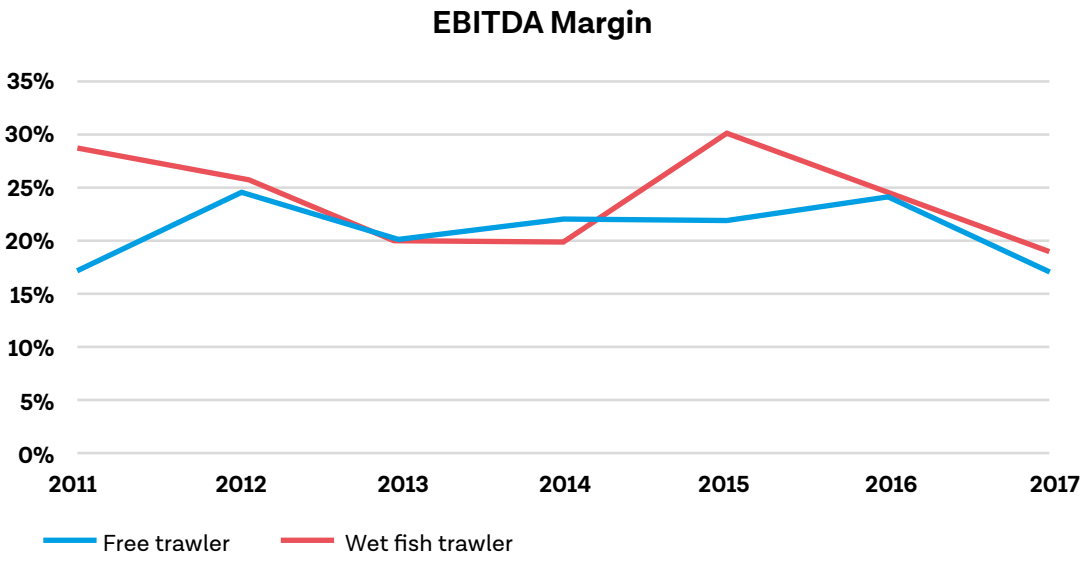
Most, if not all, factors that cause groundfish processing to move from freezer trawlers to inland facilities are based on economic incentives. This chapter considers some of these factors.

Economic Efficiency

Economic efficiency is an economic state in which resources are optimally allocated while minimizing costs and waste. Changes to economic efficiency resulting from the substitution of on-board processing for inland processing are evaluated using EBITDA (earnings before interest, taxes, depreciation and amortization), fish product prices, the labor cost to revenue ratio, and the fishing fee.

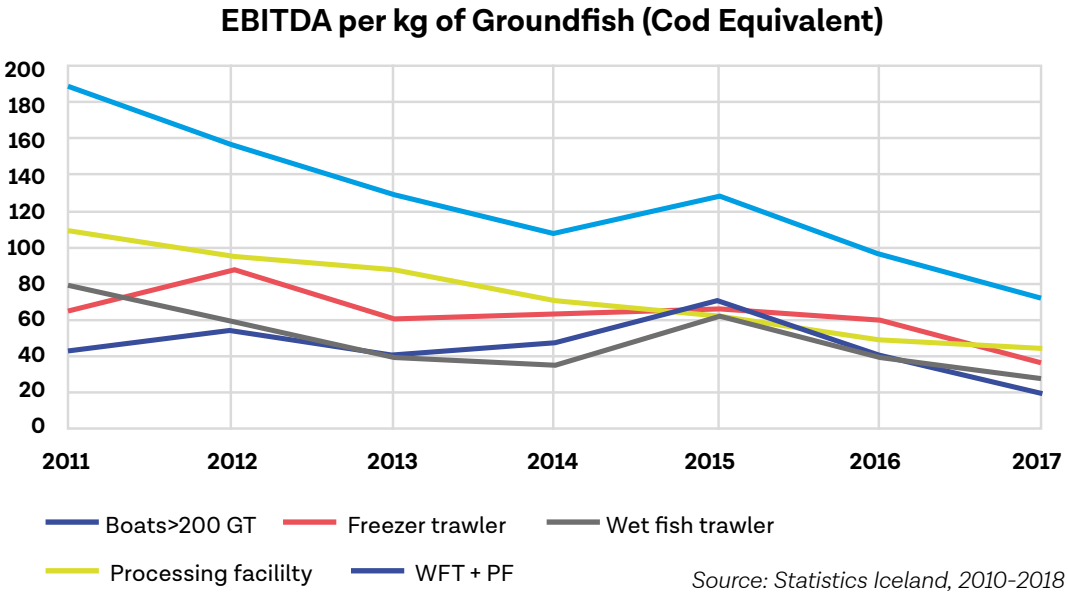
EBITDA

EBITDA is a measure of operating profitability. As such, comparing EBITDA and EBITDA margins (EBITDA/Revenue) for freezer trawlers and wet fish trawlers can reveal possible operational benefits in changing the processing setting.



Source: Statistics Iceland, 2010-2018.

The figure above compares the EBITDA margin of freezer trawlers and wet fish trawlers. In general, wet fish trawlers have a higher EBITDA margin than freezer trawlers. However, this ratio does not take into account that product prices for these two vessel categories might differ. In order to minimize any bias, the following figure compares EBITDA (in Icelandic króna) per kilogram (kg) of groundfish[1] for large boats, freezer trawlers, wet fish trawlers, processing facilities and an aggregate of wet fish trawlers and processing facilities (WFT + PF).



Source: Statistics Iceland, 2010-2018

The dataset for the graph above contains data for pelagic species, which is different from groundfish. The underlying factors behind the graph must therefore be addressed before the results are interpreted.

- EBITDA for the vessels is derived by assuming the portion of the total value contributed to groundfish to yield the same ratio in the EBITDA.
  - For example, if 50% of the total value of landed catch is from groundfish, it is assumed that 50% of EBITDA also stems from groundfish.
- EBITDA for the processing facilities is derived by using the total value of groundfish (assumed to be processed) to the total value of all fish assumed to be processed.
- For a more fruitful comparison, the groundfish weight is presented in cod equivalent weight.[2]

[1] The term groundfish refers to the four most common groundfish species in Iceland: cod, haddock, saithe and redfish.

[2] Cod equivalent weight is the weight of another species which yields the same value as one ton of cod. For example, if one kg of cod is priced at $2 and red fish at $1, the red fish is half a kg in cod equivalent measure.

- The EBITDA per kg of groundfish for the trawler types and large boats is derived by dividing the EBITDA by the total kg (cod equivalent) caught by the respective trawler type and boats.

- However, the EBITDA per groundfish kg in fish processing is divided by the volume of landed groundfish catch (assumed to be going into processing).

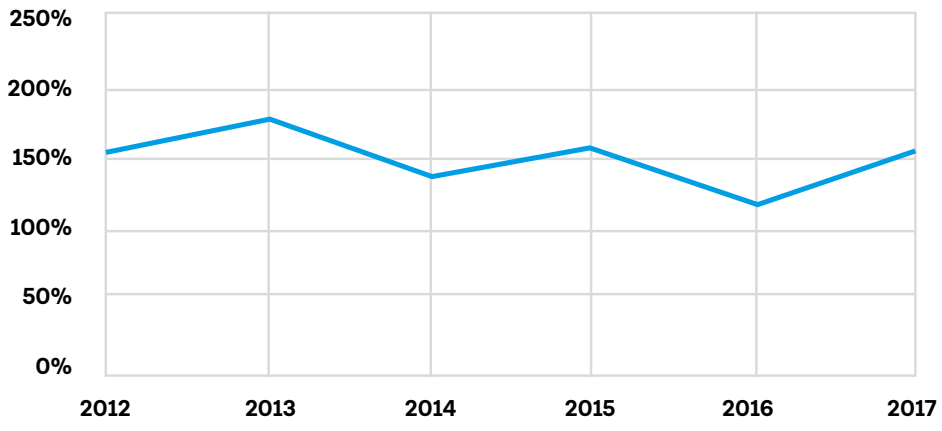
- Note that the volume and value numbers for landed catch contain figures from other boats, such as longliners and smaller fishing boats. These data points should not have a substantial effect on the outcome.

There are some difficulties associated with comparing different vessel categories, since they are aggregated statistics. Different types of companies own the trawlers. Some companies harvest a mixture of groundfish and pelagic species, and companies can have both freezer trawlers and wet fish trawlers and/or longliners. Other companies may own only wet fish trawlers and/or longliners, or be vertically integrated with their own fishing vessels, processing plant, and other equipment.

In these aggregated statistics, data is pooled from various types of companies. This makes it harder to trace the value share of groundfish. Therefore, this study only considers three types of fishing entities: a freezer trawler company, wet fish trawler or longliner company, and a vertically integrated wet fish operation.

Financial statements from these types companies were chosen at random and examined. Even though the number set differed from the aggregated statistic, the analysis revealed a similar trend. A deviation existed between similar companies and from the aggregated statistic, while a similar relationship was found to occur between these three operating elements. For interpretational purposes, it is therefore more appropriate to interpret the relationship between the different types of operating elements instead of focusing solely on the aggregated numbers themselves.

WFT + PF EBITDA relative to Freezer Trawler EBITDA

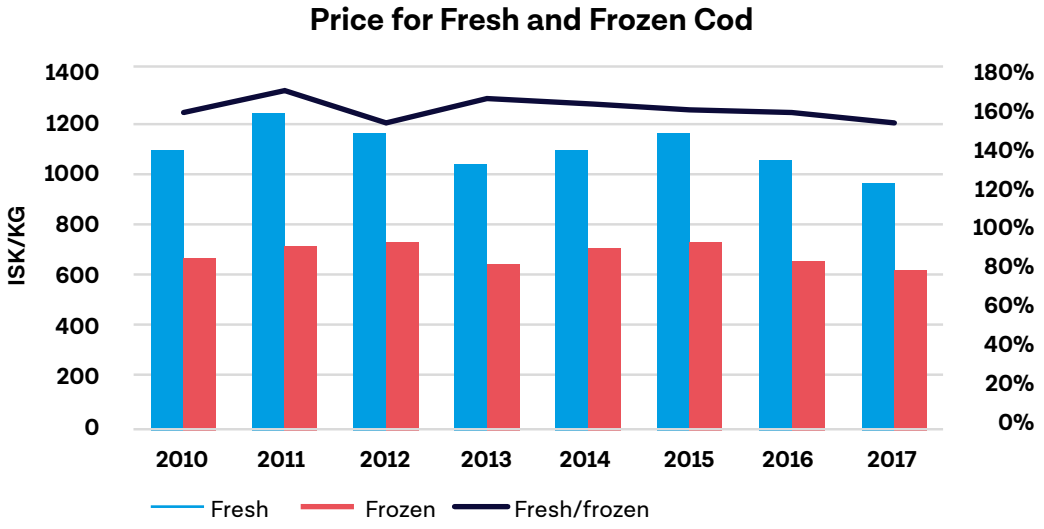


Source: Statistics Iceland, 2010-2018.

Consequently, the graphs of EBITDA in per kg (cod equivalent) and the graph of the EBITDA of wet fish trawlers and processing facilities relative to the EBITDA of freezer trawlers indicate how wet fish trawlers, in combination with processing facilities, are more economical than freezer trawlers.

Fish Product Prices

This relates directly to maximizing revenues from resources. For fish prices statistics, cod is used as a proxy, as it is by far the largest landed catch in Iceland. Landed amounts of cod compared to redfish, the second largest species landed in 2017, was more than four times greater, or 250 thousand tons compared to 60 thousand tons, respectively.



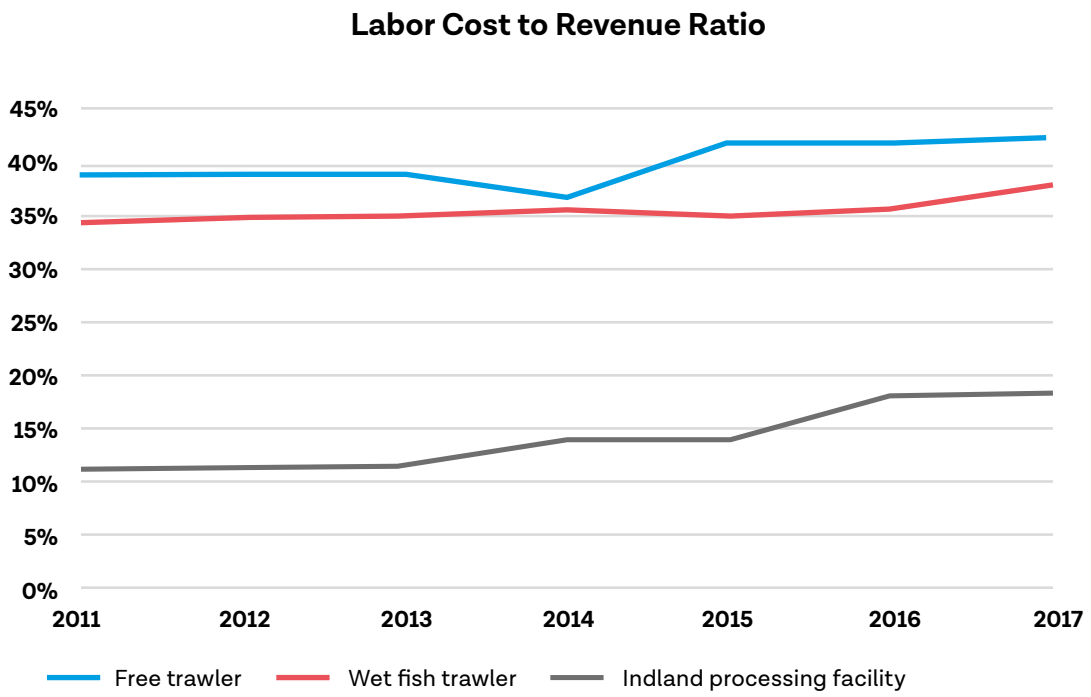
Source: Statistics Iceland, 2018.

The above graph represents aggregated statistics collected by Statistics Iceland from customs reports concerning exports of fresh and frozen cod products. To derive the króna-to-kg ratio (ISK/kg), the total value was divided by the total weight. It must be noted that the category of frozen cod may contain cod products that have been processed inland and frozen for export, as well as other cod products that are exported frozen. Even though the price statistics may be a little biased, the numbers indicate that fresh fish can be exported for much higher value on average than frozen fish.

Labor cost to Revenue Ratio

Labor cost is a significant cost item in commercial fishing. The labor cost to revenue ratio is compared across different types of vessels and operating elements to reveal if moving toward inland processing from processing vessels can be economically efficient.

The labor cost of fishermen on each type of vessel is determined as a percentage of the catch value. In freezer trawlers, fishermen process the fish and receive a percentage of the added-value part of processing. In wet fish trawlers, on the other hand, fishermen receive a percentage of the catch, but not the value-added part of processing. Labor in inland processing facilities does not get a percentage of the catch. Apart from this, technology in processing has increased throughput of fish in processing over seven-fold, measured in kg per manhour, over the last 22 years (Ólason, 2018), which reduces labor cost and generates a more economic environment.



Source: Statistics Iceland, 2010-2018.

The above figure shows how freezer trawlers pay the highest labor cost relative to revenue, while inland processing facilities pay the lowest. However, this does not tell the whole story. Again – prices create a statistical bias. A simple example illustrates more clearly how this labor cost works.

An explanation of how the seafood system in Iceland works is in order. With some simplification, freezer trawlers can be said to land the catch, which is then ready for

export. Wet fish trawlers land the fish, which is sold to processing facilities (also in the vertically integrated companies) according to an agreement between fisherman and the fishing company[3]. The fish is then processed and sold.

Assuming that freezer trawlers receive the export prices and that the processing part of a vertically integrated company sells the fish fresh and also gets the total export prices, an example can be constructed. The following table is created using fresh and frozen prices, calculated previously in the chapter on Fish Product Prices, and a weighted average price for a gutted cod (Pricing Authority for catch prices, 2017):

	Labor Cost / Revenue	Selling Price	Labor Cost	Difference	Difference/ Revenue
FREEZER TRAWLER	42%	613	255.8	357.2	58%
WET FISH TRAWLER	38%	199.4	75.3	124.1	62%
PROCESSING FACILITY	18%	967	177.0	790.0	82%
WTF + PF	26%	967	252.3	714.7	74%

According to the table, the difference per kg for the freezer trawler and the vertically integrated company after labor cost is 357.4 ISK/kg. This means that the vertically integrated company yields two times as much per kg by selling fresh cod, only accounting for labor cost and not including the purchase price to the processing facility.

However, it must be kept in mind that moving towards inland processing requires investments and various expenditures, such as for housing. Nonetheless, the statistics in this chapter present a very strong case for moving toward inland processing.

Resource Tax

This chapter aims at providing an example of how freezer trawlers yield higher fishing fees than wet fish trawlers and vertically integrated companies. A simplified explanation of the calculation of the fishing fee for groundfish is given, while more emphasis is placed on the results than the underlying assumptions. Recent changes to the fishing fee law in Iceland are irrelevant to this chapter, which presents an historical analysis.

[3] All transactions, prices and weights are registered at the Pricing Authority for catch prices.

The fishing fee is calculated for the entire sector based on aggregated statistics of financial statements and supplementary data from fishing companies, gathered by Statistics Iceland and published in the statistical series "Profitability in fishing and fish processing."

The calculation of the fishing fee follows certain rules. By means of simplification and focusing only on groundfish, a calculation base is formed by all the profit from EBT (earnings before taxes) from fishing and then 5% of the EBT from processing facilities. Then, 33% of the calculation base is used to derive the fishing fee for the sector (Fishing Fee Law 74/2012). This can be expressed using the following equation:

$$Fishing\ fee = [100\% \times EBT_{fishing} + 5\% \times EBT_{processing}] \times 33\%$$

where the bracket represents the calculation base. However, to capture the different operational elements (freezer trawlers, wet fish trawlers, and vertically integrated companies), the equation must be amended:

$$Fishing\ fee = [SV\% \times EBT + PFV\% \times P\% \times EBT] \times 33\%$$

which simplifies to:

$$Fishing\ fee = [EBT \times (SV\% + PFV\% \times P\%)] \times 33\%$$

where SV% is the percentage of the total value creation created at sea, PFV% is the portion of the total value creation created at processing facilities, and P% is the percentage for calculating the calculation base for the processing part. The third equation is more flexible and breaks down the value creation between the fishing (harvesting) part and the processing part. This creates room for making calculations for a freezer trawler, a wet fish trawler, a vertically integrated company, and a processing facility.

The fishing fee is then applied to the whole industry. Single companies are taxed only based on their catch quota. Therefore, there is not a clear direct benefit for a company to convert to inland processing from freezer trawlers. However, this can create an incentive for the industry to collectively shift to inland processing.

In general, freezer trawlers yield higher fishing fees, since the fishing fee law considers them to create the whole value while fishing. To clarify this point, it is best to construct a simple example. The base is a catch worth 1,000 million ISK in EBT. The freezer trawler example is simple, while for the wet fish trawler and processing facility setup the revenue is normally split around 55% and 45%, respectively, and is assumed to yield the same ratio in EBT for this example.

Calculating for the freezer trawler:

Fishing fee = [1000 × (100% + 0% × 5%)] × 33%
= [1000 × (100%)] × 33%
= [1000] × 33%
= 330

Calculating for the vertically integrated company:

Fishing fee = [1000 × (55% + 45% × 5%)] × 33%
= [1000 × (57.25%)] × 33%
= [572.5] × 33%
= 188.9

This yields a difference of 141 million ISK for every 1,000 million, or a 42.8% higher fishing fee for the freezer trawlers.

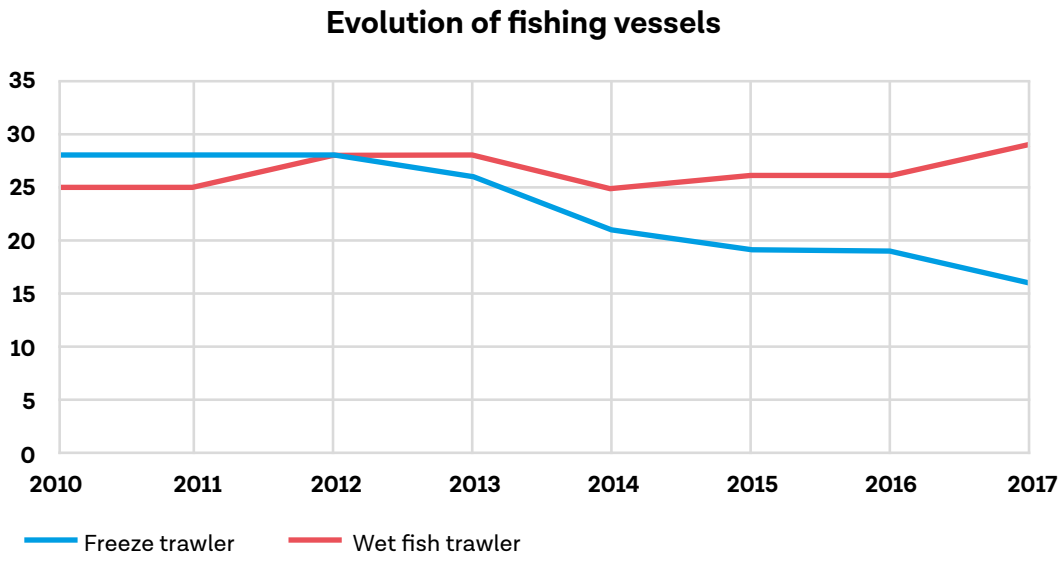
These calculations clearly show how the fishing fee on freezer trawlers is proportionally much higher than for wet fish trawlers. The main difference here is that the contribution to the calculation base from the freezer trawler is calculated from the entire value onboard, which includes the processing part, while for a vertically integrated company only 5% of the processing value contributes to the calculation base, from which 33% is calculated as the fishing fee for the industry.

Simply put, the difference between the fishing fee on freezer trawlers and wet fish trawlers is that there is more taxation on freezer trawlers, stemming from their onboard processing.

Indicators of Change

The most important indicators of a shift towards inland processing are the evolution of the fishing fleet composition and change in landed catches of fresh and frozen groundfish.

Evolution of the Fishing Fleet

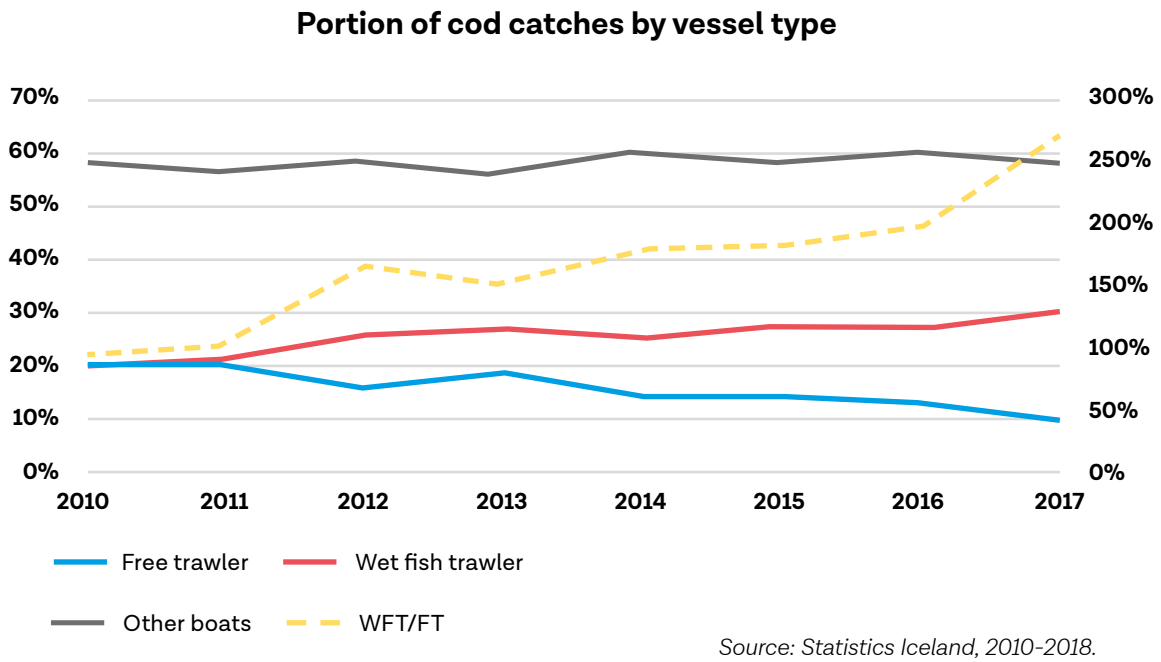


Source: Statistics Iceland, 2010-2018.

Since 2010, the number of freezer trawlers in Iceland has declined from 28 to 16, while the number of wet fish trawlers has increased from 25 to 29. Data for the number of longliners, especially large ones, is not readily available. The illustrated evolution of the trawler fleet nonetheless supports the theory that groundfish processing in Iceland has shifted from freezer trawlers to inland facilities.

The argument could be made that fewer but more productive ships explain the reduced size of the freezer trawler fleet. The evolution of groundfish catches must therefore be examined.

Development of Landed Catches



Source: Statistics Iceland, 2010-2018.

The graph above shows how the portion of cod catches by vessel type has evolved (left axis) over time and how cod catches have developed among them (WFT/FT broken line, right axis). This statistic, from "Profitability in fishing and fish processing," suggests that freezer trawlers and wet fish trawlers only account for around 40% of cod catches, while the rest is caught by boats in size categories using other fishing equipment. One observation of interest is that the portion for other boats (size categories) is similar, while the portion of total cod catches has decreased for freezer trawlers but increased for wet fish trawlers since 2010. Simultaneously, the ratio of cod catch volume between wet fish trawlers and freezer trawlers has gone from 1:1 to around 2.5:1 during the same period.

Summary and Conclusions

Analysis of the factors contributing to the change in setting of groundfish processing reveals that inland processing seems to be a more profitable option than processing the fish on-board in trawlers. Not only are fresh fish prices higher than prices for frozen fish, but cost items such as labor cost (relative to revenue) are much lower for vertically integrated companies. These factors clearly incentivize fishing companies to allocate resources towards greater inland processing.

In addition, the fishing fee is higher on freezer trawlers, which creates an incentive for the industry to collectively move towards inland processing. The net benefit of higher prices and lower cost items is clearly illustrated in the EBITDA analysis, indicating more favorable conditions for vertically integrated companies.

There are, of course, different elements at work behind some of the factors. These include the fact that there is high tech equipment in the processing facilities multiplying throughput per hour of work, which can increase efficiency. Fishing vessels also have limited room, which places a physical constraint on increasing processing at sea. Another downside to vessel processing is the cost of electricity in vessels (generated by oil), which is higher than using renewable energy sources inland.

An examination of the development of fish processing revealed that the number of freezer trawlers decreased by 43% between 2010 and 2017. Only four wet fish trawlers were added to the fleet over the same period. It is interesting to note that this development coincides with the ratification of the fishing fee in 2012. The portion of landed cod by wet fish trawlers has gone up by more than 9% since 2010, while the portion of landed cod by freezer trawlers has decreased by 9.5%. This can be explained in part by the refurbishment of the fleet, transference of quota from freezer trawlers to wet fish trawlers, and more days at sea for wet fish trawlers.

Apart from the benefits of increasing profitability and reducing costs, there are other benefits to inland processing, namely in increasing the utilization of fish.

The move towards increased inland processing has significant meaning for increased fish utilization in Iceland, as freezer trawlers have limited room and incentives to bring by-products onshore. The wet fish trawlers, however, bring the fish bled and gutted onshore, and sometimes bring the offal and liver as well, therefore creating opportunities for increasing fish utilization.

Additionally, this paper shows how the economic environment and global demand affect a whole industry. The development of fish processing in the Icelandic fishing industry is worthy of attention for other fishing nations. A progression of fish processing from vessels to inland facilities in other fishing nations would contribute to increased fish utilization, creating opportunities for developing value-added products from fish by-products.

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