UNIVERSITY OF COPENHAGEN

The Economics of a Discard Ban Policy: Short term impacts for the Danish fishery of implementing the EU Dis card Ban

Lisa Ståhl, list@ifro.ku.dk
Peder Andersen, pean@ifro.ku.dk

Department of Food and Resource Economics
University of Copenhagen

IIFET, Aberdeen, 12.07.2016

Introduction

The purpose of the study is to estimate the short term economic impacts for the Danish fleet, given various assumptions about quota top-ups, increased quota utilisation, changes in minimum sizes, and changes in discard fractions.

Source: http://curis.ku.dk/ws/files/143083454/IFRO_Rapport_242.pdf Analyse af de erhvervsøkonomiske konsekvenser af discardforbuddet. (IFRO Rapport; Nr. 242. 2015). Authors: Lars Ravensbeck, Lisa Ståhl, Jesper Levring Andersen, and Peder Andersen.

Economics and discard

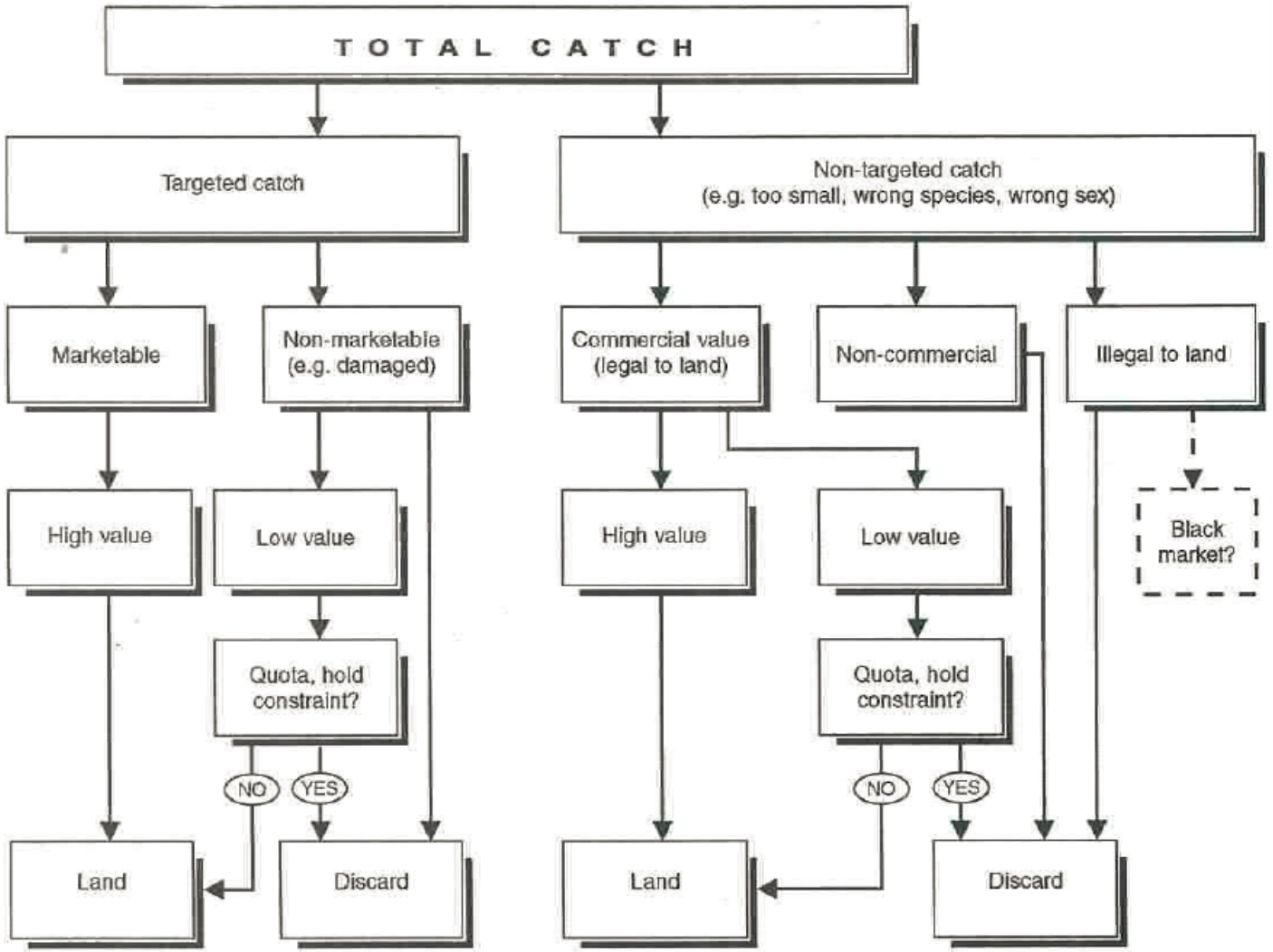
There is much written on the economics of discards.

- The knowledge of what is rational behaviour regarding discarding versus incentives driven by policy not to discard

- The fundamental idea of costs outweighing benefits or as is typically considered whenever *"the (opportunity) cost of retaining and landing fish exceeds its market value"*

However, there are gaps in the literature regarding the economic impacts of a landing obligation and very few empirical analyses.

The decision making process (Pascoe, 1997)



The decision process

Discards occur for a number of reasons and enable some sort of planning in the fisher's decision to discard (e.g. highgrading):

- Fish < legal minimum landing size
- Fish have no or low market value
- Lack of quota
- Choke species issues

In all cases, better selectivity will reduce discards:

- Spatial aspect – area fished
- Technical aspect – gear used (incl changing gear, e.g. trawl to traps)
- Temporal aspect – time of year fished
- Market (quota) aspect – ensure catch composition matches quota

In addition, reducing fishing effort will reduce total discards but at the same time landings will decrease.

Model and practical implementation

In the “new world”, landings equal catches

In the “old world” landings equal catch minus discards

There is the potential to discard under defined exemptions but basically the premise is that unwanted catch is landed, it may be

- landed and sold (if quota allows),
- landed and surrendered (for e.g. fishmeal),
- discarded at sea (under exemption), or
- illegally discarded.

In the paper the following will be included:

- Impact of landing obligation on pen access and optimal fishery
- Impact of changes in technology and behaviour

Extended version of a Clark model

Towards a Predictive Model for the Economic Regulation of Commercial Fisheries. Can. J. of Fish. and Aq. Sci., 1980, 37(7): 1111-1129.

Harvest (*h*) for vessel (*i*) is the product of a constant catchability coefficent (*q*), standardised vessel effort (*E*) and fish biomass (*x*):

$$h_i = qE_i x$$

In a model without discards the model doesn't differentiate between landings and catch but in reality landings will almost always equal catch minus discards (or unwanted catch) as harvest contributes directly to revenue. Therefore, we assume that discards (*d*) are greater than zero.

In the simplest case for modelling discards explicitly, catchability can be defined differently for landings and discards:

$$l_i = q_l E_i x$$
$$d_i = q_d E_i x$$

The profitability of a vessel can be calculated as in Clark's model:

$$\pi_i = \pi_i(x, E_i) = pqE_i x - c_i(E_i) = (p_l q_l E_i x + p_d q_d E_i x) - c_i(E_i)$$

were price, p, is different for landed and discarded quantity.

Max profit: $MR_i = p_l q_l x + p_d q_d x = c'_i(E_i)$

Examples of questions and results

Q: Is the stock level under open access < or = or > the stock level under a discard ban?

If we assume that the cost of handling discards is proportional to the amount of discards then we can define a "discard" cost function

$$c_i^d(d_i) = c_d d_i$$

Therefore, marginal revenue (MR) can be defined as

$$MR_i = p_l q_l x + (p_d - c_d) q_d x$$

Observations:

If $p_d < c_d$ then the cost of discarding outweighs catching unwanted fish thus resulting in reduced effort, also resulting in a higher equilibrium stock level

If $p_d > c_d$ then the cost of discarding incentivises catching unwanted fish thus resulting in increased effort, also resulting in a lower equilibrium stock level.

Questions cont.

Changing technology and discarding: The catch of unwanted fish can be controlled through the level of technology investment and effort applied. Therefore, the catchability coefficient is a function of cost of effort,

$$q_d = q_d(c_i(E_i))$$

As the new technology improves selectivity, it follows:

$$\frac{\partial q_d}{\partial c_i} < 0$$

An example: investment in more selective fishing gear will result in less unwanted catches.

Examples of interesting questions:

1. What is the optimal investment in new technology for the fishers and in an optimal fishery?
2. Regarding illegal discard, what is the need to revise the classical analyses of optimal enforcement when illegal discard is included?

What is analyzed in the Danish report?

1.Short term economic impacts for the whole Danish fleet and fleet segments: Impact on an average vessel in fleet segments – calculated as changes in revenue and gross margin profit in nine different scenarios:

- Baseline: The fishery in 2013
- Corresponding quota adjustment/top-up or no quota adjustment/top-up
- Increased quota utilisation
- Changes in legal minimum sizes
- Behavioral change: Reduction in discard fraction

2. Other effects

- Assessment of effects on downstream industry (input/output model)
- Assessment of longer term effects (no empirical analysis)

3. We did <u>not</u> look into the impacts of

- Stock effects
- Technology changes
- Complex behavioural changes
- Discard in pelagic and industrial fisheries
- Imperfect control and enforcement (a very important topic)
- The problem of ”choke species” (a very important topic)

Methodological approach I

Framework

- Catch data and economic data from 2013
- Only commercial vessels and demersal species and no specialised fisheries (e.g. mussels)
- Not enough data to cover pelagic species
- Only quota species are directly included in analysis
- Changes in catches of non-quota species (”bycatch”) included indirectly if vessels reduce effort (proportion principle)

Outcome

- Analysis and results by 19 fleet segments based on vessel length and gear
- Results also presented for North Sea fleet, Baltic Sea fleet, Skagerrak/Kattegat fleet, and the whole Danish fleet

Methodological approach II

Economic impact of the landing obligation for each of the 19 fleet segments is calculated as the difference in the various scenarios from the baseline situation in 2013:

Revenue: Landings value

Variable costs: Fuel, ice, supplies, landings and sales costs (average costs)

Profitability: Landings value minus variable costs (excl. wages and capital costs)

Wages: Assumed to be in proportion to landed value

Gross margin: Landings value minus variable costs and wages

Methodological approach III

Assumptions

- Variable costs change in proportion to effort change
- Fixed costs do not change in the short term
- No changes in fishery patterns
- Catches of non-quota species in proportion to reduction in effort
- No price effects from changes in landed volumes

Methodological approach IV

Marketable landings (ML) in scenarios <u>without quota top-up</u>:

$$ML^N = L^O * (1 - dp)$$

Marketable landings (ML) in scenarios <u>with quota top-up</u>:

$$ML^{N,Q} = L^O$$

where

L^N: Marketable landings **N**ew (after L.O.),

$L^{N,U}$: Marketable landings **N**ew (after L.O.) with quota top-up,

L^O : Marketable landings **O**ld (before L.O.),

dp: Discard percentage

Scenario	Description	Explanation
0 scenario	Basis scenario: The Danish fishery in 2013 is used as basis for comparison	2013 situation with discard for different segments and fishing areas
Scenario A1	2013 situation without quota uplift and therefore a reduction of landings and effort **(Effort reduction)**	Reduction of catch value, the landings of previously discarded fish replace some of the wanted catch. Effort reduction (reduction in variable costs) in proportion to the reduction in catch
Scenario A2	As scenario A1 and additional costs of handling former discard onboard **(A1 + handling costs)**	Increased variable costs caused by costs of handling a more mixed catch. This can be viewed as a ”Worst Case Scenario”
Scenario A3	No quota uplift and therefore an effort reduction but a part of landed discard can now be sold for consumption **(A1 + new minimum sizes)**	2013 situation, no quota uplift, but where the part of landed discard which was previously between the old and new minimum sizes will be sold for consumption (lowest price class)
Scenario A4	No quota uplift and therefore effort reduction, but with improved quota utilization (≤ TAC). **(A1 + improved quota utilization)**	2013 situation, no quota uplift, but the quota utilization increases when the previously discarded fish is included in the quota
Scenario B1	2013 situation with quota uplift and no reduction in effort **(Quota uplift)**	Landings = Previous landings + Estimated landed discard
Scenario B2	Quota uplift no effort changes but additional costs of handling former discard onboard **(B1 + handling costs)**	Increased variable costs caused by costs of handling a more mixed catch.
Scenario B3	Quota uplift and a part of former discard can now be sold for consumption purposes **(B1 + new minimum sizes)**	2013 situation, with quota uplift, but where the part of former discard which was previously between the old and new minimum sizes can be sold for consumption purposes (lowest price class)
Scenario C1	2013 situation with behavioral changes **(A1+behavioral changes)**	C1 is like A1, but a change in behavior is assumed which reduces unwanted catches (former discard) by 25 %
Scenario C2	2013 situation, with quota uplift and behavioral changes **(B1+ behavioral changes)**	C2 is like B1, but a change in behavior is assumed which reduces unwanted catches (former discard) by 25 % (C2 is only calculated for the total fishery)

Results – changes for the entire Danish fleet compared to 2013 baseline

	DKK 1000[1] or %				*ton*	
	changes in					
Scenarios	**Revenue**	**Gross Margin**	**Revenue**	**Gross Margin**	**Discard landings[2]**	**Marketable landings**
A1: Effort reduction (no quota adjustment)	-168,815	-127,792	-7%	-9%	-3,896	-8,541
A2: A1 + handling costs	-168,815	-147,554	-7%	-10%	-3,896	-8,541
A3: A1 + new minimum sizes	-92,719	-65,272	-4%	-4%	-5,891	-6,328
A4: A1 + increased quota utilisation	-69,356	-58,270	-3%	-4%	-1,689	-2,469
B1: Corresponding quota adjustment	10,769	8,435	0.4%	0.6%	0	0
B2: B1 + handling costs	10,769	-20,490	0.4%	-1%	0	0
B3: B1 + new minimum sizes	73,349	64,997	3%	4%	-4,084	6,685
C1: A1 + behavioural changes (25 % less discard landings)	-126,613	-95,845	-5%	-7%	-5,614	-6,406
C2: B1 + behavioural changes (25 % less discard landings)	6,822	5,209	0.3%	0.4%	-3,947	0

1) €1 = DKK 7,5; 2) Discard landings = Discard before L.O. – Discard landings with L.O.

Results – changes for trawl 18-24 m - compared to 2013 baseline

Scenarios	DKK 1000 [1] or % changes in Revenue	Gross margin	Revenue	Gross margin	ton changes in Discard landings[2]	Marketable landings
A1: Effort reduction (no quota adjustment)	-39,307	-32,181	-17%	-29%	-816	-1,793
A2: A1 + handling costs	-39,307	-34,977	-17%	-32%	-816	-1,793
A3: A1 + new minimum sizes	-20,754	-17,151	-9%	-15%	-1,311	-1,298
A4: A1 + increased quota utilisation	-16,555	-13,957	-7%	-13%	-399	-711
B1: Corresponding quota adjustment	2,230	1,901	1%	2%	0	0
B2: B1 + handling costs	2,230	-2,547	1%	-2%	0	0
B3: B1 + new minimum sizes	18,417	16,393	8%	15%	-967	1,262
C1: A1 + behavioural changes (25 % less discard landings)	-29,410	-24,066	-13%	-22%	-1,169	-1,184
C2: B1 + behavioural changes (25 % less discard landings)	1,428	1,200	1%	1%	-802	0

1) €1 = DKK 7,5; 2) Discard landings = Discard before L.O. – Discard landings with L.O.

Main results

- Negative economic impacts when no quota top-up (especially if substantial discards for important species).
  - a reduction of the legal minimum sizes would reduce losses.
  - increased quota utilisation would also reduce losses.

- Largest economic impact on Baltic Sea and Kattegat/Skagerrak fisheries
- Less impact on the North Sea fisheries.

- Largest impact on small and medium sized trawlers
- decrease in revenue by on average 20%
- decrease in gross margin by 30%-50%

- Species contributing to a large degree to the changes in revenue and gross margin are the Nephrops fishery (Norwegian lobster fishery) in Kattegat as well as cod and plaice in the Baltic Sea and Skagerrak.

- Quota top-ups are crucial to avoid significant negative economic impacts and under certain assumptions result in economics gains.

Examples of partial results

➢ ***Where is the landing obligation felt the most?***

- The fleet subgroups with the **largest decrease** (sc. A1) in revenue and gross margin respectively are the trawlers:

  Revenue decrease: between 17% and 28%

  Gross margin decrease: between 27% and 48%

- Mostly explained by the high discard of Nephrops (Norwegian lobster) in Kattegat/Skagerrak as well as cod in the Baltic Sea and Skagerrak.

- New minimum sizes/increased quota utilisation can reduce the financial losses considerably (>50%).

- Quota top-ups corresponding to “previous discard” could be beneficial especially in combination with new minimum sizes.

Challenges in implementing the L.O.

Major challenges are related to:

- Choke species – economic impacts as mentioned in report by Seafish:
- Quota top-ups
- Flexibility of quotas – within and between states
- Exceptions: de minimis and survivability

- Enforcement and illegal discarding

Current work at the University of Copenhagen

2015-2016

Analysis of the long-term economic impacts of the L.O. on the Danish fishing fleet

- Short and long term impacts – comparative statics
- Vessels grouped by length
- Behavioral changes
- Stock effects

The next four years

The DISCARDLESS project will analyse the impact of

- Stock effects
- Technology changes
- Complex behavioural changes
- Imperfect control and enforcement

The Discardless is an international, interdisciplinary project and will focus on “optimal” strategies. The long term impact and potential benefit of the discard ban are the core of the EU financed project DISCARDLESS (2015-2019, budget DKK 38 mio), lead by DTU-Aqua. The Department of Food and Resource Economics (IFRO) has the lead on the econ WP