Arctic char fish farming in Iceland*

Is it a success?

IIFET – 2016
Aquaculture1: New markets & new species

Ásgeir Friðrik Heimisson[1]

[1]Institute of Economic Studies, University of Iceland

UNIVERSITY OF ICELAND
FACULTY OF ECONOMICS

* Work on this paper was funded by from the *European Union's Horizon 2020 research and innovation programme* under grant agreement No 635188.

Content

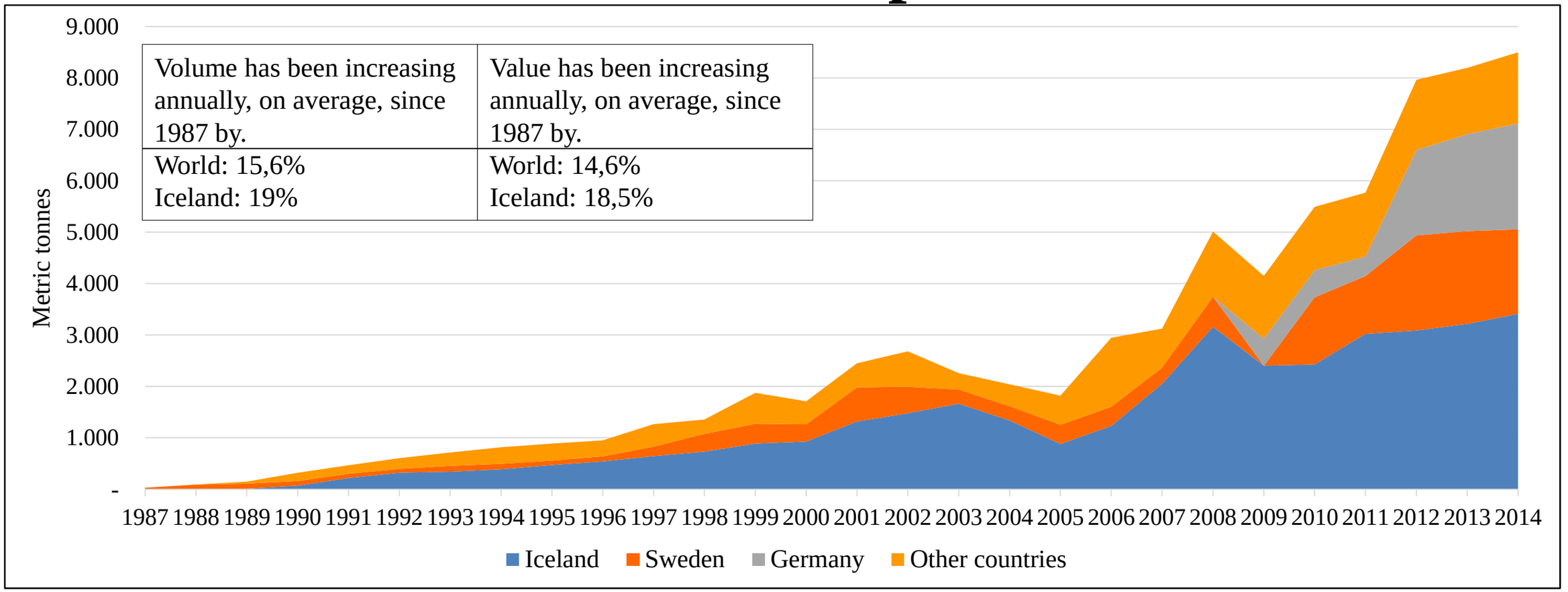
- Case study of farmed Arctic char in Iceland
  - Brief history of farmed Arctic char in Iceland
  - World production of Arctic char
  - Markets for Arctic char
  - Arctic char industry in Iceland today
    - Producers analysed
  - Comparison to other Salmonids industries
  - Economics
    - Is Arctic char farming a success?
  - Conclusion

Arctic char farming in Iceland

- Farming of Arctic char since the year 1910.
- Production of Arctic char on an industrial scale did not emerge on a significant scale until 1987.
- At first production was not profitable.
- The Icelandic government initiated an Arctic char genetic improvement program in 1992.
  - The main goal of the program has been to develop strains with an increased growth rate and delayed sexual maturation.
- Production doubled within five years from when the program was implemented.
- By 1997, Iceland accounted for more than half of the world production of Arctic char, a market share that has remained pretty stable ever since.

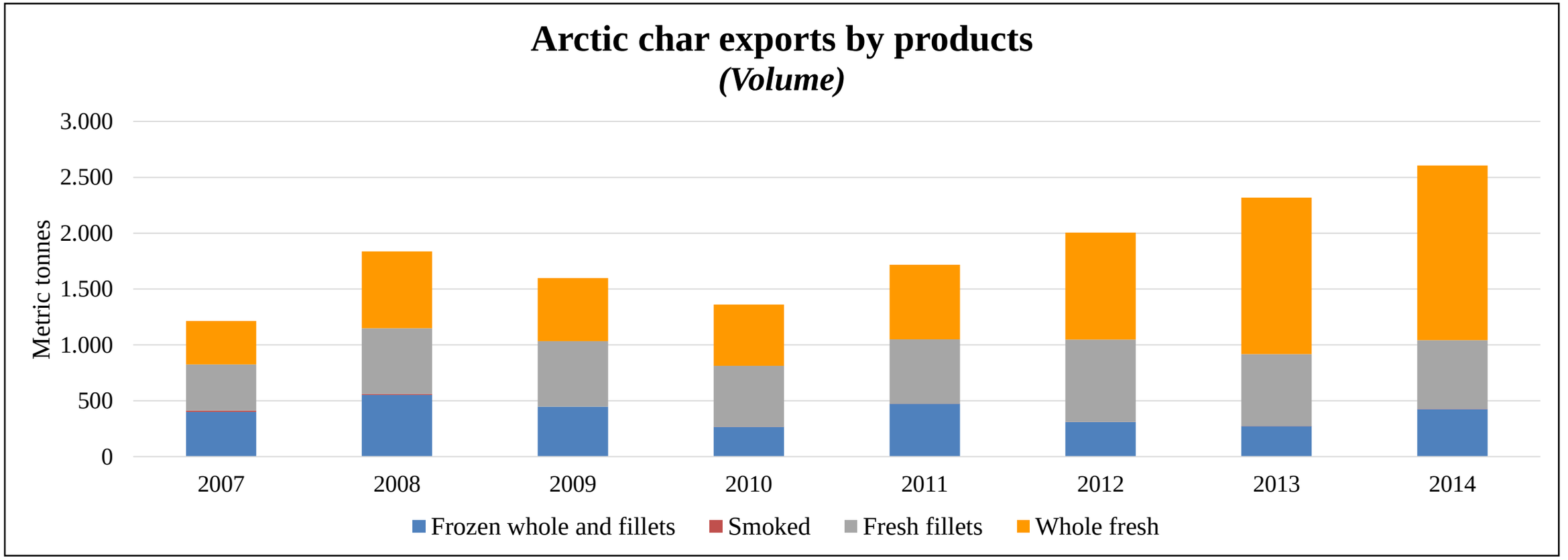
Arctic char world production

Volume has been increasing annually, on average, since 1987 by.	Value has been increasing annually, on average, since 1987 by.
World: 15,6% Iceland: 19%	World: 14,6% Iceland: 18,5%



Reference: FAO statistics and the Worldbank.

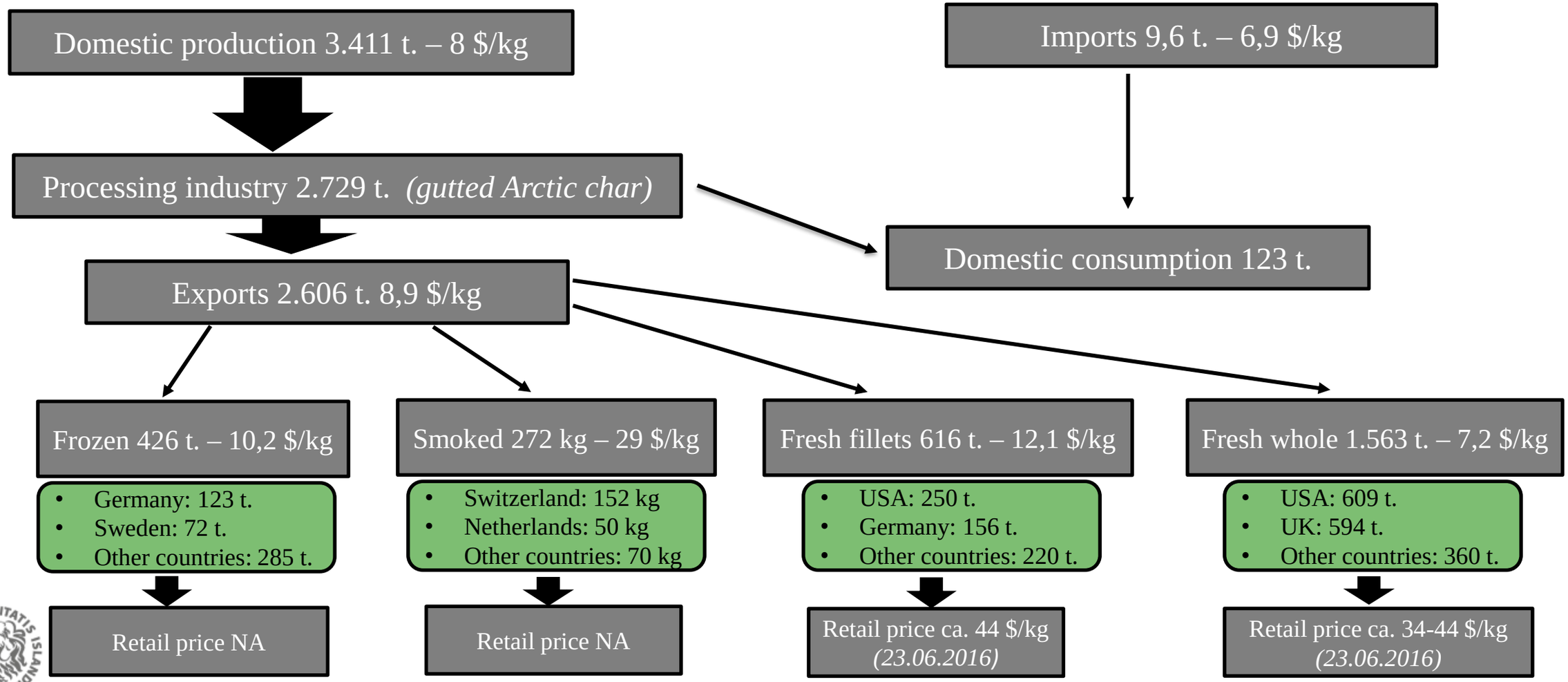
Markets for Arctic char



Reference: Statistics Iceland and the Central Bank of Iceland

Markets for Arctic char

Arctic char value chain in 2014



Reference: Statistics Iceland and the Central Bank of Iceland

Arctic char farming in Iceland today

- Two companies are in business of producing fertilized eggs.
- Today, over 90% of the domestic Arctic char production in Iceland is conducted by five farms: Holalax, Fiskeldid Haukamyri, Rifos, Nattura Fiskirækt and Islandsbleikja.
  - Four of them operate land-based grow-out technology.
  - One conducts the grow-out in water cages.
- Most of the farms use natural spring water for rearing Arctic char.
- However, one of the producers is located near the coast in a geothermal area.
  - The water is pumped from drill holes located within the farm area.
  - This water is a mix of natural spring water and ocean water.

The Icelandic Arctic char producers

Descriptive statistics for the observed data.

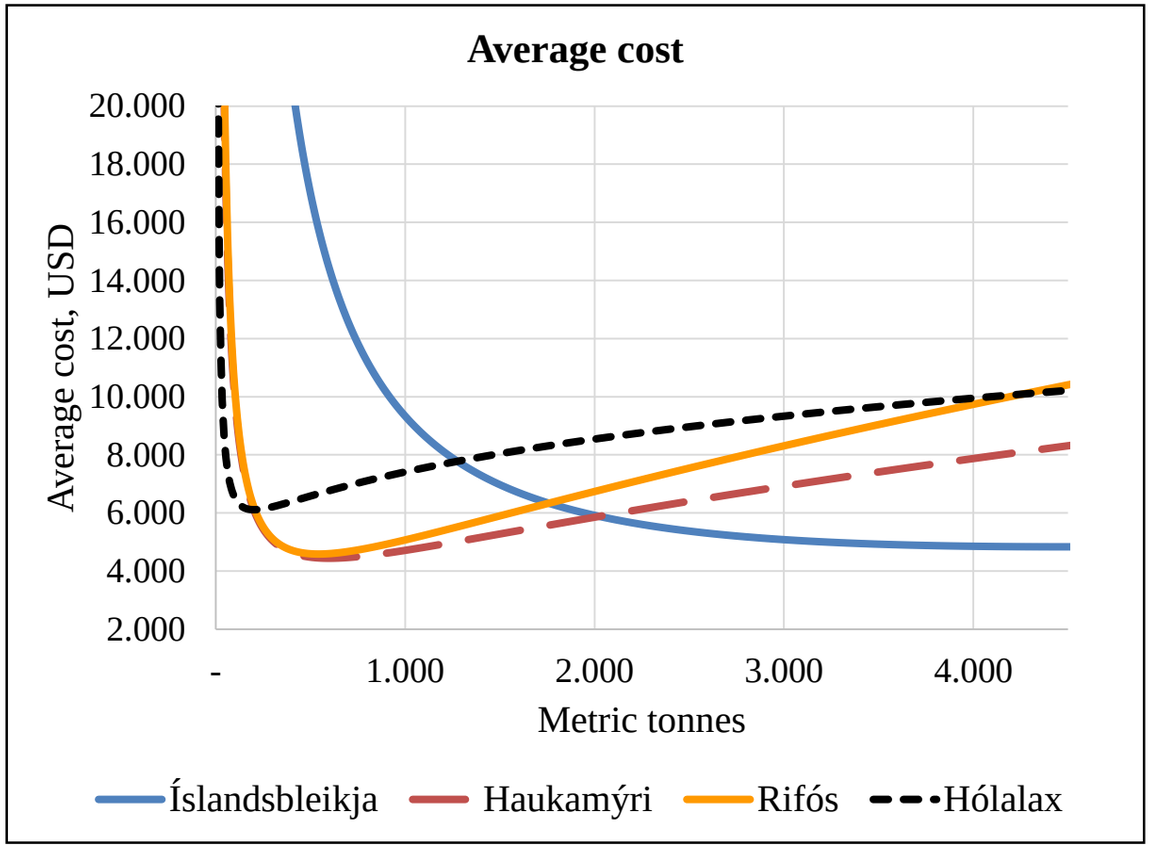
	Quantity (metric tonnes)	Total production cost (million USD)
Number of observations	25	25
Mean	681,9	4,1
Median	208,9	1,3
Maximum	2275	13,3
Minimum	82	0,58
Standard deviation	838,2	4,9
Skewness	1,08	1,01
Kurtosis	2,3	2,08

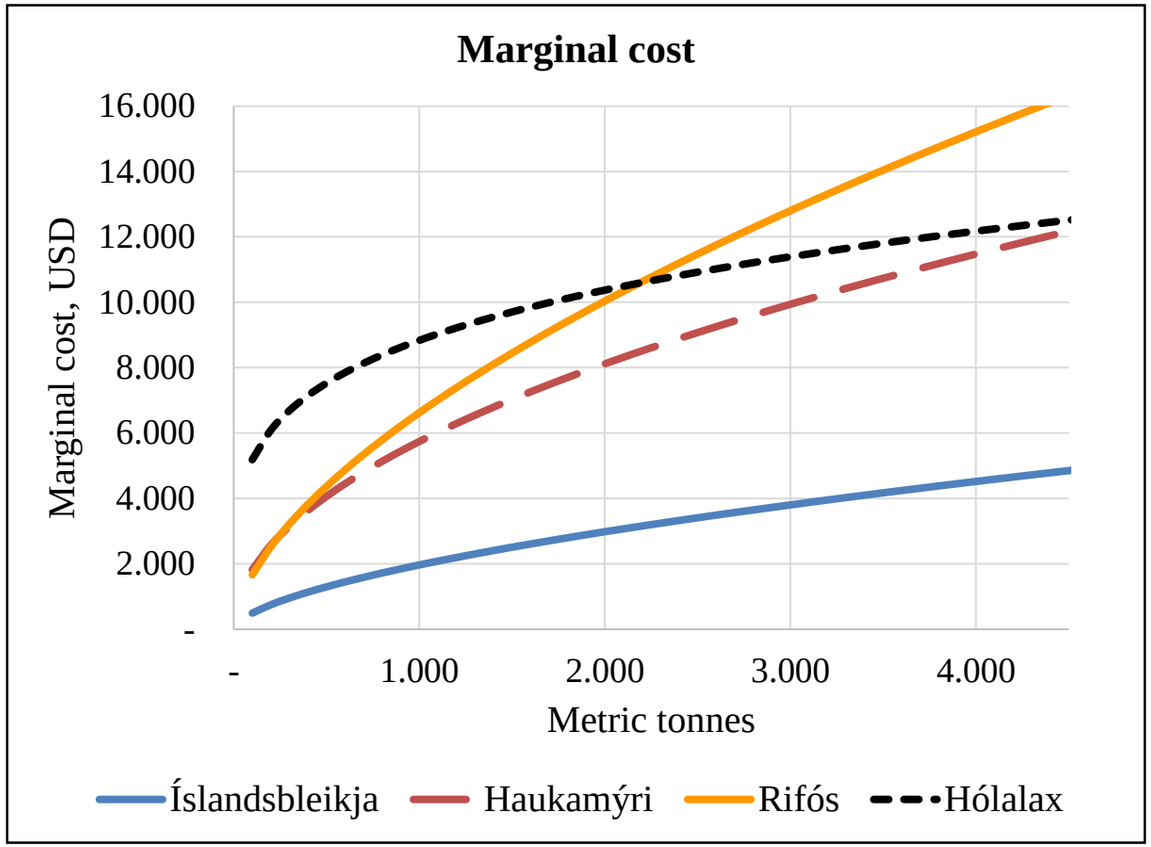
- Examination of the data suggested that the costs could be adequately explained by the following cost function form.

$$C(q(i), i) = \alpha_0(i) + \alpha_1(i) \cdot q(i)^{\alpha_2(i)}, i = 1,..4$$

- The method of non-linear least squares was used to estimate the coefficients of the four cost functions.

The Icelandic Arctic char producers





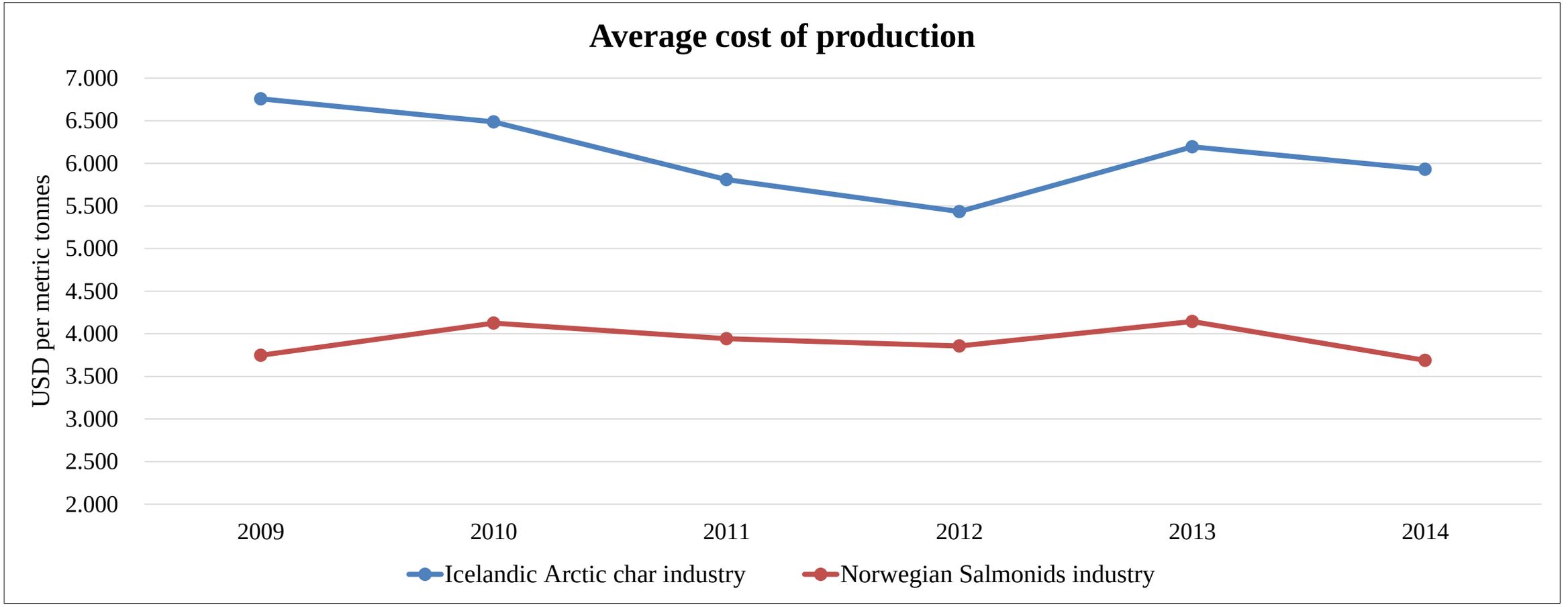
Reference: Directorate of Internal Revenue, Central Bank of Iceland and authors own calculations

How does the Icelandic Arctic char industry compare to other Salmonids industries?

Real production cost by category in USD per tonne (cost shares in parentheses)		
	Icelandic Arctic char industry*	**Norwegian Salmonids industry**
	Average (2009-2014)	**Average (2009-2014)**
Feed cost	2.133 (35,0%)	1.879 (48,0%)
Wages	1.175 (19,3%)	279 (7,1%)
Other production costs	2.237 (36,7%)	1.497 (38,2%)
Capital costs**	556 (9,1%)	263 (6,7%)
Total	6.102	3.917
Production (tonnes)	2.462	1.121.468

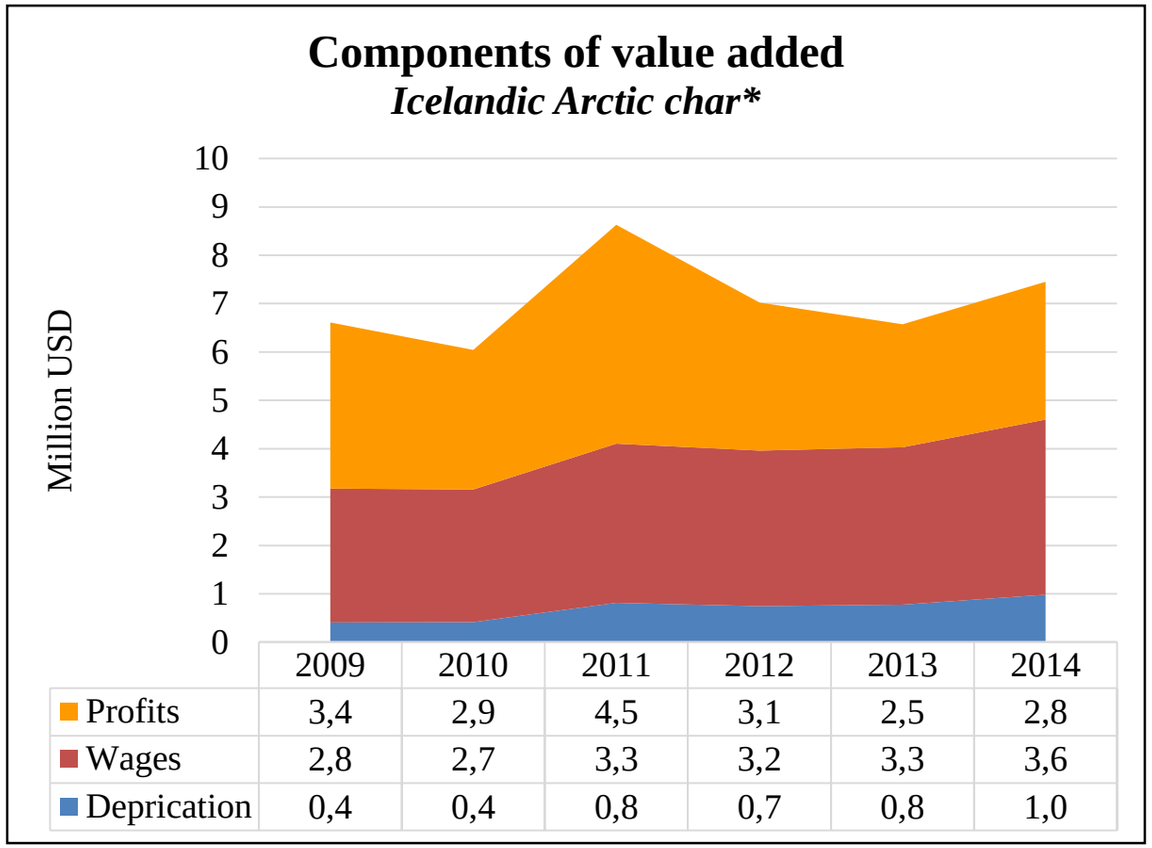
UNIVERSITY OF ICELAND
FACULTY OF ECONOMICS

Reference: Directorate of Internal Revenue, Central Bank of Iceland, Norwegian Directorate of Fisheries and authors own calculations
*Approximately 85% of the Arctic char industry is represented in these numbers
** Maintenance is not included in capital costs



Reference: Directorate of Internal Revenue, Central Bank of Iceland, Norwegian Directorate of Fisheries and authors own calculations

Success?



	2009	2010	2011	2012	2013	2014
Profits	3,4	2,9	4,5	3,1	2,5	2,8
Wages	2,8	2,7	3,3	3,2	3,3	3,6
Depreciation	0,4	0,4	0,8	0,7	0,8	1,0

- Change of main indicators since 2009:
  - Production increasing annually by 6%.**
  - Value added increasing annually by 1,8%.
  - Profits declining annually by 5%.
  - Net profits declining annually by 14%.**
  - Real wages per employee increasing annually by 2%.
  - EBIDTA ratio declining annually by 6,6%.**
  - Return of capital declining annually by 24%.**
- For comparison, in the Norwegian Salmonids industry:
  - Production increasing annually by 7%, value added by 12,5% and profits by 13,5%.**
  - EBITDA ratio declining annually by 1,2% and return of capital by 0,3%.

UNIVERSITY OF ICELAND
FACULTY OF ECONOMICS

Reference: Directorate of Internal Revenue, Central Bank of Iceland, Norwegian Directorate of Fisheries and authors own calculations
*Approximately 85% of the Arctic char industry is represented in these numbers
** Statistically significant

Conclusion

- Production has increased. More on average than other Salmonids species.
- However, profitability measures indicate that the Arctic char industry is becoming worse off.
  - Most likely explained by a less favorable exchange rate.
- Also, the industry finds that regulations and administration are badly implemented, which is effecting them negatively for further growth.

- However, the large increase in Arctic char production is a strong indicator that the industry has, overall, been profitable.

Thank you for your attention

Acknowledgement

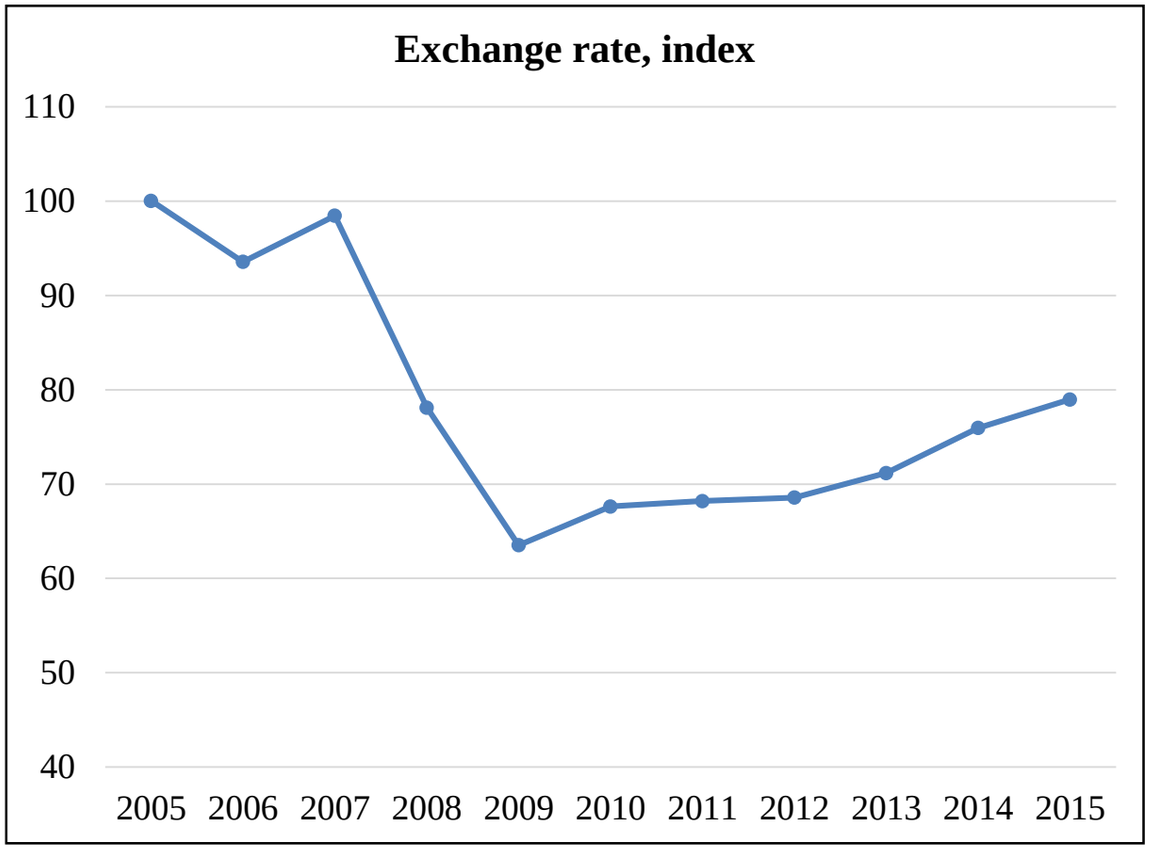
Work on this paper was funded by from the *European Union's Horizon 2020 research and innovation programme*. Grant agreement No 635188

SUCCESS: Strategic Use of Competitiveness towards Consolidating the Economic Sustainability of the European Seafood sector http://success-h2020.eu/

UNIVERSITY OF ICELAND
FACULTY OF ECONOMICS

Extra


Exports, price per kg
USD per kg
14
12
10
8
6
4
2
-
2007
2008
2009
2010
2011
2012
2013
2014


Exchange rate, index
110
100
90
80
70
60
50
40
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015