Natural resource management and rent creation. Some Norwegian experiences

Anders Skonhoft

Economic Department

Norwegian University of Science and Technology

1. Introduction

- The importance of natural resources in the Norwegian economy
- Discussing rent creation in the most important commercial production activities based on natural resources:
    - Oil and gas production, Hydropower production, Capture fisheries, Fish farming (aquaculture), Mining and Forestry
- Rent creation I natural resources; Ricardian (intramarginal) rent plus scarcity (concession) rent
- Details on
    - Fish farming
    - Capture fisheries
- Management and rent taxation
    - The well-managed Norwegian natural resources started with hydropower production

2. Natural resources in the Norwegian economy

- Commercial natural resources play an important role in the Norwegian economy. Possibly of most importance in all rich OECD countries

- The main reason is oil and gas production, but also hydro power production and aquaculture are of great importance

- The importance of commercial natural resources may be expressed in several ways:

  - As capital stocks, and compare with human and physical capital stocks

  - As flows; GDP contribution

  - As flows; Natural resource rent creation

-

- GDP contribution:

GDP contribution

	1984	1997	2009	2021
Hydro power production	6,5 (1,3)	13,3 (1,0)	34,9 (1,3)	85,6 (2,0)
Oil and gas production	84,3 (16,6)	162,2 (14,2)	425,8 (16,2)	832,1 (19,8)
Capture fisheries	2,8 (0,6)	5,6 (0,5)	7,6 (0,2)	16,1 (0,4)
Aquaculture	0,4 (0,0)	2,0 (0,2)	7,1 (0,2)	26,1 (0,6)
Forestry	2,3 (0,4)	4,8 (0,4)	4,6 (0,2)	7,7 (0,2)
Mineral exploitation	1,3 (0,2)	2,2 (0,2)	4,1 (0,2)	7,7 (0,2)
GDP Norway	506,5	1141,3	2622,1	4211,6

- The tree important ones (and capture fisheries):
  - Oil and gas production; close to 20 % of GDP 2021
  - Hydro power production; 2 % of GDP 2021)
  -
  - Aquaculture (basically salmon production); 0.6 % GDP 2021 (but somewhat higher 2018-2020)
  - ------
  - Capture fisheries between 0.2 – 0.6 % GDP. 0.4 % in 2021

3. Rent creation in natural resources

- Natural resources can (not will…) produce rents
- Resource rent is super profit derived from exploiting natural resources
- Profit that remains after the input costs, and after subtracting for the normal return to capital
- Result of significant demand, and scarcity in nature
- BUT, scarcity may also be due to regulations through concession systems
  - aquaculture production, capture fisheries

- Natural resource rent is generally composed of two elements:

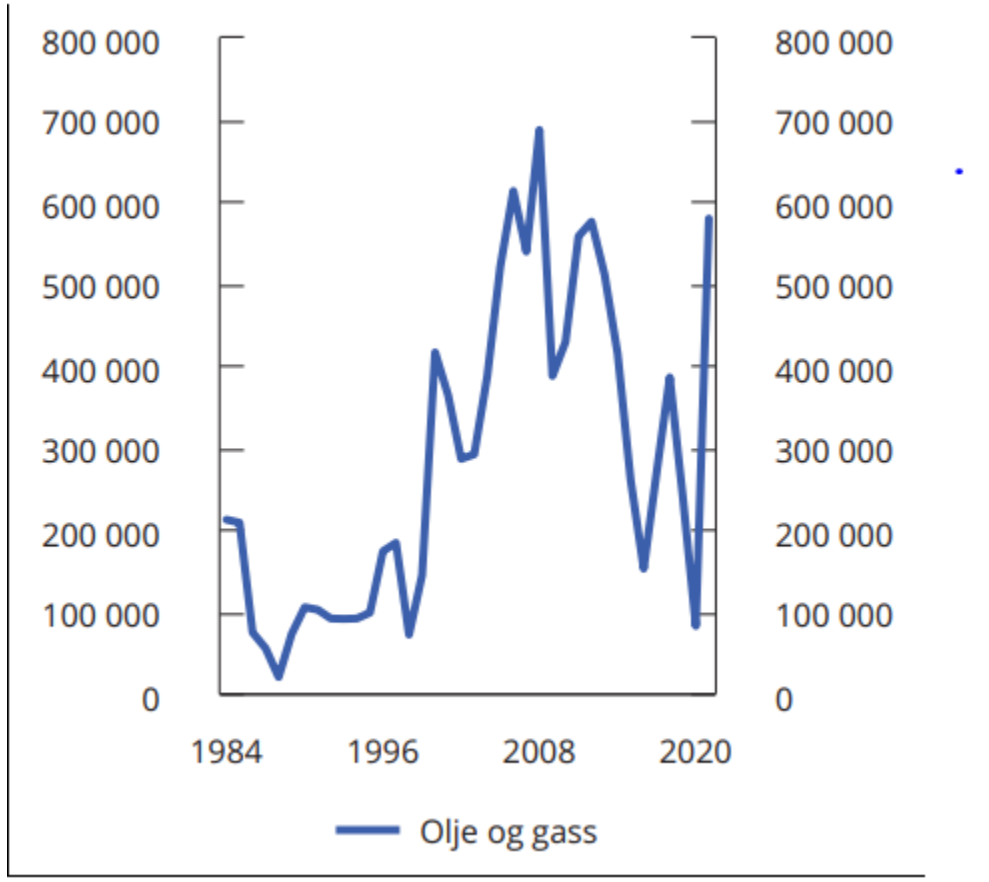
- a) **Ricardian rent** (or intramarginal rent)
  - Variations in production costs among the firms due to differences in land productivity (forestry), different water fall quality (hydro power production) different quality fjords and inlets (fish farming), etc.

- b) **Scarcity rent (**or regulation rent)
  - Related to natural scarcity, or due to regulation/concessions

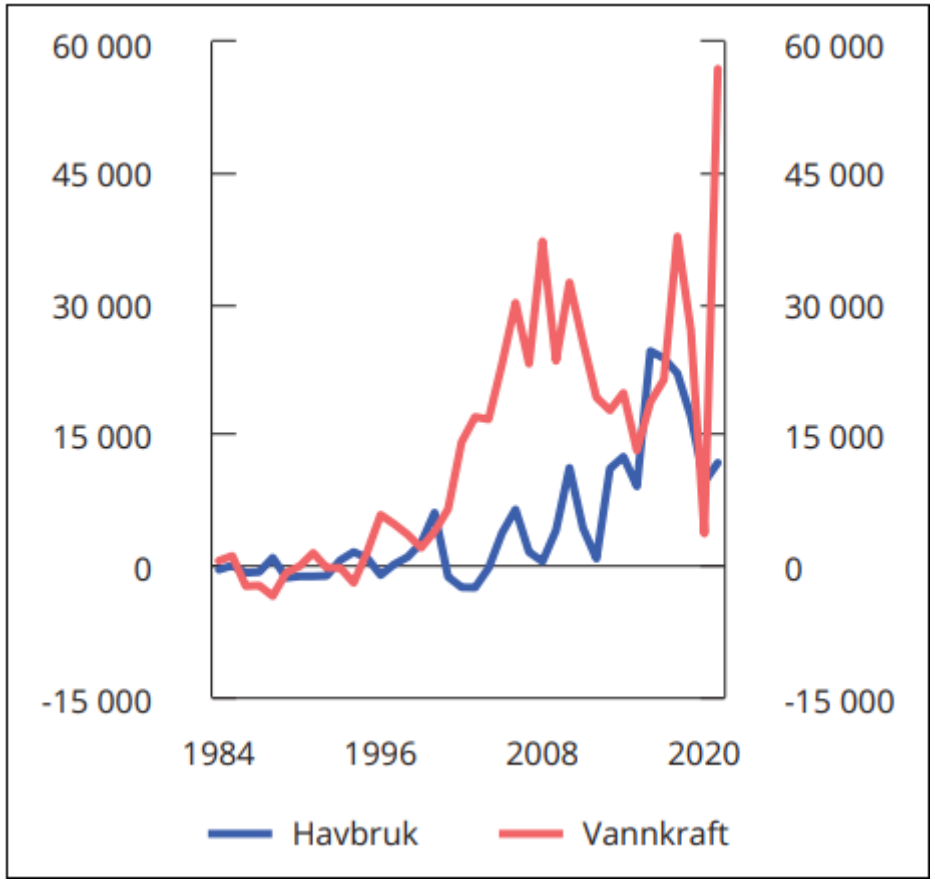
- Evidence for the commercial resources considered here. Source: Statistics Norway, Tax commission 2022

- Calculated as net profit, minus normal rate of return on capital (4 %)

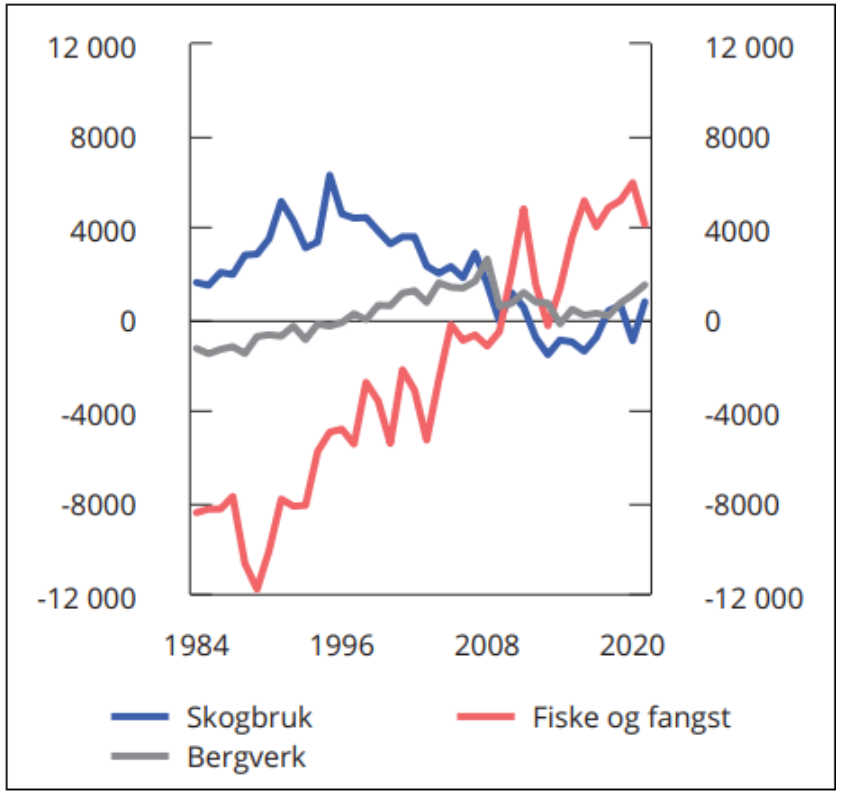
- Oil and gas production 1984 – 2021 (mill NOK)



- Aquaculture and hydro power production (mill NOK)



- Capture fisheries, mineral production and forestry



- More details oil and gas production 1984 and 2021:

	1984	2021
Net profit (mia NOK)	72.,0	654.7
Value fixed capital (mia NOK)	133.5	1883.1
Rate of return (%)	53.9	34.8
Normal profit (4 %) (mia NOK)	5.3	75.3
Resource rent (mia NOK)	66.7	579.4

4. Aquaculture

- The natural resource is fjords and inlets with good water streaming. Common property
- Started as a state subsidized activity in the late 1960's to strenghten the livelihood in (partly depressed) fishing communities along the Norwegian coast
- Improved technology/biology in the 1970's particularly related to i) the feeding process and ii) the smolt (recruitment) production
- The large commercial breakthrought in the 1980's
- Crisis and restructuring; from small independent (often family owned) farms to large multinatinional firms. (Burenstram Linder 1961: Growth and Expansion through the Home Market)
- Today less than 80 different producers, but where the market share of the 8 largest is above 70 %. Basically production for export

- In 1985: Production less than 50 000 tonn. Last years production was about 1.5 million tonn

- Enormous production (world capture fisheries 85 – 90 million tonn yearly production)

- Modest growth during the few last years; disease (sea lice) problems (close to 20 % mortality during the (adult) growth process)

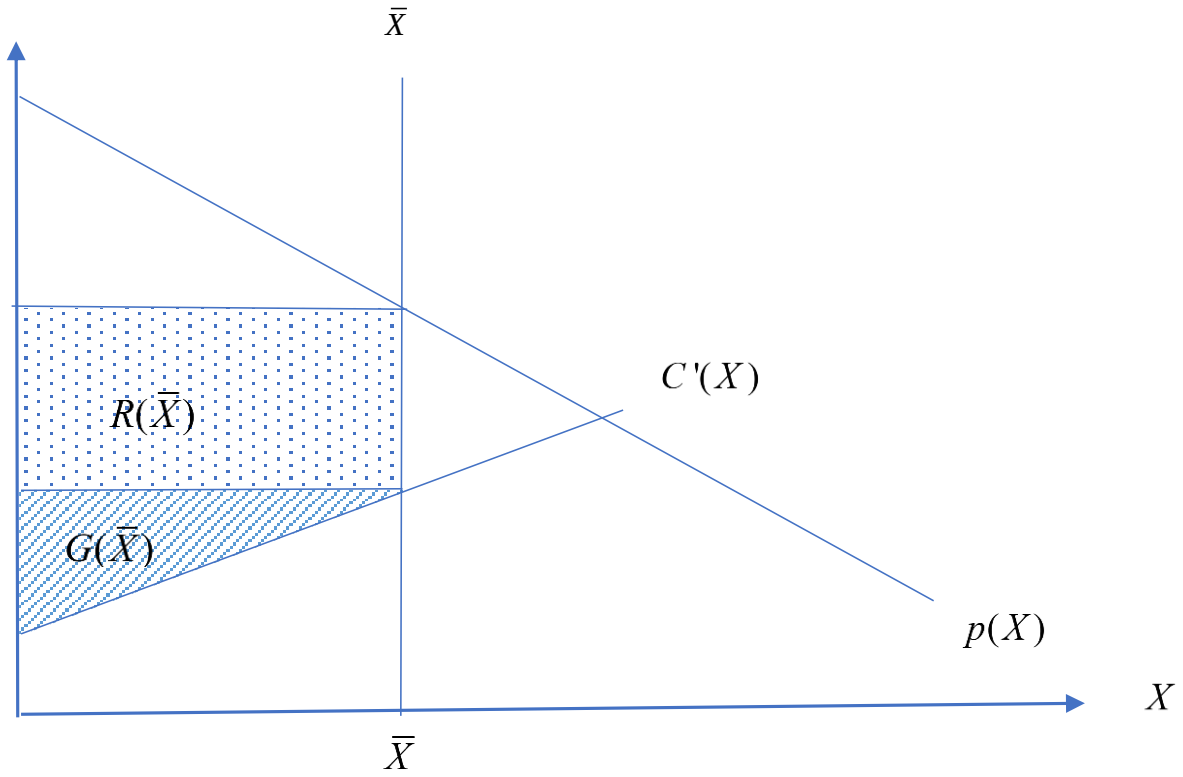
- In the very beginning; few if any regulations

- In 1981 the first concession round; production needed a permission (tonn fish, biomass volume)

- Todays a well-organized concession system (infinite duration!!), but the price of a new concession is well below the market value
- Few new concessions the last years due to the sea lice problem and the high natural mortality
- The net profit 2021 NOK 14 billion (table above)
- The capital stock NOK 43,8 billion
- Rate of return this year 32 % (14/43.8)
- Normal rate of return 4 %: 0.04*43.8=1.7 NOK million
- The resource rent NOK 12.3 billion (14-1.7) (figure above)

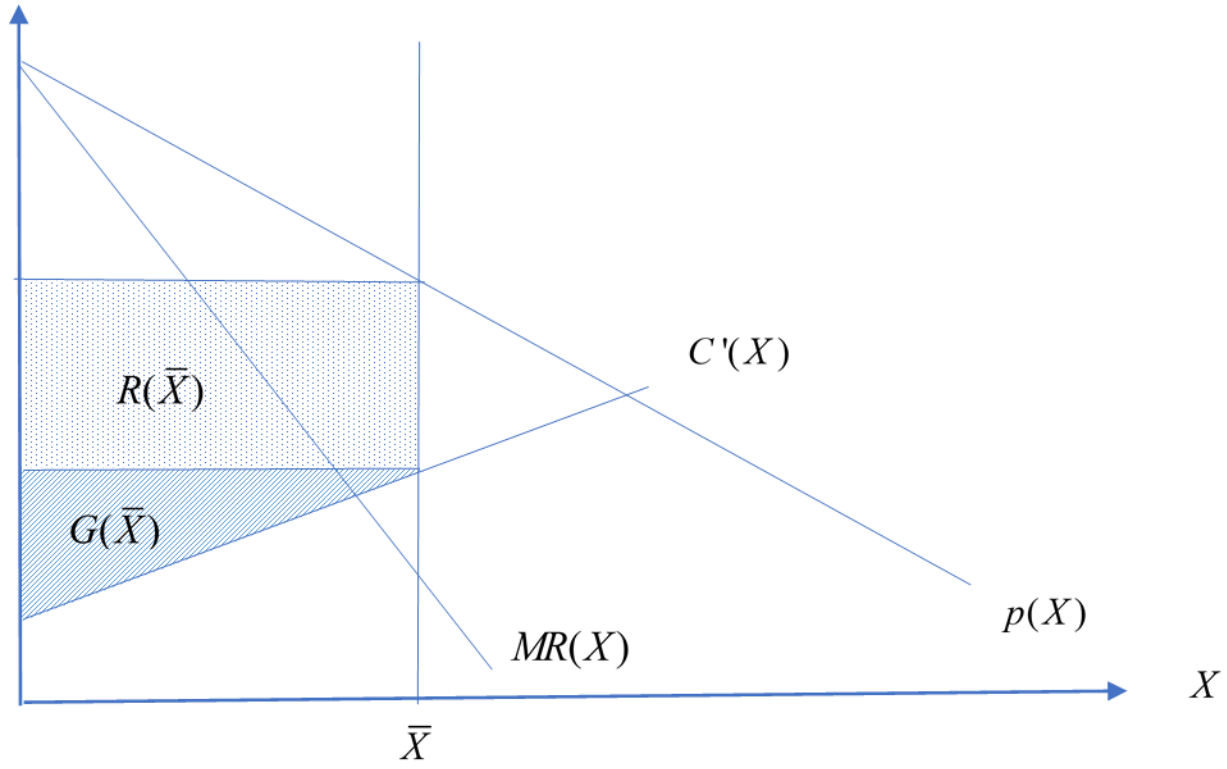
- The distinction Ricardian (intramarginal) and scarcity (regulation) rent
- Different productivity among the firms; Ricardian rent
- Concession system and regulated supply. The market price well above the unit cost even for the least efficient firm; scarcity rent
- In the figure inverse supply curve with the firms ordered after decreasing productivity. Here as smoothened Salter (Salter 1969) curve
- Invers demand curve

Supply curve represented by a smoothened Salter curve (unit production cost different production units) and regulated production $\bar{X}$. Ricardian rent, and scarcity rent



- Calculations (Flåten and Thuy 2019) indicate that the scarcity rent about half of the total rent (2016).
- Higher demand means higher scarcity rent, but no effect Ricardian rent
- The working of the concession regulation through an expansion of number of concessions (for fixed demand):
- The total rent increases if MR > MC
- In the opposite case and MR < MC; new profitable concessions reduce the profitability for all existing units
- MR = MC monopoly profit case. Therefore, total rent generally lower than of monopoly profit

Effect of changing regulation; marginal cost vs. marginal revenue. Here: more concessions and higher production will reduce the total industry rent (reduced scarcity rent dominates hgher Ricardian rent)

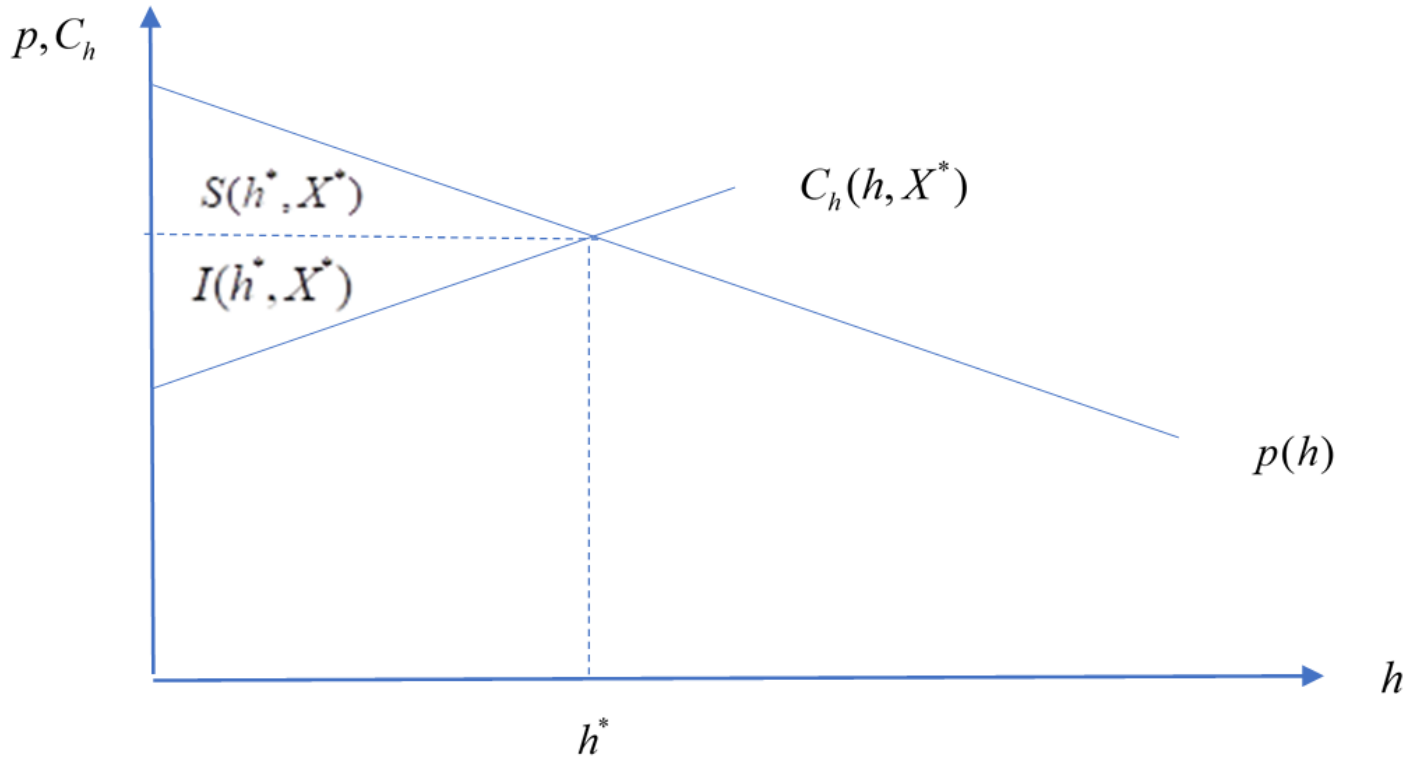


5. Capture fisheries

- As seen above, the resource rent in capture fisheries has generally been quite low, but has increased during the last few years
- Reason?? Structural changes, and high fish prices
- But important conflicts; the trawler fleet vs. the coastal fleet, the working conditions for the Norwegian (land based) fish processing industry
- A simple model can be constructed to explain rent creation in capture fisheries, but more complicated than for aquaculture
- Two reasons for that: i) Fishing costs depend generally on the size of the fish stock, and ii) The issue of equilibrium fishery or not (natural growth vs. total offtake)

- Consider a fish stock exploited myopically by a large number of fishermen (stock and market price taken as given)
- Without and with TAC regulation, and assuming biological equilibrium and stock depended fishing costs
- The smoothened supply curve as above, but now contingent upon the size of the equilibrium stock
- Without TAC regulation only Ricardian rent (intramarginal rent); price equalizes unit cost for the marginal effort use and fisherman
- Too much fishing effort causing overfishing and low harvest
  - Small Ricardian (intramarginal) rent (and also small consumer surplus; the consumer issue of more interest here that in aquaculture because of domestic market…)

The unregulated fishery; the fish price is equal to the marginal harvesting cost (cost per unit harvested for the marginal fisherman).
Ricardian rent rent and consumer surplus

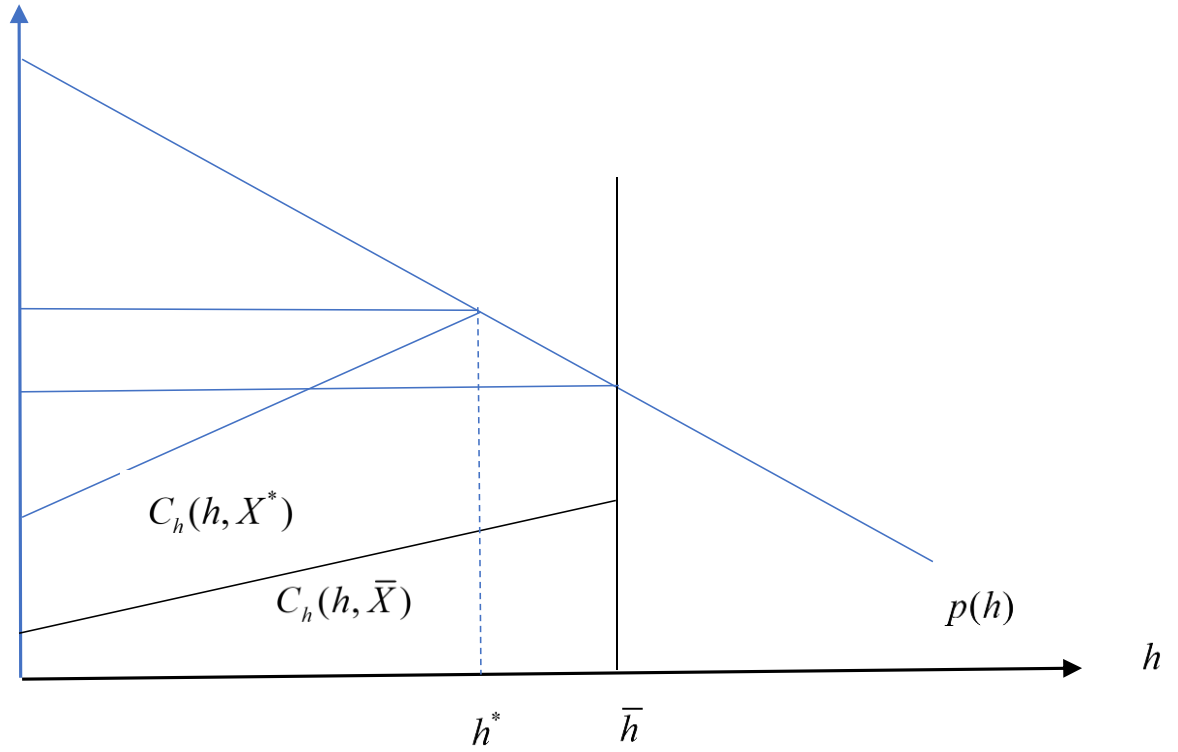


- Then TAC regulation and also regulated size of the stock (biological equilibrium), and still myopic profit maximization

- Compared to the unregulated fishery; higher stock. The inverse supply function shifts down, and higher harvest (…but MSY location)

- Now scarcity (concession) rent, in addition to Ricardian (intramarginal) rent

Rent creation with and without TAC regulation (



- The total resource rent increases compared to the unregulated fishery. But generally unclear effect intramarginal rent

- The consumer surplus increases (higher catch and lower price)

- The welfare increases…, but inefficient fishermen (high fishing costs) are excluded from the fishery. They are losing due to the TAC regulation

6. Management and rent taxation

- The Norwegian natural resources have generally been managed well
    - No ‘Dutch disease’ and no resource curse related to oil and gas
    - No serious overexploitation issues of the renewable resources (…however, the herring stock was close to be depleted in the 1960’s)
    - The profit and rent of the natural have primarily gone to the owners of these resources, the Norwegian people:
        - ordinary firm profit taxation
        - resource rent taxation
        - Company ownership (hydropower production, oil and gas production)

.

- In my view there are two important exemptions; aquaculture and capture fisheries
  - The Norwegian capture fisheries have silently been privatized and where the IVQ holders have got quotas for free
  - Norwegian and foreign owned firms have obtained the resource rent in aquaculture based on a common resource (fjords and inlets)
  -
- Additionally: Often very serious natural and environmental damages related to natural resource exploitation
  - hydropower construction and production
  - aquaculture

- **Hydropower production**
- The start of the quite successful management of the Norwegian natural resources can be traced back to hydropower production which started more than 100 years ago

    - Certain concession laws to secure national control
    - Certain regulations to secure public ownership. Today about 90 % owned by the public (the State and municipals)
    - Certain benefits for local communities where power plants are located
    - Resouce rent taxation (37 %) from 1997 an onwards, in addition to the ordinary firm profit tax (22 %)
    - As seen extremely high profitability during the last few years. Production cost (LCOE) about 0.10 - 0.12 NOK/KWh (on average), market price last couple of years often higher 0.70 NOK/KWh

- ..

- **Oil and gas production**
- Norwegian control and ownership of the continental shelf after agreements with Denmark and Great Britain in 1963 and later with Russia. Oil and gas production started in 1973. Strict national control and concession system.
- In the beginning all concessions given to foreign firms (Phillips), because of no Norwegian competence…
- The state-owned company Statoil established in 1973, and gradually this firm together with other private owned Norwegian firms took over large parts of the production
- An important issue has been all the been how fast the exploitation should take place. Today, debate about new concessions in the light of the climate problem (….The Norwegian government view on solving he climate problem; nothing should be done on the supply side, regulating the the demand side will do the job…)
- Resource tax from the very beginning. Today 56 % in addition to the ordinarily profit tax of 22 %. Additionally, income from the (now partly) state-owned company Statoil (Equinor)

- mm

- **Aquaculture**

- Have given a very brief review of the history….

- The concession system protects already existing firms from competition

- The extremely high profitability in fish farming during the last years has only been met with the ordinary profit tax 22 %

- NOU 2019 18: ‘Skattlegging av havbruksvirksomheten’ with main conclusion that resource rent tax should be introduced. Supported by all Norwegian university economists, except some few

- This has been debated in Norway the three years, and opposed by the very powerful aquaculture firms and their lobby groups

- Finally, a resource tax of 25 % is now introduced (far lower than in oil and gas production and in hydropower production)

- Large environmental problems
  - Sea lice. Also an external problem; transmitting to wild salmon and trout
  - Local pollution (the feeding process)
  - Escapement and genetic interbreeding with wild salmon

- The polluter-pay-principle is absent for this industry with a huge economic muskels

- **Capture fisheries**

- The Norwegian fish stocks have been more or less privatized without any decision in the parliament (Stortinget)

- Supreme Court 2013: The fish belongs to the Norwegian people

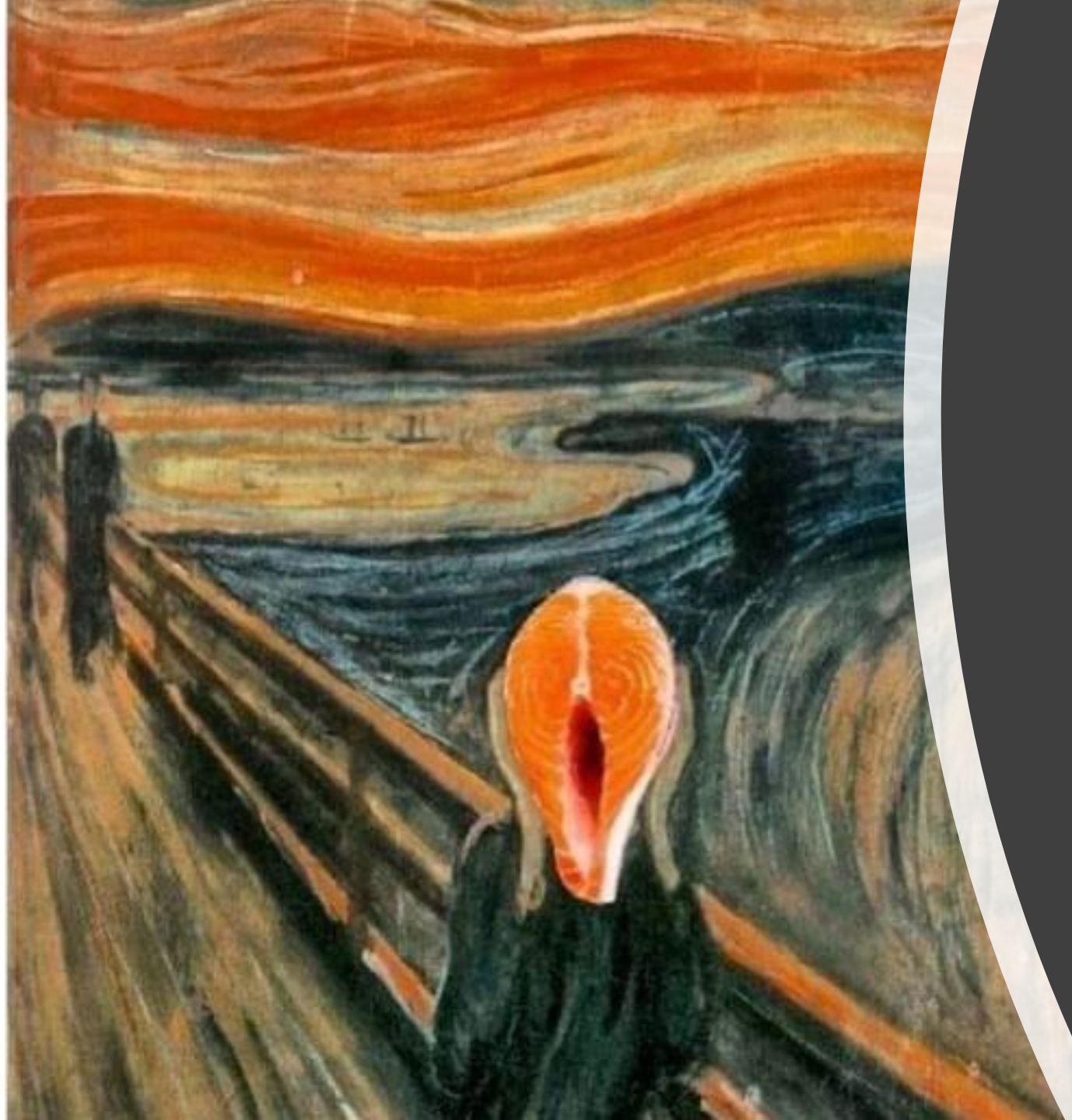
- Riksrevisjonen (2020) critical assessment of the so-called fleet structural system

- This system together with IVQ for free have been the driving forces behind the privatization

- Paying no resource tax, and no payment for quotas to the public. But the public is paying a huge amount of money for research and management of the fishereis

7. Final remarks

- Scarcity (concession) rent vs. Ricardian (intramarginal) rent
- Aquaculture firms are using the common, and the concession system protects existing production units and creates (todays) huge scarcity rent. Until now no resource rent tax
- Capture fisheries: The TAC and IVQ system protect active fishermen/firms and create scarcity (concession) rent. No resource rent tax
- High resource rent tax in oil and gas production, and in hydropower production



- Thank you!