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The Political Game of European Fisheries Management

Margrethe Aanesen and Claire W Armstrong,
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Background

Jensen, F. and N.Vestergaard (2002) Management of Fisheries in the EU: A principal-agent Analysis. Marine Resource Economics, 16, 277-291

Optimal regulation under asymmetric information.
On EU level: Tax instead of TAC.

The model

Players

- EU authorities (principal)
- Memeber state authorities (principal)
- Fishers organisation (agent)

Assumptions

- Utility maximising
- Symmetric and complete information
- Nash equilibibirium (non-cooperative)

The utility functions

- Each agent has utility depending on environ-mental, economic and social factors.

- $U_i = \lambda_{1i} * ENV + \lambda_{2i} * ECO + \lambda_{3i} * SOC$

- $ENV = P * q * K * E\left(1 - \left(\frac{qE}{r}\right)\right)$
- $ECO = p * q * K * E(1-(q*E/r))-a*E$
- $SOC = S*E$

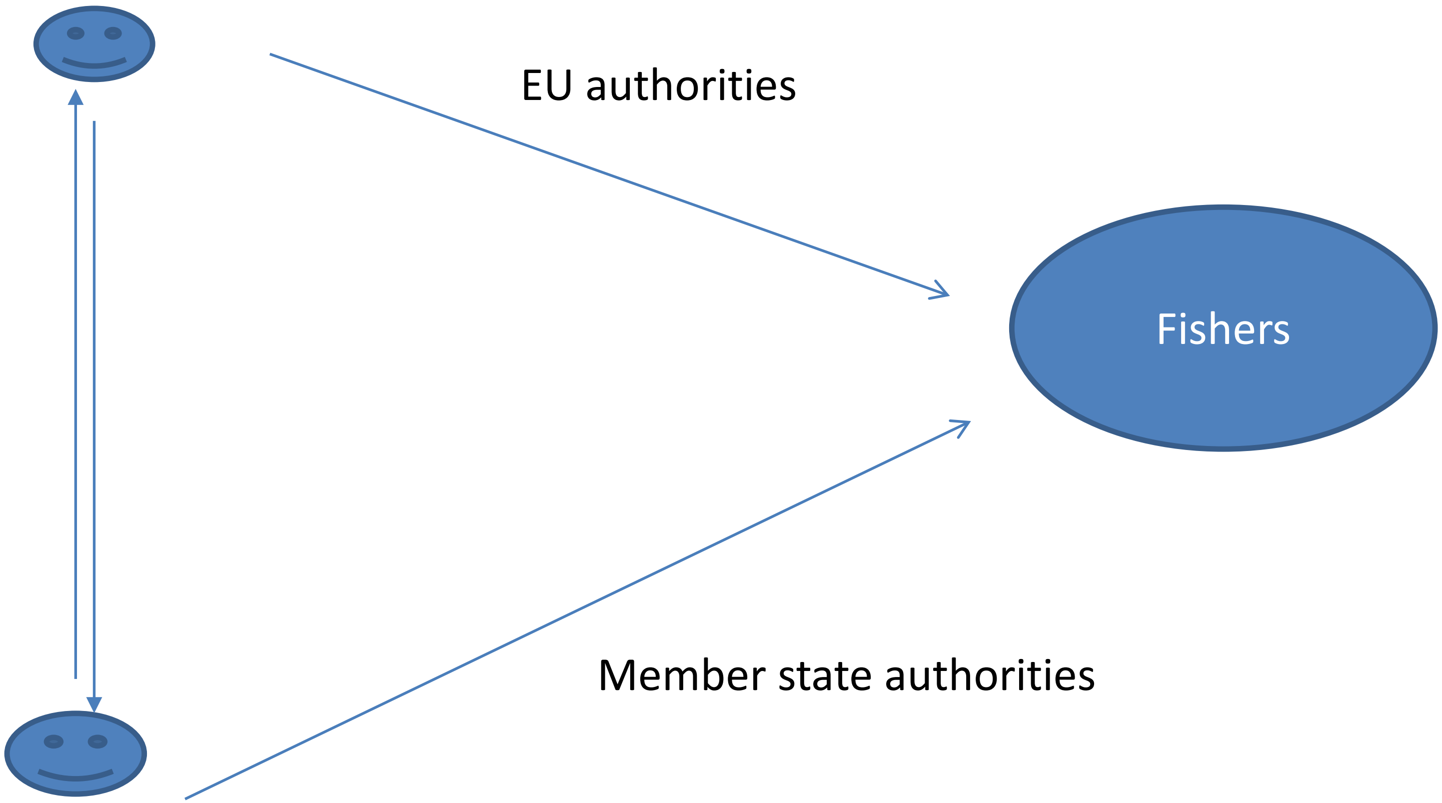
The games

- **Stackelberg**
- First, EU sets the overarching rules
- Next, MS decides how to implement the rules in their countries
- Finally, fishers decide their fishing behaviour given the rules

- **Cournot**
- EU and MS simultaneously set the rules (i.e. EU decides the rules and MS decides how to implement them)
- Fishers decide their fishing behavious given the rules and the enforcement

The game (Stackelberg)

The game (Cournot)



The regulation

- The Walsh contract
- $W = w_0 + w_1 * E$

Solving the model

- Static constrained optimisation problem:
- ${t_i}^{EU} = g_i(\lambda_{ij}, P, p, q, K, r, S)$ optimal responses
- ${v_i}^{MS} = h_i(\lambda_{ij}, P, p, q, K, r, S)$
- ${E_i}^{k} = fi(\lambda_{ij}, P, p, q, K, r, S)$

Example of solution of the Cournot game

$$v_1^{CR} = -\frac{\Gamma^{EU}}{\Gamma^{EU} + \Gamma^F} t_1^C + \frac{\left(Q^{EU}\Gamma^F - Q^F\Gamma^{EU}\right)}{\Gamma^{EU} + \Gamma^F}$$

$$t_1^{CR} = -\frac{\Gamma^N}{\Gamma^N + \Gamma^F} v_1^C + \frac{\left(Q^N\Gamma^F - Q^F\Gamma^N\right)}{\Gamma^N + \Gamma^F}$$

$$v_1^{C*} + t_1^{C*} = \frac{Q^{EU}\Gamma^F - Q^F\Gamma^{EU} + Q^N\Gamma^F - Q^F\Gamma^N}{\Gamma^{EU} + \Gamma^N + \Gamma^F}$$

$$E_F^{C*} = \frac{r\left[qK\Gamma^F - Q^F - \left(v_1^{C*} + t_1^{C*}\right)\right]}{2q^2K\Gamma^F}$$

Data

Social

	EU	MS	Fishers
ENV	0.48	0.5	0.36
ECO	0.29	0.28	0.36
SOC	0.23	0.22	0.28

Biological/economic

parameter	Size
r	0.144
q	0.0000002778
K	349.8k tons
p	2500 EUR/tons
a	57.25 EUR/unit effort
P	2500 EUR/tons
S	57.25 EUR/unit effort

Results (unrealistic?)

	EU (EUR per effort hour)	MS (EUR per effort hour)	Aggregate (EUR per effort hour)	Fishers effort level (fishing hours)
Stackelberg				
- One regulator		-0.73	-0.73	253,200
- Two regulators	-0.5	-0.45	-0.95	253,550
Cournot				
- One regulator		-0.73	-0.73	253,200
- Two regulators	-0.48	-0.47	-0.95	253,550

Data

Social

	EU	MS	Fishers
ENV	0.48	0.5	0.36
ECO	0.29	0.28	0.21
SOC	0.23	0.22	0.43

Biological/economic

parameter	Size
r	0.144
q	0.0000002778
K	349.8k tons
p	2500 EUR/tons
a	57.25 EUR/unit effort
P	2500 EUR/tons
S	57.25 EUR/unit effort

Results (more realistic?)

	EU (EUR per effort hour)	MS (EUR per effort hour)	Aggregate (EUR per effort hour)	Fishers effort level (fishing hours)
Stackelberg				
- One regulator		20	20	273,500
- Two regulators	12.14	12.02	24.16	270,750
Cournot				
- One regulator		20	20	273,500
- Two regulators	12.17	11.99	24.16	270,750

Data

Social

	EU	MS	Fishers
ENV	0.29	0.5	0.36
ECO	0.04	0.28	0.21
SOC	0.67	0.22	0.43

Biological/economic

parameter	Size
r	0.144
q	0.0000002778
K	349.8k tons
p	2500 EUR/tons
a	57.25 EUR/unit effort
P	2500 EUR/tons
S	57.25 EUR/unit effort

Results (mimicking reality)

	EU (EUR per effort hour)	MS (EUR per effort hour)	Aggregate (EUR per effort hour)	Fishers effort level (fishing hours)
Stackelberg				
- One regulator	-40.00		-40.00	307,800
- Two regulators	-31.00	15.40	-15.60	275,150
Cournot				
- One regulator	-40.00		-40.00	307,800
- Two regulators	-16.60	1.00	-15.60	275,150

Robustness of the model

Social

	EU	MS	Fishers
ENV	?	?	?
ECO	?	?	?
SOC	- / -	- / -	+ / +

Biological/economic

parameter	Effort	Regulation
r	10	0
q	-8.9	0
K	0.2	0
p	0.1	-3.3
a	-0.1	39.5
P	0.12	3.25
S	0.74	-39.25

Conclusions

- Two layers of regulators with relatively similar preferences will increase the aggregate regulation, but the original regulator will modify their regulation when a second regulator is introduced (strategic effect)

- Similar preference weights for the regulators will imply similar regulations, whereas with diverging preferences the regulation set by one regulator may be countered by the regulation set by the other regulator, resulting in a insignificant aggregate regulation.

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Thank you for your attention.

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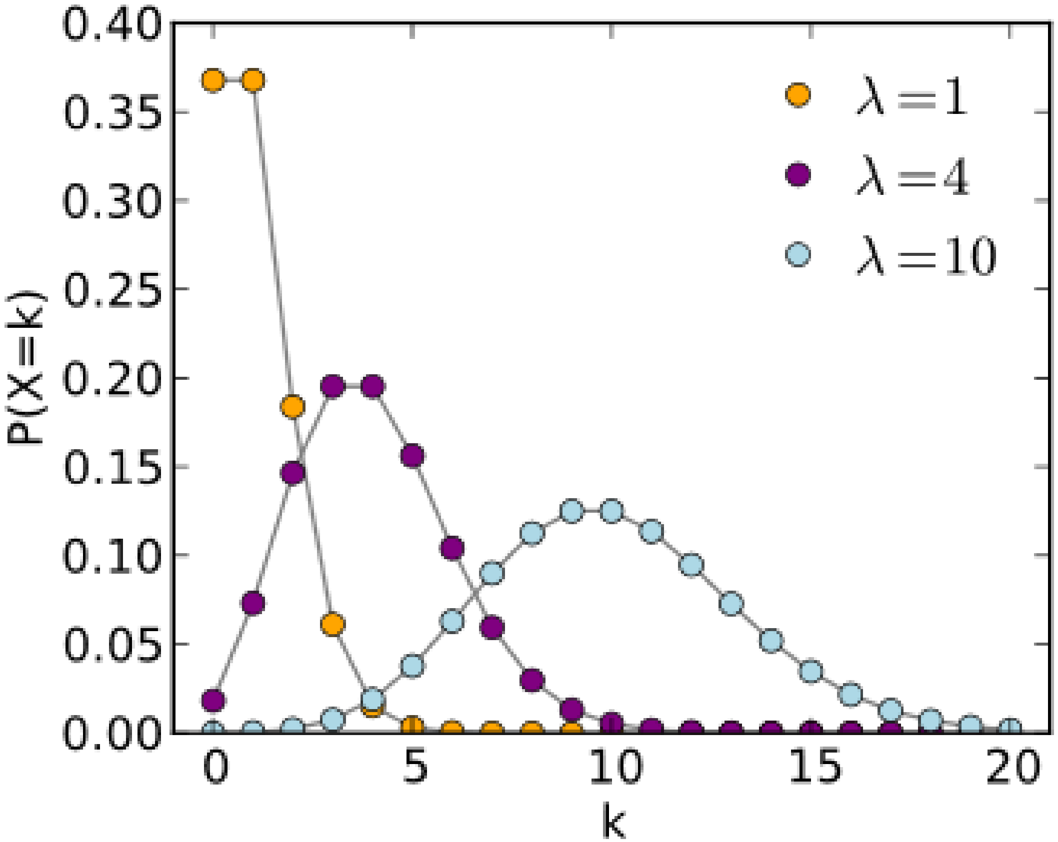
Hva er tapet i velferd om fiskelokasjonen forsvinner?

- Kompenserende variasjon

  - Dersom folk i utg.pkt. har rett til å fiske der:
    - WTA: da må folk bli kompensert hvis lokasjonen skal brukes til andre formål
    - WTP: næringsvirksomhet må betale for å bruke lokasjonen til andre formål

- Ekvivalent variasjon

  - Dersom folk må godta en situasjon som den etter at det har vært gjort inngrep rundt lokasjonen:
    - WTP: folk må spørres om sin betalingsvillighet for å unngå at lokasjonen blir brukt annerledes
    - WTA: næringsvirksomhet må bli kompensert for å la være å bruke lokasjonen til andre formål


0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
P(X=k)
0
5
10
15
20
k
$\lambda = 1$
$\lambda = 4$
$\lambda = 10$