Allocation without Property Rights

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Introduction

- Competition between commercial and recreational sectors for harvest of near-shore species has increased in recent years

- Fisheries managers compelled to consider explicit allocations of quota for the respective sectors to mitigate user conflicts

- Commercial quota usually enforced with season closures when no individual allocation is in place

- Recreational restrictions typically include size and bag limits
Optimal allocation: the equi-marginal principle

- Economic value maximized when TAC allocated at point where marginal WTP equal for both sectors (point O)
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This standard equi-marginal principle has been used in actual allocation studies: summer flounder, scup, red grouper, etc.
Optimal allocation: the equi-marginal principle

However, the equi-marginal principle only holds if access to the catch within each sector is efficient:

- Efficiency arrived at by allocation by a perfectly informed manager
- Alternatively, efficiency achieved by well-functioning markets for quota
Optimal allocation: the equi-marginal principle

However, the equi-marginal principle only holds if access to the catch within each sector is efficient:

- Efficiency arrived at by allocation by a perfectly informed manager (unfeasible)
- Alternatively, efficiency achieved by well-functioning markets for quota
In the absence of markets and price-sorting, we need to revisit the equi-marginal principle.
Access scenarios and aggregate value
A simple example

- Two available units of a public resource
- Three potential users with WTP: $v_1 = $5, $v_2 = $3, and $v_3 = $1
- The *efficient assignment* would allocate the two units to the highest valuation individuals:

\[
\begin{align*}
    a(v_1, 1) &= 1, & a(v_2, 1) &= a(v_3, 1) = 0 \\
    a(v_2, 2) &= 1, & a(v_1, 2) &= a(v_3, 2) = 0 \\
\Rightarrow \quad V &= v_1 + v_2 = $8
\end{align*}
\]
Access scenarios and aggregate value

A simple example

- Two available units of a public resource
- Three potential users with WTP: $v_1 = $5, $v_2 = $3, and $v_3 = $1

- If under access scenario all valuations have equal probability (random access) to access the resource:

$$a(v_i, j) = 1/3 \text{ for } i = 1, 2, 3 \text{ and } j = 1, 2,$$

$$\Rightarrow V = \frac{2}{3}(v_1 + v_2 + v_3) = $6$$
Optimal allocation: revisiting the equi-marginal principle

- Marginal values insufficient for inferring aggregate value. It is critical to understand the rules governing access and the sorting of marginal values they induce.
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⇒ We need a “expected” value function
Access scenarios and assignments

- The expected value function:
Access scenarios and assignments

- Welfare depends on how MWTPs are sorted under each scenario
Optimal allocation: the equi-marginal principle revisited

- Economic value maximized when TAC allocated at point where \textbf{expected} marginal WTP equal for both sectors.
Optimal allocation: the equi-marginal principle revisited

Generalized Equi-marginal Principle:
For any pair of access scenarios $A_I$ and $A_{II}$, the allocation of harvest that maximizes total welfare is defined by

$$EV_I(q^*) = EV_{II}(X - q^*)$$

$$\int_0^{\hat{v}} v\gamma_I(v, q^*)dF(v) = \int_0^{\hat{u}} u\gamma_{II}(u, X - q^*)dG(u)$$
Optimal allocation: the equi-marginal principle revisited

- Corner solutions are possible!

\[ EV_1(y) = \bar{v} \]
\[ EV_2(X - y) = \bar{u} \]

Sector I quota: \( q^* = X \)
Sector II quota: \( X - q^* = 0 \)
Fisheries management and access scenarios

- Commercial sector: season closures redistribute access towards low-cost, high valuation operators

- Commercial sector: capital and gear restrictions lessen this redistribution

- Recreational sector: effect of season closures and bag limits on probability of access depend on correlation of income, cost and skill
An illustration: Gulf of Maine cod and haddock

- Simulations from bioeconomic model used by NOAA Northeast Fisheries Science Center to examine effects of changes in possession and size limits.

- Model combines information derived from an angler CE survey, actual biological stock structures, and catch-at-length data.

- We looked at two scenarios:

<table>
<thead>
<tr>
<th></th>
<th>Cod Limits</th>
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<th>Haddock Limits</th>
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<tbody>
<tr>
<td></td>
<td>Quantity</td>
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<tr>
<td>Scenario A</td>
<td>9</td>
<td>19&quot;</td>
<td>35</td>
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<tr>
<td>Scenario B</td>
<td>9</td>
<td>24&quot;</td>
<td>35</td>
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An illustration: Gulf of Maine cod and haddock

- Total welfare under scenario A is $10 million (harvest of 1.2 million pounds)
Total welfare under scenario B is $4.4 million (harvest of 529,000 pounds)
An illustration: Gulf of Maine cod and haddock

- Same reduction in harvest could be accomplished by closing season in May-Jun. Total welfare would be $3.7 million
An illustration: Gulf of Maine cod and haddock

- Welfare reduction of reallocating recreational quota depends on management instrument used to implement reallocation!
Summary

- There are no declining MV schedules without incentive compatible rules of access

- In the absence of declining MV schedules, information about access to the resource also required

- Access scenarios and sorting of MVs determined (explicitly or implicitly) by management rules

- Optimal allocation given by the equality of expected marginal values across sectors