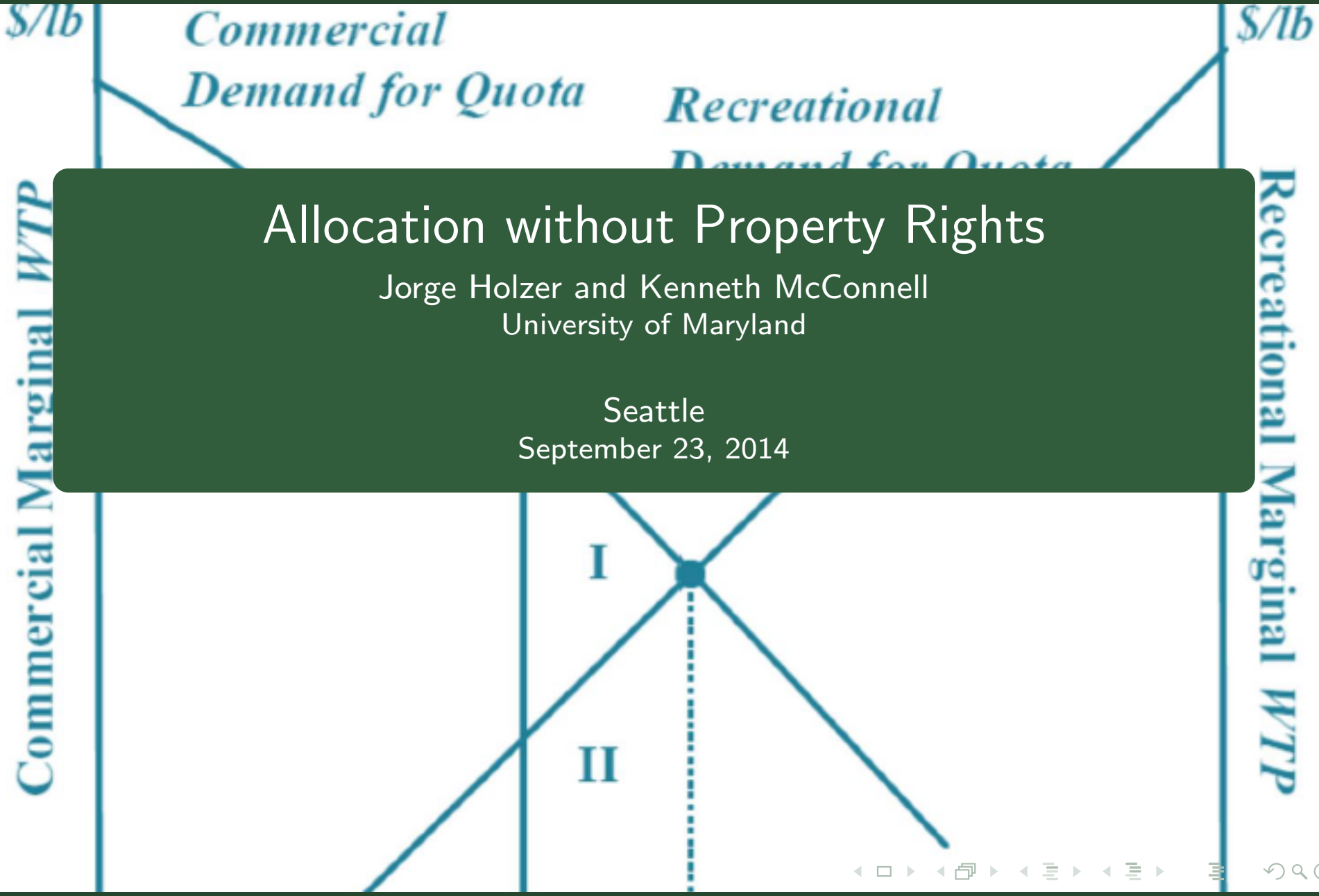

Allocation without Property Rights

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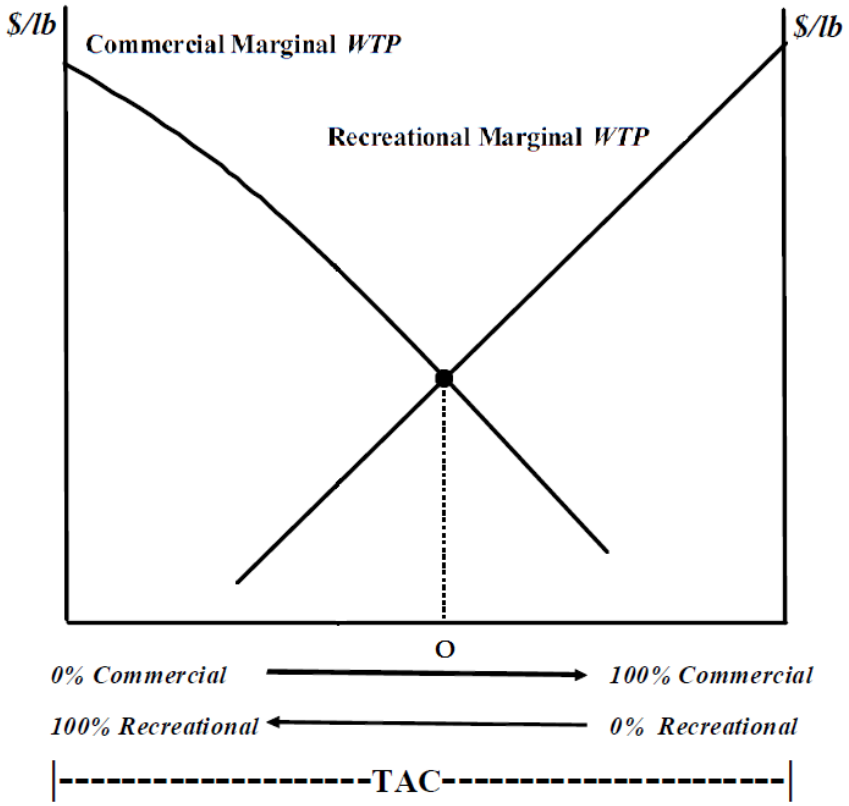
Introduction

- 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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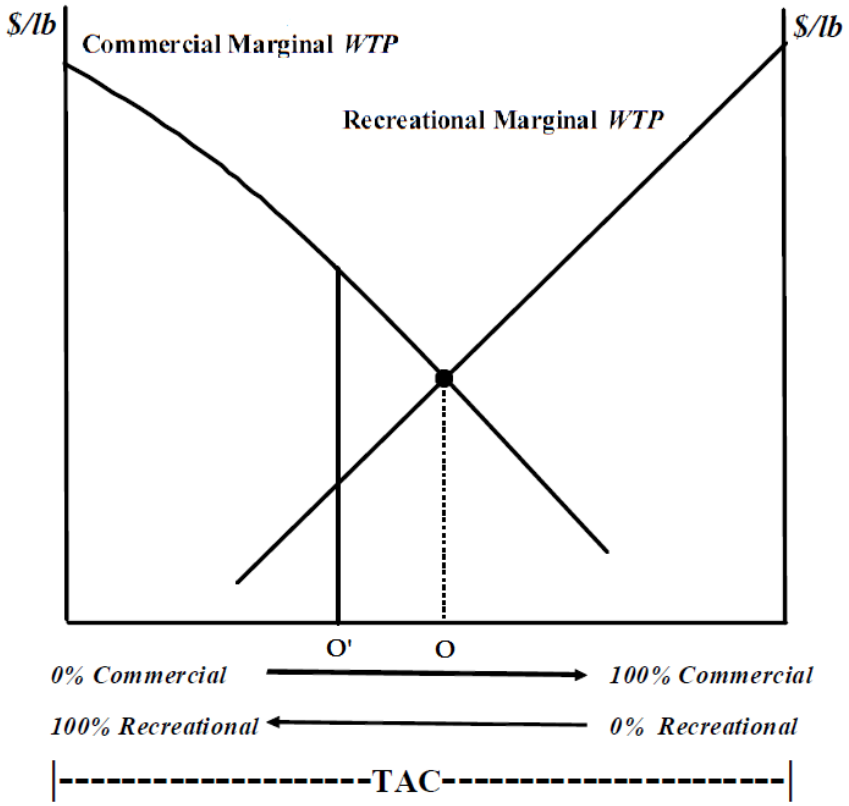

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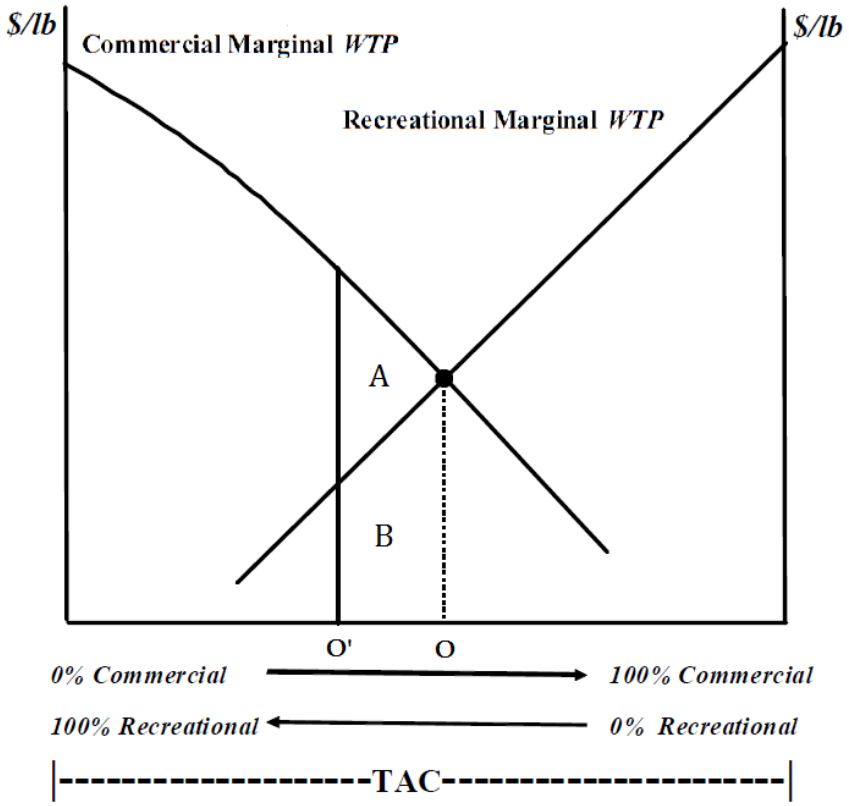

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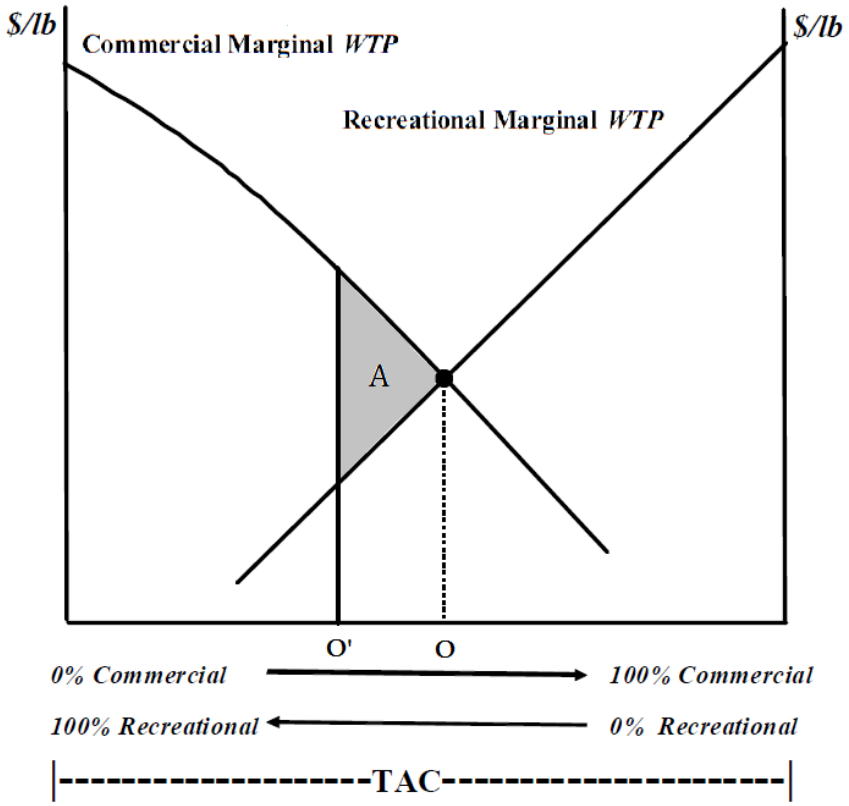


Optimal allocation: the equi-marginal principle

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

Optimal allocation: the equi-marginal principle?

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:

$$a(v_1, 1) = 1,\ a(v_2, 1) = a(v_3, 1) = 0$$
$$a(v_2, 2) = 1,\ a(v_1, 2) = a(v_3, 2) = 0$$
$$\Rightarrow\ V = v_1 + v_2 = \$8$$

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:

$$a(v_i, j) = 1/3 \text{ for } i = 1, 2, 3 \text{ and } j = 1, 2,$$
$$\Rightarrow \; V = \tfrac{2}{3}(v_1 + v_2 + v_3) = \$6$$

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.

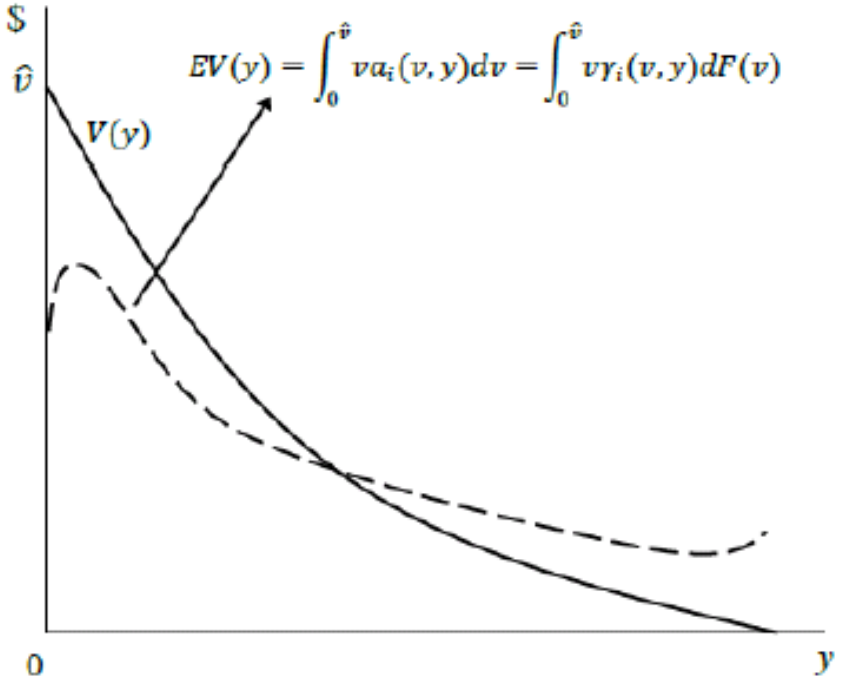
Optimal allocation: revisiting the equi-marginal principle

- Marginal values insufficient for inferring aggregate value. It is critical to understand the rules governing access and the sorting of marginal values they induce.

  $\Rightarrow$ We need a "expected" value function

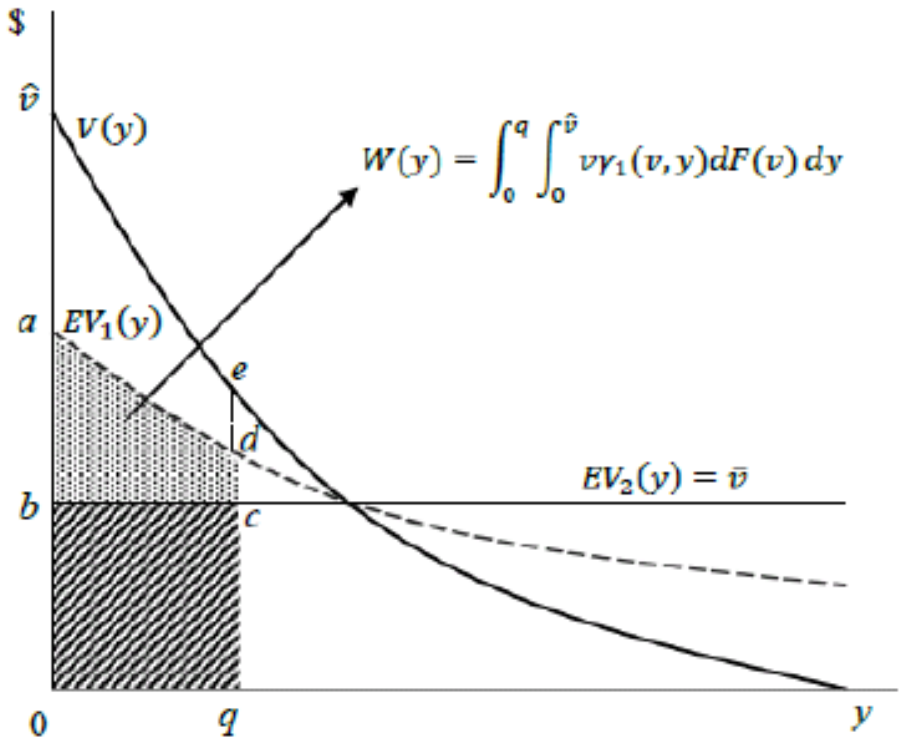
Access scenarios and assignments

- The expected value function:



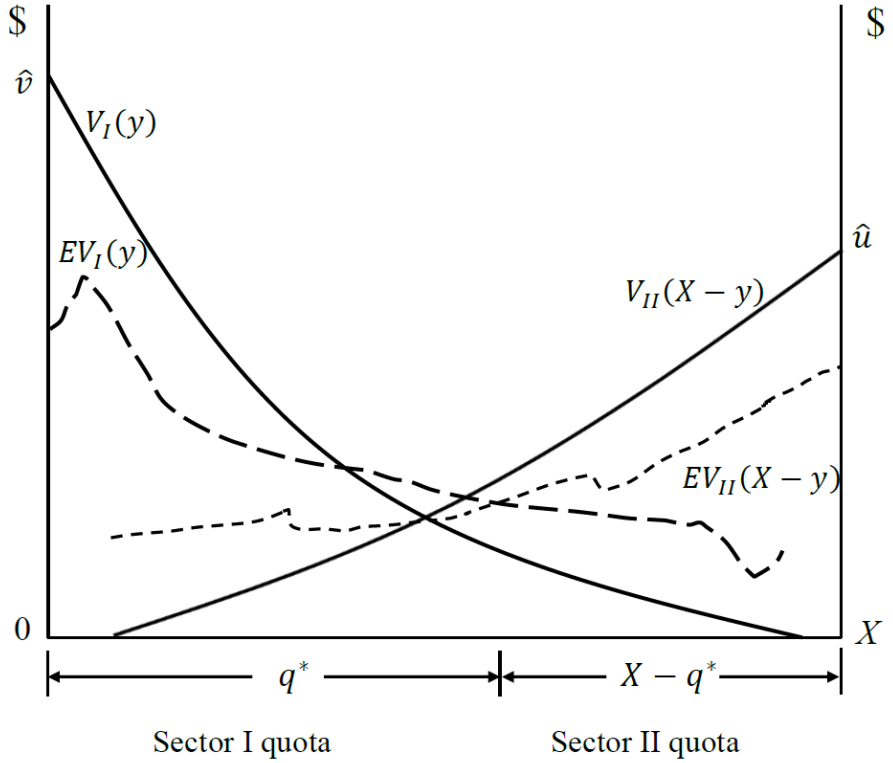
Access scenarios and assignments

- 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 **expected** marginal WTP equal for both sectors



Optimal allocation: the equi-marginal principle revisited

Generalized Equi-marginal Principle:

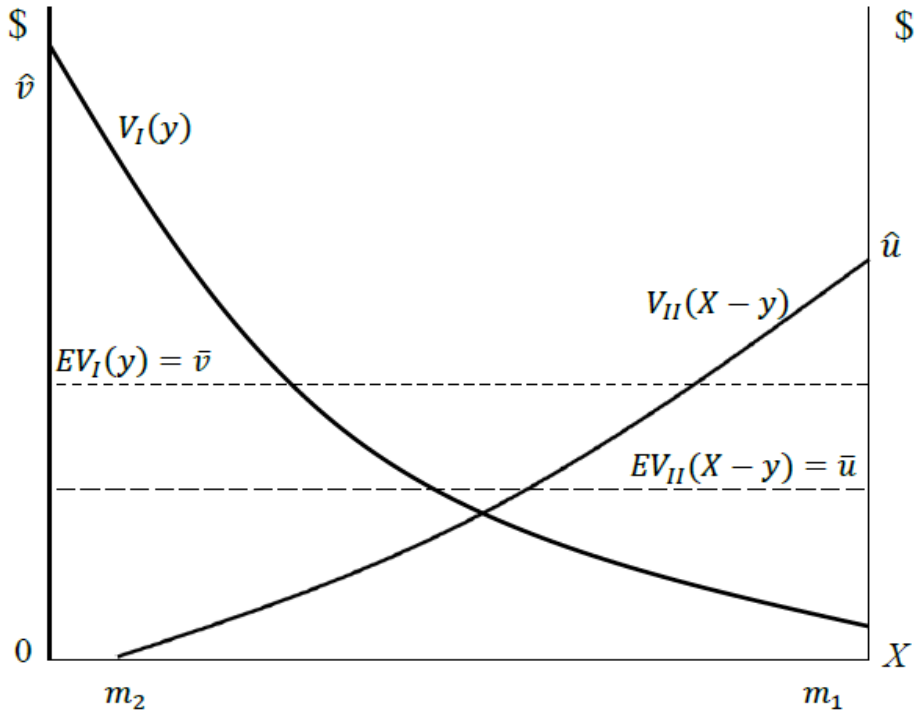
For any pair of access scenarios $\mathcal{A}_{\mathrm{I}}$ and $\mathcal{A}_{\mathrm{II}}$, the allocation of harvest that maximizes total welfare is defined by

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

$$\int_0^{\hat{v}} v\gamma_I(v, q^*)dF(v) = \int_0^{\hat{u}} u\gamma_{II}(u, X - q^*)dG(u)$$

Optimal allocation: the equi-marginal principle revisited

- Corner solutions are possible!



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

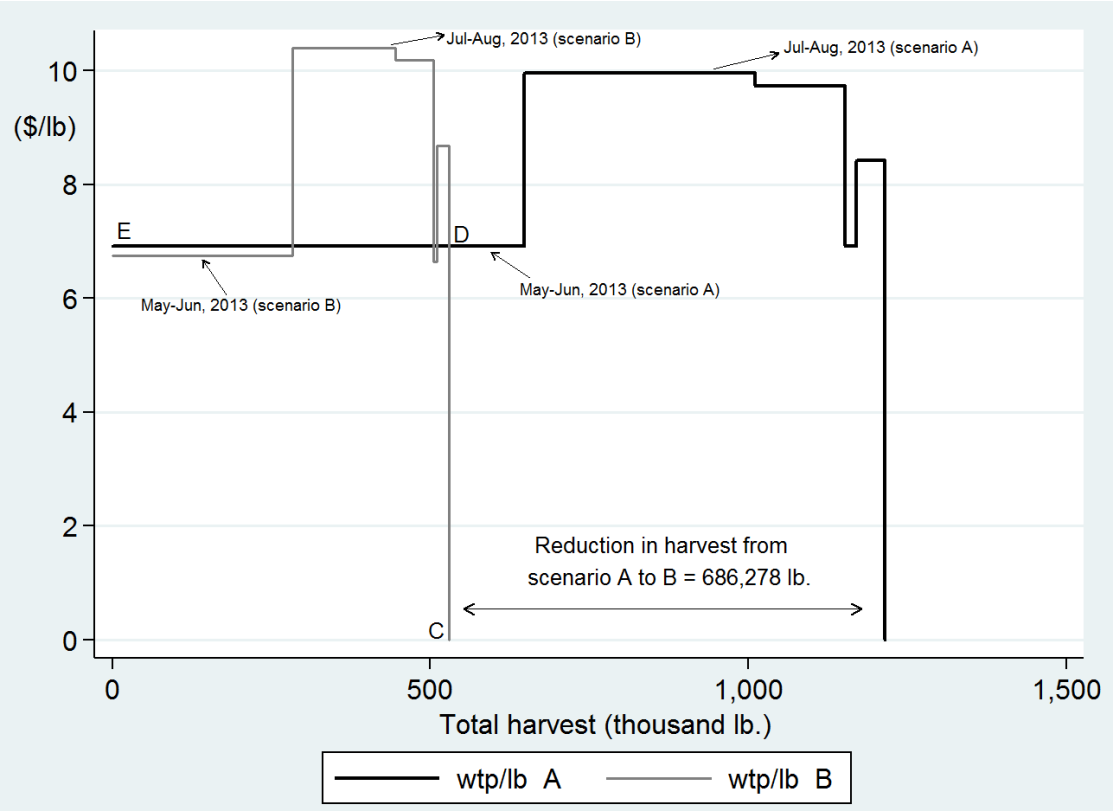
An illustration: Gulf of Maine cod and haddock

- 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:

	Cod Limits		Haddock Limits	
	Quantity	Size	Quantity	Size
Scenario A	9	19″	35	21″
Scenario B	9	24″	35	21″

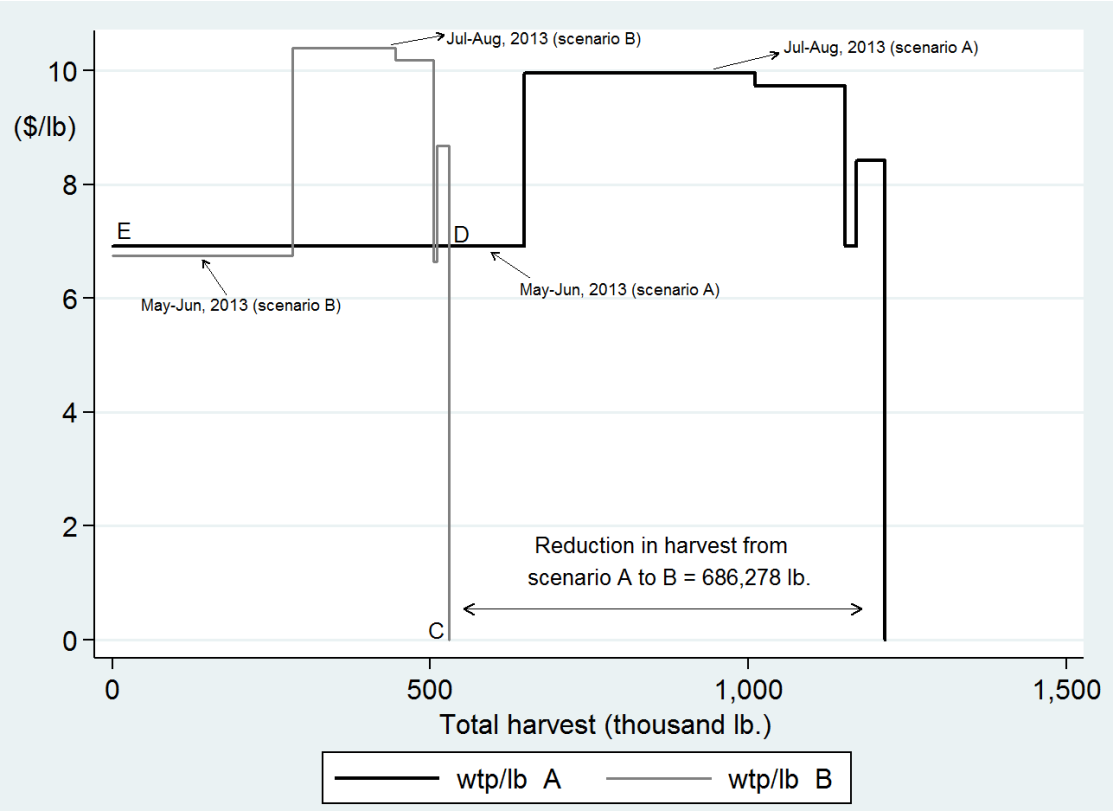
An illustration: Gulf of Maine cod and haddock

- Total welfare under scenario A is $10 million (harvest of 1.2 million pounds)



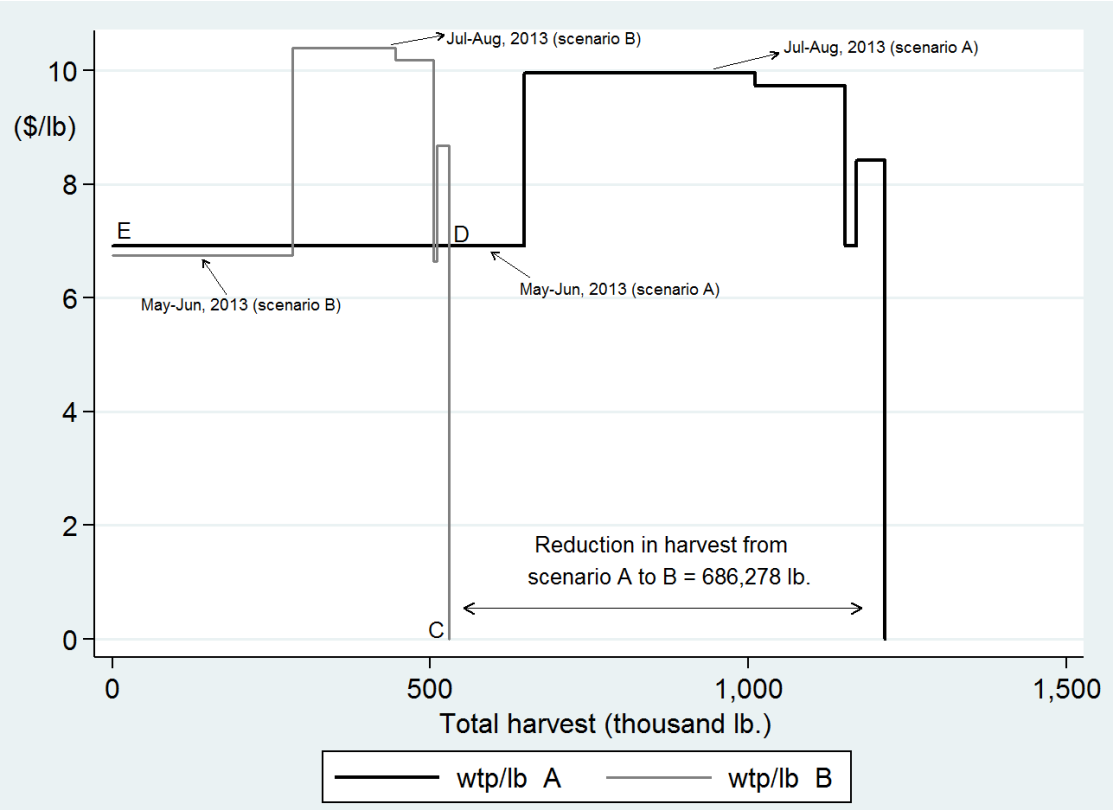
An illustration: Gulf of Maine cod and haddock

- Total welfare under scenario B is $4.4 million (harvest of 529,000 pounds)



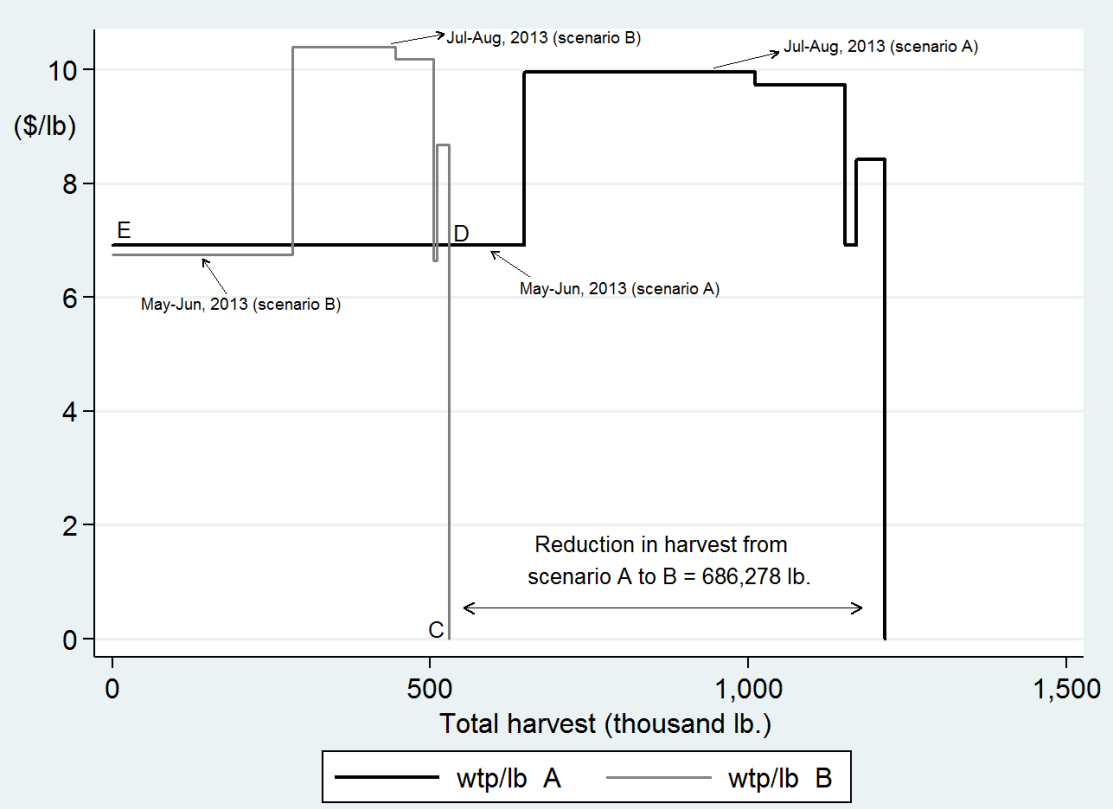
An illustration: Gulf of Maine cod and haddock

- 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