

Bycatch Saving Technological Change

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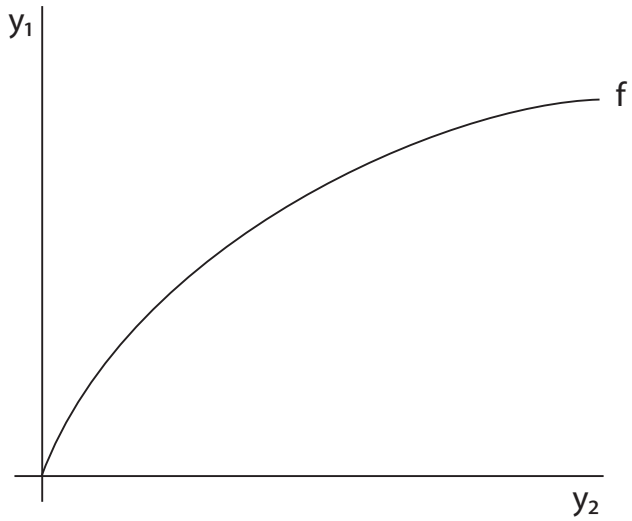
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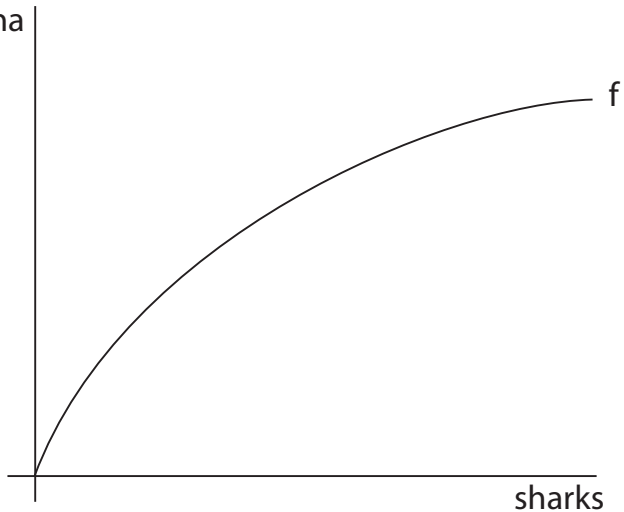
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October 7, 2013

**What is bycatch saving
technological change?**

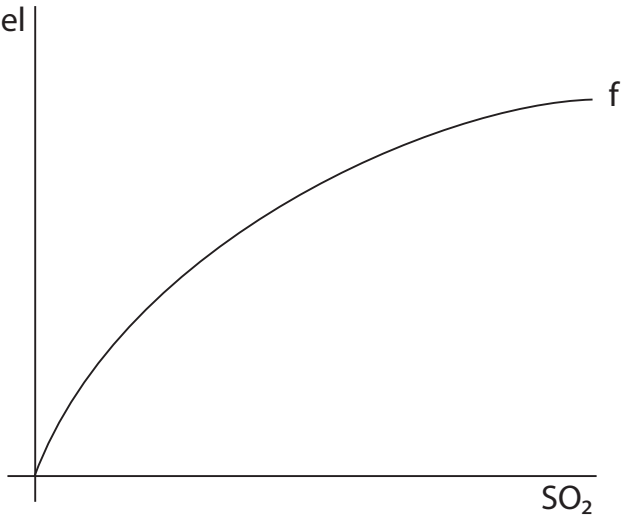


tuna



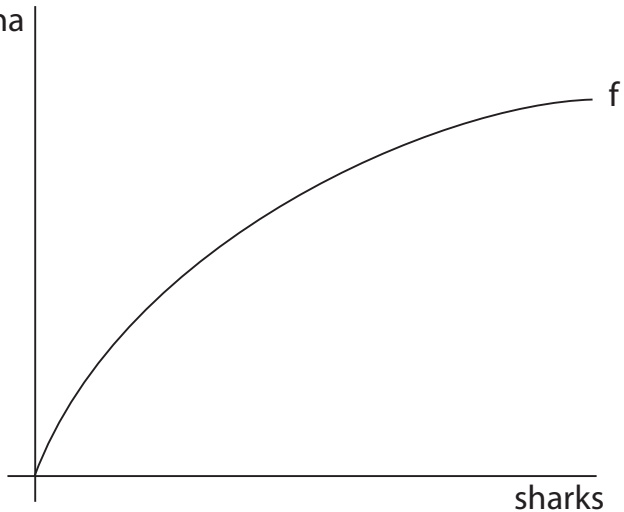
sharks

steel

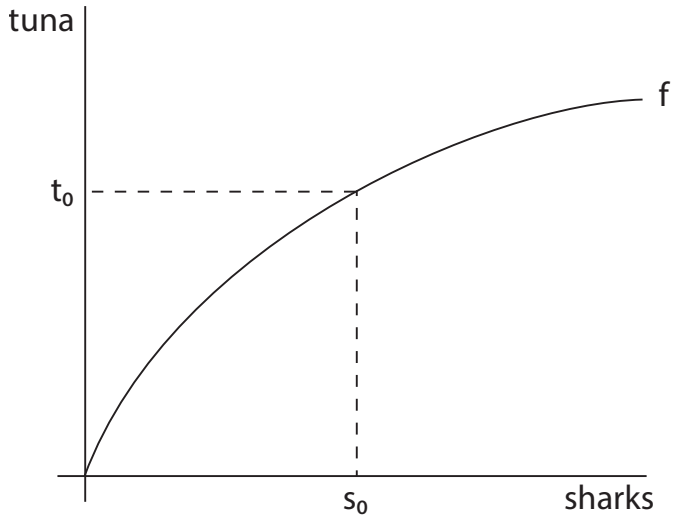


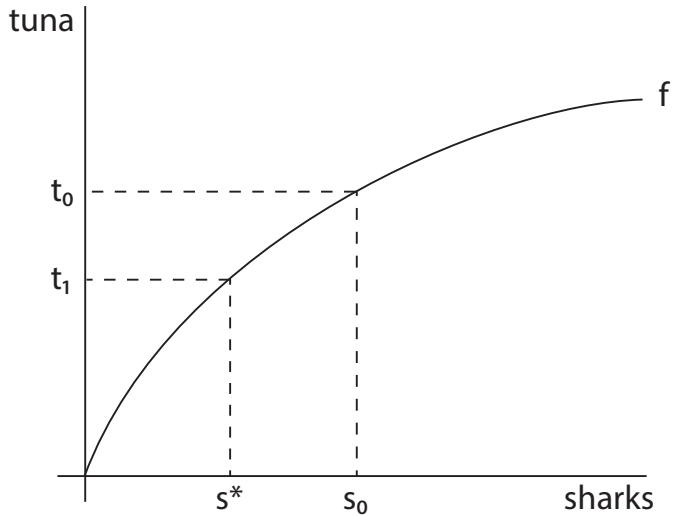
SO₂

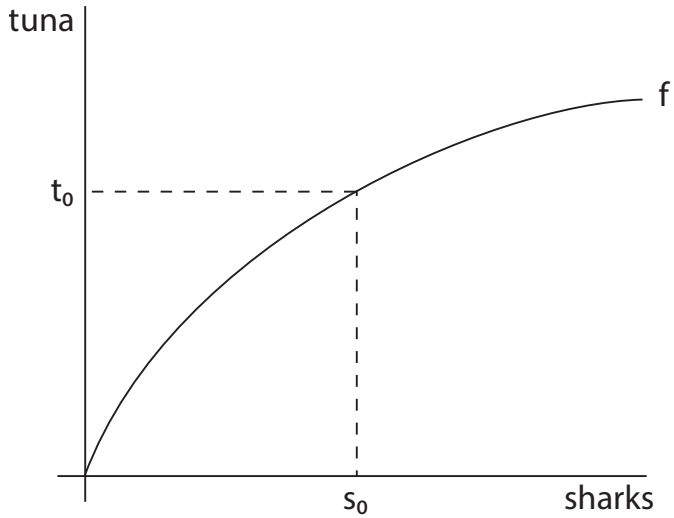
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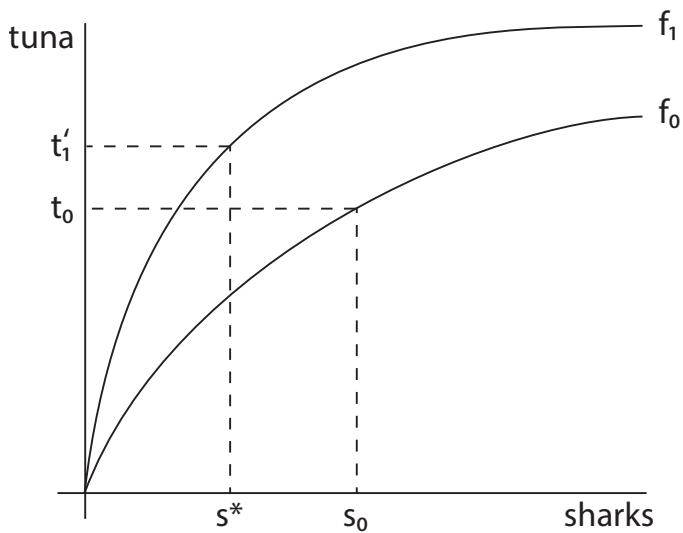


sharks









How do you induce bycatch saving technological change?

Compare technological incentives in different policies.

Standard policies

Tax: charge $\$T$ for each unit of bycatch so that s^* is obtained

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ITQ: Set number of quotas to obtain s^* and let harvesters trade

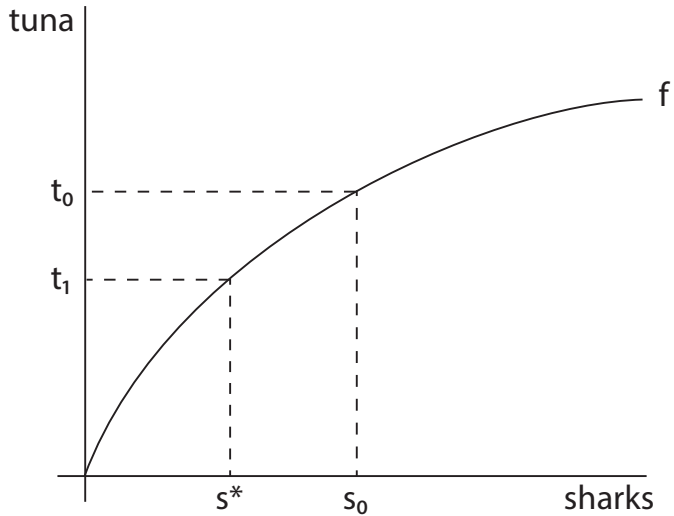
Subsidy: Pay harvesters based on how far from s^* they are

$$\tau(s_0 - s^*)$$

Tax vs subsidy

- On the margin, same incentives for harvesters
→ same static outcome
- Transfers matter
 - Tax transfers from firms to taxpayers
 - Subsidy transfers from taxpayers to firms

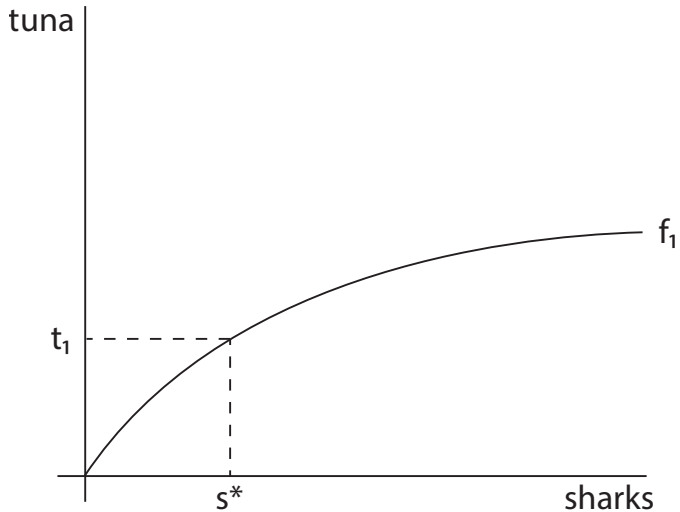
Overall quota or TAC:



Overall quota or TAC: tell harvesters they can only capture s^*

Tax vs subsidy vs TAC

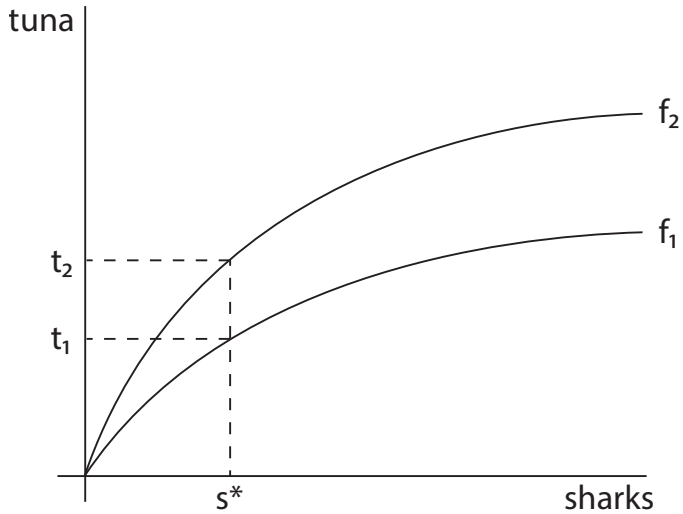
Static economic analysis is the same from a bycatch perspective

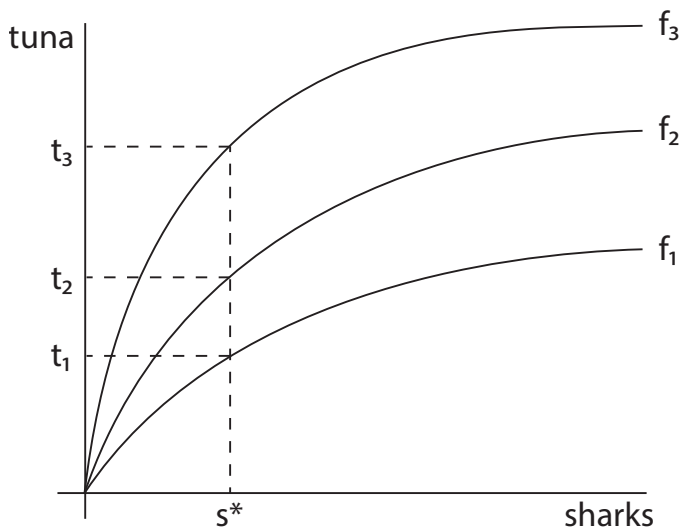


Tax vs subsidy vs TAC

Exogenous technological change dynamics are also the same

Both give incentive to adopt bycatch reducing technologies or techniques in order to increase profit.





Tax vs subsidy vs TAC

Endogenous technological change might differ based on:

- Transfers
- Severity of restriction
- R&D targetting

Tax vs subsidy vs TAC

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Transfers would suggest: Subsidy $>$ TAC $>$ Tax

Technology standards

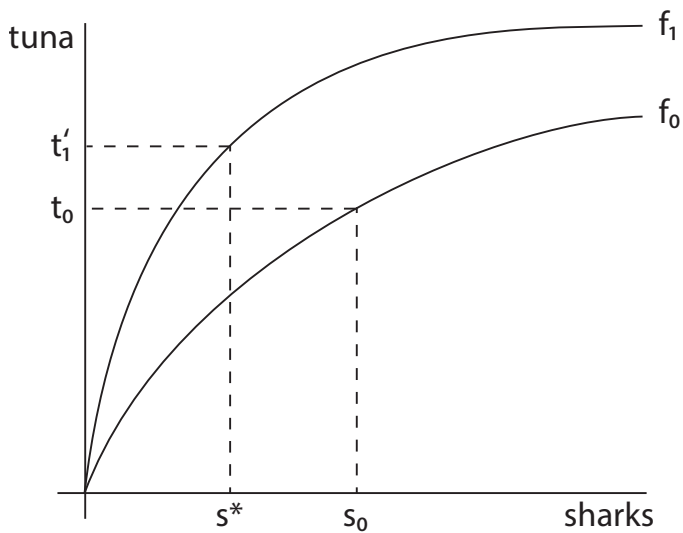
From fisheries: Medina panels, circle hooks, eco fads

From other settings: Smoke stack scrubbers,
catalytic converters

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Could also be regressive: limits on the types of gear



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A2: Our current analysis has overlooked costs.

$$y = f(A, k, l)$$

$$\pi = pf(A, k, l) - rk - wl$$

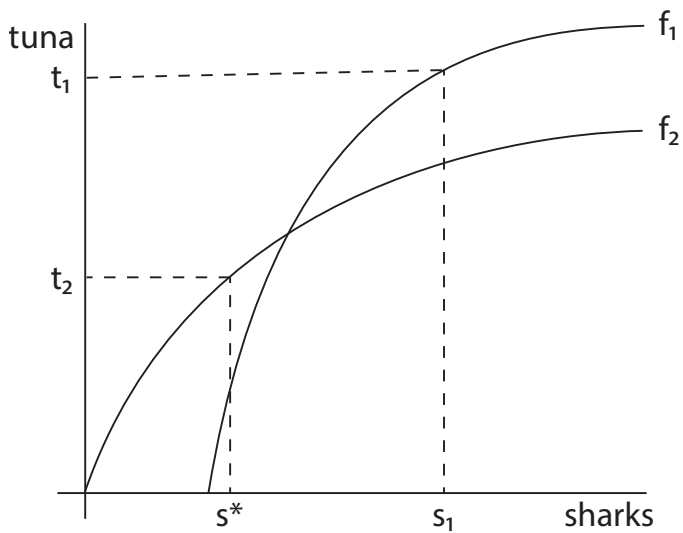
$$\pi = pf(A, k, l) - rk - wl$$

$$\pi' = pf(A', k, l) - rk - wl - p_{A'}$$

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$$\pi' = pf(A', k, l) - rk - wl - p_{A'}$$

Could be that $\pi' < \pi$

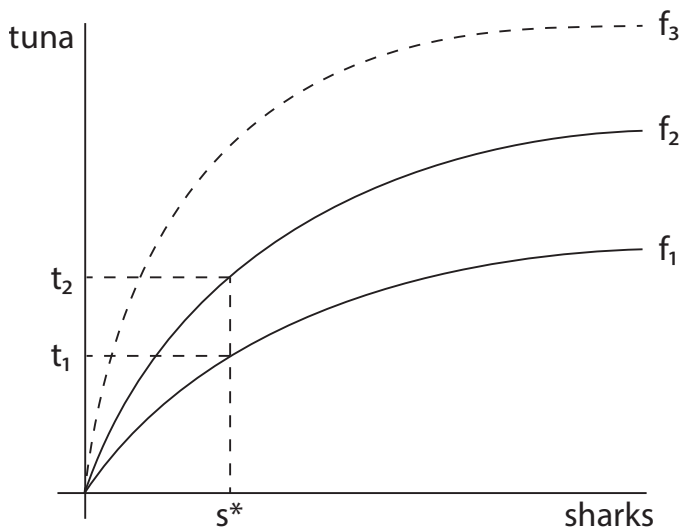


Q: If these technologies are better, why haven't they already been adopted?

A1: Sometimes they are (e.g. medina panels).

A2: Our current analysis has overlooked costs.

A3: The technology might not exist (e.g. eco fads).



Area closures and effort restrictions

Example:
**Dolphin bycatch in the Eastern
Pacific Ocean**

Figure: EPO Purse Seine Dolphin Bycatch

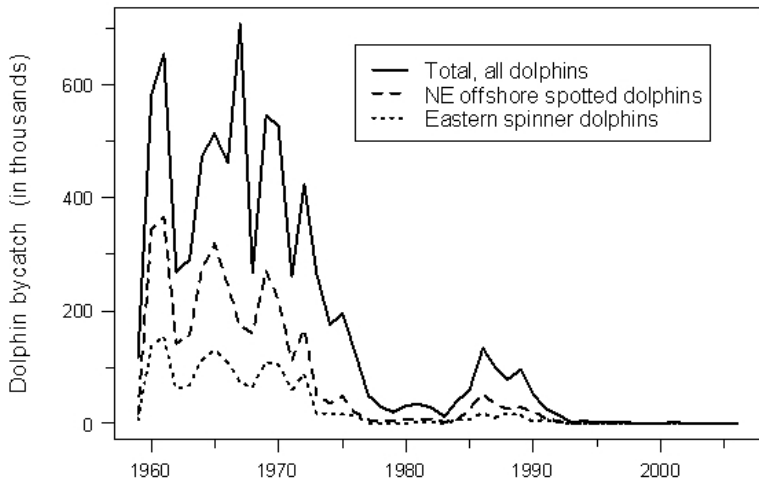


Figure: EPO and WCPO FAD Use

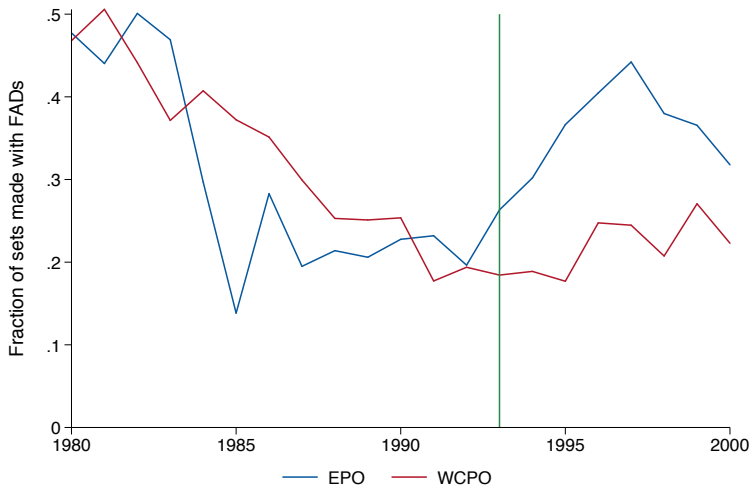
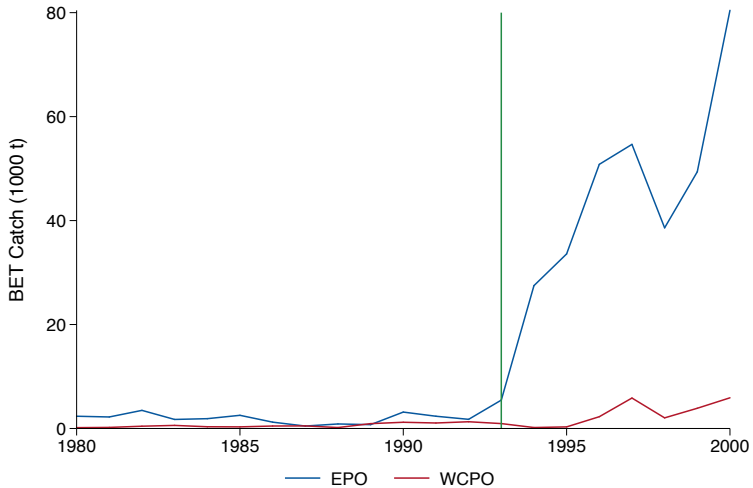


Figure: EPO and WCPO BET Catch



Conclusions

We haven't discussed:

- Other plausible policies
 - Community supported conservation or changes in norms
 - Effort or capital restrictions
 - Government or industry R&D
- Uncertainty
- Enforcement costs

Conclusions

- Technological change possibly decreases the burden of bycatch reductions, so the effect of policy on technology shouldn't be ignored
- Standard policies are often equivalent from a static economic standpoint but can be ranked from an induced technical change standpoint
- Technology standards might help induce changes in technology in the short run but can have unintended consequences for the ecosystem and for later technological development