

The “tragedy” of the commons



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Adam Smith



“...by pursuing his own interest he frequently promotes that of the society more effectually than when he really intends to promote it.”

Open Access



A fishery



- In 1954, H. Scott Gordon published a paper in the *JPE* in which he analyzed the problem of a fishery under open access.
- He showed that free entry would result in complete rent dissipation.
- The reason is simple: as long as a fish is worth more than it costs to catch it, more boats will start fishing.
- Eventually, with enough boats, the fish will become so scarce that the cost of catching one will rise until it reaches the value of a fish.

Background...2

- Rent dissipation occurs because the increasing number of boats results in an increasing scarcity of fish that raises the unit cost of catching them.



- In 1968, the biologist Garrett Hardin published a paper in *Science* arguing that common property would be over-used. This had a much greater impact than Gordon's paper.



Common property versus Open Access



- When the number of people using the resource is fixed, the tragedy can still occur, but not in full force.
- Consider a group of lobster fishermen operating in a given territory to which they have exclusive access.
- Now, if the fishermen were putting in so many traps that their profits were zero, some fisherman would reduce the number of traps he has in the water.
- This would increase the catch per trap for all of them.
- So profits would increase from zero.



- We conclude that with common property, rents will *not* be completely dissipated.
- Nevertheless, they will not be maximized either.
- Why? Consider the situation when the number of traps is at the level that maximizes the total rent.



- If one fisherman puts in one more trap, this will raise his expected profit.
- Why? Because the additional trap has two effects.
- The first is that he experiences an increase in profit equal to the average profit per trap.
- Second, the average profit per trap falls. But this fall affects *all* traps, not just his own. He has shifted some of the cost of his action onto the others, so his profit must go up (since the total profit hardly changes.)



- So a profit-maximizing number of traps won't be maintained as long as the fishermen in the group act selfishly.
- The number of traps will be larger than the profit-maximizing level.
- The resource will be over-exploited, but, at least in the short term, there will not be zero profits.

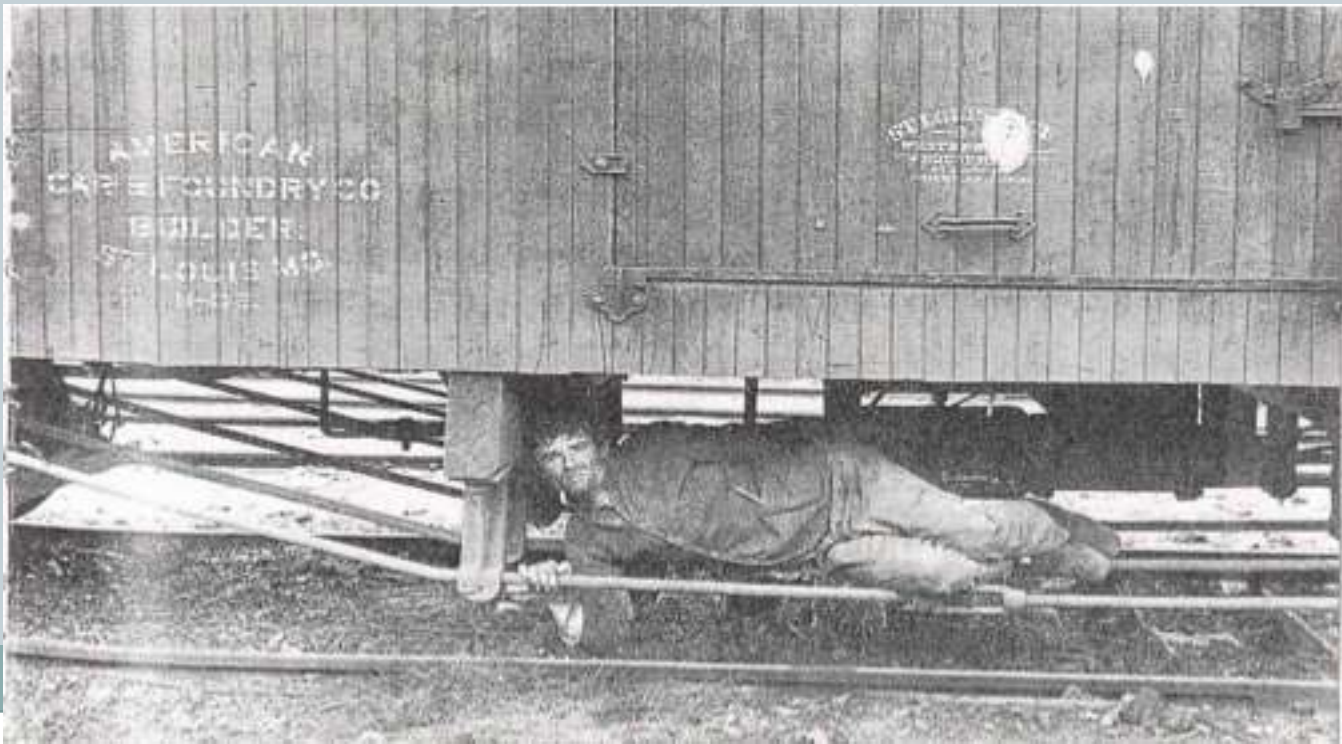


- So far, I've only been talking about moas and fish.
- But the commons problem is ubiquitous.
- Road space tends to be congested, as do bandwidth and airports, the regenerative capacity of the atmosphere, streams and lakes, the ocean.

Background...3



- In 1965, the economist Mancur Olson published a book called “The Logic of Collective Action” in which he pointed out that groups with common interests face *free-rider* problems.





- Economists' models at this time generally concurred with Hardin's conclusion that the commons would be over-exploited.
- It became the default assumption among economists that the commons had to either be privatized or regulated by the government if they were not to be over-used.

Ph.D. thesis



- In the early 1960's, before Hardin wrote about the tragedy of the commons, Elinor Ostrom studied groundwater governance in southern California for her doctoral thesis.
- Saltwater intrusion into the basin prompted users to find institutional arrangements that would help them reduce over-pumping and preserve the resource.
- This study showed Ostrom that the tragedy could be overcome by self-governance by users.

Elinor Ostrom



Governing the Commons



- Ostrom's was hardly the only such study.
- What she came to realize over the years was that there were literally thousands of such studies of the self-governance of common pool resources such as fisheries, pastures, forests, and water resources, done by anthropologists and other social scientists.
- Her reading of these studies culminated in her 1990 book, *Governing the Commons: The Evolution of Institutions for Collective Action*.

Key contribution



- The book's most important contribution was empirical. It laid to rest the presumption of the 'tragedy of the commons' in the absence of privatisation and regulation. It showed that local self-governance was not an aberration, but rather a very frequent occurrence.
- It noted the common features of successful arrangements:

Observed features of resource governance



- There were clearly understood rules or norms of resource use, that might be formal or informal. Formal governance structures were quite common.
- There were punishments for rule violations, but these were mostly nominal and sometimes involved nothing more than adverse gossip. They served as warnings. Serious punishments such as exclusion from the resource were usually rare, and reserved for repeated or grave violations.
- Local governance structures were often nested in larger systems of authority.



- But local self-management wasn't always successful.
- There are many examples of well-governed local commons breaking down as transport costs fell, migration increased, resource prices rose, harvesting technologies improved, and wages rose.

When does local management work?



- Punishment of those who over-exploit is costly. So why punish?
- Social norms?
- What is a social norm? *An unspoken agreement to behave in a certain way in some context, with violations being subject to social sanctions.*
- Under what circumstances will a social norm of restraint in harvesting and punishment of those who over-exploit be stable?
- Suppose there are three types of people in the group.



- *Defectors*. They harvest as much as they like, showing no restraint.
- (Passive) *cooperators*. They adhere to the norm not to over-harvest, but don't participate in the sanctioning of violators.
- *Enforcers*. They adhere to the norm of restraint in harvesting and sanction defectors.

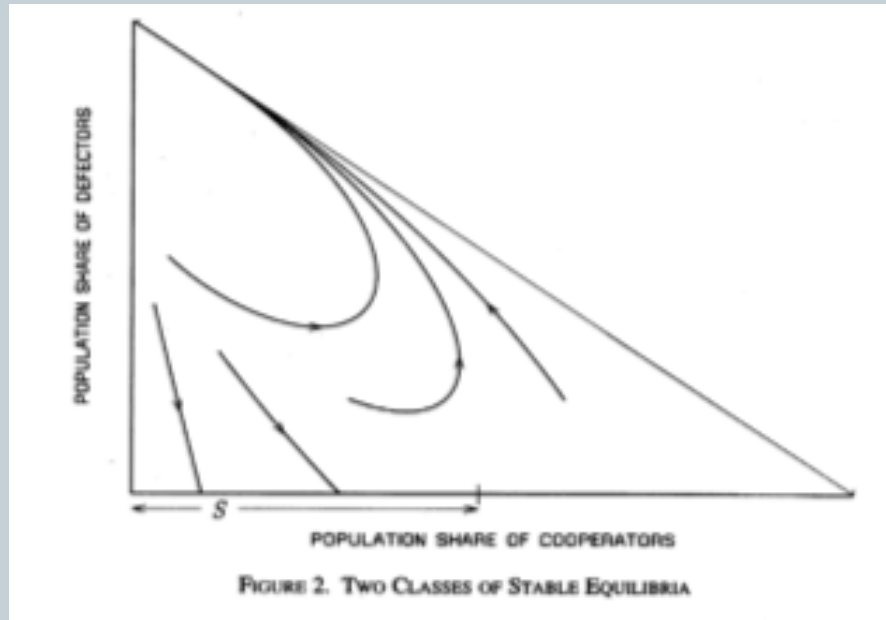
Evolution



- Those behaviors with higher payoffs get imitated and rise in frequency, while those with lower than average payoffs get weeded out.
- Under what circumstances will a norm of restraint be stable under such evolutionary selection pressure?
- You might think that it could never be because enforcers *always* do worse in terms of payoffs than cooperators. They get the same harvest but bear the sanctioning cost.



- Such a norm will be stable as long as *the damage from being sanctioned is less than the gain from harvesting more than the norm* when nearly the entire group consists of enforcers.
- If this condition holds (notice that it is independent of the cost of sanctioning), then any defector who appears in the population will be quickly eliminated. This will reduce the proportion of enforcers somewhat in favor of cooperators, but in the meantime, the defectors will have vanished.





- When transport costs fell and isolated villages got integrated with markets, this raised the value of natural resources like timber from common forests that could now be exported, grass from common pastures.
- Harvesting technologies in fisheries improved.
- Migration allowed people to escape social sanctions.
- The effect in many cases was to de-stabilize social norms that restrained harvesting.



- Economic growth eventually raised wages that reduced the return to labor-intensive natural resource extraction activities. This might render restraint once more viable.
- But once social norms have broken down, it may not be easy to restart them.
- The result have been degraded forests, over-grazed pastures and collapsed fisheries.

Human nature and the commons



- The commons were important for our hunter-gatherer ancestors throughout pre-history. So were other social dilemmas, such as the provision of defence against rival groups.
- Might the forces that made for cooperation in recorded history also have shaped our ancestors' genes?
- More specifically, would people with a taste for reciprocity survive in a Darwinian competition with those that were purely self-interested?



- To answer this question, imagine that there are two types of behavior in the population – self-interested, and reciprocal.
- The population is divided into small groups that form randomly every generation.
- The reciprocators obey a norm of restraint in harvesting, and monitor and punish at some cost to themselves, those in their group that violate the norm.
- The self-interested opportunists are smart and calculating. They violate the norm only when it pays to do so.



- As a result, self-interested types get higher payoffs (more food to eat) than reciprocators in their group because, if they comply with the norm they do better because they don't bear monitoring costs,
- And if they don't comply with the norm, that's because it's more paying not to comply.
- So you would think reciprocators must be weeded out.



- But, if there are enough reciprocators (but not too many) then reciprocators will tend to find themselves *in groups that comply* more often than self-interested types.
- And such groups, we know, solve the tragedy of the commons. The other groups don't.
- So these groups will do better than other groups.
- As a result, reciprocators and self-interested types can have a stable co-existence.
- Look around you.

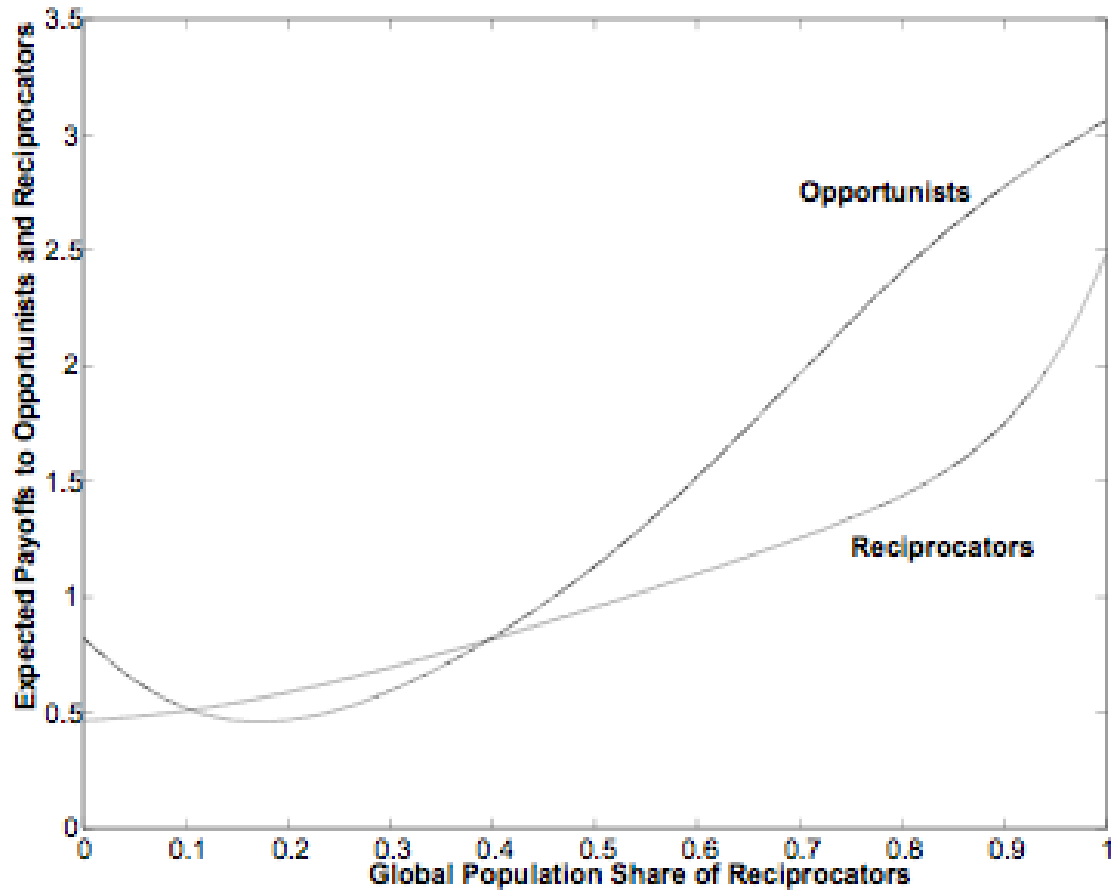


Figure 4. Multiple Stable Steady States.