



Seeking Policy Resilience Research on Methods to Avoid the Tragedy of the AntiCommons

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Outline of Presentation

- A solid understanding of the underlying model and causes of the Tragedy of the Anticommons;
 - Background in how to identify when a scenario may match the model;
 - Review of early empirical research on the model;
 - Review of theoretical (formal) means and hypothetical observations on how a Tragedy of the Anticommons might be avoided;
 - Understanding that the Tragedy is not always tragic, it might be strategically implemented;
- Applications to International Law, Generally

The Tragedy of the Commons

The population problem has no technical solution;
it requires a fundamental extension in morality.

Garrett Hardin

At the end of a thoughtful article on the future of nuclear war, Wiesner and York (1) concluded that: "Both sides in the arms race are . . . confronted by the dilemma of steadily increasing military power and steadily decreasing national security. *It is our considered professional judgment that this dilemma has no technical solution.* If the great powers continue to look for solutions in the area of science and technology only, the result will be to worsen the situation."

I would like to focus your attention not on the subject of the article (national security in a nuclear world) but on the kind of conclusion they reached, namely that there is no technical solution to the problem. An implicit and almost universal assumption of discussions published in professional and

sional judgment. . . ." Whether they were right or not is not the concern of the present article. Rather, the concern here is with the important concept of a class of human problems which can be called "no technical solution problems," and, more specifically, with the identification and discussion of one of these.

It is easy to show that the class is not a null class. Recall the game of tick-tack-toe. Consider the problem, "How can I win the game of tick-tack-toe?" It is well known that I cannot, if I assume (in keeping with the conventions of game theory) that my opponent understands the game perfectly. Put another way, there is no "technical solution" to the problem. I can win only by giving a radical meaning to the word "win." I can hit my opponent over the head; or I can drug him; or I can falsify

What Shall We Maximize?

Population, as Malthus said, naturally tends to grow "geometrically," or, as we would now say, exponentially. In a finite world this means that the per capita share of the world's goods must steadily decrease. Is ours a finite world?

A fair defense can be put forward for the view that the world is infinite; or that we do not know that it is not. But in terms of the practical problems that we must face in the next few generations with the foreseeable technology, it is clear that we will greatly increase human misery if we do not, during the immediate future, assume that the world available to the terrestrial human population is finite. "Space" is no escape (2).

A finite world can support only a finite population; therefore, population growth must eventually equal zero. (The case of perpetual wide fluctuations above and below zero is a trivial variant that need not be discussed.) When this condition is met, what will be the situation of mankind? Specifically, can Bentham's goal of "the greatest good for the greatest number" be realized?

No—for two reasons, each sufficient by itself. The first is a theoretical one. It is not mathematically possible to maximize for two (or more) variables at the same time. This was clearly stated by von Neumann and Morgenstern (3), but the principle is implicit in the theory of partial differential equations, dating back at least to D'Alembert (1717—

Hardin's point was to locate a set of "no technical solution" problems faced by humanity; he immediately recognized it as a Game Theory mathematics problem.

HARVARD LAW

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FROM MARX TO MA

Michael A. Helle

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THE TRAGEDY OF THE ANTICOMMONS:
PROPERTY IN THE TRANSITION
FROM MARX TO MARKETS

Michael A. Heller*

Why are many storefronts in Moscow empty, while street kiosks in front are full of goods? In this Article, Professor Heller develops a theory of anticommons property to help explain the puzzle of empty storefronts and full kiosks. Anticommons property can be understood as the mirror image of commons property. By definition, in a commons, multiple owners are each endowed with the privilege to use a given resource, and no one has the right to exclude another. When too many owners hold such privileges of use, the resource is prone to overuse — a tragedy of the commons. Depleted fisheries and overgrazed fields are canonical examples of this familiar tragedy. In an anticommons, according to this Article, multiple owners are each endowed with the right to exclude others from a scarce resource, and no one has an effective privilege of use. When too many owners hold such rights of exclusion, the resource is prone to underuse — a tragedy of the anticommons. Empty Moscow storefronts are a canonical example of the tragedy of underuse. Anticommons property may appear whenever governments define new property rights in both post-socialist and developed market economies. Once an anticommons emerges, collecting rights into usable private property bundles can be brutal and slow. The difficulties of overcoming a tragedy of the anticommons suggest that policymakers should pay more attention to the content of property bundles, rather than focusing just on the clarity of rights.

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I. INTRODUCTION

Socialist rule stifled markets and often left store shelves bare. One promise of the transition “from Marx to markets”¹ was that new entrepreneurs would acquire the stores, create businesses, and fill the shelves.² However, after several years of reform, storefronts often re-

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Heller’s article in Harvard Law Review, “Tragedy of the AntiCommons”
The abstract carries three important ideas.

Duopoly	Complementary Monopoly
<p>Given the quantity demanded, $q = q^a + q^b$, $G(q)$ is the price at which this quantity is demanded (called the demand price at q)</p>	<p>Given price, $p = p^a + p^b$, $F(p)$ is the quantity demanded at this price</p>
<p>$G(q)$ is a decreasing function of q The reaction of A to q^b is the q^a that maximizes $q^a \times G(q^a + q^b)$</p>	<p>$F(p)$ is a decreasing function of p The reaction of A to p^b is the p^a that maximizes $p^a \times F(p^a + p^b)$</p>
<p>The reaction curve for B is defined symmetrically q^a and q^b (note $q^a = q^b$) are determined by the intersection of the reaction curves of A and B</p>	<p>The reaction curve for B is defined symmetrically p^a and p^b (note $p^a = p^b$) are determined by the intersection of the reaction curves of A and B</p>
<p>$p = G(q^a + q^b)$</p>	<p>$q = F(p^a + p^b)$</p>

The concept of a **mathematical dual**;
 the relationships are identical but the names (of the variables) are different

and can set different prices for their consent to transfer exploitation rights. This is the case analyzed by Buchanan and Yoon (2000), and Parisi et al. (2005), as a model of the anticommons problem. The third party's decision to purchase exploitation rights will be driven by the total price, which is given by the sum of the prices independently charged by the various co-owners, $\sum_{i=1, \dots, n} P_i$. Thus, in setting his price, co-owner i faces the following problem:

$$\text{Max } \pi_i = PQ_i = \left(V - P_i - \sum_{j \neq i} P_j \right) P_i = VP_i - P_i^2 - P_i \sum_{j \neq i} P_j \quad (2)$$

Assuming that co-owner i chooses his price assuming that $\partial P_j / \partial P_i = 0$ (i.e. using the Nash assumption that considers all other players' prices as given) the first order conditions for a maximum are $\partial \pi_i / \partial P_i = V - 2P_i - \sum P_j$. The n co-owner reaction functions can be solved simultaneously for the equilibrium values of P_i and P_j to yield $P_i = P_j = V/(n + 1)$; with a total price of $nV/(n + 1)$; $Q = V - P_i - \sum P_j = V/(n + 1)$. As the number of co-owners increases, the total price for the exploitation rights increases and the quantity purchased is reduced. In the limit ($n \rightarrow \infty$) the price of the exploitation rights becomes arbitrarily high and no units are sold.

Commons	Private property	Anticommons
$P = V/(n + 1)$	$Q = V/2$	$P = nV/(n + 1)$
$Q = nV/(n + 1)$	$P = V/2$	$Q = V/(n + 1)$

The economic model generates predictions summarized in the above table on the (inversely) symmetric behavior of players in commons and anticommons problems. These predictions assume the strategic rationality of the players involved. In the present study, we test these predictions to explore which other factors, such as different behavioral attitudes

Vanneste, Van Hiel, Parisi, & Depoorter 2006, demonstrate the reactions of resource developers are symmetrical under Tragedy of the Commons and Tragedy of the Anticommons, due to duality

Definition of Anticommons 1

- Anticommons
 - Has a group of owners of a common resource/good/goal/objective,
 - Each owner possessing an exclusionary right to prevent any other parties from using that resource.
 - Unless all of the holders of the exclusionary rights agree to allow use of the resource, the resource cannot be used.

Definition of Anticommons 2

- Anticommons
 - Has a process that need multiple inputs to output a singular result
 - Each input is complementary to the other inputs
 - Unless all of the inputs are present, the process to create or enable output is not possible

Anticommons Game: Join the Club

- A group of individuals exists, they are a club.
 - And in that club, each person has been granted a special privilege, the right to exclude new members from the group.
 - If a new person wants to join the group, they need to gather a card from each member, a complete set of cards means you get to join the club.
- But gathering the cards is not easy.
 - Each member of the group can set their own price, or test, for obtaining the approval card from him or her. A member can simply say no, setting her price at infinity.
 - Each member independently decides on his or her own price.
- They all realize that not every potential new member will be able to afford all of the prices, or pass all of the tests, that some applicants will fail to join.
- What the Tragedy of the Anticommons reveals, is that if the club members continue this process in independence from each other, fewer people will get to join the club than if the same club of members coordinated on a singular admissions price or test.
- If the club is deciding who gets to use a resource, then the resource will go underused, or at the limit, not used at all. This creates a loss of social welfare.

Research Results on Anticommons

1. We have learned that the Tragedy of the Anticommons fundamentally is the same result as Cournot's models of complementary oligopolies and of firms competing with complementary goods, these models originated in the early 1800s and are well understood;
2. The core problem in the Tragedy of the Anticommons is one of Pigouvian positive externalities;
 1. "The Tragedy of the Anticommons is the result of common resources remaining idle even when there could be some net social benefit. It occurs simply because the multiple holders of exclusion rights do not fully internalize the cost created by the enforcement of their right to exclude others"
 2. The positive externality of coordinated production is ignored in the math of self-interest and utility/profit maximization;
 3. In contrast, the Tragedy of the Commons has a core problem of negative externalities;
3. The Tragedy of the Anticommons is systemic and rational; its underuse of resource is embedded in the mathematical structure of the game – it is not a result of psychology, of contextual framing, of behavioral economics, or of human weaknesses – it is a calculated mathematical result given the standard model;

Research Results on Anticommons

4. Anticommons are created when multiple inputs to a process are complementary, meaning that the process cannot happen nor complete without the full set of inputs;
 - a. This is equivalent to saying when a group of actors all have individual rights of exclusion to a common resource
 - b. Each actor's exclusionary right(s) needs to be unconstrained when examined in social settings; similarly, the inputs must actually be complementary in nature
5. The inputs need not be perfectly complementary, but the more complementary they are, the worse the effects of the Anticommons will become;
6. Inputs can be complementary in both horizontal and vertical senses.
 - a. Horizontal means simultaneous, at the same time. Exclusionary rights can be simultaneous. Like coffee powder and water are needed to make coffee, both are needed at same time.
 - b. Vertical means sequential, upstream and downstream. Exclusionary rights can be sequential. First you gain approval from Agency A, then you can get approval from Agency B, then you can receive permit to perform activity.

Research Results on Anticommons

7. The more input that are required the worse the Tragedy of the Anticommons will become;
 - a. Another way to say this, is the more actors that hold exclusionary rights over a process, the worse the Tragedy of the Anticommons will become
8. In modelling binary policy choices, economists rely on ‘pricing competition’ models of the Anticommons;
9. It is likely easier to fragment rights than to re-assemble them again – the ‘Humpty Dumpty’ rule:
 - a. Transaction costs to dis-bundle rights to property are low in most legal systems
 - b. Transaction costs to re-bundle rights to property are high in most legal systems
 - c. In most cases, there will be asymmetrical tendency to accumulate more Anticommons than ‘solve’ them by rebundling the exclusionary rights
 - d. Anticommons will emerge in many systems, almost as if a function of time

Research Results on Anticommons

10. Regulatory Anticommons exist and are readily modelled;

- a. Pricing models are a common model for regulatory Anticommons;
- b. Eg, agencies have overlapping areas of regulatory authority;
- c. Political science provides many logical reasons for decentralizing power across both horizontal and vertical axes of governments, so multiple vectors of Anticommons can arise
- d. Multiple reasons more difficult to cure than ‘market-based’ Tragedy of Anticommons events

11. Anticommons persist over the long run, they don’t ‘self-cure’

12. Anticommons can be strategically good; sometimes they are an efficient means to protect certain resources or properties;

Research Results on Anticommons

13. Early Empirical Studies and Results are Available

- a. Human actors find it more difficult to spot the circumstances of Anticommons than that of Commons
 - i. Anticommons are waste of un-manifested events (missed chance),
 - ii. Commons are waste of manifest events (ruined fish stocks),
- b. The larger the number of human actors with exclusionary rights, the worse the Tragedy of Anticommons becomes,
- c. Human actors frame the two Tragedies differently, and this cognitive bias results in worse reactions under the Tragedy of the Anticommons versus that witnessed in the Commons version
 - i. No sense of loss from what never was, versus loss of previously exploitable Commons resource
 - ii. “Disaster of Anticommons vs mere Tragedy of Commons?”

Potential Strategies for Anticommons

- Avoid, Eliminate, or Mitigate the Anticommons
 - Expropriation of Exclusionary Rights, for cases of full exclusion,
 - 'Public' Facilitation of Cooperation for Joint Strategy
 - Resisting the Legal Acts that Create Anticommons
 - An Uber-Authority, 'super-ministries'
 - Teamwork - Living with the Anticommons
- Embrace the Comedy of the Anticommons

Where Scholars of International Law can Focus

- Where scholars of international law can focus, at least in the near term, is to try and identify where Anticommons phenomena are to be found. When considering how an international treaty works or operates, does it contain the necessary ingredients of an Anticommons?
 - i. Multiple Inputs:** Are there multiple inputs, actors, or agencies involved in a process?
 - ii. Anticommons mechanism:**
 - a. Do the various actors have some type of exclusionary rights, can they block or prevent actions or decisions, or, do they have ‘rights of necessary approval’? OR
 - b. Are there procedures that need to happen together making something result, either simultaneously or sequentially?
 - iii. Contrast of Singularity:** Can you see how things could be done better if all the actors (or inputs) coordinated as-if they were a singular entity (occurred altogether)?
- If a legal researcher finds that questions (i) and (ii) can both be answered yes, then that researcher likely has an Anticommons on their plate.
- But the answer to question (iii) reveals what is lost by the presence of the Anticommons.

Types of Anticommons Commonly Found in International Law

- Where one finds a committee that holds votes wherein one veto can derail a process, you have an Anticommons.
- Where you find a peace process that requires all parties to submit to a process, say allowing inspectors to examine something, and if breach by any party could breach and risk the loss of the accords, then you have an Anticommons.
- If you have an environmental treaty that attempts to gain controls over the emissions of a pollutant to a river, signed by parties upstream and downstream, but if it only takes only polluter to ruin the water, then you have an Anticommons.
- If you have an international process that requirements a process and approval (could be recognized as merely “completing” a process) from multiple authorities or NGOs, then you have an Anticommons.



Thank you!

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