2013

# The Tragedy of the Anticommons: A Concise Introduction and Lexicon

Michael Heller
*Columbia Law School*, mheller@law.columbia.edu

THE MODERN LAW REVIEW

# ARTICLES

## The Tragedy of the Anticommons: A Concise Introduction and Lexicon

Michael Heller*

This article gives a concise introduction to the 'tragedy of the anticommons.' The anticommons thesis is simple: when too many people own pieces of one thing, nobody can use it. Usually, private ownership creates wealth. But too much ownership has the opposite effect – it leads to wasteful underuse. This is a free market paradox that shows up all across the global economy. If too many owners control a single resource, cooperation breaks down, wealth disappears, and everybody loses. Conceptually, underuse in an anticommons mirrors the familiar problem of overuse in a 'tragedy of the commons.' The field of anticommons studies is now well-established. Over a thousand scholars have detailed examples from across the innovation frontier, including drug patenting, telecom licensing, climate change, compulsory land purchase, oil field unitisation, music and art copyright, and post-socialist economic transition. Fixing anticommons tragedy is a key challenge for any legal system committed to innovation and economic growth.

Some years ago, a drug company executive presented me with an unsettling puzzle. His scientists had found a potential treatment for Alzheimer's disease, but they couldn't develop it for the market unless the company bought access to dozens of patents. Any single patent owner could demand a huge payoff; some blocked the whole deal. This story does not have a happy ending. The drug sits on the shelf though it might have saved millions of lives and earned billions of dollars.[1]

Here's a second high stakes puzzle: what's the most underused natural resource in America? The answer may be a surprise. It's the air waves. Over 90 per cent is dead air because ownership of broadcast spectrum is so fragmented. As a result, America's information economy is relatively hobbled; wireless broadband capacity lags far behind that in Japan and Korea. The cost of spectrum underuse may be in the trillions.

And another puzzle: why do we waste weeks of our lives stuck in airports? Bad law for real estate assembly. In America, air travel was deregulated thirty-five years

*Lawrence A. Wien Professor of Real Estate Law, Columbia Law School. This article is adapted from the 41st Annual Chorley Lecture given at the London School of Economics, 12 June 2012 (finally revised 10 October 2012). The article draws substantially from the Preface and from Chapter 2 of M. A. Heller, *The Gridlock Economy: How Too Much Ownership Wrecks Markets, Stops Innovation, and Costs Lives* (New York: Basic Books, 2008).

1 The fullest account of anticommons theory and solutions appears in *The Gridlock Economy ibid*. On the anticommons in drug patents, see *ibid* 49–78 (chapter 3); in telecom, see *ibid* 79–106 (chapter 4); in land, see *ibid* 107–142 (chapter 5). See also M. A. Heller (ed), *Commons and Anticommons* (Cheltenham, UK: Elgar Publishing, 2011) (collecting and reprinting, in two volumes, the key scholarly articles on the theory and economics of commons and anticommons property).

 

Published by Blackwell Publishing, 9600 Garsington Road, Oxford OX4 2DQ, UK and 350 Main Street, Malden, MA 02148, USA

ago. The number of fliers has tripled. So how many new airports have been built since 1975? One. Denver. You can't build new airports, not anywhere, because multiple landowners can block every project. Twenty-five new runways at America's busiest airports would end most routine air travel delays in the country. Imagine that.

All these puzzles share a common cause: when too many people own pieces of one thing, nobody can use it. The anticommons thesis is that simple: when too many people own pieces of one thing, nobody can use it. Usually, private ownership creates wealth. But too much ownership has the opposite effect – it leads to resource underuse in an anticommons. This is a free market paradox I discovered and it shows up all across the global economy. If too many owners control a single resource, cooperation breaks down, wealth disappears, and everybody loses.

There has been an unnoticed revolution in how we create wealth. In the old economy, twenty or thirty years ago, you invented a product and got a patent; you wrote a song and got a copyright; you subdivided land and built houses. Today, the leading edge of wealth creation requires assembly. From drugs to telecom, software to semiconductors, anything high-tech demands the assembly of innumerable patents. And it's not just high tech that's changed – today, cutting edge art and music are about mashing up and remixing many separately-owned bits of culture. Even with land, the most socially-important projects, like new runways, require assembling multiple parcels. Innovation has moved on, but we are stuck with old-style ownership that's easy to fragment and hard to put together.

Fixing anticommons tragedy is a key challenge for our time. Some solutions are entrepreneurial; for example, people can profit from finding creative ways to bundle ownership. Philanthropists can assemble patents for disease cures. Political advocacy and legal reform will be needed to secure solutions. But the first and most important step in solving anticommons tragedy is to name it and make it visible. This article takes that step by briefly introducing the anticommons lexicon. With the right language, anyone can spot links among anticommons puzzles, and all can come together to fix them.

## COMMONS AND ANTICOMMONS

To understand the dilemma of resource underuse in an anticommons, it is helpful to start with overuse in a commons. Aristotle was among the first to note how shared ownership can lead to overuse: 'That which is common to the greatest number has the least care bestowed upon it . . . each thinks chiefly of his own, hardly at all of the common interest; and only when he is himself concerned as an individual.'[2]

2 Aristotle, *The Politics and the Constitution of Athens* (S. Everson (ed), B. Jowett (trans) Cambridge: Cambridge UP, 1996) 33. Before Aristotle, Thucydides noted that people 'devote a very small fraction of time to the consideration of any public object, most of it to the prosecution of their own objects. Meanwhile each fancies that no harm will come to his neglect, that it is the business of

Why do people overuse and destroy things that they value? Perhaps they are shortsighted or dim-witted, in which case reasoned discussion or gentle persuasion may help. But even the clear-headed can overuse a commons, for good reasons. The most intractable overuse tragedy arises when individuals choose rationally to consume a common pool of scarce resources even though each knows that the sum of these decisions destroys the resource for all. In such settings, reason cuts the wrong way and gentle persuasion is ineffective. In other words, I do what's best for me, you do what's best for you, and no one pays heed to the sustainability of the shared resource.

Ecologist Garrett Hardin captured this dynamic well when he coined the phrase *tragedy of the commons*.[3] In 1968 he wrote, 'Ruin is the destination toward which all men rush, each pursuing his own best interest in a society that believes in the freedom of the commons. Freedom in a commons brings ruin to all.'[4] Since Hardin wrote these lines, thousands have identified additional areas susceptible to overuse and commons tragedy.[5]

In addition, Hardin's metaphor inspired a search for solutions. Most solutions revolve around two main approaches: regulation or privatisation. Suppose a common lake is being overfished. Regulators can step in and decide who can fish, when, how much, and with what methods. Such direct 'command-and-control' regulation has dropped from favor, however, partly because it fails so often and partly because of disenchantment with socialist-type regulatory control.

These days, regulators are more likely to look for some way to privatise access to the lake. They know that divvying up ownership can create powerful personal incentives to conserve. Harvest too many fish in your own lake today, starve tomorrow; invest wisely in the lake, profit forever. Extrapolating from such experience, legislators and voters reason – wrongly – that if some private property is a good thing, more must be better. In this view, privatisation can never go too far.

Until now, ownership, competition, and markets – the guts of modern capitalism – have been understood through the opposition suggested by figure 1. Private property solves the tragedy of the commons. Privatisation beats regulation. Market competition outperforms state control. Capitalism trounces socialism. But these simple oppositions mistake the visible forms of ownership for the whole spectrum. The assumption is fatally incomplete.

somebody else to look after this or that for him; and so, by the same notion being entertained by all separately, the common cause imperceptibly decays' *History of the Peloponnesian War* (R. Crawley (trans), New York: E.P. Dutton, 1910) bk 1, sec 141.

3 G. Hardin, 'The Tragedy of the Commons' (1968) 162 *Science* 1243, 1244. The power of Hardin's rhetoric sometimes exceeded the reach of his data. For example, Hardin's work overlooks the important distinction between 'open access' and 'limited access commons'. On the implications of this distinction for common pool resource dilemmas, see below n 15 and accompanying text.

4 Hardin, *ibid* 1244.

5 See, eg, 'The Digital Library of the Commons' http://dlc.dlib.indiana.edu (last visited 2 October 2012).

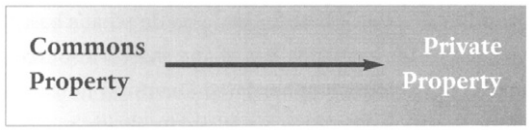


Figure 1: The standard solution to commons tragedy

Privatising a commons may cure the tragedy of wasteful overuse, but it may inadvertently spark the opposite. English lacks a term to denote wasteful underuse. To describe this type of fragmentation, I coined the phrase *tragedy of the anticommons*.[6] The term covers any setting in which too many people can block each other from creating or using a scarce resource. Rightly understood, the opposite of overuse in a commons is underuse in an anticommons.

This concept makes visible the hidden half of our ownership spectrum, a world of social relations as complex and extensive as any we have previously known (see figure 2). Beyond normal private property lies anticommons ownership. As one commentator notes, 'To simplify a little, the tragedy of the commons tells us why things are likely to fall apart, and the tragedy of the anticommons helps explain why it is often so hard to get them back together.'[7]

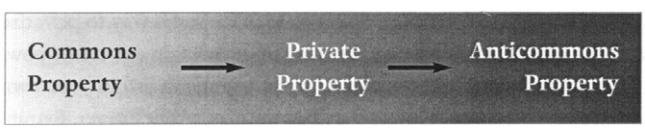


Figure 2: Revealing the hidden half of the ownership spectrum

Making anticommons ownership visible is not easy. Let me give you an image that I have found helpful in crystallising the abstract idea. A thousand years ago, the Rhine was one of the world's great trade routes. Boatmen traded under the protection of the Holy Roman Emperor. When the Emperor weakened in the 13th century, freelance German barons built castles and began collecting their own illegal tolls. The growing gauntlet of 'robber baron' castles, over 200 at one point, make for a wonderful bicycling holiday today, but made shipping impracticable back then. The river continued to flow, but for 500 years, boatmen would not bother making the journey. As one boatman's plaintive song went:

6 M. A. Heller, 'The Tragedy of the Anticommons: Property in the Transition from Marx to Markets' (1998) 111 *Harvard Law Review* 621, 624. In turn, my term builds on earlier conceptual work by Frank Michelman, *ibid* 667–669 (discussing evolution of the concept); see also F. J. Michelman, 'Ethics, Economics and the Law of Property' (1982) 24 *Nomos* 3 (discussing what he calls the 'regulatory regime').

7 L. A. Fennell, 'Common Interest Tragedies' (2004) 98 *Northwestern University Law Review* 907, 936–937.

> The Rhine can count more tolls than miles
> And knight and priestling grind us down
> The tollman's heavy hand falls first,
> Behind him stands the greedy line
> Master of tolls, assayer, scribe
> Four man deep they tap the wine.[8]

Everyone suffered – even the robber barons. The European economic pie shrank. Wealth disappeared. Too many tolls meant too little trade. To understand anticommons tragedy, just update this image. Phantom tollbooths today emerge whenever ownership first arises and property is being created all the time in ways many of us do not realise. Today's robber barons are often private owners and public regulators, all the people holding vetoes on the path to innovation. Today's missing river trade takes the form of crushed entrepreneurial energy and forgone investment. When too many public decision makers or private owners can block access to a resource, they harm us all.

Often, we think that governments need only to create clear property rights and then get out of the way. So long as rights are clear, owners can trade in markets, move resources to higher valued uses, and generate wealth. But clear rights and ordinary markets are not enough. The anticommons perspective shows that the *content* of property rights matters as much as the *clarity*. Wasteful underuse can arise when ownership rights and regulatory controls are too fragmented.

Making the tragedy of the anticommons visible upends our intuitions about private property. Private property can no longer be seen as the end point of ownership. Privatisation can go too far, to the point where it destroys rather than creates wealth. Too many owners paralyse markets because everyone blocks everyone else. Well-functioning private property is a fragile balance poised between the extremes of overuse and underuse.

## THE MAGICAL PARKING LOT

So far, I've introduced the nutshell version of the commons and anticommons. To understand the concepts more fully, imagine you've discovered an empty paved lot near Leicester Square in London. At first, the parking paradise is free and open to all. No one tickets or tows. You park and go to the theater. No problem. Later, you tell friends, who park there too. No problem. But then others notice, and soon the lot is jammed. Cars are blocked in. Doors are dinged. Fights break out. The lot becomes a scary place. You pay to park elsewhere.

This overused lot is an example of a tragedy of the commons. It's a tragedy because every parker is acting reasonably, but their individual actions quickly sum to collective disaster. Similarly, if a single shepherd has access to a field, the result is well-trimmed grass and fat sheep. But open the field to all shepherds, each of whom may add sheep without regard to the others, and soon there may be nothing left but bare dirt and hungry animals.

8 J. P. Chamberlain, *The Regime of the International Rivers: Danube and Rhine* (New York: Columbia UP, 1923) 148.

Overuse tragedies are everywhere: species extinction, ozone depletion, and highway congestion. After Garrett Hardin popularised the 'tragedy of the commons' metaphor in 1968, people gained a new language for a phenomenon that was widely experienced, but had been difficult to name. The concept helped people give voice to then-emerging concerns about environmental degradation.

Metaphors can be powerful. The tragedy of the commons concept revealed hidden links among innumerable resource dilemmas, large and small. Spotting this shared structure helped people identify shared solutions. For example, the International Association for the Study of the Commons brings together a global network of scholars, policymakers, and practitioners, while the Digital Library of the Commons hosts an online database that cites about fifty thousand articles related to the commons.[9]

How do we solve such tragedies? There are three distinct approaches: privatisation and markets, cooperative engagement, and political advocacy and regulation. Bear in mind that each solution has an analogue on the anticommons side of the property spectrum.

Private property and market transactions can solve overuse tragedy. Recall that in the parking example, you were the first to discover the empty lot. You might claim ownership for yourself based on your original discovery and first possession. Being first is a standard (but not necessarily fair or efficient) way to hand out rights in resources. Another path to private ownership passes through state control. The state might reject your claim of original discovery and instead appropriate the lot and auction it to the highest bidder or transfer it quietly to a crony. However the lot arrives in private hands, it will likely be managed better than if it had remained open to all. Owners can profit if they spruce up the lot, repave it perhaps, paint lines, and keep it clean, safe, and well used. As a parker in a private property regime, you lose the freedom of the commons but gain order and access.

The moral justifications for private ownership are controversial for philosophers, but as a practical matter, moving to private property often does prevent overuse in a commons. Harold Demsetz, author of the leading economic theory of ownership, argues that this 'conservation effect' is the main reason private property emerges in, and provides a benefit to, society.[10]

Because of our private-property focus, we tend to overlook cooperative solutions to overuse dilemmas. Cooperative solutions are often small-scale, context specific, local, and not reliant on legal structures – thus invisible. In the case of our magical parking lot, notes under windshields, gossip on the street, and other neighborly devices can coordinate the parkers. Parkers may figure out how to keep the parking lot running smoothly without state coercion or private ownership. In *Governing the Commons*, Ostrom demonstrated that close-knit communities around the world have succeeded in managing group property

9 On the IASC, see http://www.iascp.org (last visited 2 October 2012). On the Digital Library of the Commons, see n 6 above.

10 See H. Demsetz, 'Toward a Theory of Property Rights' (1967) 57 *American Economic Review, Papers and Proceedings* 347, 354–359.

without tragic outcomes.[11] There are thousands of stories of successful cooperation that preserve contested resources and promote overall social welfare.

Finally, state coercion can solve overuse. Cooperative mechanisms may break down if there are too many newcomers coming and going, if people don't really know each other, or if it is otherwise hard to discipline deviants. Then, parkers may move from polite notes under windshields to breaking antennae, purposely scratching cars, slashing tires, and fistfights. The state might assert ownership over the lot, put up a gate, and hand out or sell parking permits. But bureaucracy is costly and often capricious. Political pressure may lead to bizarre uses of the lot. States are rarely nimble or efficient parking-lot operators. Public ownership and management can eliminate the tragedy of the parking-lot commons, but they may create new costs and inconveniences for the parkers.

Privatising a commons may cure the tragedy of wasteful overuse and lead to orderly parking; but it also may inadvertently spark the opposite, a lot that no one can use. The *tragedy of the anticommons* describes this problem of wasteful underuse. Though the anticommons concept refers at its core to fragmented ownership, the idea extends to fragmented decision-making more generally. Resource use often depends on the outcome of some regulatory process. If the regulatory drama involves too many uncoordinated actors – neighbors and advocacy groups; local, state and federal legislators; agencies and courts – the sheer multiplicity of players may block use of the underlying resource.

How could the parking lot become an anticommons? Recall that underuse in an anticommons is the mirror image of overuse in a commons. Much can go wrong when politicians privatise state-owned resources, when resources are owned for the first time, or when owners divvy up property later on. For example, in privatising the lot, politicians might not want to annoy parkers who are also voters. So they might give free parking spots based on every parker's previous use of the lot. (This is approximately how US regulators have allocated ocean fishing quotas and tradable pollution permits.) If there are thousands of parkers, but say one hundred spots, dozens might have to share each spot. Assembling the fractional shares back into a usable parking lot would require too many deals. Even if each parker behaved reasonably, bargaining is costly. And many of us are not reasonable, especially at seven o'clock in Leicester Square when shows are about to start. So the 'privatised' lot may sit empty and unused – an anticommons.

Now substitute sheep in a meadow for the parkers in the lot. If a common field were privatised down to the square inch, no shepherd would be able to graze a single sheep. The same might happen if innumerable heirs separately owned scattered strips of an ancestor's farm. In an anticommons, the grass may be lush and tall and unused; in a commons, it may be picked bare. In both cases, the pasturage can be wasted and the sheep starve.

11 See generally E. Ostrom, *Governing the Commons: The Evolution of Institutions for Collective Action* (Cambridge: Cambridge UP, 1990) 1–28 (setting out the theoretical framework); E. Ostrom, 'Coping with Tragedies of the Commons' (1999) 2 *Annual Review of Political Science* 493 (discussing solutions).

The parking lot and shepherd's field show that creating private property can solve the problem of overuse in a commons. But privatisation can go too far. When it does, we can tip into an anticommons, and again everyone loses. Adding the concepts of underuse and anticommons makes visible a new frontier for private bargaining, political debate, and wealth creation. Our goal should be to find the sweet spot for property rights, between commons and anticommons.

## THE NEW WORLD OF USE

My tales of the magical parking lot are a bit of a sleight of hand. They give a succinct overview of overuse and underuse, commons and anticommons. But *underuse* and *anticommons* are still squiggly – until recently, my Word spellchecker rejected them by underlining each with red squiggles, and instead suggested *undersea* and *anticommunist* as replacements. These squiggles are a signal: the nonexistence of a word can be as telling as its presence. When we lack a term to describe some social condition, it is because the condition does not exist in most people's minds. So, it should be no surprise that we have overlooked the hidden costs of anticommons ownership. We cannot easily fix the problem until we have created a shared lexicon to spot tragedies of the anticommons.

Besides highlighting the language problem, the squiggles prompted me to look around the Internet at overuse and underuse. Googling *overuse* yielded about ten million hits in late 2012, while *underuse* generated under one million. (*Commons* had 800 million hits and *anticommons* had 25,000.) To me, the data immediately suggest two possibilities: either overuse is about ten times more important a social problem than underuse, or we are only about ten percent as aware of underuse as we should be. You will not be surprised that I believe the latter to be correct.

To understand the Google results, start with overuse. According to the *Oxford English Dictionary* (OED), *overuse* entered the language as a verb in the early 1600s. One of the earliest usages is as apt today as it was centuries ago: 'When ever we overuse any lower good we abuse it.' By 1862, the noun form was well recognised: 'The oyster beds are becoming impoverished, partly by over-use.'[12]

Overuse continues to mean 'to use too much' and 'to injure by excessive force,' definitions that have been stable for hundreds of years. Many of Google's top links for *overuse* come from medicine. Doctors diagnose 'overuse syndrome' and dozens of 'overuse injuries' – injuries from too much tennis, running, violin playing, book reading, whatever. So what is the opposite of overuse?

Ordinary use. The opposite of injuring yourself through too much use and excessive force is staying injury free by using an ordinary amount of force. Instead of abandoning an activity, do it in a reasonable, sustainable way. In medicine as in everyday language, the opposite of overuse is ordinary use (figure 3). Since the 1600s, overuse and ordinary use have been an either-or proposition. Either you will feel pain in your elbow, or you will be able to play happily, if not well. When you overuse a resource, bad things happen. It is much better to engage in ordinary use.

12 OED, 'overuse, *v.*' at http://www.oed.com/view/Entry/135291 (last visited 2 October 2012).


Figure 3: Ordinary use as the end point

How do we achieve ordinary use? Recall the problem of the magical parking lot. The usual solutions to tragedies of the commons are, as I've mentioned, privatisation, cooperation, and regulation. These three solutions map onto the traditional view that ownership can be organised into three basic types of property: private, commons, and state (figure 4).[13]

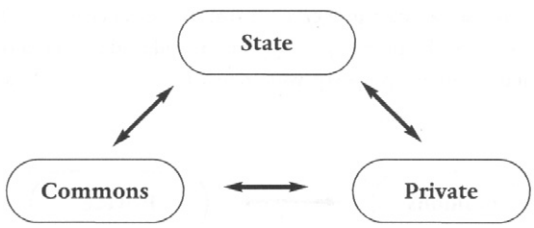


Figure 4: The trilogy of ownership

We all have strong intuitions about private property, but the term is surprisingly hard to pin down. A good starting point is William Blackstone, the foundational eighteenth-century British legal theorist. His oft-quoted definition of private property is 'that sole and despotic dominion which one man claims and exercises over the external things of the world, in total exclusion of the right of any other individual in the universe.'[14] In this view, private property is about an individual decision maker who directs resource use.

Commons property refers to shared resources, resources for which there is no single decision maker. In turn, the commons can be divided into two distinct categories. The first is *open access*, a regime in which no one at all can be excluded, like anarchy in the parking lot or on the high seas. Mistakenly, the legal and economics literatures have long conflated the commons with open access, hence reinforcing the link between commons and tragedy. The second type of commons has many names, but for now let's call it *group access*, a regime in which a limited number of commoners can exclude outsiders but not each other. If the ocean is open access, then a small pond surrounded by a handful of landowners may be group access (or consider the shared mews behind houses in Notting Hill, London's keyholder-only squares, and New York City's Gramercy Park). Group

13 On the property trilogy, see M. A. Heller, 'The Dynamic Analytics of Property Law' (2001) 2 *Theoretical Inquiries in Law* 79, 82–92.

14 W. Blackstone, *Commentaries on the Laws of England: In Four Books*, bk 2, *2.

access is often overlooked even though it is the predominant form of commons ownership and often not tragic at all.[15]

State property resembles private property in that there is a single decision maker but differs in that resource use is directed through some process that is, in principle, responsive to the needs of the public as a whole. In recent years, state property has become less central as a theoretical category: the cold war is over, most socialist states have disappeared, intense state regulation of resources has dropped from favor, and privatisation has accelerated. Today, for many observers, the property trilogy can be reduced to an opposition of private and commons property, what one scholar calls simply 'all and none' (figure 5).[16]


Figure 5: The familiar split in ownership

I believe a substantial cause of our cultural blindness to the costs of fragmented ownership arises from the dominance of this too simple image of property. Note how the commons–private opposition tracks the overuse–ordinary use opposition. The former implies that there is nothing beyond private property; the latter suggests that we cannot overshoot ordinary use. Together, these oppositions reinforce the political and economic logic of the global push toward privatisation. We assume, without reflection, that the solution to overuse in a commons is ordinary use in private ownership. This logic makes it difficult to imagine underuse dilemmas and impossible to see the uncharted world beyond private property.

According to the OED, *underuse* is a recent coinage. In its first recorded appearance, in 1960, the word was hedged about with an anxious hyphen and scare quotes: 'There might, in some places, be a considerable "under-use" of [parking] meters.' By 1970, copy editors felt sufficiently comfortable to cast aside the quotes: 'A country can never recover by persistently under-using its resources, as Britain has done for too long.' The hyphen began to disappear around 1975.[17]

In the OED, this new word means 'to use something below the optimum' and 'insufficient use.' The reference to an 'optimum' suggests to me how *underuse* entered English. It was, I think, an unintended consequence of the increasing role of cost-benefit analysis in public policy debates. What happens when we slot

15 On open access versus group access property, see T. Eggertsson, 'Open Access versus Common Property' in T. Anderson and F. McChesney (eds), *Property Rights: Cooperation, Conflict, and Law* (New York: Princeton UP, 2003) 74–85. I advocate that we use the term *liberal commons* to describe many forms of legally sanctioned group ownership. See generally H. Dagan and M. A. Heller, 'The Liberal Commons' (2001) 110 *Yale Law Journal* 549.

16 Y. Barzel, *Economic Analysis of Property Rights* (Cambridge: Cambridge UP, 1989) 71.

17 OED, 'under-use, *n.*' at http://www.oed.com/view/Entry/212195 (last visited 2 October 2012).

underuse into the opposition in figure 3? Although the result seems simple, it leads to conceptual turmoil (figure 6).


Figure 6: The new spectrum of use

In the old world of overuse versus ordinary use, our choices were binary and clear-cut: injury or health, waste or efficiency, bad or good. In the new world, we are looking for something more subtle – an 'optimum' along a continuum. Looking for an optimum level of use has a surprising twist: it requires a concept of underuse and surreptitiously changes the long-standing meaning of overuse. Like Goldilocks, we are looking for something not too hot, not too cold, not too much or too little – just right. Figure 7 suggests how underuse changes our quest.

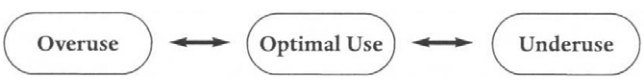


Figure 7: Goldilocks' quest for the optimum

How can we know whether we are underusing, overusing, or optimally using resources? It's not easy, and not just a matter for economic analysis. Searching for an optimum between overuse and underuse sets us on the contested path of modern regulation of risk, an inquiry that starts with economic analysis but quickly implicates our core beliefs. We have to put dollar values on human lives and on the costs of overuse and underuse behaviors – a process filled with moral and political dilemmas. I note this difficult topic to show that finding the optimum requires the idea of *underuse* and that this new word in turn transforms the meaning of *overuse*. Overuse no longer just means using a resource more than an ordinary amount. The possibility of underuse reorients policy making from relatively simple either-or choices to the more contentious trade-offs that make up modern regulation of risk.

## THE TRAGEDY OF THE ANTICOMMONS

Adding the idea of 'underuse' sets the stage for the anticommons. Looking back at figures 3–7, you can see there is a gap in our labeling scheme. We have seen the complete spectrum of *use*, but not the analogous spectrum of *ownership*. What form of ownership typically coincides with squiggly underuse? The force of symmetry helped reveal a hidden property form. Figure 8 shows my path to the anticommons.

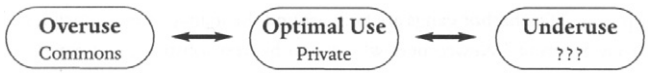


Figure 8: An ownership puzzle

I coined the term *tragedy of the anticommons* to help make visible the dilemma of too fragmented ownership beyond private property. Just as the idea of 'underuse' transforms the continuum of resource use, 'anticommons' transforms the continuum of ownership. It shows that the move from commons to private can overshoot the mark (figure 9). When privatisation goes too far, resources can end up wasted in an unfamiliar way.


Figure 9: The full spectrum of ownership

Seeing the full spectrum of ownership has another benefit. Our understanding of commons ownership may help inform solutions to anticommons tragedy. To start, consider the distinction between open access (anarchy open to all) and group access (property that is commons to insiders and private to outsiders). This distinction can do some work on the anticommons side of the spectrum as well. The conventional wisdom has often overlooked group access, but we don't have to. Under the right conditions, groups of people succeed at conserving a commons resource without regulation or privatisation.[18] Cooperation can get us to optimal use. Under what conditions does cooperation work, and what does that teach us about fixing underuse dilemmas?

At the extreme of open access, group norms don't stick. For example, anyone can fish for tuna on the high seas. Tuna fleets work in relative isolation, and their catches can be sold anonymously to diverse buyers. Conservation norms, such as voluntary limits on fishing seasons, may gain little traction. Gossip and other low-cost forms of policing don't work for wide-ranging international fleets. Unless states intervene, overuse is hard to avoid. Whales were saved from extinction more through naval powers enforcing international treaties than through gossip at the harbor bar.

The state can sponsor hybrid solutions. What if the state asserted ownership over lobsters and fish, and then created private rights (such as licenses and tradable quotas) that complement cooperative solutions? Often, such hybrid regimes lead to fairer and higher-yielding results than informal group access can achieve. For

18 See, eg, R. C. Ellickson, *Order without Law: How Neighbors Settle Disputes* (Cambridge: Harvard UP, 1991) 167–183.

example, in Australia, the government issues licenses for a sustainable number of lobster traps and enforces strict harvesting limits. Lobstermen can wait to harvest until the lobsters mature, or they can sell their government-created rights, secure in their markets and property. With far less fishing effort, this system yields more and bigger lobsters than US lobstermen catch either in coastal harbor gangs or on the open ocean.[19]

Hybrid systems are the cutting edge of natural resource management: examples include not only tradable fishing quotas, but also carbon-emission markets and transferable air-pollution permits.[20] These solutions can work far beyond lobsters and tuna, even beyond natural resources generally. They may reach the edge of high-tech innovation.

Solutions to commons property dilemmas give clues to solving anticommons tragedy. For *open access*, like the high seas, states must command resource use directly or create hybrid rights, such as fishing quotas. The anticommons parallel to open access is *full exclusion* in which an unlimited number of people may block each other. With full exclusion, states must expropriate fragmented rights or create hybrid property regimes so people can bundle their ownership. Otherwise, the resource will be wasted through underuse. There is, however, one important respect in which full exclusion differs from open access: an anticommons is often invisible. You have to spot the underused resource before you can respond to the dilemma.

*Group access* in a commons also has an anticommons parallel: *group exclusion* in which a limited number of owners can block each other. Recall the multiple owners of our magical parking lot. For both group access and group exclusion, the full array of market-based, cooperative, and regulatory solutions is available. Although self-regulation may be more complex for anticommons resources,[21] close-knit fragment owners can sometimes organise to overcome anticommons tragedy. For group exclusion resources, the regulatory focus should be support for markets to assemble ownership and removal of roadblocks to cooperation.

Group property on the commons or anticommons side of private ownership is exponentially more important than the rare extremes of open access or full exclusion. Much of the modern economy – corporations, partnerships, trusts, condominiums, even marriages – can be understood as legally structured group property forms for resolving access and exclusion dilemmas.[22] We live or die depending on how we manage group ownership. Now, we can see the full spectrum of property, as shown in figure 10.

19 See generally J. Tierney, 'A Tale of Two Fisheries' *New York Times* 27 August 2000; J. Acheson, *Lobster Gangs of Maine* (Hanover, NH: UPNE, 1988).

20 See C. M. Rose, 'Expanding the Choices for the Global Commons: Comparing Newfangled Tradable Allowance Schemes to Old-Fashioned Common Property Regimes' (1999) 10 *Duke Environmental Law and Policy Forum* 45.

21 See B. Depoorter and S. Vanneste, 'Putting Humpty Dumpty Back Together: Pricing in Anticommons Property Arrangements' (2007) 3 *Journal of Law, Economics, and Policy* 1.

22 See Dagan and Heller, n 15 above, 552–54; see also H. Dagan and C. J. Frantz, 'Properties of Marriage' (2004) 104 *Columbia Law Review* 75.

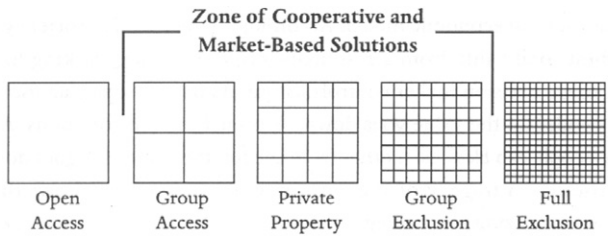


Figure 10: The full spectrum of property, revealed[24]

## THE ECONOMICS OF THE ANTICOMMONS

After I proposed the possibility of anticommons tragedy, economist and Nobel laureate James Buchanan and his colleague Yong Yoon undertook to create a formal economic model. They wrote that the anticommons concept helps explain 'how and why potential economic value may disappear into the "black hole" of resource underutilisation.'[23] According to their model, society gets the highest total value from a resource – say, the magical parking lot – when a single decision maker controls its use. As more people can *use* the lot independently, the value goes down – a tragedy of the commons. And as more people can *block* each other from the lot, the value also goes down symmetrically – a tragedy of the anticommons. Figure 11 shows their graphic summarising this finding.

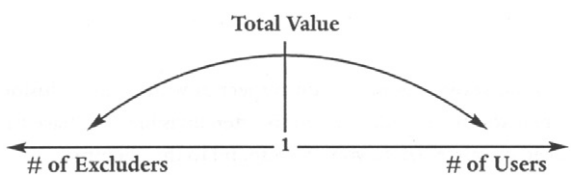


Figure 11: Value symmetry in an anticommons and a commons[25]

After developing their proof and showing how the anticommons construct may apply to a wide range of problems, Buchanan and Yoon concluded that 'the anticommons construction offers an analytical means of isolating a central feature of sometimes disparate institutional structures . . . [People] have perhaps

23 J. Buchanan and Y. J. Yoon, 'Symmetric Tragedies: Commons and Anticommons' (2000) 43 *Journal of Law and Economics* 1, 2.

24 I develop an early version of this spectrum in M. A. Heller, 'The Boundaries of Private Property' (1999) 108 *Yale Law Journal* 1163, 1194–98.

concentrated too much attention on the commons side of the ledger to the relative neglect of the anticommons side.'[26]

In recent years, economic modeling of the anticommons, including game theory approaches, has become quite sophisticated.[27] At the simplest level, anticommons theory can be understood as a legal twist on the economics of 'complements' first described by Antoine-Augustin Cournot in his 1838 *Researches into the Mathematical Principles of the Theory of Wealth*[28] (and discovered independently by Charles Ellet in 1839 in his work on railway tariffs[29]). Anticommons theory is a partial corrective for modern economic models that focus on 'substitutes' and often neglect the role of 'complements'.[30] What's the difference?

In figure 12, Railways A, B, and C are substitute ways to get from here to there. Say the fare is 9. If railway A finds a way to provide service for 8, it will win riders. B and C must become more efficient to keep up. In markets with robust substitutes, competitors have incentives to innovate, lower prices, and thereby indirectly benefit society as a whole. By contrast, Railways D, E, and F are complements. When inputs are complementary, generally you want all or none of them.

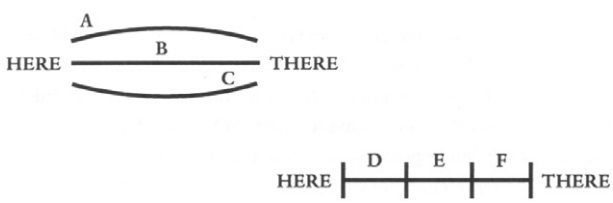


Figure 12: Substitutes versus complements

Again, assume the fare from here to there is 9. D, E, and F each charge 3. Railway D knows that if you want to ride, you must buy its ticket. So why innovate? Instead, D may *raise* its fare to 5, hoping that E and F lower theirs to 2 each. But why would E and F go along? More likely, they too would raise fares,

25 *ibid* 8.

26 *ibid* 12.

27 See F. Parisi, 'Entropy in Property' (2002) 50 *American Journal of Comparative Law* 595; F. Parisi, N. Schulz and B. Depoorter, 'Fragmentation in Property: Towards a General Model' (2003) 159 *Journal of Institutional and Theoretical Economics* 594; see also Fennell, n 7 above (arguing that tragedies of the commons are best modeled as prisoner's dilemma games and anticommons as chicken games).

28 A. Cournot, *Researches into the Mathematical Principles of the Theory of Wealth* (1838) (N.T. Bacon trans, 1897) 99–104 (sections 55–57, introducing theory of complements).

29 C. Ellet, Jr, *An Essay on the Laws of Trade in Reference to the Works of Internal Improvement in the United States* (1839).

30 On the problem of complements in an information economy, see H. R. Varian, J.V. Farrell, and C. Shapiro, *The Economics of Information Technology: An Introduction* (Cambridge: Cambridge UP, 2005) 43–45. On the interaction of substitutes and complements in the anticommons context, see G. Dari-Mattiacci and F. Parisi, 'Substituting Complements' (2006) 2 *Journal of Comparative Law and Economics* 333.

so the total exceeds 9, and ridership falls below the optimal level. With complementary competition, incentives to innovate are blunted: if D did lower fares, then E and F just might raise theirs.

It's the same problem if D, E, and F are complementary patents instead of railways. Then innovators face what economist Carl Shapiro calls a 'patent thicket', a lot of phantom tollbooths on the route to commercialising new technology.[31] Cournot proved that in markets dominated by complements – whether railways or patents – we can get higher overall social welfare if D, E, and F merge. Here, monopoly trumps competition. Anticommons theory, in turn, moves from railways and patents to ownership and regulation generally. All these concepts describe facets of the same dilemma: too many uncoordinated owners or regulators blocking optimal use of a single resource.

## ANTICOMMONS PUZZLES

Our rhine boaters from a little earlier may seem an esoteric example, but there are a near-infinity of everyday puzzles that share this common structure – one whose solution could jump-start innovation, release trillions in productivity, and help revive the global economy.

Let me return to the drug patent example that opens this article. The Alzheimer's drug that never came to market is not alone. Numerous potential drugs are lost to anticommons ownership. In the past 30 years, drug R&D has been going steadily up, but discoveries of major new classes of drugs have been declining. Instead, drug companies focus on minor spinoffs of existing drugs for which they have already assembled the necessary property rights. How did this new drug discovery gap happen? Patent anticommons. Paradoxically, more biotech patent owners can mean fewer life-saving innovations. Drugs that should exist, could exist, are not being created.

To date, the most debated application of anticommons theory has built on the above example. The field was sparked in part by my article with Rebecca Eisenberg on the anticommons in biomedical research.[32] Since then, there has been a flurry of follow-on papers, studies, and reports, many of which conclude that patents should be harder to obtain, in part to avoid potential anticommons tragedy effects.[33] In their 2009 book, *The Patent Crisis*, Dan Burk and Mark Lemley review the most recent literature on patents and biotech innovation and conclude that, 'the structure of the biotechnology industry seems likely to run

31 C. Shapiro, 'Navigating the Patent Thicket: Cross Licenses, Patent Pools, and Standard Setting' in A. B. Jaffe *et al* (eds), *Innovation Policy and the Economy* (Cambridge, MA: MIT Press, 2001) vol 1, 119; cf D. L. Burk and M. A. Lemley, *The Patent Crisis and How the Courts Can Solve It* (Chicago: University of Chicago Press, 2009) (distinguishing anticommons and patent thickets in the patent context) 75–78, 86–92.

32 M. A. Heller and R. S. Eisenberg, 'Can Patents Deter Innovation? The Anticommons in Biomedical Research' (1998) 280 *Science* 698; see generally Heller, n 1 above 49–78 (Chapter 3, "Where are the Cures?" reviewing ten years of scholarship and debate on anticommons effects in drug development).

33 *ibid* 65 (discussing three influential policy-oriented reports that argue for patent reform based on anticommons concerns).

high anticommons risks', particularly when companies are attempting to bring products to market.[34] However, the empirical basis for finding that anticommons effects are stifling innovation remains inconclusive – it remains an important area for empirical work.[35]

In addition, the anticommons framework has been used to analyse ownership across the high tech frontier, ranging from Thomas Hazlett's work on broadcast spectrum ownership, what he calls the 'tragedy of the telecommons', to Rosemarie Ham Ziedonis' study of anticommons effects in technology patenting.[36] In my *Gridlock Economy* book, I show that it is not just biotech that is susceptible to anticommons tragedy. Cutting edge art and music are about mashing up and remixing many separately owned bits of culture.[37] And as I earlier said, even with land the most socially important projects often require assembling multiple parcels.[38]

Anticommons theory is now well established, but empirical studies have yet to catch up. How hard is it to negotiate around ownership fragmentation? How much does ownership fragmentation slow down technological innovation? Does the effect vary by industry? It is difficult to measure discoveries that should have been made but weren't, industries that could exist but don't. We are just starting to examine these conundrums.

In 2006, a team of law, economics, and psychology researchers reported experimental findings that rejected the presumed symmetry of commons and anticommons. They found that anticommons dilemmas 'seem to elicit more individualistic behavior than commons dilemmas' and are 'more prone to underuse than commons dilemmas are to overuse'. The researchers conclude that 'if commons leads to "tragedy", anticommons may well lead to "disaster".'[39]

These preliminary findings of bargaining failure around anticommons ownership may help provide some insight into otherwise puzzling economic phenomena. For example, some of the world's biggest energy companies have for years failed to agree on joint management of oil and gas fields they own together.

34 Burk and Lemley, n 31 above 89.

35 Several survey-based studies have questioned whether anticommons tragedy is blocking academic biomedical research. See eg, J. P. Walsh, A. Arora, and W. M. Cohen, 'Effects of Research Tool Patents and Licensing on Biomedical Innovation' in W. M. Cohen and S. A. Merrill (eds), *Patents in the Knowledge-Based Economy* (Washington DC: National Academies Press, 2004) 285–340, 324.

36 On the anticommons in the telecom context, see Heller, n 1 above, 79–106 (Chapter 4, 'You Can't Hear Me Now'). See also T.W. Hazlett, 'Spectrum Tragedies' (2005) 22 *Yale Journal of Regulation* 242; R. H. Ziedonis, 'Don't Fence Me In: Fragmented Markets for Technology and the Patent Acquisition Strategies of Firms' (2004) 50 *Management Science* 804.

37 On the anticommons in the copyright context, see Heller, *ibid* 9–16 (discussing tragedy in filmmaking, art, history, and music), 27–30 (discussing the anticommons in online search, such as Google Books). See also F. Parisi and B. Depoorter, 'Fair Use and Copyright Protection: A Price Theory Explanation' (2003) 21 *International Review of Law and Economics* 453.

38 On the anticommons in land, see Heller, n 1 above, 107–142 (detailing anticommons tragedies and solutions in land resources).

39 S. Vanneste et al, 'From "Tragedy" to "Disaster": Welfare Effects of Commons and Anticommons Dilemmas' (2006) 26 *International Review of Law and Economics* 104. Follow-up studies looked at why negotiations fail when presented in anticommons form. They found more failure as the number and complementarity of fragment owners increase. Also, as uncertainty increases, losses become even more pronounced. Depoorter and Vanneste, n 21 above, 21–23.

If one company pumps the oil too fast, it can wreck the pressure in the gas field; if the other extracts gas too fast, it traps the oil. American law has offered them an effective legal tool, called 'unitisation', to overcome anticommons tragedy and smooth joint management of divided oil and gas interests. Yet firms block each other year after year.[40]

How can this be? Oil units aren't a case of two spiteful neighbors arguing over a broken backyard fence. They involve arm's-length business negotiations between savvy corporations. Everyone has good information about the underlying geologic and technical issues. The gains from cooperation are in the billions of dollars. Why doesn't one firm sell its interest to the other? Why don't the firms merge? What's going on? The experimental studies are beginning to give us explanations rooted in the psychology of the anticommons. Even the most sophisticated businesspeople can fail to reach agreement when a negotiation is framed in anticommons terms.

## ROUNDING OUT THE LEXICON – CAVEATS AND CAUTIONS

In rounding out the anticommons lexicon, there are some caveats: first, my term focuses on one form of underuse, the tragedy that arises when ownership is too fragmented. Here, *multiple* owners block each other from using a scarce resource. Underuse can also arise in the monopoly context, when a *single* owner blocks access to a resource. This situation may be tragic, but it is not an anticommons tragedy in my sense of the term.

In the old economy, many companies held monopolies – Ma Bell (the American telephone monopoly), railways, local water utilities, and others. Society gained the economic benefits of scale and scope from allowing these sectors to be monopolised. The state policed against abuse of monopoly power through complex rate regulation and oversight. Phone lines were cheaper and more available than in many other countries. The costs of these monopolies were often invisible, costs such as deferred and dampened innovation.

In an information economy, any piece of intangible property, such as a patent, is also a monopoly. We award patents because monopoly profits create incentives to invent and because patents give inventors incentives to disclose their discoveries (without patents people might prefer to invent things they could keep secret). On the other hand, drugs would be cheaper and lives could be saved if competitors could make generic copies at will. To balance the values of innovation, disclosure, and competition, the US Congress keeps shifting the bundle of rights that a patent confers.

The dilemmas of any individual monopoly in the old or new economy are a great topic, but are not relevant here. For better or worse, these quandaries are familiar. We do not, however, have much experience dealing with the interaction

40 On the costs of 'excessive anarchy' in the oil industry, see G. D. Libecap and J. L. Smith, 'The Economic Evolution of Petroleum Property Rights in the United States' (2002) 31 *Journal of Legal Studies* S589. The same tragedy affects excessive pumping of groundwater. See B. H. Thompson Jr, 'Tragically Difficult: The Obstacles to Governing the Commons' (2000) 30 *Environmental Lawyer* 241, 250.

of ownership fragments or an array of blocking patents. The anticommons lexicon addresses not monopoly per se, but ownership multiplicity.

Next, here's a caution: when talking about an anticommons, stay away from absolutes. First, you shouldn't assume that anticommons ownership is inevitably tragic.[41] If we lived in a world where people had perfect information and could bargain with each other at no cost, they could avoid anticommons tragedy every time (just as, in a perfect world, there would be no commons tragedy, or for that matter, tragedy of any sort).[42] In practice, however, bargaining is never free, people shirk duties and hold out for payoffs, and there are cognitive limits that shape owners' decisions. In the real world, anticommons ownership is not necessarily tragic, but it does tend that way.

Second, it's theoretically possible that an anticommons may face overuse instead of underuse.[43] For example, consider real estate development along the California coast. It's a mess. Multiple community groups, environmentalists, neighbors, and government agencies may each prefer different versions of a project. Even in that regulatory morass, though, *overbuilding* may occur if it is sufficiently costly to exercise each right to veto development. Every opponent of development may prefer to go surfing and hope the others sit through the boring public hearings. If enough people opt for a free ride, a project might face *too little* opposition, not too much. It's an empirical question whether the California coast tips toward over- or under-building. That said, in most cases I've seen, anticommons regulation tends to be associated with too little economic development, not too much.[44]

Finally, there is a caveat that comes from the legal theorist Carol Rose. Certain resources, such as roads and waterways, are sometimes owned most efficiently in common. As Rose points out, creating and enforcing private-property rights is itself costly; sometimes these costs exceed the gains, not just economically but also socially. Village greens and town halls may strengthen communities in ways that are socially valuable but hard to quantify in monetary terms. Rose coined the term 'the comedy of the commons' to describe these social and economic benefits that can flow from group access.[45]

Rose's insight is equally true on the anticommons side – there are both economic and social reasons that we may prefer group exclusion to sole ownership. For example, it's possible that creating multiple vetoes may help preserve a treasured resource against transient political pressures for development – for instance, Central Park in New York City or Indian burial grounds in Arizona.[46]

41 These points are developed in Heller, n 6 above at 676.

42 See generally R. H. Coase, 'The Problem of Social Cost' (1960) 1 *Journal of Law and Economics* 1.

43 Fennell develops this insight in her theory of common interest tragedies, see n 7 above, 934–937.

44 Just as an anticommons theoretically may lead to overuse, it is possible for a commons to be associated with underuse, *ibid*. For a real-world example, see W. W. Buzbee, 'The Regulatory Fragmentation Continuum, Westway, and the Challenges of Regional Growth' (2005) 21 *Journal of Law and Politics* 323.

45 C. M. Rose, 'The Comedy of the Commons: Custom, Commerce, and Inherently Public Property' (1986) 53 *University of Chicago Law Review* 711; see also R. C. Ellickson, 'Property in Land' (1993) 102 *Yale Law Journal* 1315, 1336–1338.

46 On the potential use of an anticommons to preserve Central Park, see A. Bell and G. Parchomovsky, 'Of Property and Antiproperty' (2003) 102 *Michigan Law Review* 1, 3–4, 31–36, 60–61.

Similarly, 'conservation easements' intentionally use anticommons ownership to foster environmental goals.[47] (With a conservation easement, the owner sells or gives away the right to develop land, gets a tax break, and retains the right to continue a current use such as farming.) The underuse created by split ownership may be justifiable if the environmental gains exceed fragmentation costs. On balance, though, I'm sceptical. What happens a generation from now when communities want to reduce sprawl but face a patchwork of easements that make 'in-fill' development prohibitively difficult? Many conservation easements look to me like potential anticommons tragedies.[48]

The 'comedy of the anticommons' insight suggests that sometimes, for some resources, we should promote little or no use. Most of the time, for most resources, however, some positive level of use will be socially most valuable. Underuse is rarely the optimum.

## TOWARD A NON-SQUIGGLY LANGUAGE

We have millennia of practice in spotting tragedies of the commons. When too many people fish, fisheries are depleted. When too many people pollute, we choke on dirty air. Then, we spring into action with market-based, cooperative, and legislative solutions. Similarly, we have a lot of experience spotting underuse caused by a particular monopoly owner. We have created regulatory bodies that know (more or less) what to do with such dilemmas.

But underuse caused by multiple owners is unfamiliar. The affected resource is hard to spot. Our language is new. A tragedy of the anticommons may be as costly to society as the more familiar forms of resource misuse, but we have never noticed, named, debated, or learned how to fix underuse. How do we stumble into the problem of too many owners? How do we get out? As a first step, underuse in a tragedy of the anticommons should be squiggly no more.

Fixing anticommons tragedies is a key challenge for our time. Individual entrepreneurship and legal reform will be important. But I want to stress that the first and most important step to solving an anticommons is to name it and make it visible. With the right language, we can all spot links among ownership puzzles, and we can all come together to fix them. Nothing is inevitable about an anticommons. Every ownership puzzle results from choices we make, and can change, about how to control the resources we value most.

47 See J. D. Mahoney, 'Perpetual Restrictions on Land and the Problem of the Future' (2002) 88 *Virginia Law Review* 739, 785.

48 *ibid* 785–786 (noting potential anticommons tragedy in conservation easements).