

University of Chicago Law School

Chicago Unbound

Public Law and Legal Theory Working Papers

Working Papers

2020

Property as the Law of Complements

Lee Anne Fennell

Follow this and additional works at: https://chicagounbound.uchicago.edu/public_law_and_legal_theory



Part of the [Law Commons](#)

Chicago Unbound includes both works in progress and final versions of articles. Please be aware that a more recent version of this article may be available on Chicago Unbound, SSRN or elsewhere.

Recommended Citation

Lee Anne Fennell, "Property as the Law of Complements", Public Law and Legal Theory Working Paper Series, No. 737 (2020).

This Working Paper is brought to you for free and open access by the Working Papers at Chicago Unbound. It has been accepted for inclusion in Public Law and Legal Theory Working Papers by an authorized administrator of Chicago Unbound. For more information, please contact unbound@law.uchicago.edu.

PROPERTY AS THE LAW OF COMPLEMENTS

*Lee Anne Fennell**

Resources often produce more value in combination than they do separately: think of segments of a highway or parts of a machine. I argue that property's defining purpose is to group together complements, and that property law and theory should focus on identifying and realizing valuable bundles of resources. While some complementarities align with traditional asset boundaries and can be protected by exclusion rights, realizing others requires crossing or eschewing boundaries to recombine resources in ways that further larger social, economic, or ecological objectives. The gains associated with the entrenching and excluding functions of property thus vie with the gains that come from breaking through those entrenchments to reconfigure resources and rights. Conceptualizing property as complementarity – a kind of bundling machine – allows both sorts of projects to be accommodated within a common analytic structure. A law-of-complements view thus offers a new way to understand, in functional terms, what is distinctive about property. Taking complementarity seriously also has dramatic distributive implications, given that some of the most valuable complementarities exist between human capital and property.

INTRODUCTION

What sort of institution is property? What is it good for? How does it differ from other kinds of entitlements? This chapter suggests that complementarity—the idea that some resources and entitlements produce more value together than they do separately—offers a coherent way of answering these questions. Seeing property as the law of complements provides a way to harmonize standard economic efficiency considerations with broader interests in promoting welfare and human flourishing. For

* Max Pam Professor of Law, University of Chicago Law School. I thank the Harold J. Green Faculty Fund and the SNR Denton Fund for research support. I am grateful to Ken Ayotte, Avi Bell, Bethany Berger, Hanoch Dagan, Brian Lee, Tim Mulvaney, Meredith Render, Henry Smith, and participants in a faculty workshop at the University of Alabama School of Law, in the 2019 Property Works in Progress conference, and in the 2019 Annual Meeting of the Midwestern Law and Economics Association for helpful questions and suggestions.

example, a focus on complementarity considers how specific resources work together with human labor inputs to produce value—an inquiry that connects questions of efficiency and distribution.

To thrive and flourish, human beings must put resources together into useful packages, whether for purposes of consumption or production.¹ Property law furthers this goal when it helps people assemble and protect sets of complementary resources. This mission is complicated when keeping existing complementarities intact (such as those that are present in a close-knit neighborhood) precludes realizing new complementarities (such as those that exist between different segments of a planned highway). My claim is that property as an institution must squarely confront and intelligently manage such conflicts, which are pervasive in modern society. A law-of-complements approach shares common ground with Henry Smith’s influential formulation of “property as the law of things,” which highlights complementarities found within legally recognized things.² But it also gives equal weight to complementarities that span existing thing-boundaries.³

Notably, I reject any special privileging of the clusters of interests with which property protections have traditionally been associated. There is no natural or inevitable unit of property, but rather only contingently or normatively connected sets of resources, rights, and attributes. On a welfarist account, property’s project is to continually identify and realize those packages of resources and rights that generate the most well-being in combination. Nonwelfarist normative commitments may also mandate or forbid certain forms of bundling or unbundling. For example, antidiscrimination principles require that those opening their doors to the public or putting housing on the market do so in a nondiscriminatory way rather than slice access in any way they choose. Interests in dignity and autonomy may likewise require that rights be provided in certain chunks or configurations.⁴ Because a focus on complementarities turns attention to the

¹ See, e.g., CARL MENDER, PRINCIPLES OF ECONOMICS 58-63 (James Dingwall & Bert F. Hoselitz trans., 1976); Michael A. Heller, *The Tragedy of the Anticommons: Property in the Transition from Marx to Markets*, 111 HARV. L. REV. 621, 659 (1998).

² See Henry E. Smith, *Property as the Law of Things*, 125 HARV. L. REV. 1691 (2012). For a helpful discussion of Smith’s view and other variations on a law-of-things approach, see generally Christopher Essert, *Property in Licenses and the Law of Things*, 59 MCGILL L.J. 559 (2014).

³ This distinction depends on how Smith, or others using a law-of-things approach, define (and redefine) “things.” If the term “things” is meant to denote nothing more than “that which is complementary” there is no difference between the approaches. It also bears emphasis that Smith’s work recognizes a larger form of complementarity that manifests in property as a system. See, e.g., Henry E. Smith, *Systems Theory: Emergent Private Law*, in THE OXFORD HANDBOOK OF NEW PRIVATE LAW (Andrew Gold et al. eds., forthcoming); see also Thomas W. Merrill & Henry E. Smith, *The Architecture of Property* (this volume).

⁴ For example, one way to understand the New Jersey Supreme Court’s opinion in *State v.*

bases for grouping or splitting entitlements, it can accommodate a variety of normative approaches and foster dialogue among them.

I do not maintain that every detail of property law boils down to the management of complements. But complementarity features prominently in the core problems that property has addressed and must address going forward: When should entitlement holdings be protected in their current patterns and when is it appropriate to disrupt those holdings to create new patterns? What boundaries should property law recognize and how should it defend (or override) them? Because these questions implicate collective action problems and large-scale social projects, a law-of-complements approach underscores that property is a public law field as well as a matter of private law.⁵ The coercive power of the state comes into play not only to define and enforce property rights, but also, and crucially, to configure them and to assist in (or inhibit) their reconfiguration. Attention to complements also serves to distinguish property from other kinds of entitlements, and can sustain property's distinctiveness as social, economic, and ecological conditions change. Things may lose their current shapes, but complementarities remain with us always.

To build my case for a law-of-complements approach, I start with definitions, turn to the ways in which things group together complements, and then examine how cross-boundary and inter-thing complements complicate the story, with implications for both distribution and efficiency.

I. WHAT'S COMPLEMENTARY (AND WHY DO WE CARE)?

Property, I argue, is distinctively centered around facilitating and protecting complementarities. But what do I mean by complementarities? And why do they matter?

A. *Defining Terms*

Although economic definitions of complementarity vary, Peter Newman offers this helpful take: "If x and y are complements in the rough everyday sense, one would expect that as one has more y one would be willing to pay more for a marginal unit of x , while if they are substitutes one would be

Shack is as an anti-slicing doctrine: the employer could not provide housing to workers without also providing certain visiting rights. *See* State v. Shack, 277 A.2d 369 (N.J. 1971).⁵ *See, e.g.,* Roderick M. Hills, Jr. & David Schleicher, *Planning an Affordable City*, 101 IOWA L. REV. 91, 134–35 (2015) (urging an "institutional turn" in property that would integrate ideas from public and private law). *Cf.* Gregory C. Keating, *Is Modern Tort Law 'Private'?*, in CIVIL WRONGS AND JUSTICE IN PRIVATE LAW (Paul B. Miller & John Oberdiek eds., 2020) (observing that to cast tort law as wholly private is to adopt a "pre-modern" view of the subject).

willing to pay less.”⁶ Two goods are complements in consumption, like left and right shoes, if having both increases the consumption value one gets from each. Two goods are complements in production, like a mortar and pestle, if each increases the productivity of the other. Here, I define complementarity broadly to encompass the related ideas of economies of scale and indivisible (or “lumpy”) goods.⁷

For real property and other resources, complementarities are present when the whole is greater than the sum of the parts—whether we are talking about putting together more units of the same thing (like acres or years of possession) or a set of different things (like pieces of a machine, parts of a house, or the patent licenses necessary for a given product). If a particular minimum scale is necessary in order to pursue a particular use (Stephen Shmanske and Daniel Packey use the example of a golf course), the full assembly is lumpy in delivering that form of use value.⁸ Likewise, a threshold level of conservation or habitat preservation may be necessary to sustain a fishery or an animal population; falling just a little short can mean a devastating collapse.⁹

Perfect complements are valuable *only* when provided or used in combination: segments of a bridge, for example. A good that is made up of strongly complementary components is often considered “indivisible,” which simply means that it is very difficult to divide or much less valuable when divided.¹⁰ Complementarity is not always strict in this way; often putting resources together yields more surplus than keeping them apart, but it is still possible to derive value from the separately held elements. Determining which resources and entitlements produce more value together and assessing the strength of that complementarity is a crucial task for property.

B. Why Complements Matter

To see why complements matter to property, we first must consider why property, as an institution, exists at all. For law and economics scholars, the

⁶ Peter Newman, *Substitutes and Complements*, in THE NEW PALGRAVE DICTIONARY OF ECONOMICS 13269, 13273 (3d ed., 2018); see also ANGUS DEATON & JOHN MUELLBAUER, ECONOMICS AND CONSUMER BEHAVIOR 57 (1980).

⁷ On lumpy goods, see, e.g., LEE ANNE FENNELL, SLICES AND LUMPS: DIVISION AND AGGREGATION IN LAW AND LIFE 8-26 (2019); Michael Taylor & Hugh Ward, *Chickens, Whales, and Lumpy Goods: Alternative Models of Public-Goods Provision*, 30 POL. STUD. 350, 353 (1982).

⁸ Stephen Shmanske & Daniel Packey, *Lumpy Demand and the Diagrammatics of Aggregation*, 30 J. ECON. EDUC. 64, 72 (1999).

⁹ See, e.g., Taylor & Ward, *supra* note 7, at 357-58.

¹⁰ See H. Peyton Young, *Dividing the Indivisible*, 38 AM. BEHAV. SCI. 904, 904, 906 (1995).

answer comes down to transaction costs.¹¹ Property as we know it would be altogether unnecessary if transaction costs were zero—a fact Ronald Coase acknowledged.¹² Instead, access to resources could be costlessly arranged and rearranged moment by moment.¹³ It is only because transacting is costly that the design of legal entitlements becomes important to efficiency. As Yoram Barzel puts it, “[t]he presence of positive transaction costs is what makes the study of property rights significant.”¹⁴ Accordingly, property law is shaped by the pressures that positive transaction costs create.¹⁵

The assembly of complements overwhelmingly takes place unnoticed through the ordinary workings of the market—think of everyday examples like getting all four tires for your car or cream for your coffee. Even here, property law plays a role—by defining and protecting entitlements in resources so that people can trade over them in the marketplace, and by supporting market structures that enable seamless transactions.¹⁶ Complementarities emerge as important phenomena where markets fail.¹⁷ Forestalling and working around such market failures, which are a product of high transaction costs, is a core challenge for property law.

Property law’s concern for complementarities implies two basic yet often contradictory moves: (1) strongly protecting sets of complements that take the form of (or that can be conceptualized as) “things”; and (2) enabling the assembly of new sets of complements. The second move is in tension with the first when protecting existing property rights confers monopoly power that blocks valuable reconfigurations. Property rights convey monopoly power when an owned element is uniquely necessary to another party’s ends, and the current owner has property rule protection that grants her a veto over its transfer.¹⁸ Thus, strongly protecting rights in things can realize complementarities, but it can also thwart them. In the next section, I explore both halves of this proposition before turning to property’s optimal degree of dynamism, and to questions of distribution.

¹¹ See R. H. Coase, *The Problem of Social Cost*, 3 J.L. & ECON. 1 (1960).

¹² R.H. COASE, *THE FIRM, THE MARKET, AND THE LAW* 14-15 (1988) (agreeing with Steven Cheung’s observation along these lines); see STEVEN N.S. CHEUNG, *WILL CHINA GO ‘CAPITALIST’?* 37 (2d ed. 1986).

¹³ See Brian Angelo Lee & Henry E. Smith, *The Nature of Coasean Property*, 59 INT’L REV. ECON. 145, 147-48 (2012); Lee Anne Fennell, *The Problem of Resource Access*, 126 HARV. L. REV. 1471, 1491-92 & n.90 (2013)

¹⁴ YORAM BARZEL, *ECONOMIC ANALYSIS OF PROPERTY RIGHTS* 11 (2d ed. 1997).

¹⁵ See Henry E. Smith, *Economics of Property Law*, 2 OXFORD HANDBOOKS ONLINE: PRIVATE AND COMMERCIAL LAW 149, 152 (Francesco Parisi ed., 2017).

¹⁶ See, e.g., Fennell, *supra* note 13, at 1505, 1516-18 (discussing “transactability features”).

¹⁷ See, e.g., MENDER, *supra* note 1, at 64.

¹⁸ See Guido Calabresi & A. Douglas Melamed, *Property Rules, Liability Rules, and Inalienability: One View of the Cathedral*, 85 HARV. L. REV. 1089, 1092 (1972) (defining property rules and distinguishing them from liability rules).

II. COMPLEMENTS IN THINGS

In Smith’s “architectural” account, property’s structure represents a huge “shortcut”¹⁹—one that proceeds by chunking the world into “legal things.”²⁰ By operating *in rem*, property gives owners rights to things that are automatically good against the world, in one fell swoop.²¹ Moreover, property rights tend to be plenary by default, protecting a broad and unspecified range of uses.²² This makes it unnecessary to list all the actions that the owner is entitled to undertake on her property, much less require her to separately negotiate for each one: to use her property as a place to take a nap, read a book, eat a peach, and so on.²³ Exclusion from well-defined things also simplifies property rights: a broad-based “keep out” command is easier to communicate, enforce, and obey than delineating and monitoring particular behaviors.²⁴ Lumping together entitlements into enduring thing-shaped servings backed by exclusion incorporates all of these shortcuts while adding temporal durability to the mix. Things thus help to auto-fill the who, what, how, and when of resource access rights.

This shortcut-based structure has clear advantages over a fanciful system of fully specified, individually sliced entitlements that govern each action by every person.²⁵ Although some of the claimed information-cost advantages associated with a law-of-things view of property are contestable²⁶ or not unique to property law,²⁷ one advantage is crucial to the vision of property I

¹⁹ Smith, *supra* note 2, at 1692-94.

²⁰ See Henry E. Smith, *The Persistence of System in Property Law*, 163 U. PA. L. REV. 2055, 2065 (2015).

²¹ See, e.g., Thomas W. Merrill & Henry E. Smith, *Making Coasean Property More Coasean*, 54 J. L. & ECON. S77, S90-S91 (2011).

²² See, e.g., J.E. PENNER, *THE IDEA OF PROPERTY IN LAW* 72 (1997).

²³ See, e.g., Henry E. Smith, *Mind the Gap: The Indirect Relationship Between Ends and Means in American Property Law*, 94 CORNELL L. REV. 959, 964 (2009).

²⁴ See, e.g., Robert C. Ellickson, *Property in Land*, 102 YALE L.J. 1315, 1327-29 (1993); Henry E. Smith, *Exclusion and Property Rules in the Law of Nuisance*, 90 VA. L. REV. 965, 978-83 (2004); see also Robert D. Sack, *Human Territoriality: A Theory*, 73 ANNALS ASS’N AM. GEOGRAPHERS 55, 58 (1983) (“Territoriality can be easy to communicate because it requires only one kind of marker or sign—the boundary.”).

²⁵ Smith, *supra* note 2, at 1693; see Lee & Smith, *supra* note 13, at 152.

²⁶ For example, an exclusion-based system of private property may not convey helpful information to people who are uncertain whether particular lands are private or public, and hence whether their entry is prohibited or allowed. See Avihay Dorfman & Assaf Jacob, *The Fault of Trespass*, 65 U. TORONTO L.J. 48, 59 (2015).

²⁷ For example, property’s *in rem* rights avoid the costs of naming every person to whom they apply, see, e.g., Merrill & Smith, *supra* note 21, at S99, but this does not distinguish property from, say, criminal law (where the law need not list all the people one is not to murder).

pursue here: the capacity of things to group together complementary elements and attributes. Well-defined things put together—and help keep together—packages that enable people to make more valuable use of resources. As Smith observes, “[c]ertain collections of attributes go together” and these “[c]omplementary resource attributes are collected into things or assets.”²⁸ There are two efficiency shortcuts in the picture.

First, putting (or keeping) complementary resources together in the *same* hands tends to advance allocative efficiency, regardless of whose hands those might be. By defining sets of complements, property keeps owners from having to seek and out assemble these complements on their own.²⁹ If the value of each entitlement or subcomponent were completely independent, then grouping them together would not be expected to reduce the need for transactions, since no one would be any more likely than anyone else to value a given attribute or right more highly. But due to complementarities, the person who most highly values a given entitlement is often the one who already holds closely related entitlements.

Second, once aggregated together, these complementary sets of entitlements are easy to transact over all at once, if someone else values the full set more highly.³⁰ Thus, things not only package together components that are more valuable in combination, but also simplify moving them intact into the hands of the highest valuing user.

Complementarity explains how designating an owner as the residual claimant of an asset (or thing) generates gains: by incentivizing the kinds of actions that will make an entire assembly of property attributes work best together.³¹ Absent this interaction among attributes and entitlements, often extended over lengthy periods, ownership stops looking like an institutional solution and becomes just a way of describing purely additive wealth holdings. It is the management of interactions among resources, as well as between owned resources and human labor and skill, that makes property interesting and makes its institutional design consequential. And those interactions are shot through with complementarities.

Significantly, some of these complementarities exist in the dimension of time and interact with another argument for property rights: the internalization of costs and benefits. Because property ownership persists, it motivates people to invest in the property by visiting upon them the negative

²⁸ Smith, *supra* note 15, at 153; *see also* Smith, *supra* note 2, at 1693.

²⁹ *See, e.g.*, Smith, *supra* note 15, at 153.

³⁰ *See* Merrill & Smith, *supra* note 21, at S79-80 (explaining that Coase’s work “has underscored the importance of concentrating ownership of property in a way that facilitates transfer”).

³¹ *See* BARZEL, *supra* note 14, at 78-80; *see also* Smith, *supra* note 15, at 154-55.

or positive effects of their acts or omissions.³² This amounts to a temporal bundling of complements—between possession today and possession tomorrow. Legally recognized things group entitlements into strongly complementary bundles, which can promote both allocative efficiency (to the extent it helps get sets of entitlements together, in the right hands) and dynamic or investment efficiency (by enabling and motivating people to make the most of stably held sets of resources).³³

Complementarities also surface in the legal construction of things. As work on the theory of the firm emphasizes, it is essential that the inputs that represent perfect complements in a given value-production process remain available for simultaneous use. If I need both Input A and Input B to make my product, I need to ensure the availability of both; Input B becomes valueless in my hands unless I can get hold of Input A as well. This, of course, is the source of well-rehearsed hold-up problems, one solution to which involves consolidating ownership over complementary productive assets in the same hands.³⁴ In fact, it is not necessary to consolidate ownership in the same hands if access or coordination can be accomplished in another way—a fact that opens the door to creative new institutional solutions.³⁵ Regardless, the successful assembly of complements through *some* means lies at the core of property's mission of enabling people to derive value from resources.

Likewise, the boundaries of land holdings can be drawn in ways that reflect economies and diseconomies of scale—instances in which the whole is greater than the sum of its parts, or vice versa.³⁶ Just as firms are defined based on the relative costs of arranging transactions within boundaries and across boundaries, so too should property lines reflect when the grouping of components within one ownership envelope produces more benefits than costs.³⁷ For example, less total fencing is required overall if parcels are larger, but managing what lies inside the fence becomes more costly.³⁸

Complementarity seems easiest to appreciate where there is a need to put

³² See, e.g., Harold Demsetz, *Toward a Theory of Property Rights*, 57 AM. ECON. REV. 347, 356 (1967).

³³ See Merrill & Smith, *supra* note 21, at S90.

³⁴ See, e.g., Benjamin Klein et al., *Vertical Integration, Appropriable Rents, and the Competitive Contracting Process*, 21 J. L. & ECON. 297 (1978); Sanford J. Grossman & Oliver D. Hart, *The Costs and Benefits of Ownership: A Theory of Vertical and Lateral Integration*, 94 J. POL. ECON. 691 (1986); Oliver Hart & John Moore, *Property Rights and the Nature of the Firm*, 98 J. POL. ECON. 1119 (1990).

³⁵ See Raghuram G. Rajan & Luigi Zingales, *Power in a Theory of the Firm*, 113 Q.J. ECON. 387 (1998); Lloyd Cohen, *Holdouts and Free Riders*, 20 J. LEGAL STUD. 351, 353 (1991).

³⁶ See Ellickson, *supra* note 24, at 1332-35; Demsetz, *supra* note 32, at 357-58.

³⁷ See, e.g., Merrill & Smith, *supra* note 21, at S93-S94.

³⁸ See, e.g., Elinor Ostrom & Charlotte Hess, *Private and Common Property Rights*, in 5 PROPERTY LAW AND ECONOMICS: ENCYCLOPEDIA OF LAW AND ECONOMICS 53, 64 (Boudewijn Bouckaer ed., 2d ed. 2010); Ellickson, *supra* note 24, at 1332-34.

together a set of factors (acres, machines, and so on), but it also surfaces in indivisible goods. The parts of many ordinary goods are perfect complements in that removing one makes the remainder useless. For example, imagine that an individual owns a Widgetmaker, a specialized machine that spits out widgets. Assuming the other inputs that make a Widgetmaker work (oil, water, polymers, and so on) can be readily accessed on the open market, there might appear to be no notable complementarities in the picture. But that's just because we haven't yet considered what it would mean for the Widgetmaker (and its owner) if someone removed a small cog that is integral to the machine's operation and repurposed it for a craft project.

Property rights operating in the background keep this possibility and others like it from surfacing. Exclusion protects the Widgetmaker as an intact entity, so its complementarities attract no notice. The property rights that the Widgetmaker's owner will gain in the widgets themselves incentivize her to keep all of the machine's parts together and operating. One way to understand the role of exclusion in this story is to posit some degree of noninterference as complementary to widget production. Getting the participation of the machine's operator, who contributes labor to the production process, is also essential. Property provides a structure for bringing all these elements together to produce value. And while some of the relevant complementarities are found within things, others are not.

III. COMPLEMENTS BEYOND THINGS

All things (that we continue to recognize as such) contain complements. But not all complementarities are found within what we might reasonably regard as things. Some complementarities require breaking open existing things so that parts of each can be assembled together. Often, keeping inputs within one complementary set makes the building of another complementary set impossible, and vice versa. How should property law deal with this pervasive situation?

A. *Modifying Things*

One possibility is to treat thinghood as a relatively stable starting point for understanding property's workings but to recognize that some modifications are necessary around the edges where especially compelling cross-boundary issues are at stake. Smith seems to embrace this approach, recognizing uncontroversial examples such as airplane overflights and antidiscrimination law as refinements to a thing-based model.³⁹ Both of these

³⁹ See, e.g., Smith, *supra* note 2, at 1719; Merrill & Smith, *supra* note 21, at S96. Another exception that Smith mentions, the doctrine of necessity, implicates a facet of

examples involve strong cross-boundary complementarities. In the case of overflights, there is the lumpy good of unimpeded air travel that can only be achieved if landowners are stripped of their right to exclude aircraft from passing through their airspace at high altitudes.⁴⁰ The different pieces of a given route are perfect complements, the type that is very difficult to assemble for reasons relating to monopoly power and holdouts.⁴¹

Antidiscrimination law can be understood similarly. The important social project of making access to property nondiscriminatory cannot be achieved piecemeal. Again, there is a complementarity in play. If we seek to create a society in which one's status as a member of a protected class does not inflict systemic disadvantages,⁴² then antidiscrimination law must also be applied system-wide, rather than just here and there. In addition to an overarching complementarity between property access and the development of human capital, certain facets of that property access are themselves complementary.

Consider accessibility requirements for people with disabilities. For a person who uses a wheelchair to run errands, attend work or school, and get to and from her home each day, it is important that all parts of her daily route be accessible to her. If half the intersections have curb cuts and half do not, or if half the buildings she needs to enter have accessible entrances and half do not, it is not half as good; it is wholly unworkable.⁴³ Having the ability to freely navigate a city is similar to having the ability to travel along a particular airline route: having it all is very important. A similar point can be made about efforts to combat segregation, which require that all groups have free access to *all* neighborhoods, not just certain ones.

If we recognize that thinghood is contingent—that the package of rights an owner has depends, or ought to depend, on what competing or conflicting packages of complements are most important to human well-being or to society's core normative commitments—then it becomes less true that prepackaged things produce transaction cost savings by making it

complementarity discussed below. *See infra* note 97 and accompanying text. Smith's work has also emphasized the need for governance mechanisms to address spillovers, a topic I take up in Part IV.C.2.

⁴⁰ On the development of airplane overflight rights, see generally STUART BANNER, *WHO OWNS THE SKY?* (2008).

⁴¹ *See, e.g.*, Scott Duke Kominers & E. Glen Weyl, *Holdout in the Assembly of Complements: A Problem for Market Design*, 102 AM. ECON. REV. (Papers & Proc.) 360 (2012). *See also* Henry E. Smith, *Restating the Architecture of Property*, in 10 MODERN STUDIES IN PROPERTY LAW (Ben McFarlane & Sinéad Agnew eds., 2019) (emphasizing the *lack* of complementarity between the landowner's other rights and airspace rights).

⁴² *See* Noah D. Zatz, *Disparate Impact and the Unity of Equality Law*, 97 B.U. L. REV. 1357 (2017).

⁴³ *See* David A. Weisbach, *Toward a New Approach to Disability Law*, 2009 U. CHI. LEGAL F. 47, 98 (2009) (discussing the possibility that accessibility features could have network effects).

unnecessary to compose valuable packages of complementary interests.⁴⁴ Moreover, we now have to confront another problem that is made worse by the privileging of pre-existing things: the difficulty of assembling from many separate owners the entitlements necessary to form these new and vitally important complementary packages.

B. Things Get in the Way

Making *things* the unit of analysis for property entitlements is a double-edged sword when it comes to transaction costs. If things are defined in a compositionally enduring way, then they must be broken open somehow in order to form new things when circumstances change and different complementarities become more valuable. Here we confront a type of transaction cost that property's architecture exacerbates: strategic holdout (or holdup) behavior.⁴⁵ By design, an exclusion-based system backed with property rule protection makes reconfiguration difficult. Yet reconfigurability is perhaps the most important attribute for a modern property system to possess.

Pressure comes from two directions. First, interdependence among property interests is far greater in the twenty-first century than it was in the agrarian past. Creating valuable urban agglomerations and solving large-scale ecological problems requires packages of entitlements that cut across traditional boundaries. Second, the significance of owning enduring things over time has diminished, as new ways of delivering streams of access on demand have taken hold. Due to the convergence of these two trends, complementarities between and among separately owned entitlements are rapidly eclipsing those within existing entitlement packages.

If existing things no longer represent the most valuable combinations of resources, exclusion rights that protect existing compositions now enable a party with monopoly power to hold out. Holdouts are problematic for two reasons. First, they can keep resource reconfigurations from going forward when they should, as a matter of efficiency, do so. This can happen when a monopolist—or multiple monopolists holding separate pieces of a larger would-be assembly—misgauges how much of the available assembly surplus she can extract, and winds up killing a deal that would have been valuable for all involved. A second, more subtle problem is that holdout dynamics can dramatically increase the time and trouble required to reach a deal, even if one is eventually completed. In some cases the costs of making a deal and the uncertainty surrounding its successful completion can discourage would-be

⁴⁴ Cf. Katrina M. Wyman, *The New Essentialism in Property*, 9 J. LEGAL ANALYSIS 183 (2017).

⁴⁵ See, e.g., Smith, *supra* note 15, at 166; Heller, *supra* note 1.

assemblers from even attempting valuable assemblies.⁴⁶

The shape of the problem is clear. Property's architecture sequesters complementary resources behind exclusionary walls along with their positive and negative effects to enable and motivate owners to generate value from using them in combination. The higher and more impenetrable the wall, the better this works. But when unique complements are found on opposite sides of the wall, and must be brought together in the same hands to produce value, the height and impenetrability of the walls become liabilities rather than assets. Thinking of property as bound up in enabling valuable complementarities illuminates both halves of this story. It makes vivid a tension lurking in property's very design: that between protecting existing entitlements and enabling new combinations.⁴⁷

C. *Is There a Really a Conflict?*

Significantly, the tension just identified does not surface so long as existing legal things continue to be the most important repositories of compositional value. To the extent this is the case, building property to be highly change-resistant would not have the drawbacks I have suggested because it would continue to instantiate lasting, important complementarities without thwarting the realization of any more valuable nascent ones. This seems implausible as a categorical matter, although certainly there is room for debate about how much value we are leaving on the table by making property so inertial.

Another way of reconciling between- and within-thing complementarities is to suggest that the kinds of interests that require the reconfiguration of rights (e.g., antidiscrimination law and overflights) are so rare and involve such obviously crucial societal interests that they simply do not implicate the sort of recompositional concerns I am raising. Such reconfigurations can be pursued without holdout problems through the coercive force of law—as indeed was the case in the two examples cited. Put differently, the claim might be that existing things should be maintained as intact packages of entitlements, subject only to voluntary deal-making, unless and until a competing interest emerges that is so overwhelming as to justify widespread legal coercion.

This approach quickly turns circular, however. If we can coercively

⁴⁶ See, e.g., Michael A. Heller & Roderick Hills, *Land Assembly Districts*, 121 HARV. L. REV. 1465, 1472-74 (2008).

⁴⁷ Often this plays out as a conflict between investment efficiency (associated with protecting existing holdings) and allocative efficiency (associated with moving entitlements to higher valuing users). See Eric A. Posner & E. Glen Weyl, *Property Is Only Another Name for Monopoly*, 9 J. LEGAL ANALYSIS 51 (2017).

reconfigure property rights when it is important enough to do so, how should we decide when that is? Smith cites the adoption of the right to roam in England and Scotland as an example of problematically cavalier rebundling of property, although he does not take a stand on whether such a right should or should not be recognized.⁴⁸ Notably, a right to roam involves a form of complementarity similar to that of a highway: travel paths are far more valuable when they are complete and unbroken. Empirical work showing that owners suffer a property value loss from the right to roam is interesting but incomplete.⁴⁹ If impinging on the right to exclude completes one valuable assembly at the expense of disrupting another (the disproportionate gains that come from a complete rather than broken exclusion right), then both sets of complements must be considered.

Another way to dodge the conflict between within- and between-thing complementarities would be to bake complementarity into thing-definition and continually redefine things as needed to capitalize on the most valuable complementarities. But this way of proceeding makes the invocation of thinghood both unnecessary and confusing. If complementarity is what we're really after, we should simply say so.

IV. OPTIMAL DYNAMISM IN PROPERTY

What is really at stake in calibrating the ease of reconfigurability is the appropriate degree of dynamism in property. Neither infinite mutability nor complete rigidity is desirable. To see how a law-of-complements approach might aim for optimal dynamism, it is helpful to see how it differs not only from a law-of-things account but also from a vision of property as a “bundle of rights” or “bundle of sticks”—a metaphor popularized by the Legal Realists and later adopted by some law and economics scholars.⁵⁰ A law-of-complements view falls in between these two approaches, adding structure to the bundle view and flexibility to the thing view.

A. *Things, Bundles, Events*

Smith's law-of-things approach to property is explicitly framed in opposition to the bundle-of-rights view. His objection to the bundle metaphor

⁴⁸ Henry E. Smith, *Complexity and the Cathedral: Making Law and Economics More Calabresian*, 48 EUR. J.L. & ECON. 43, 49 (2019).

⁴⁹ Jonathan Klick & Gideon Parchomovsky, *The Value of the Right to Exclude: An Empirical Assessment*, 165 U. PA. L. REV. 917 (2017).

⁵⁰ On the history and use of the bundle metaphor, see, e.g., Thomas W. Merrill & Henry E. Smith, *What Happened to Property in Law and Economics?*, 111 YALE L.J. 357, 365-66 (2001); Daniel B. Klein & John Robinson, *Property: A Bundle of Rights? Prologue to the Property Symposium*, 8 ECON J. WATCH 193, 194-201 (2011).

relates to its malleability and hyper-contingency; he criticizes bundle proponents for assuming “that the bundle is maximally protean and easily reformable.”⁵¹ Unconcerned with complementarities, the bundle view lacks the “glue” to keep useful attributes together.⁵² Indeed, in characterizing this view, Smith sometimes dispenses with the term bundle itself, referring instead to a “heap” or “collection” of rights.⁵³

There is a contradiction buried in Smith’s critique of the bundle view. If it is the *contingency* of the bundle model that makes it unacceptable, then thinghood must be conceptualized in a manner that is considerably less contingent. Things must cohere and endure, and not be vulnerable to being pulled apart and reconstituted at will. But if what makes things powerful is their capacity to group together complements, then their value depends on how well they actually manage to do so. Because complementarities are inherently contingent, a static and contingency-resistant thing-based vision of property cannot consistently capture them.

This does not mean the bundle view gets things right. Although adherents to that approach presumably occupy a wide spectrum of positions, it is probably not unfair to associate at least some of them with skepticism about property’s distinctiveness as a field, as well as a belief that an open-ended all-things-considered inquiry is an appropriate way to resolve conflicts over resources. Such an unstructured view avoids privileging existing things, but it also provides no basis for deciding when and how to pull them apart. Can a vision of property step back from that approach without losing the flexibility to pursue new complementarities?

One way to approach the problem is to redefine thinghood in terms of activities, subtly shifting property’s discourse from the realm of things to the realm of events.⁵⁴ Smith’s own work hints at this move when he invokes network theory and machine learning—an approach where the goal is to identify patterns of interactions using a system that does not “prejudge” where the most intense interactions will occur.⁵⁵ This method of inquiry leaves open the possibility that across-thing interactions would turn out to be more intense.⁵⁶ If so, one might continually redefine a thing based on where

⁵¹ Smith, *supra* note 48, at 49.

⁵² See Smith, *supra* note 20, at 2066.

⁵³ See, e.g., Smith, *supra* note 41 (describing the bundle view as envisioning “a heap of detachable rules” or “a collection of rights, privileges, duties, and so on”).

⁵⁴ See, e.g., Christopher M. Newman, *Using Things, Defining Property*, in PROPERTY THEORY: LEGAL AND POLITICAL PERSPECTIVES 69, 90 (James Penner & Michael Otsuka eds., 2018) (defining a thing, in the context of property theory, “as a discrete and intelligible nexus of human activity with respect to which actions by different persons are likely to come into conflict”).

⁵⁵ Smith, *supra* note 15, at 153-54; see also Smith, *supra* note 48, at 51-52.

⁵⁶ See Smith, *supra* note 48, at 52; Smith, *supra* note 15, at 153-54.

the most intense interactions occur. But how can one make such an assessment if property law itself limits what interactions are even possible?⁵⁷

Nonetheless, a focus on events offers an important input into the construction of some legal things. Consider the setting of real property boundaries. Here, we see that property draws lines not around things but rather around *events*—sets of actions and effects involving resources. Robert Ellickson captures this insight in his discussion of efficient scale, when he speaks of small, medium, and large events.⁵⁸ According to this account, property is not about controlling things, but rather about managing events. Things come into the mix only because some bundles of control work better at managing events than others—that is, because of complementarities.

B. Complements and Change

Although things can be made more dynamic by grounding them in activities and events, an explicit focus on complements offers more traction. Not only can a law-of-complements framework recognize how existing holdings capture interactions and events, it also can identify places where new assemblies add value. And it confronts head-on the design challenge introduced earlier: how to protect existing combinations without thwarting value-enhancing reconfigurations.

A first step is to identify the relevant dimensions along which complementarities differ. One such dimension is whether the complements are perfect, in that each is useless without all the others. This dimension matters because it determines the degree of monopoly power in play. Where complementary components have substitutes or where not all of the pieces must be assembled in order for the assembly to produce value, no single owner possesses meaningful holdout power, and markets are more likely to enable resource reconfigurations that will add value.⁵⁹

A second dimension is the amount of social value that can be derived from the new assembly, relative to the old. Of course, we are typically unsure on this score, unless market transactions can reveal the answer. Often they cannot, for two basic reasons. One is that where complementarities are strict (that is, the components are perfect complements, or very nearly so), monopoly power can keep a market transaction from occurring even when it would generate more value. For example, a blocked land assembly that results from entitlement holders who truly have high valuations of their

⁵⁷ Cf. Eduardo Moisés Peñalver & Sonia K. Katyal, *Property Outlaws*, 155 U. PA. L. REV. 1095, 1138-40 (2007) (explaining that it may be necessary to break property laws to show what an alternative regime looks like and providing the example of lunch-counter sit-ins).

⁵⁸ Ellickson, *supra* note 24, at 1325-35.

⁵⁹ See, e.g., Kominers & Weyl, *supra* note 41.

parcels (“holdins”)⁶⁰ is observationally equivalent to one involving parcel owners who are acting as strategic holdouts. A coercive solution that cuts through stratagems may unwittingly destroy value if the original configuration was the more valuable one.

Second, liquidity problems, imperfect capital markets, and free rider problems can keep the more valuable assembly from coming about even when holdouts do not block the way. This can be especially problematic where human capital is part of a complementary set, given well-known difficulties in tapping into future earnings.⁶¹ Difficulty also emerges when a large number of people stand to gain from the new arrangement and there is no way to aggregate their willingness to pay for it. A political solution (and associated coercion) is one possibility, but for reasons well-rehearsed elsewhere may generate both false negatives and false positives in producing new assemblies—some assemblies that would be valuable are not completed, while others that are completed may prove less valuable than the preexisting sets of complements that were coercively disrupted.

Nonetheless, examining these parameters helps reveal places where markets are likely to fail at the task of reconfiguration in ways that seriously threaten human well-being—as well as instances where disrupting existing complementarities is likely to have devastating consequences. Mechanism design can help create property structures that detect and adjust for these conditions, whether by eliciting valuation information from entitlement holders, or setting triggering conditions for certain kinds of reconfigurations. Rather than privileging existing sets of complements or engaging in episodic acts of coercion to break them apart, methods for facilitating entitlement rearrangement in light of shifting complementarities should be made part of the warp and woof of property law itself. Property, in short, should be designed for optimal reconfigurability.

C. Reconfigurable by Design

Property law today falls far short of optimal dynamism, and many design challenges remain. Yet the idea of building in reconfigurability is not alien to property, and existing doctrines provide footholds for expanding attention to complementarities. Some concrete examples will help to illustrate.

1. Accession

Consider the doctrine of accession, the law’s habit of assigning new

⁶⁰ Gideon Parchomovsky & Peter Siegelman, *Selling Mayberry: Communities and Individuals in Law and Economics*, 92 CAL. L. REV. 75, 128-29 (2004).

⁶¹ See, e.g., MILTON FRIEDMAN, CAPITALISM AND FREEDOM 102-04 (1962).

things to the person who already owns a related thing: the calf to the owner of the mother cow, and the crops to the owner of the field.⁶² While it would be possible to describe this move as simply expanding the scope of a given “thing,” it is more naturally understood as a choice about the allocation of an entirely new thing.⁶³ Although a variety of rationales might be mustered for it, complementarity provides a compelling one: If the calf will generally do best when kept with its mother, and if the crops will generally do best when rooted in the ground, having the same person act as owner of both is likely to generate more value than granting the new thing to a separate owner.⁶⁴ Thomas Merrill makes a related point in observing that “the most prominently connected owner is likely to have specialized or local knowledge or skills relevant to developing the resource.”⁶⁵ Here, the complementarity runs between the owner’s skill set (honed on the existing resource) and the new, related resource.

Complementarity features even more prominently in accession cases involving mistaken improvers. Here, one party mistakenly appropriates some property of another and incorporates it into her own new creation—for example, by accidentally building over a property line.⁶⁶ Once the mistake is discovered, returning everyone to their previous positions may be impossible or prohibitively costly. The reason boils down to indivisibilities: a house that is built over a property line cannot be readily disaggregated from the bit of unowned land on which it sits, nor can the over-the-line part of the house be readily split from the part that sits legally on the owner’s parcel. Similarly, logs that have been turned into hoops, or old cars that have been painstakingly restored, cannot simply be put back as they were.⁶⁷ A solution that respects complementarity in the new things that have been created will tend to keep them intact, and settle up as needed using the divisible medium of money.⁶⁸

These legal solutions show property law’s willingness to suspend the

⁶² See Thomas W. Merrill, *Accession and Original Ownership*, 1 J. LEGAL ANALYSIS 459, 464-67 (2009) (discussing these and other “traditional examples”); *id.* at 468-73 (discussing examples involving intangibles, and examples in which following the principle of accession is contested).

⁶³ See *id.* at 481 (resisting the idea that accession merely changes the scope of ownership, given that it is “often applied to determine the ownership of objects that are most naturally regarded as being separate or distinct from the thing that supplies the basis for accession, such as baby animals, minerals underground, or screenplays for movies”).

⁶⁴ See, e.g., Lee Anne Fennell, *Forcings*, 114 COLUM. L. REV. 1297, 1328 (2014). A closely related justification is cost internalization. See Merrill, *supra* note 62, at 484-85.

⁶⁵ Merrill, *supra* note 62, at 489.

⁶⁶ For discussion and analysis of this type of accession, see Yun-chien Chang, *An Economic and Comparative Analysis of Specificatio (the Accession Doctrine)*, 39 EUR. J.L. & ECON. 225 (2015).

⁶⁷ See *id.* at 226-27 (discussing these and other examples, drawing on case law).

⁶⁸ For details on when and whether the law has required compensation, see *id.* at 238-40.

owner's veto power over owned entitlements where compelling complementarities are present. Where the underlying physical components have already been recombined by mistake and putting things back as they were would cost too much, legal entitlements will be realigned to match the new physical configuration.⁶⁹ Such examples of property's dynamic potential might seem far removed from questions about whether to allow a right to roam or facilitate a new assembly of land. Yet on reflection, the only real distinction is that the recombination has already been realized in a physical sense in one case and not in the other; the law must still decide in each case whether to realign the underlying entitlements.

It might seem especially wasteful to tear asunder what has already been put together. But failing to put a more valuable assembly together in the first place can also generate great losses.⁷⁰ We also want people to use market processes to create new combinations where possible. Yet the mistaken improver cases show us that property law will readily toss aside that requirement where monopoly power is likely to be great—that is, where the house has already been built over the line, and now the builder has to negotiate with the landowner for the right to stay there.⁷¹ Essentially identical monopoly problems can also impede as-yet-unrealized assemblies.

2. Spillovers

Property's dynamism can also be detected in a wide range of measures aimed at addressing spillovers of various sorts. Spillovers qualify the thing-based vision of property because they cross module boundaries.⁷² One response is simply to resize the parcel to contain the spillovers, although there are drawbacks to this approach.⁷³ Other options involve governance mechanisms such as "easement, contract, nuisance, or regulation," or creating new forms of "entity property" such as common interest communities "to govern the wider interaction."⁷⁴ Spillover control can be understood as

⁶⁹ I focus here on mistaken (i.e., good faith) scenarios; bad faith improvers are treated more harshly under the common law. *See id.*

⁷⁰ Cf. Christopher Serkin, *Existing Uses and the Limits of Land Use Regulations*, 84 N.Y.U. L. REV. 1222, 1265-72 (2009) (critiquing the law's greater protection of existing uses compared with as-yet-unrealized ones).

⁷¹ The fact that good substitute sites are likely to be available to the improver before she starts building provides a rationale for allowing only good faith improvers to benefit from a forced entitlement shift. That is, the physical realignment itself is what creates the potential hold-up problem.

⁷² *See Smith, supra* note 15, at 166.

⁷³ For example, commentators have observed that broader ownership means less specialization. *See, e.g., id.* at 159 (citing Ellickson, *supra* note 24, at 1322-35); BARZEL, *supra* note 14, at 51-52.

⁷⁴ Smith, *supra* note 15, at 159.

aligning incentives (internalizing costs and benefits) but it can also be cast as securing a complement to productive use of property. For example, if producing the good of residential living requires some degree of peace and quiet, or the absence of noise and fumes, then control over the adjacent areas represents an entitlement that complements the homeowner's own property interests.

Nuisance law might secure these complements on a case-by-case basis,⁷⁵ but other land use controls sweep more broadly to control activities throughout a specified neighborhood or zone. If it is important for everyone in a given area to refrain from a particular practice in order for significant value to be realized, then everyone's forbearance must be somehow assembled. Notably, many spillover solutions are consciously structured in ways that sidestep holdout problems. For example, zoning is a political solution that reallocates entitlements from the individual landowner to the community coercively, without the need for unanimous consent.⁷⁶ Common interest communities enable people to opt in through purchase decisions, agreeing to be bound by a governance regime that does not require unanimous consent to make changes.⁷⁷

Finally, attention to complementarities among land uses can spotlight instances in which they are absent. For example, it may be unnecessary to keep a particular type of activity out of an area altogether, or it may be desirable to mix certain kinds of uses together.⁷⁸

3. Accommodating Multiple Complementarities

Although competing sets of complements raise some of the most important challenges in property law, sometimes two sets of complements are not mutually exclusive, but can instead be accommodated simultaneously, seasonally, or in some other pattern. Consider the example of medieval common fields, which were open to the community for grazing during part of the year, but seasonally farmed as individual holdings.⁷⁹ Each landowner

⁷⁵ Whether or not it does so in a given case depends not only on whether an actionable nuisance is found, but also on the remedy provided.

⁷⁶ For the characterization of zoning as a collective property right, see, e.g., ROBERT H. NELSON, *ZONING AND PROPERTY RIGHTS* 1, 15-18 (1977); William A. Fischel, *Equity and Efficiency Aspects of Zoning Reform*, 27 *PUB. POL'Y* 301, 302 (1979).

⁷⁷ See, e.g., Lee Anne Fennell, *Contracting Communities*, 2004 *U. ILL. L. REV.* 829, 848-49 (2004).

⁷⁸ See, e.g., JANE JACOBS, *THE DEATH AND LIFE OF GREAT AMERICAN CITIES* 152-77 (1961) (discussing the benefits of mixed uses); NICOLE STELLE GARNETT, *ORDERING THE CITY* 49-76 (2010) (discussing and critiquing Jacobs's ideas).

⁷⁹ See generally Henry E. Smith, *Semicommon Property Rights and Scattering in the Open Fields*, 29 *J. LEGAL STUD.* 131-69 (2000).

held a collection of small strips of land dispersed throughout the field, which provided a way of combatting strategic behavior and diversifying risk.⁸⁰ Here, economies of scale could be realized through larger grazing areas without disrupting seasonal crop-growing that was capable of matching up inputs and outcomes at a much smaller physical scale.

A present-day approach that can accommodate competing complementarities is land readjustment, an approach that has been commonly used in a number of countries.⁸¹ This mechanism comes in many variations, but the core idea is to facilitate land reconfigurations that make a redeveloped area more valuable, while granting residents the right to stay in the newly reconfigured area. Such an approach can assemble new complements, such as higher density housing that can support nearby retail and transit, while preserving the complementarity that already exists in a tight-knit neighborhood. Finding innovative ways to accommodate what might at first appear to be incompatible sets of complements represents an important research direction for property scholars.

4. Managing Mixed Regimes

Another persistent and growing challenge for property law is managing the abutments between privately and commonly owned elements.⁸² Mixed property regimes are ubiquitous, with commonly held elements pervasively threaded through private entitlements.⁸³ Complementarities and economies of scale explain why it is not possible to reduce all entitlements to individual private ownership—think of large and lumpy infrastructure, or ecological systems that operate at a landscape level.⁸⁴ Private owners may exploit and degrade these resources to benefit their own holdings. Converting more resources to common ownership can address this incentive problem—for example, a communal pasture will not be overgrazed if the cows are also

⁸⁰ See *id.* at 146-54; Donald N. McCloskey, *The Open Fields of England: Rent, Risk, and the Rate of Interest, 1300–1815*, in *MARKETS IN HISTORY: ECONOMIC STUDIES OF THE PAST* 5 (David W. Galenson ed., 1989).

⁸¹ See, e.g., *ANALYZING LAND READJUSTMENT: ECONOMICS, LAW, AND COLLECTIVE ACTION* (Yu-Hung Hong & Barrie Needham eds., 2007).

⁸² See, e.g., Lee Anne Fennell, *Commons, Anticommons, Semicommons*, in *RESEARCH HANDBOOK ON THE ECONOMICS OF PROPERTY LAW* 35, 37-40, fig. 2.1 (Kenneth Ayotte & Henry E. Smith eds., 2011); Armen A. Alchian & Harold Demsetz, *The Property Right Paradigm*, 33 *J. ECON. HIST.* 16, 23-24 (1973).

⁸³ See, e.g., Yochai Benkler, *Commons and Growth: The Essential Role of Open Commons in Market Economies*, 80 *U. CHI. L. REV.* 1499 (2013) (book review).

⁸⁴ See, e.g., Lewis D. Hopkins, *Urban Development: The Logic of Making Plans* 28 (2001); Karen Bradshaw Schulz & Dean Lueck, *Contracting for Control of Landscape-Level Resources*, 100 *IOWA L. REV.* 2507 (2015).

owned in common.⁸⁵ But because labor inputs remain under private control, a shirking problem may take its place.⁸⁶

Although the interface between private and common ownership cannot be avoided, attention to complements can help in designing ways to manage it. For example, Elinor Ostrom and Charlotte Hess discuss Swiss villages that prohibited cattle owners from sending more cows to the pasture than they could support on hay produced on their own land during the winter season.⁸⁷ Here, a private complement to cattle-keeping, hay production, serves as a rationing device. If year-round cattle ownership exploits temporal economies of scale, this rule may impose relatively few burdens on private owners, while building in a check on overgrazing the commons. The broader lesson is that complementarities and economies of scale can be creatively leveraged to address collective action problems.

5. Public Goods and New Modes of Access

Complementarities also feature in the private provision of public goods—nonrival and nonexcludable goods such as lighthouses that we might expect markets to undersupply. One strategy to effectively price access to a public good involves metering access to a complementary good (using port access fees for ships to fund lighthouses, for example).⁸⁸ Similarly, paid parking lots are often used to meter access to otherwise free events, and a special glass or mug might be sold at a wine or beer festival to grant access to libations. Significant too are constructed and enforced forms of complementarity, such as consumer electronics that cease to function without continual software updates or other ongoing interactions with vendors.⁸⁹ If the continued usefulness of a product depends on a component that another party controls, this presents the risk of a hold-up situation—a design challenge for property.

As technology enables us to divide up assets in new ways, slivers of on-demand access can create new complementary sets—a stream of benefits that stands in for the old-fashioned temporal complementarity of constant asset ownership. These new arrangements offer opportunities (cheaper access to assets, access to better assets, access to more variety, fewer storage burdens), as well as risks and costs associated with breaking up the traditional ownership bundle (externalities, changes in regulatory oversight).⁹⁰ Finding

⁸⁵ See Alchian & Demsetz, *supra* note 82, at 23-24.

⁸⁶ See *id.*

⁸⁷ Ostrom & Hess, *supra* note 38, at 65.

⁸⁸ See R.H. Coase, *The Lighthouse in Economics*, 17 J. L. & ECON. 357, 362 (1974); Rosolino A. Candela & Vincent Geloso, *Why Consider the Lighthouse a Public Good?*, 60 INT'L REV. L. & ECON. 105852 (2019).

⁸⁹ See Chris Jay Hoofnagle et al., *The Tethered Economy*, 87 GEO. WASH. L. REV. 783 (2019).

⁹⁰ See BARZEL, *supra* note 14, 62-63 & n.10.

the combinations that produce real improvements in total value—and not just as a function of offloading costs onto third parties—represents an important focus for property law.

6. Assembly Problems, Old and New

Perhaps the largest and most diverse category of property problems implicating complementarity involves the assembly of entitlements. Sometimes these assemblies involve perfect complements, which combine to produce “lumpy” or “single-step” goods in which having all the pieces is essential. In both intellectual property and real property contexts, concerns have surfaced about holdout problems blocking efficient assemblies. These concerns, and rebuttals to them, have been well-aired elsewhere. What is most important to emphasize here is the generalizability of the entitlement assembly concern and its relevance for property theory and doctrine.

Whether we are talking about putting together contributions to achieve a social goal like curing a disease, increments of forbearance to avoid an ecological disaster, pieces of habitat sufficient to make up a wildlife corridor, segments of beachfront to create a contiguous shoreline path, or parcels of land sufficient to build a highway or other large piece of infrastructure, the problem is the same: putting together inputs that are held separately. What must be assembled in each case is the cooperation of those who hold these crucial components—or coercion to override the lack of such cooperation. Finding mechanisms to achieve the former and setting criteria for the latter are not one-off or unusual situations; they are recurring features of property law, and among its greatest challenges.

V. DISTRIBUTION AND COMPLEMENTARITY

Although a focus on complementarity connects to standard efficiency concerns, taking it seriously also has distributive implications. While distribution is a deep concern of many property scholars, the idea of bringing these considerations squarely into the domain of a welfarist analysis through attention to complementarity has not received much attention. One reason relates to the tendency in law and economics to artificially separate questions of efficiency (making the pie larger) from questions of distribution (dividing the pie), and to assume that distributive issues can be best addressed through a tax and transfer mechanism.⁹¹

⁹¹ See, e.g., Louis Kaplow & Steven Shavell, *Should Legal Rules Favor the Poor? Clarifying the Role of Legal Rules and the Income Tax in Redistributing Income*, 29 J. LEGAL STUD. 821 (2000). For discussion and critique, see Lee Anne Fennell & Richard H. McAdams, *The Distributive Deficit in Law and Economics*, 100 MINN. L. REV. 1051 (2016).

Complementarity adds an important wrinkle: if resources become more valuable depending on how they are matched up with people's skills, abilities, and labor inputs, then questions of resource distribution bear directly on the efficiency of property arrangements. When it is not possible to match up labor with other resources in appropriate combinations, economic loss results.⁹² For example, Carl Menger describes conditions under which large amounts of grain would simply "spoil on the fields" because "the goods complementary to the crops standing on the fields (the labor services necessary for harvesting them) are missing."⁹³ When people do not have access to the complementary resources that would, combined with their own labor, produce value, we are likely to see metaphorical instances of grain spoiling on the fields in many domains. Standard economic analysis would suggest that a person who can use a resource more productively would have a higher willingness to pay for it, and would therefore acquire it without any need for intervention. But people often lack liquidity, and capital markets do not reliably supply it.

Recognizing these points and their distributive implications becomes especially important in light of an amassing tendency that is baked into property law itself. As Merrill explains, "[b]ecause of the principle of accession, regressive distribution is hard-wired into the very operation of a system of private property."⁹⁴ The result is a "built-in multiplier effect that means owners of property continually get more property."⁹⁵ Some of these regressive tendencies stem from accommodating complementarities, as we saw in the case of accession's rules for assigning ownership of crops and baby animals. But property's amassing tendencies can also get in the way of making better matches between resources and human capital. This is true at a most basic level, as we can see in the following observation by Jeremy Waldron: "Everything that is done has to be done somewhere."⁹⁶ This reality makes access to real property a perfect complement to every human endeavor and activity, including those acts essential to sustaining life itself.⁹⁷

The larger project of how property might best address distribution cannot be tackled here, but the distributive implications of taking complementarity seriously are dramatic. Work decades ago recognized the importance of enabling human capital to be combined with other forms of capital.⁹⁸ Recent

⁹² See MENER, *supra* note 1, at 62.

⁹³ *Id.*

⁹⁴ Merrill, *supra* note 62, at 499.

⁹⁵ *Id.* at 502-03.

⁹⁶ Jeremy Waldron, *Homelessness and the Issue of Freedom*, 39 UCLA L. REV. 295, 296 (1991).

⁹⁷ See *id.* The doctrine of necessity might be understood as a nod in this direction.

⁹⁸ See, e.g., LOUIS O. KELSO & MORTIMER J. ADLER, *THE CAPITALIST MANIFESTO* (1958); LOUIS O. KELSO & MORTIMER J. ADLER, *THE NEW CAPITALISTS* (1961).

work examining how people can leverage their way of out poverty traps likewise stresses the significance of enabling people to access the right combinations of resources at a sufficient scale at the appropriate time.⁹⁹ Grounding these discussions in complementarity offers a way to carry the conversation forward within property theory.

CONCLUSION

Property faces an identity crisis. It is torn between the forms of the past, which emphasize stability, and the challenges of the future, which require mutability. I have suggested that grounding property in complementarity provides a way to take seriously the ways that property's architecture has operated in the past to generate value, while taking equally seriously the ways that architecture can run aground in an interconnected world. A law-of-complements approach provides a flexible, modern, and meaningful answer to the question of what makes property distinctive. It keeps the production of value center stage by focusing on how property, as an institution, enables and protects combinations of resources—with other resources and with human skill, labor, and ingenuity. This reorientation frees us to think creatively about questions of both efficiency and distribution in designing institutions aimed at optimizing resource access.

⁹⁹ See ABHIJIT V. BANERJEE & ESTHER DUFLO, POOR ECONOMICS (2011).