

2012

Lumpy Property

Lee Anne Fennell

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Recommended Citation

Lee Anne Fennell, "Lumpy Property" (University of Chicago Public Law & Legal Theory Working Paper No. 371, 2012) available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1977646.

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LUMPY PROPERTY

LEE ANNE FENNELL[†]

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INTRODUCTION

A bridge stretching only three-quarters of the distance across a chasm is useless, while a bridge that is longer than necessary does no more good than one that just spans the gap. This standard, intuitive example of a lumpy, indivisible, or “step” good makes regular appearances in the literature on collective action.¹ But it also illustrates a point about discontinuities and complementarities that has broad, and mostly unexplored, significance for property law.² From land assemblies to takings doctrines to cotenant partitions to public housing to the *numerus clausus* principle, we see property delivering value—and being delivered to us—in certain identifiable, discontinuous chunks. This Article examines the implications of lumpiness for property theory and doctrine. While strains of this conceptual element run through some of the existing theoretical work on property,³ the ways in which lumpiness may explain, justify, and challenge features of property law have not been systematically analyzed.

Viewing property through the lens of lumpiness matters for at least three reasons. The first is descriptive accuracy. Property law is lumpy as a positive matter, filled with doctrines and approaches that deal with

¹ See, e.g., RUSSELL HARDIN, *COLLECTIVE ACTION* 59 (1982) (observing that the bridge is a “standard example[]” of a “single-step good[],” but qualifying this example by noting the wide spectrum of possible bridge types).

² This Article focuses exclusively on real and personal property. It does not engage the interesting complementarities and discontinuities that arise in intellectual property, or the scholarly literature surrounding them. See, e.g., ROBERT P. MERGES, *JUSTIFYING INTELLECTUAL PROPERTY* 162-69 (2011) (using “the parable of the bridge” to illustrate proportionality and leverage in intellectual property). Lumpiness has implications for other areas of law as well. For a brief overview, see Lee Anne Fennell, *Slices and Lumps* (Univ. of Chi. Law & Econ. Olin, Working Paper No. 395), available at <http://ssrn.com/abstract=1106421>.

³ See, e.g., Henry E. Smith, *Self-Help and the Nature of Property*, 1 J.L. ECON. & POL'Y 69, 76-79 (2005) (positing that less costly ways of delineating property rights produce lumpy, asymmetric entitlements). Lumpiness also relates closely to the literatures on economies of scale and land assembly problems, where larger holdings may be disproportionately more valuable than the sum of smaller holdings. See Robert C. Ellickson, *Property in Land*, 102 YALE L.J. 1315, 1332-35 (1993) (discussing situations in which “returns increase with parcel size”); see also Michael A. Heller, *The Tragedy of the Anticommons: Property in the Transition from Marx to Markets*, 111 HARV. L. REV. 621, 659 (1998) (addressing problems in assembling property entitlements into useful bundles).

the world in discrete, hard-to-divide chunks. Understanding how property operates thus requires an appreciation of its lumpiness. Second, optimal property design requires evaluating the chunkiness that is built into property doctrines and asking whether and how it corresponds to underlying discontinuities in the production or consumption of property. Third, many of property law's most important conflicts can be usefully framed as "lump versus lump." For example, an exercise of eminent domain may achieve a valuable spatial aggregation by splitting up some other aggregation, such as lengthy temporal attachments to the land or a cohesive community that shares social capital.⁴ Recognizing the significance of nonlinearities in such stories can offer new traction on contemporary property debates.

The analysis here proceeds in four parts. Part I explains how and why we might regard property as lumpy. Part II examines how ideas connected to lumpiness enter into property law, whether as rationales for legal intervention, justifications for doctrinal protections, or bases for judicial or administrative outcomes. Part III turns to property theory, where notions of lumpiness map onto current debates over the bundle-of-rights metaphor and over the relationship between exclusion and social obligation. This discussion also raises questions about the mutability and social contingency of property's lumpy nature. Part IV offers some analytic lessons that property scholars can take away from a study of lumpiness.

I. HOW AND WHY IS PROPERTY LUMPY?

Property entitlements that encompass strongly complementary elements may be said to have a lumpy or indivisible quality. To take a simple example, a dwelling's four walls, roof, and foundation are generally viewed as strongly complementary: removing any one element changes a fully contained private shelter into a windbreak, a cubicle, or a lean-to. Just as the last segment of a bridge delivers a disproportionate amount of utility, so too will a dwelling's last wall. Similar claims might implicitly underpin a variety of legal doctrines and interventions, including minimum standards for the quality and size of housing, minimum tenure lengths, minimum bundles of property rights, and the use of eminent

⁴ See *infra* notes 65-67 & 142 and accompanying text.

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domain to assemble land into larger chunks. Before we can analyze these and other examples, however, we first need to lay some definitional and taxonomic groundwork.

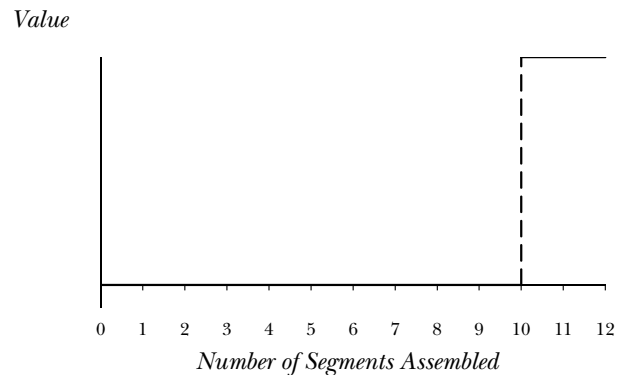
A. *What's Lumpy?*

As Michael Taylor and Hugh Ward observe, some goods “cannot be usefully provided in *any* amounts but only in more or less massive ‘lumps.’”⁵ A good is lumpy (in one sense) if it provides benefits only when a particular quantity threshold is reached, rather than delivering utility in smoothly scalable units as quantities increase.⁶ More broadly, the notion of lumpiness is associated with various kinds of discontinuities, indivisibilities, nonlinearities, and complementarities.

1. Steps and Lumps

Lumpiness is a matter of degree. At the extreme, a good might take a “step” form, like the prototypical bridge shown in Figure 1.

Figure 1: The Bridge



⁵ Michael Taylor & Hugh Ward, *Chickens, Whales, and Lumpy Goods: Alternative Models of Public-Goods Provision*, 30 POL. STUD. 350, 353 (1982).

⁶ See, e.g., *id.* at 353-54 (using bridges and rail projects as examples of goods that exhibit such discontinuities); see also Jean Hampton, *Free-Rider Problems in the Production of Collective Goods*, 3 ECON. & PHIL. 245, 248-50 (1987) (contrasting “pure step goods” such as bridges, which require “one big production step,” with goods that can be produced in smaller increments). Another sort of lumpiness stems from production limitations rather than consumption utility, as where a product can only be supplied profitably in a particular size or quantity. See *infra* subsection I.A.2.

As Figure 1 shows, the structure is worthless until all the segments required to span the gap are in place, and it becomes no more valuable as superfluous segments are added.⁷

Such pure step goods are rare.⁸ But equally rare are perfectly linear goods—those with a smooth, continuous production function in which each infinitesimally fine unit of input is matched by a similar adjustment in output or utility. Between these two extremes, we find different degrees of nonlinearity or indivisibility.⁹

I will use the term “lumpiness” broadly here to refer to severe discontinuities or nonlinearities in the production function, whether or not those functions take a pure step form or intersperse sharply increasing or decreasing returns with ranges exhibiting linearity.¹⁰ These differences in shape are important, however, because they can influence the prospects for cooperation and the risks of strategic behavior.¹¹

Figure 2 shows another example of a (relatively) lumpy good. Although this good does not deliver all its value in a single shot, its production function contains ranges over which the marginal effect of added segments is sharply increasing or decreasing.

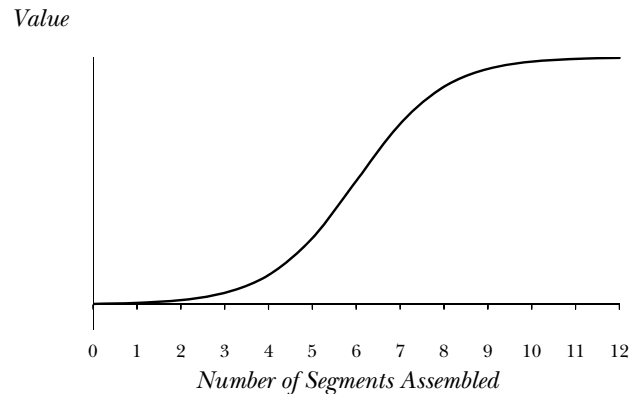
⁷ See, e.g., Hampton, *supra* note 6, at 248-49 & 248 fig.2 (defining and depicting pure step goods).

⁸ See HARDIN, *supra* note 1, at 59 (observing that even the standard example of a bridge does not really qualify as a step good, given that bridges may be supplied at a wide variety of price and quality levels).

⁹ See, e.g., Hampton, *supra* note 6, at 249-50 (discussing “steppy” collective goods, for which contributions in particular increments will add value, and “mixed structure” collective goods, which may require an initially large production step but could then be improved in smaller increments).

¹⁰ Definitions vary. Compare *id.* at 248-50 (equating “lumpy goods” with “pure step goods” and distinguishing both from hybrid forms like multi-step and mixed goods), with MARGARET LEVI, OF RULE AND REVENUE 57-58 (1988) (recognizing the possibility of “lumpy goods with sloping risers” that exhibit linearity “after the initial production threshold is crossed”).

¹¹ See Pamela Oliver et al., *A Theory of the Critical Mass* (pt. I): *Interdependence, Group Heterogeneity, and the Production of Collective Action*, 91 AM. J. SOC. 522, 525-28 (1985) (examining the relationship between production-function shapes and the prospects for collective action); Lee Anne Fennell, *Common Interest Tragedies*, 98 NW. U. L. REV. 907, 971-78 (2004) (exploring this point in the context of land use and resource entitlements).

Figure 2: The S-Curve

The S-curve shown in Figure 2 matches up with many collective goods that require a critical mass of participation to succeed, but that at some point plateau.¹² It might also fit with certain kinds of land assembly projects, where value increases sharply once a certain number of parcels are aggregated, but where having all the parcels is not essential.¹³

Of course, nonlinearities might take many other forms; Figure 1 and Figure 2 offer just two examples.

2. What's in the Lump?

So far, I have spoken of “segments” that produce value when aggregated together. As this formulation suggests, lumpiness or indivisibility often refers to quantities of relatively fungible inputs—pieces of a bridge, lengths of railroad track, tires for a car, units of work, years of housing tenure, and so on. Yet it may also refer to organic systems made up of heterogeneous elements, such as a machine that cannot operate without each and every one of its parts.¹⁴ In the context of land assembly, the unique spatial location of each parcel may make the component parts of the desired assembly nonfungible. What matters

¹² See Oliver et al., *supra* note 11, at 527-28, 527 fig.1(a) (presenting and discussing an S-shaped “general third-order” production function).

¹³ For graphical representations and analyses of possible land assembly scenarios, see, for example, John F. McDonald, *What Is Public Use? Eminent Domain and the Kelo Decision*, 5 CORNELL REAL EST. REV. 10, 15-19 (2007), and Lee Anne Fennell, *Taking Eminent Domain Apart*, 2004 MICH. ST. L. REV. 957, 972-75.

¹⁴ See ARNOLD M. FADEN, *ECONOMICS OF TIME AND SPACE* 208, 213 (1977).

most to the shape of a given assembly problem is not whether the components are interchangeable with each other, but rather whether close substitutes exist for each of the components required for a given assembly.¹⁵ Thus, both homogenous and heterogeneous aggregations fit within the broad conception of lumpiness pursued here.

It is also worth emphasizing that the components in question may be temporal in nature. Some goods, such as private residences, are often viewed as disproportionately valuable when consumed in lengthy, unbroken temporal chunks. Often, these valuable temporal chunks are defined by reference to external events, such as the length of a life, a job, or an educational program. Property intentionally bundles along the temporal dimension and, at least in the case of the fee simple absolute, it does so in a very open-ended way.

B. *Lumpy Demand, Lumpy Supply, and the Law*

A good may exhibit lumpiness either because it is considerably less valuable when divided or because it is very expensive to divide (or to produce in smaller units in the first instance). The loss in consumption utility associated with dividing a lumpy good corresponds to lumpiness in demand, while the increase in production cost associated with making goods in particular quantities or configurations corresponds to lumpiness in supply. Lumpiness becomes noticeable and relevant when there is a mismatch between the units that users demand and the units that producers supply.

Consider first lumpy demand. Most people have two feet of similar size and follow the social custom of shodding them identically; thus, they buy shoes in lumps of two. Likewise, the users of bridges drive vehicles that are sensitive to gravity; consequently, they demand complete rather than partial bridges. In these cases and many others, the indivisibility relates to consumption utility, not to production processes that compel the provision of goods in particular chunks.¹⁶ The

¹⁵ Thus, even though a car may require many different mechanical parts to run (none of which could substitute for another), there will be no difficulty assembling the necessary pieces so long as each part is readily available on the open market. Conversely, even if a group is building a bridge out of identical, interchangeable segments, there may still be an assembly problem if there are no outside sources of bridge material and each individual in the group holds a segment essential to the whole.

¹⁶ Indivisibility in production might also be present, however, to the extent that these goods require design or assembly work that is more cheaply provided in a lump.

lumpiness shows up in the demand curve, with little or no demand for quantities of the good below the critical threshold.¹⁷

In other instances, lumpiness stems not from consumption utility, but rather from the costs or technological limits of production. For example, the fixed costs associated with certain kinds of factory upgrades or expansions may make them affordable only in chunks of certain sizes.¹⁸ Lumpiness in supply can also manifest itself in limited menus of products, where each variety requires a fixed minimum outlay.¹⁹ Consider, for example, Henry Ford's decision to offer Model T purchasers "a car painted any colour that he wants so long as it is black."²⁰ Here, the lumpiness is a function of the indivisible cost of setting up a particular production run.

Finally, law often introduces indivisibilities. In the property context, the *numerus clausus* principle has the effect of producing a limited, and hence lumpy, menu. Other aspects of property law keep certain interests from being split up, or require that they be split only in particular ways. Legally imposed lumps push the inquiry back to the question of whether there are underlying discontinuities that explain why certain combinations of entitlements must be consumed or produced together, or not at all.²¹

C. Property Lumps

With the idea of lumpiness more clearly in mind, we can consider the ways in which property might be understood as lumpy. To start, property can be described as a lumpy institution to the extent that its defining features are associated with discontinuities or indivisibilities—and, indeed, to the extent it is understood as having *a set* of defining

¹⁷ See generally Stephen Shmanske & Daniel Packey, *Lumpy Demand and the Diagrammatics of Aggregation*, 30 J. ECON. EDUC. 64 (1999).

¹⁸ See, e.g., William J. Baumol & J. Gregory Sidak, *The Pig in the Python: Is Lumpy Capacity Investment Used and Useful?*, 23 ENERGY L.J. 383, 385 (2002) (explaining that because a public utility can only add capacity in large chunks—as by installing a new generator or power plant—"new capacity will often give the utility more capacity than it needs for immediate purposes").

¹⁹ See JOEL WALDFOGEL, *THE TYRANNY OF THE MARKET: WHY YOU CAN'T ALWAYS GET WHAT YOU WANT* 21-28, 100-07 (2007) (describing "lumpy markets" and discussing how fixed costs can impact product availability).

²⁰ HENRY FORD WITH SAMUEL CROWTHER, *MY LIFE AND WORK* 72 (1922); see also WALDFOGEL, *supra* note 19, at 119-20 (attributing Ford's choice to the costs of customization and to the quick-drying nature of black enamel).

²¹ A separate question is whether market forces would produce the optimal configuration without the need for legal restrictions. See *infra* Section IV.B.

features.²² Yun-chien Chang and Henry Smith have recently identified three features they view as essential to property rights: in rem rights, the right to exclude, and rights “running with assets.”²³ Their approach suggests that the concept of property is itself lumpy, requiring some minimum set of attributes in order to bear the label “property.”²⁴

Moreover, each of the three attributes that Chang and Smith identify strongly implicates lumpiness. In rem rights lump together the world at large when defining duties toward a property owner and thereby economize on the production of legal relationships between owners and nonowners.²⁵ Exclusion protects an undifferentiated set of uses by relying on a complete (rather than broken or partial) conceptual boundary around a resource’s edges.²⁶ Rights that run with assets respond to the fact that property interests in other people’s land, such as easements, exhibit a form of temporal lumpiness: they are often most valuable when consumed over long periods that are not interrupted by changes in ownership.²⁷

More broadly, a system of property rights may embody or produce lumpy public goods. There may be no single discrete “step” between a system of property rights that is too insecure to be meaningful and one that is sufficiently secure to induce widespread reliance and investment. But it seems likely that some threshold must be reached before the bulk of the benefits of the property system can be realized, and that enhancements beyond a certain level add relatively little to perceptions of stability.²⁸ Similarly, patterns of lumpy property use and

²² This point bears on the larger theoretical debate about whether a “bundle of sticks” is an appropriate metaphor for property. See *infra* Section III.A.

²³ Yun-chien Chang & Henry E. Smith, *An Economic Analysis of Civil Versus Common Law Property*, 88 NOTRE DAME L. REV. (forthcoming 2012) (manuscript at 24-27), available at <http://ssrn.com/abstract=2017816>.

²⁴ See *id.* at 33 (arguing that a legal relation that lacks one or more of three enumerated attributes of property is “at best quasi-property”).

²⁵ See *id.* at 24-25. See generally Thomas W. Merrill & Henry E. Smith, *The Property/Contract Interface*, 101 COLUM. L. REV. 773 (2001) (discussing the significance of the distinction between in rem rights associated with property and in personam rights associated with contract).

²⁶ See, e.g., Henry E. Smith, *Property and Property Rules*, 79 N.Y.U. L. REV. 1719, 1755-57 (2004) (describing property’s “exclusion strategy”); see also *infra* Section II.A.

²⁷ Chang and Smith do not focus on temporal lumpiness as such, but instead suggest that the “running with assets” approach follows from viewing property as “a thing.” Chang & Smith, *supra* note 23, at 31-33.

²⁸ In other words, the production of security in property rights may follow an S-shaped curve like the one in Figure 2 above, if a certain “critical mass” of stability is required to induce investment. For discussion and modeling of “critical mass” in vari-

consumption may produce second-order lumpy goods, like uniformity. Finally, doctrines that protect, regulate, standardize, adjudicate, and reconfigure property entitlements may be informed and limited by ideas of lumpiness. The next Part provides some examples.

II. LUMPY DOCTRINES

The sections below examine how lumpiness relates doctrinally to three of property law's basic moves: enforcing exclusion, limiting configurations, and dividing and aggregating entitlements. Although my treatment here is necessarily illustrative rather than exhaustive, it suggests the range of property doctrines implicated by lumpiness.

A. *Enforcing Exclusion*

Just as a partial bridge is no bridge, leaving one side of a parcel of land legally unprotected from intruders undoes the idea of exclusion. Thus, an "exclusion strategy"²⁹ depends on defining resources as *things* with closed edges.³⁰ Understanding property holdings as opaque, self-contained "modules"³¹ with hard exclusionary edges makes property a lumpy institution. On this view, breaking into the capsule, even trivially, alters its integrity and may have any number of unanticipated effects that only the owner can fully know or appreciate.

This vision of property fits well with a system of strong "property rule" protection against trespass and physical interference.³² It explains

ous social and collective action contexts, see THOMAS C. SCHELLING, *MICROMOTIVES AND MACROBEHAVIOR* 91-110 (1978), and Oliver et al., *supra* note 11.

²⁹ See Smith, *supra* note 26, at 1755 ("In an exclusion strategy, the law sets up rough signals (informational variables, proxies) defining the boundaries of the asset.").

³⁰ See Chang & Smith, *supra* note 23, at 25-26 (explaining how exclusion relates to "thing-based packages of rights—property"); see also Henry E. Smith, *Property as the Law of Things*, 125 HARV. L. REV. 1691, 1702 (2012) ("The exclusion strategy defines a chunk of the world—a thing—under the owner's control . . ."). To say that an exclusion-based property interest requires complete boundaries does not mean that it requires *impermeable* boundaries, nor does it require that the boundaries constitute the only means of protecting the property's value. See Chang & Smith, *supra* note 23, at 26 (noting the respective roles of governance and exclusion).

³¹ See, e.g., Henry E. Smith, *Community and Custom in Property*, 10 THEORETICAL INQUIRIES L. 5, 16-18 (2009) (drawing connections between exclusion strategies and modularity, and noting that modules hide information as a way of managing complexity).

³² See Guido Calabresi & A. Douglas Melamed, *Property Rules, Liability Rules, and Inalienability: One View of the Cathedral*, 85 HARV. L. REV. 1089, 1105-06 (1972) (distinguishing "property rule" protection, under which property may only be transferred if the owner chooses to sell, from "liability rule" protection, under which property may be transferred against the will of the owner at an externally determined price).

why even harmless encroachments may be addressed injunctively or strongly deterred with supercompensatory remedies. As Henry Smith has emphasized, property rule protection legally constructs a discontinuity at the parcel's edges by making the consequences of boundary crossing highly significant.³³ That legal discontinuity operates on both sides of the border. Not only can trivial and harmless encroachments be prevented and punished,³⁴ but very significant and harmful impacts emanating from outside the property's edges may either be entirely nonactionable or may be redressed only with damages—a liability rule solution.³⁵

Explicitly focusing on lumpiness pushes us to ask whether the legally constructed discontinuity corresponds to some underlying discontinuity in how property is produced or consumed, or whether it is an artifact of an earlier set of social circumstances that we should seek to unwind. The notion of modularity suggests an underlying lumpiness in consumption utility: if property's uses are opaque and potentially idiosyncratic, having the whole thing may be enormously different from having almost the whole thing, and in ways nonowners may be unable to understand. This proposition, however, is empirically debatable.

Significantly, most land in metropolitan areas today is subject to zoning and other forms of land use controls that take the mystery out of what the owner may be doing with her property. Moreover, modern threats to owners' holdings are less likely to involve physical intrusions than effects emanating from beyond the property lines—impacts from the activities of neighbors, merchants, governmental entities, and employers in the surrounding area.³⁶ Some owners surely have construction or other plans for their land that depend on retaining control over the full spatial and temporal footprint; for them, losing a little could mean losing a lot. But this observation does not necessarily support generalizing a hard-edged exclusion strategy for all owners. It is also the case that some owners have plans (such as upgrading to a larger home as their family grows) that depend on retaining a mini-

³³ Smith, *supra* note 26, at 1750; *see also* Robert Cooter, *Prices and Sanctions*, 84 COLUM. L. REV. 1523, 1525-31 (1984) (discussing discontinuities produced by sanctions).

³⁴ This is not to say that all encroachments are addressed through injunctive or supercompensatory relief. *See, e.g.*, *Mannillo v. Gorski*, 255 A.2d 258, 264 (N.J. 1969) (holding that a good faith encroacher who constructed substantial improvements may be eligible for equitable relief conveying the encroached-upon land to him at fair market value).

³⁵ *See* Calabresi & Melamed, *supra* note 32, at 1092.

³⁶ *See* LEE ANNE FENNELL, *THE UNBOUNDED HOME: PROPERTY VALUES BEYOND PROPERTY LINES* 13-14 (2009).

mum sum of home equity. Yet we have not generalized a strategy for protecting owners against all threats to home equity.

A separate argument for strong exclusion rights might be based on economies in the production of property protection—lumpiness in supply. Perhaps it is cheaper for a system of property rights to provide property rule protection along parcel edges than to engage in an enforcement strategy that requires assessing exactly how and to what degree intruders have drained value from the property.³⁷ In other words, the constructed discontinuity in legal consequences at the parcel edges may have less to do with the ways that owners value and use their land than with the way that property protection is most economically produced. This claim, however, also requires empirical support—evidence of the relative costs of different kinds of property protection as well as of the efficacy of each type of protection in achieving the goals of property under present social conditions.

B. *Limiting Configurations*

Property is dispensed and consumed only in certain chunks, rather than in all imaginable combinations. For example, public housing assistance in the United States is distributed by allowing households to queue up for units that meet particular standards,³⁸ rather than by distributing housing dollars evenly among all eligible families.³⁹ An argument for deploying housing dollars in discrete lumps, even if it

³⁷ See Ellickson, *supra* note 3, at 1328-29 (maintaining that boundary crossings are easier to detect and address than are unwanted behaviors occurring on the property).

³⁸ Demand for public housing exceeds supply so significantly in some areas of the United States that families must win a lottery simply to be placed on a lengthy waiting list. See, e.g., *Family Wait List Lottery FAQs*, CHI. HOUSING AUTHORITY, http://www.thecha.org/pages/family_wait_list_lottery_faqs/76.php (last visited Apr. 15, 2012) (providing information about the 2010 random lottery that added 40,000 families to the waitlist for Chicago public housing, and indicating that those who were successful in the lottery may have to wait five to seven years before being screened).

³⁹ David Super uses the term “functional entitlement” to denote public benefits that are provided at a level that is intended to be sufficient to meet a particular need. David A. Super, *The Political Economy of Entitlement*, 104 COLUM. L. REV. 633, 655-58 (2004). Although Super finds functional entitlements to be “relatively rare in public benefits law,” housing assistance programs that require units to meet certain standards fit the definition. *Id.* at 657 & n.109. Some households do require deeper subsidies than others in order to obtain housing that complies with the applicable standard. Thus, to the extent that public housing authorities have discretion to target assistance based on income, they can exercise some choice about how to slice up the available funding. See, e.g., 24 C.F.R. § 982.201(b)(2) (2011) (setting parameters for income-targeting of tenant-based Housing Choice Vouchers). I thank Nestor Davidson for this point.

leaves many families out of the distribution, might follow from the claim that “incomplete” or substandard housing bundles add little to a household’s well-being until the quality level reaches a certain threshold.⁴⁰ Thus, a social welfare system faced with six needy families and only enough building materials to construct one full dwelling might rationally decide not to divide the available building components equally among the families, but rather to construct one full unit.

The law’s interventions in property configurations are not limited to the public housing context. Notably, the *numerus clausus* principle limits new property forms and thus maintains a fixed and chunky property menu.⁴¹ Because laws and regulations cluster around approved entries on the property menu, hybrid alternatives can be hard to initiate and sustain.⁴² In the housing realm, for example, marked gaps exist on the tenure spectrum, leaving out a range of innovative hybrid arrangements that would blend elements of renting and owning.⁴³ The result is a lumpiness in property forms that requires households either to take on a large chunk of risk by becoming owners or to continue renting; households whose ideal point lies between the two tenure forms have to settle for more risk or less.⁴⁴ Thomas Merrill and Henry Smith posit

⁴⁰ For a related discussion, see CHARLES KARELIS, *THE PERSISTENCE OF POVERTY* 67-81, 127-29 (2007). Karelis suggests that the marginal utility of money may rise within certain ranges because it allows larger and hence disproportionately more effective doses of relief to be applied. *Id.* at 67-71; *see also* Milton Friedman & L.J. Savage, *The Utility Analysis of Choices Involving Risk*, 56 J. POL. ECON. 279, 298-99 (1948) (presenting the Friedman-Savage utility curve, which hypothesizes that there are intervals in which the marginal utility of money increases); Sarah B. Lawsky, *On the Edge: Declining Marginal Utility and Tax Policy*, 95 MINN. L. REV. 904, 929-39 (2011) (providing an overview of the Friedman-Savage curve and related empirical work).

⁴¹ *See generally* Thomas W. Merrill & Henry E. Smith, *Optimal Standardization in the Law of Property: The Numerus Clausus Principle*, 110 YALE L.J. 1 (2000).

⁴² For a discussion of the *numerus clausus* doctrine as a “regulatory platform,” *see* Nestor M. Davidson, *Standardization and Pluralism in Property Law*, 61 VAND. L. REV. 1597, 1644-50 (2008).

⁴³ Such hybrids do exist, but they are limited in scope and are not well supported by current tax and regulatory regimes. *See, e.g.*, Andrew Caplin et al., *Rectifying the Tax Treatment of Shared Appreciation Mortgages*, 62 TAX L. REV. 505, 508, 514-15 (2009) (cataloguing the tax obstacles to one such hybrid, shared appreciation mortgages, which entitle lenders to a share of the property’s appreciation instead of fixed interest payments); Andrew Caplin et al., *Home Equity Insurance: A Pilot Project* 24-28 (Yale Int’l Ctr. for Fin., Working Paper No. 03-12, 2003), *available at* <http://ssrn.com/abstract=410141> (describing regulatory barriers to implementing a home equity insurance program in Syracuse, New York).

⁴⁴ *See* ANDREW CAPLIN ET AL., *HOUSING PARTNERSHIPS: A NEW APPROACH TO A MARKET AT A CROSSROADS* 6 (1997) (“The ‘all or nothing’ constraint on home ownership forces households to make the stark choice between rental accommodations’ disadvantages and complete ownership’s harsh financial realities.”).

that information costs justify the limited property menu; in their view, idiosyncratic tenure forms impose informational externalities by making it harder for both potential counterparties and strangers to learn about the relevant rights.⁴⁵

A different rationale for the limited property menu relates to economies of scale in producing and comprehending law. For example, legal restrictions may be more easily built around identifiable tenure nodes.⁴⁶ There may be other network effects as well. For instance, prospective homebuyers may confront a more comprehensible risk environment when everyone in a given neighborhood shares the same tenure form.⁴⁷ Yet, even if we accept informational or network externalities as an argument favoring a limited menu, we would still want some account of why the particular entries on our current property menu are at least roughly the correct ones, both in number and content.

Other interventions into property configuration choices might be justified as attempts to improve or conserve opportunities for future reaggregation.⁴⁸ This rationale has been invoked as a potential explanation for everything from minimum lot sizes to the rule against perpetuities.⁴⁹ The issue of reconfiguration arises when there is a change over time in the optimal scale of resource use.⁵⁰ For example, land that at Time One was most valuable subdivided into townhouse-sized parcels might at Time Two be best suited to a large shopping center or an urban park. If a certain minimum scale is necessary for the new efficient use, even small shortfalls can have significant negative impacts on social value. Stephen Shmanske and Daniel Packey give the example

⁴⁵ Merrill & Smith, *supra* note 41, at 31-34. For a critique of this claim, see Glen O. Robinson, *Personal Property Servitudes*, 71 U. CHI. L. REV. 1449, 1484-88 (2004). See also Henry E. Smith, *Standardization in Property Law* (revisiting the standardization arguments with respect to third-party information costs), in RESEARCH HANDBOOK ON THE ECONOMICS OF PROPERTY LAW 148, 157-65 (Kenneth Ayotte & Henry E. Smith eds., 2011).

⁴⁶ See Davidson, *supra* note 42, at 1635, 1652-53 (observing that standardization carries potential benefits for producers of law to the extent that “categorization channels legal innovation and regulation” and each existing form “provides a relatively stable point of focus around which changes in meaning and content can be negotiated”).

⁴⁷ See Lee Anne Fennell, *Unbundling Risk*, 60 DUKE L.J. 1285, 1344-45 (2011).

⁴⁸ See, e.g., Michael A. Heller, *The Boundaries of Private Property*, 108 YALE L.J. 1163, 1173-82 (1999).

⁴⁹ See *id.* (examining how these limitations prevent “excessive fragmentation”).

⁵⁰ See, e.g., Abraham Bell & Gideon Parchomovsky, *Reconfiguring Property in Three Dimensions*, 75 U. CHI. L. REV. 1015, 1024 (2008) (“Aggregation and disaggregation of parcels in order to permit each use as it becomes most efficient is not an easy matter.”); Lee Anne Fennell, *Commons, Anticommons, Semicommons* (discussing the problem of shifts in efficient scale over time), in RESEARCH HANDBOOK ON THE ECONOMICS OF PROPERTY LAW, *supra* note 45, at 35, 48.

of a golf course that requires a minimum of ninety-one acres to be viable.⁵¹ If the golf course would be the best use of the land, but only ninety acres can be assembled, the land will be relegated to a lower-valued use, such as a park.⁵²

A change in the optimal scale of use can introduce a mismatch between the chunks in which property is supplied (by those who already hold it) and the chunks in which it is demanded. Here we see an interesting feature of real property that distinguishes it from many other products and services: it is supplied in packages and quantities that are determined solely by past patterns of ownership and use, and by the legal rules governing transfers.⁵³ The old maxim about real estate—“they aren’t making any more of it”⁵⁴—translates into a strong and important technological constraint on the ability of supply to adapt to current demand. All of the property available for use by future owners exists in the hands of current owners, each of whom holds a spatial monopoly. Although these spatial monopolies provide little leverage under most circumstances (close locational substitutes typically abound), they can produce well-known difficulties when individually owned parcels represent integral and complementary pieces of a much more valuable whole.⁵⁵

The question remains, however, whether and when the costs of restricting alienability (that is, keeping transacting parties from slicing entitlements as thinly and idiosyncratically as they desire) are outweighed by the prospect of easing future reconfiguration difficulties. The answer depends on a variety of factors, including the degree to

⁵¹ Shmanske & Packey, *supra* note 17, at 72.

⁵² *Id.* Obviously, we can imagine instances where a park, or even completely unused open space, would be more valuable than a golf course. The value of these uses, too, may similarly implicate lumpiness, as where a species’ habitat requires a certain size and configuration of contiguous land. See Jonathan Remy Nash, *Trading Species: A New Direction for Habitat Trading Programs*, 32 COLUM. J. ENVT. L. 1, 20-25 (2007) (describing how contiguity and shape factor into the habitat value of a tract).

⁵³ Cf. Larissa Katz, *Exclusion and Exclusivity in Property Law*, 58 U. TORONTO L.J. 275, 307-08 (2008) (“Pre-owned resources, and land in particular, bear the legal and physical imprint of the agendas set by prior owners.” (footnote omitted)).

⁵⁴ A variant of this aphorism has been attributed to Will Rogers. See PETER WOLF, *LAND IN AMERICA: ITS VALUE, USE, AND CONTROL* 6 (1981) (“Will Rogers advised the whole country: ‘Buy land. They ain’t making any more of the stuff.’”).

⁵⁵ See, e.g., Richard A. Epstein, *Justified Monopolies: Regulating Pharmaceuticals and Telecommunications*, 56 CASE W. RES. L. REV. 103, 108-09 (2005) (observing that a landowner’s monopoly is usually not problematic); Thomas W. Merrill, *The Economics of Public Use*, 72 CORNELL L. REV. 61, 75 (1986) (discussing assembly problems that can arise from property owners’ monopoly power).

which we can reliably predict the optimal scale of future uses,⁵⁶ the relative cost of coercive reconfiguration,⁵⁷ and the likely shape of the production functions through which particular configurations generate value.⁵⁸ For example, it typically will be unclear whether future efficient uses will require more aggregation or more disaggregation. Anticommons theorists focus their attention exclusively on the dangers of fragmentation and suggest that aggregation (or reaggregation) is far more difficult to achieve than disaggregation.⁵⁹ But if consolidated holdings implicate the interests of multiple stakeholders with either de facto or de jure vetoes, disaggregation may also prove difficult. For instance, holdout dynamics may block efforts to move property out of common ownership and into individual ownership.⁶⁰

There are many other complications that would benefit from scholarly attention. Imagine, for example, that a developer needs a contiguous eighty-five-acre parcel within an area containing one hundred acres. Will her chances of a private assembly be better if she faces five owners who each own twenty-acre lots, or one hundred owners who each own one-acre lots? It is impossible to be sure without more information,⁶¹ but we can say this much: each owner's contribution will

⁵⁶ See Larissa Katz, *Red Tape and Gridlock*, 23 CANADIAN J.L. & JURISPRUDENCE 99, 120-21 (2010) (arguing that Michael Heller's approach implicitly and incorrectly assumes that we can identify a resource's "ideal use" in advance and arrange property rights to achieve it).

⁵⁷ See *infra* Section II.C.

⁵⁸ See *supra* subsection I.A.1.

⁵⁹ See, e.g., Heller, *supra* note 48, at 1165-66 (positing that fragmentation "may operate as a one-way ratchet" that impedes recombination); Francesco Parisi, *Entropy in Property*, 50 AM. J. COMP. L. 595, 627 (2002) ("[S]ub-optimal fragmentation can be easily corrected ex post, while excessive fragmentation is likely to be irreversible . . .").

⁶⁰ See, e.g., CARL J. DAHLMAN, *THE OPEN FIELD SYSTEM AND BEYOND: A PROPERTY RIGHTS ANALYSIS OF AN ECONOMIC INSTITUTION* 187 (1980) (describing the potential holdout problem among opponents of enclosure and explaining how legislation addressed it); Carol M. Rose, *Evolution of Property Rights* (explaining how earlier stakeholders can impede the evolution of environmental regulation), in 2 *THE NEW PALGRAVE DICTIONARY OF ECONOMICS AND THE LAW* 93, 97 (Peter Newman ed., 1998); see also Fennell, *supra* note 50, at 45-46 (observing that holdout dynamics can beset moves from commons property to private property as well as moves in the opposite direction).

⁶¹ For example, we would need to know the degree to which contiguity is required or whether there are other constraints on the shape or configuration of the assembled parcels. These questions will determine the degree to which different parcels compete with each other and the degree to which the problem breaks down into one in which some smaller subset of parcels (such as those in the core of the configuration) exhibit perfect complementarity. See Scott Duke Kominers & E. Glen Weyl, *Holdout in the Assembly of Complements: A Problem for Market Design*, 102 AM. ECON. REV. (PAPERS & PROCS.) 360 (2012) (comparing assembly problems exhibiting perfect complementarity with

be critical in the case of twenty-acre holdings, whereas fifteen owners' contributions will be unnecessary where the pieces are smaller. Once we consider the possibility that production functions can vary depending on the size of the pieces in play, it is no longer self-evident that smaller holdings always perform less well on private aggregation tasks.

C. *Dividing and Aggregating*

When market transactions prove unequal to the task of shifting from one scale of use or form of ownership to another, the government may turn to coercive reconfiguration, as through eminent domain or partition.⁶² The doctrines surrounding these operations are, or should be, sensitive to the ways in which aggregations of entitlements may produce nonlinear lumps of value.

1. Eminent Domain

Property's lumpiness arises most saliently in the context of land assembly. Eminent domain routinely addresses situations where the whole is (or may be) greater than the sum of its parts. Sometimes this is dramatically so, as where a planned highway—much like a bridge—becomes close to useless if segments are missing. In other cases, having all the pieces of a particular contiguous holding would greatly increase the value of the entire holding, even if it would be possible to glean positive returns from an aggregation short of the whole. Relying on private transactions to assemble land is one alternative, and configuration rules may bear on the ease or difficulty of these transactions. But a core problem of monopoly power (holdouts), coupled with private information about reservation prices, can plague many attempted aggregations.⁶³ Thus, private efforts to reconfigure property—whether to achieve more efficient lumps or to break down inefficient lumps—may run aground due to strategic bargaining problems or other transaction costs.

Coercive overrides can solve this problem, but they carry costs of their own. Notably, it is often unclear *ex ante* whether an assembly is efficient or whether the property pieces are collectively more valuable in an unassembled state. Relying on private transactions largely rules

those that require all the components in one of several possible clusters, as well as with those that require one component from each of several clusters).

⁶² See, e.g., Bell & Parchomovsky, *supra* note 50, at 1049 (noting these and other examples of “forced aggregation or disaggregation”).

⁶³ See *supra* note 55 and accompanying text.

out inefficient assemblies,⁶⁴ but bargaining impasse may block efficient assemblies. Eminent domain and other coercive transfers solve the impasse problem but at the potential cost of allowing some inefficient assemblies to go forward. Explicitly recognizing lumpiness provides a basis for choosing between these alternatives. Where strict complementarities are present and all the parcels are essential to a valuable assembly, coercion may be the only way to overcome strategic holdout problems—even though there is some risk of an inefficient assembly. But where the complementarities are not strict and not all the components are essential, the bargaining dynamic changes in ways that can make coercion less justified.

Thus, lumpiness provides traction on the rationale for coercion and offers a reasoned basis for constructing functional limits on its use.⁶⁵ Significantly, however, the spatial aggregation facilitated by eminent domain may not be the only aggregation in the picture: there may also be temporal or community-based aggregations that will be disrupted if land is assembled involuntarily.⁶⁶ Differences in the respective production functions of these competing assemblies can also have a large impact on the need for, and impact of, coercive reconfigurations.⁶⁷

2. Regulatory Takings

Sometimes coercive aggregations occur not through condemnation of land but rather through regulatory action that seeks to achieve some consistent result across parcels or to otherwise employ existing property rights in pursuit of a collective goal. Some of the lumpiness-related points discussed in the context of exclusion reappear in regulatory takings doctrine. Consider *Loretto's* per se rule for permanent

⁶⁴ Private transactions could generate inefficient assemblies under some circumstances, as where the valuation of different parcel holders is interdependent and early sales transactions alter the value associated with the remaining parcels. See Gideon Parchomovsky & Peter Siegelman, *Selling Mayberry: Communities and Individuals in Law and Economics*, 92 CALIF. L. REV. 75, 119-24 (2004).

⁶⁵ See Merrill, *supra* note 55, at 72-93 (analyzing eminent domain as a means for overcoming impediments to private bargains); see also *infra* Section IV.C.

⁶⁶ See, e.g., Parchomovsky & Siegelman, *supra* note 64, at 113-19 (discussing positive “community externalities” that stem from keeping a community intact). Takings are not the only way that these community aggregations can be disrupted. For example, a developer who acquires a subset of the community through voluntary sales transactions can also break up social networks and interfere with the provision of “lumpy” local goods, thereby potentially inducing the rest of the community to sell as well. See *id.* at 119-24.

⁶⁷ See *infra* Section IV.C.

physical encroachments, no matter how small.⁶⁸ This rule deepens the discontinuity in legal results at the property's boundary by treating even trivial physical incursions as takings for which just compensation must be paid,⁶⁹ while allowing more severe financial impacts associated with regulatory changes to go uncompensated.⁷⁰

Another important line in takings law proceeds from the premise that losing *all* of some particular interest is a more severe interference than losing *part* of the value of an interest—even if the dollar value of the interference is much larger in the latter situation. This idea appears in *Lucas*'s per se rule, which holds that regulations that remove all economically viable use will always constitute takings except where those regulations reflect background restrictions on title.⁷¹ It also surfaces in the Supreme Court's invocation of "distinct investment-backed expectations" in the *Penn Central* test.⁷² And the same "all versus some" distinction features in the Court's refusal to "conceptually sever"⁷³ time slices in *Tahoe-Sierra*⁷⁴ and air rights in *Penn Central*.⁷⁵

⁶⁸ See *Loretto v. Teleprompter Manhattan CATV Corp.*, 458 U.S. 419, 438 (1982) (finding a cable company's legislatively authorized installation of "plates, boxes, wires, bolts and screws" on an apartment building to be a taking).

⁶⁹ The argument from lumpiness might be taken even further: given complementarities, paying for the encroachment alone may be undercompensatory. A more protective rule might force the government to choose between taking nothing and taking a larger chunk than it might otherwise elect (and compensating for it). See Bell & Parchomovsky, *supra* note 50, at 1064-65 (observing that an "asset-oriented perspective" would argue against a "minimalist" approach of taking as little through eminent domain as possible).

⁷⁰ See e.g., Richard A. Epstein, *The Seven Deadly Sins of Takings Law: The Dissents in Lucas v. South Carolina Coastal Council*, 26 LOY. L.A. L. REV. 955, 957-59 (1993) (criticizing the distinction that takings law draws between physical impositions and reductions in value).

⁷¹ *Lucas v. S.C. Coastal Council*, 505 U.S. 1003, 1027 (1992).

⁷² *Penn Cent. Transp. Co. v. New York City*, 438 U.S. 104, 124 (1978) (citation omitted); see also *Lingle v. Chevron U.S.A. Inc.*, 544 U.S. 528, 538-39 (2005) (quoting *Penn Central*, 438 U.S. at 124). The phrase was based on Frank Michelman's notion of a "distinctly perceived, sharply crystallized, investment-backed expectation." Frank I. Michelman, *Property, Utility, and Fairness: Comments on the Ethical Foundations of "Just Compensation" Law*, 80 HARV. L. REV. 1165, 1233 (1967).

⁷³ See Margaret Jane Radin, *The Liberal Conception of Property: Cross Currents in the Jurisprudence of Takings*, 88 COLUM. L. REV. 1667, 1674-79 (1998) (coining the term "conceptual severance" and tracing the concept's use in the Supreme Court's takings jurisprudence). If litigants were allowed to slice up their interests in property conceptually, any regulatory encroachment could be treated as the elimination of "all" of the interest that was regulated away. See *id.*

⁷⁴ *Tahoe-Sierra Pres. Council, Inc. v. Tahoe Reg'l Planning Agency*, 535 U.S. 302, 331 (2002) ("Petitioners' 'conceptual severance' argument is unavailing because it

Initially, this distinction might seem to be in tension with a notion of lumpiness and with my suggestion above that physical encroachments are problematic precisely because they break open a unified whole. Note, however, that the all-versus-some distinction is not applied in contexts where there has been a permanent physical encroachment, but rather where there has been an interference with one or more ways of deriving value from property. Such an interference is arguably more analogous to a stock losing value than to a capsule breaking open.⁷⁶

Indeed, current regulatory takings doctrine seems almost to assume a form of reverse lumpiness in which losses scarcely register until one has lost almost the whole thing—or at least *some* whole thing. Unlike a bridge that stops generating value after the first major part is removed, property, on this view, is more like a tank of gas that can generate excellent value even when it is significantly depleted. Pushing the analogy further, compare the effects of gasoline siphoning on family *A*, whose large vehicle has half its thirty-gallon tank drained away, and on family *B*, that owns three identical vehicles with ten-gallon tanks, one of which is drained entirely. While *A* suffers a greater loss in absolute terms (fifteen gallons rather than ten gallons), *B* loses more in vehicular functionality.

Whether or not property should be viewed in these terms is open to question. As Frank Michelman has observed, there may be something psychologically salient and especially demoralizing about losing an entire thing due to government action.⁷⁷ That reaction might be a product of the binary way that objects tend to be acquired—all at

ignores *Penn Central*'s admonition that in regulatory takings cases we must focus on 'the parcel as a whole.'" (quoting *Penn Central*, 438 U.S. at 130-31)).

⁷⁵ *Penn Central*, 438 U.S. at 130 ("Taking' jurisprudence does not divide a single parcel into discrete segments and attempt to determine whether rights in a particular segment have been entirely abrogated.").

⁷⁶ This observation raises the question of why governmentally imposed losses in value do not *always* count as takings, an inquiry that relates conceptually to the literature on the line between taxes and takings. See, e.g., Amnon Lehari, *The Taking/Taxing Taxonomy*, 88 TEX. L. REV. 1235, 1257-62 (2010) (emphasizing American property law's differential treatment of governmental acts that reduce value and those that interfere with exclusion or other core property rights). For a novel discontinuity-based argument for the distinction (albeit one that would require some changes in current takings doctrine), see Eric Kades, *Drawing the Line Between Taxes and Takings: The Continuous Burdens Principle, and Its Broader Application*, 97 NW. U. L. REV. 189, 223-56 (2002).

⁷⁷ See Michelman, *supra* note 72, at 1233-34 (noting this possibility, but recognizing that the assumptions underlying it "are surely debatable").

once, rather than through a process of slow accretion.⁷⁸ If people tend to think in all-or-nothing lumps as a result of acquisition protocols, then they might also be inclined to think in all-or-nothing terms when it comes to losing value. The question remains, however, whether this is simply a psychological artifact that proves misleading in the takings realm, or whether it tracks onto something meaningful about how people experience—or produce value from—property.⁷⁹

Another potential rationale for the “discrete twig”⁸⁰ approach to takings law might lie in production cost discontinuities—here, the cost of regulating without placing disproportionate burdens on owners. Michelman’s notion of settlement costs bears on this point.⁸¹ If screening for and settling up over the loss of a discrete thing is relatively cheap, this could explain the law’s introduction of a discontinuity at the point of complete loss.

3. Judicial Takings

The Supreme Court’s recent decision in *Stop the Beach Renourishment*⁸² has drawn new attention to the possibility that a court-initiated change in property law could amount to a compensable taking. Some commentators worry that such a judicial takings doctrine might hamper courts in carrying out the usual business of adjudication and thereby impair the organic development of the common law.⁸³ In the

⁷⁸ Adverse possession and prescriptive claims are notable exceptions. There are also a variety of lease-to-own and installment purchase arrangements that spread acquisition over time.

⁷⁹ For discussion on perceptions of property and the extent to which those perceptions are manipulable, see, for example, Jonathan Remy Nash, *Packaging Property: The Effect of Paradigmatic Framing of Property Rights*, 83 TUL. L. REV. 691, 715-24 (2009), and Jonathan Remy Nash & Stephanie M. Stern, *Property Frames*, 87 WASH. U. L. REV. 449, 479-84 (2010).

⁸⁰ Michelman, *supra* note 72, at 1233-34.

⁸¹ *See id.* at 1214 (defining “settlement costs” as the “time, effort, and resources” necessary “to reach compensation settlements adequate to avoid demoralization costs”); *see also id.* at 1234 (describing as “probably true” the proposition that such “specially painful” deprivations of a discrete thing “can usually be identified by compensation tribunals with relative ease”).

⁸² *Stop the Beach Renourishment, Inc. v. Fla. Dep’t of Envtl. Prot.*, 130 S. Ct. 2592 (2010). All eight participating justices agreed that the Florida Supreme Court’s rejection of a challenge to a beach restoration project did not constitute a taking. *Id.* at 2610-13. However, a four-justice plurality endorsed the idea of a judicial taking. *See id.* at 2601-02.

⁸³ *See, e.g.,* Stacey L. Dogan & Ernest A. Young, *Judicial Takings and Collateral Attack on State Court Property Decisions*, 6 DUKE J. CONST. L. & PUB. POL’Y 107, 112-13 (2011) (expressing concern that a judicial takings doctrine could “chill the process of common-

search for limiting principles to address this concern, the notion of lumpiness might well play a role.

Consider again the recurring theme in takings law that losing a discrete thing is a more severe interference than losing a portion of a thing's value, and hence more likely to be considered a taking. Transplanted into the judicial realm, this principle would seem to offer little insulation against the threat to common law adjudication. After all, many property disputes involve some discrete interest, such as an easement, a chattel, or even an estate in land. But examining lumpiness on the other side of the transaction provides a potential limiting principle. In virtually all regulatory takings committed by political actors, the thing taken from the owner is not just shifted to someone else, but rather is combined with interests taken from other owners to form a larger assemblage of entitlements. Just as eminent domain can explicitly generate an assembly surplus by putting together parcels of land, regulatory action generates surplus through regulatory assemblages, whether a path along a beach, a conservation goal, or a uniform plan for the preservation of landmarks.

By contrast, most adjudicated property disputes boil down to, "Who owns this twig?" Regardless of the case's outcome, the disputed interest will remain a twig. In rare instances, though, a judicial decision could have the effect of assembling many property interests together to achieve a larger goal. For example, a court might change beach-access rights and thereby effectively construct a new easement across the property of many landowners. Such an exercise more closely resembles the acts of eminent domain undertaken by the political branches and looks less like ordinary dispute resolution.⁸⁴ The pursuit of regulatory or spatial lumps might thus be used to help pour content into an emerging judicial takings doctrine.⁸⁵

law decisionmaking"); Timothy M. Mulvaney, *The New Judicial Takings Construct*, 120 YALE L.J. ONLINE 247, 265-66 (2011) (contending that the plurality's view of judicial takings is inconsistent with an "evolutionary view of the law").

⁸⁴ See Joseph L. Sax, *Takings and the Police Power*, 74 YALE L.J. 36, 62 (1965) (making an analogous distinction "between the role of government as participant and the government as mediator in the process of competition among economic claims"); cf. Thomas W. Merrill, *Why Lingle Is Half Right*, 11 VT. J. ENVTL. L. 421, 424-28 (2010) (describing a "boundary maintenance" approach to regulatory takings that compares how much a given regulatory act resembles eminent domain with how much the act resembles an exercise of the police power).

⁸⁵ The normative question of whether a judicial takings doctrine should be recognized at all is one I do not address here.

4. Ordinary Adjudication

Despite occasional results like the one in *Popov v. Hayashi*, which split ownership of a home-run baseball,⁸⁶ property law usually delivers all-or-nothing outcomes.⁸⁷ Does the lumpy character of these decisions match some underlying feature of the way utility is thought to map onto property, or is there something about the process of producing results that creates pressure toward lumpy outcomes? The questions are empirical ones, but both suppositions could play a role. Land and other things may be much more valuable when kept physically and temporally intact, and high transaction costs might impede reuniting the whole after pieces are dispersed among litigants. A system that dispenses lumpy outcomes may also be cheaper to administer. The party with the weaker claim to an asset cannot gain leverage by winning a fractional share, and courts need not parse the relative strength of claims falling short of the level necessary to win a case.⁸⁸

The treatment of cotenants' interests in partition cases offers an interesting window into the lumpiness of property adjudication, precisely because the concurrent interests of the parties preclude an entirely all-or-nothing outcome. Although traditionally preferred, partition in kind (physically dividing the land) is much less common than partition by sale (keeping the land intact but dividing the sales proceeds).⁸⁹ The widespread use of partition by sale, and the rationales underlying it, map onto notions of spatial lumpiness. Where physically dividing the land would render it less valuable, courts will often order a partition by sale instead.⁹⁰ What, then, could account for the historical preference for partition in kind? Temporal lumpiness may offer

⁸⁶ No. 400545, 2002 WL 31833731, at *8 (Cal. Super. Ct. Dec. 18, 2002); see also R.H. Helmholz, *Equitable Division and the Law of Finders*, 52 FORDHAM L. REV. 313, 322-27 (1983) (assessing the prospects for equitable division in the law of finding and noting examples of its limited use in cases involving joint finders).

⁸⁷ See, e.g., JESSE DUKEMINIER ET AL., PROPERTY 113 (7th ed. 2010) (noting that property law "awards a finder all or nothing, subject to the rights of the true owner"); see also LEO KATZ, WHY THE LAW IS SO PERVERSE 139-55 (2011) (noting the prevalence of "either/or" results in law and discussing possible explanations and related challenges).

⁸⁸ To be sure, most property cases settle rather than go to trial, thereby producing what amounts to split outcomes on the ground. Nonetheless, the parties bargain in the shadow of the courts' all-or-nothing propensities.

⁸⁹ See DUKEMINIER ET AL., *supra* note 87, at 343.

⁹⁰ See, e.g., *Johnson v. Hendrickson*, 24 N.W.2d 914, 916 (S.D. 1946) (reading a statute to permit partition by sale "if it appears to the satisfaction of the court that the value of the land when divided into parcels is substantially less than its value when owned by one person").

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an answer. For example, an elderly cotenant who has resided on a parcel throughout her whole life may experience an extraordinarily sharp discontinuity in utility between being allowed to stay there until the end of her life and being ousted even a day before her death.⁹¹ To return to a metaphor introduced earlier, partition must break open the capsule of property, either spatially or temporally; the question is which of the two is less costly.

III. LUMPINESS AND PROPERTY THEORY

The doctrinal lumpiness in property law described above carries important implications for property theory. The following sections show how lumpiness bears on two current theoretical debates: the status of the bundle-of-sticks metaphor and the tension between exclusion and social obligation.

A. *Bundles and Sticks*

The idea of property as a “bundle of sticks” or “bundle of rights” has been associated with the work of the Legal Realists, and, more recently, the law and economics movement.⁹² The metaphor has come under sustained attack for its alleged implicit suggestion that property lacks a stable core and comprises nothing more than a loosely assembled and

⁹¹ A similar rationale seems to have been in play in *Delfino v. Vealencis*, a Connecticut case in which the court ordered partition in kind. See 436 A.2d 27, 33 (Conn. 1980) (“[O]ne of the tenants in common has been in actual and exclusive possession of a portion of the property for a substantial period of time; . . . has made her home on the property; . . . [and] derives her livelihood from the operation of a business on this portion of the property, as her family before her has for many years.”); see also *Ark Land Co. v. Harper*, 599 S.E.2d 754, 761 (W. Va. 2004) (holding that the economic value of the property alone is not dispositive and that “[e]vidence of longstanding ownership, coupled with sentimental or emotional interests in the property, may also be considered in deciding whether the interests of the party opposing the sale will be prejudiced by the property’s sale”).

⁹² 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) (discussing the role of the bundle-of-rights model in the thinking of the Legal Realists and law and economics scholars); see also Daniel B. Klein & John Robinson, *Property: A Bundle of Rights? Prologue to the Property Symposium*, 8 ECON.J. WATCH 193, 194-201 (2011) (compiling views on the bundle-of-rights conceptualization of property). The metaphor of a “bundle of sticks” stands for the same idea as the “bundle of rights” and is “an only slightly less popular” formulation. Robert C. Ellickson, *Two Cheers for the Bundle-of-Sticks Metaphor, Three Cheers for Merrill and Smith*, 8 ECON.J. WATCH 215, 215 (2011).

endlessly disaggregable pile of use rights.⁹³ Both the defenders and the critics of the bundle approach have a point—and that point, I suggest, boils down to lumpiness. The bundle metaphor may be criticized for paying too little attention to within-property-holding complementarities. But the vision of property as an indivisible lump ignores a competing set of complementarities—those that are, or might be, made up of rights ceded from a number of property owners. What neither model offers is what property theory needs most: a way to weigh these two sets of conflicting complementarities against each other.

The question of whether property is (or should be treated as) an indivisible lump has played a prominent, if not always fully articulated, role in the bundle-of-rights debates.⁹⁴ Robert Ellickson captures the possibility that property might be a step good when he suggests that Michael Heller might analogize rights in property to cards in a deck—a package of complementary elements that becomes virtually worthless (at least for playing card games) if even one is missing.⁹⁵ But is property really a step good constructed of such strongly complementary elements that removing one will drastically deplete its value? One difficulty lies in figuring out exactly what the sticks in the bundle represent.⁹⁶

Sometimes the sticks are described as use rights, with different twigs representing, say, the right to build a house, to emit smoke, to grow tall trees, to play pinochle, to turn somersaults on the lawn, and so on.⁹⁷ At other times, the sticks are described as different facets of the ownership interest, so that twigs represent the right to alienate, to devise, to destroy, to use, and to exclude,⁹⁸ or as the Hohfeldian units

⁹³ See, e.g., Henry E. Smith, *Property is Not Just a Bundle of Rights*, 8 ECON J. WATCH 279, 281-87 (2011). Other scholars have attacked the metaphor based on different sets of concerns. See, e.g., Jeanne L. Schroeder, *Chix Nix Bundle-o-Stix: A Feminist Critique of the Disaggregation of Property*, 93 MICH. L. REV. 239 (1994).

⁹⁴ The state of play can be inferred from a recent symposium devoted entirely to the bundle-of-rights metaphor. Symposium, *Property: A Bundle of Rights?*, 8 ECON J. WATCH 193 (2011), <http://econjwatch.org/issues/volume-8-issue-3-september-2011>.

⁹⁵ Ellickson, *supra* note 92, at 218.

⁹⁶ For discussion of the many ways the bundle metaphor might be understood, see generally J.E. Penner, *The “Bundle of Rights” Picture of Property*, 43 UCLA L. REV. 711 (1996). Merrill flags a related problem in interpreting the Supreme Court’s use of the metaphor: “how to distinguish between a horizontal stick and a lateral chop” through every stick, where only the latter is understood to be a compensable taking. Thomas W. Merrill, *The Property Prism*, 8 ECON J. WATCH 247, 248 (2011).

⁹⁷ See Penner, *supra* note 96, at 734.

⁹⁸ See TONY HONORÉ, *Ownership* (enumerating eleven “standard incidents of ownership”), in MAKING LAW BIND: ESSAYS LEGAL AND PHILOSOPHICAL 161, 165-66 (1987).

into which these incidents of ownership might be subdivided.⁹⁹ The sticks might be also thought to stand for the interests into which a fee estate might be disaggregated, such as leaseholds, life estates, and easements.¹⁰⁰ They might even be understood to represent rights against all the other people in the world, so that the twigs might be property rights enforceable against Paul, property rights enforceable against Kita, property rights enforceable against Oswald, and so on until the name of every person on the planet has been listed, save the owner's.¹⁰¹ And, of course, all these elements can be combined in innumerable ways (the right to sell pinochle-playing rights to Alex, the right to exclude Josephine from the front lawn on Tuesdays, the right to emit smoke in the direction of Tess when the wind blows from the southwest, and so on) to create a very large bundle of very small sticks.¹⁰²

Viewed at this level of specificity, it seems absurd to suggest that removing one element would always, or even very often, render property valueless. On the contrary, owners transact over these rights (and much larger ones) all the time without ceasing to be owners. However, a weaker but more convincing claim can be made about agglomeration effects among rights that keep aggregation and disaggregation from being a zero sum game.¹⁰³ There is also an information story in play: it may be impossible for a nonowner or governmental entity to ascertain the effects of removing a given twig of value, based on an analysis of that twig alone. This observation fits with the idea that property is designed to group together complementary elements in ways that are intentionally opaque to outsiders and that make inquiry into the interrelationship among the elements unnecessary.¹⁰⁴

But the argument from complementarity proves too much. In a complex society, complementarities exist both within and between

⁹⁹ See Penner, *supra* note 96, at 724-38 (examining the relationship between Hohfeld and Honoré's work and the bundle-of-rights view of property (citing WESLEY NEWCOMB HOHFELD, *FUNDAMENTAL LEGAL CONCEPTIONS AS APPLIED IN JUDICIAL REASONING AND OTHER LEGAL ESSAYS* (Walter Wheeler Cook ed., 1923))).

¹⁰⁰ See, e.g., Ellickson, *supra* note 92, at 216-17.

¹⁰¹ See Penner, *supra* note 96, at 758 ("The disaggregative bundle of rights thesis logically entails that an owner of a piece of property holds the rights that every person could conceivably have to use that particular thing . . .").

¹⁰² See *id.* ("[I]t boggles the mind to suppose that [the bundle] includes actual rights permitting everyone else to do everything with the property, each of which can be transferred to the proper person at will.").

¹⁰³ See Ellickson, *supra* note 92, at 217-18 (emphasizing the importance of "agglomeration effects" in property holdings); Smith, *supra* note 93, at 286 ("[A]dding or subtracting a stick to the bundle affects the rest of the sticks.").

¹⁰⁴ See *supra* note 31 and accompanying text.

owners' holdings. The bundle-of-rights image of property, with its general inattention to the power of aggregation, offers no way to test the strength of within- and between-property complementarities. But, importantly, neither does an exclusion-based vision of property. While treating property as a lumpy and irreducible whole does protect within-property complementarities, it neglects potential complementarities among separately owned elements. Because those between-property complementarities also matter, property cannot operate as a domain of categorical exclusion. And indeed, it does not so operate: incursions into owners' prerogatives occur regularly.¹⁰⁵ What is needed, and what existing accounts of property lack, is a way to gain analytical traction on the choices that must be made among competing aggregations.

Another facet of the debate between critics and defenders of the bundle metaphor relates to the mutability and social contingency of property packages. Suppose we accept that certain entitlement packages currently tend to be more valuable for participants in a property system. We would then want to know whether these configurations hold greater value due to some underlying fact of the matter. Indeed, we might go further and ask whether property has some inherent pre-political or natural unity that, even if it is later splintered, retains a recognizable form.¹⁰⁶ Or are lumps largely of our own making? If the strong complementarity that makes us draw property lines *here* and not *there* is contingent on social, cultural, and technological factors, rebundling may become necessary as conditions change. Recognizing property as a bundle makes the enterprise of rebundling easier to contemplate and accomplish—for better or worse.¹⁰⁷

¹⁰⁵ See GREGORY S. ALEXANDER & EDUARDO M. PEÑALVER, AN INTRODUCTION TO PROPERTY THEORY 140 (2012) (describing the right to exclude as “pock-marked . . . with exceptions”).

¹⁰⁶ Carol Rose’s metaphor for property protected by a property rule—“the whole meatball”—raises similar questions. Carol M. Rose, *The Shadow of The Cathedral*, 106 YALE L.J. 2175, 2178-79 (1997).

¹⁰⁷ See Nash & Stern, *supra* note 79, at 484 (finding that the bundle metaphor eased the reframing of property rights). For some bundle critics, that very ease of rebundling is cause for concern, and an independent reason to oppose the bundle metaphor. See, e.g., Klein & Robinson, *supra* note 92, at 195 (“Characterizing property as a ‘bundle of rights’ would make government intervention, not the violating of property, but rather the rearranging or redefining of the bundle.”). But see Richard A. Epstein, *Bundle-of-Rights Theory as a Bulwark Against Statist Conceptions of Private Property*, 8 ECON J. WATCH 223, 233 (2011) (“[T]he correct view under the bundle-of-rights theory is that the state pays for what it takes, no matter how many sticks of the original bundle the owner retains.”).

B. *Exclusion, Obligation, Aggregation*

Positioning itself in opposition to economic or welfarist accounts of property, a “progressive property” school has recently emerged to argue that property should be informed by a wider range of human values, including virtue, social obligation, and democracy.¹⁰⁸ Among other things, proponents of this approach have questioned the prominence of exclusion in current understandings of property.¹⁰⁹ These arguments have been met with predictable pushback from scholars who view exclusion as a core, defining feature of property.¹¹⁰ These disagreements can be usefully reframed as debates over competing indivisibilities.

Consider again the exclusion theorists’ objection to the bundle-of-sticks metaphor on the ground that it is insufficiently sensitive to the complementarities embedded in individual property holdings. Their approach takes as a given the blocky chunks of control that property has historically given owners. Interfering with what seems to be a minor twig, we are warned, could upend the owner’s plans and projects in ways we cannot foresee. The point resonates: who are we to decide what rights the owner can and cannot do without, or to predict the intricate and subtle interweaving of entitlements that lies inside the owner’s block of control? Yet those same blocks of control can quietly preclude the assembly of larger-scale sets of rights that might be interwoven in much the same way. If we began with a particular community-owned assembly of rights in place, the same “take a twig, ruin the whole” argument could cut against conferring the rights in question on individual owners. The notion of complementarities is a robust

¹⁰⁸ See, e.g., Gregory S. Alexander, *Pluralism and Property*, 80 *FORDHAM L. REV.* 1017, 1023-24 (2011) (explaining that for social obligation theorists, property ownership involves both rights against others and duties to others); Gregory S. Alexander et al., *A Statement of Progressive Property*, 94 *CORNELL L. REV.* 743, 743-44 (2009) (maintaining that property serves a broad and incommensurable set of human values). For a helpful overview and critique of different strands within the movement, see Ezra Rosser, Essay, *The Ambition and Transformative Potential of Progressive Property*, 101 *CALIF. L. REV.* (forthcoming 2013) (manuscript at 11-21), available at <http://ssrn.com/abstract=2018030>.

¹⁰⁹ See, e.g., Alexander, *supra* note 108, at 1023 (explaining that social obligation theorists resist the view that property has exclusion at its core); Rosser, *supra* note 108, at 41 (“A call for a reconsideration of the centrality of the right to exclude in property law is perhaps the dominant theme of progressive property scholarship.”).

¹¹⁰ See, e.g., Henry E. Smith, Response, *Mind the Gap: The Indirect Relation Between Ends and Means in American Property Law*, 94 *CORNELL L. REV.* 959, 963-64 (2009) (noting the advantages of “the basic exclusion mechanism” while acknowledging that exclusion “does not always have the last word”).

one, but it is double-edged in the property context: private property can both block and embody complementarities.

The fact that discontinuities and complementarities often stand on both sides of an interaction presents real challenges for property law. Households may get disproportionate amounts of utility from having unlimited tenure (even if they do not actually stay forever), yet truncating tenure (and hence breaking up one valuable lump) can be instrumental in forming valuable spatial lumps, as through eminent domain. Similarly, partition in kind facilitates lumpiness in one direction (time of tenure) but disrupts it in another (space). If aggregating on one dimension means splintering along another, we might ask whether lumpiness on one or the other of these dimensions should get more deference, and why. And here, different property theorists have come up with different answers.

The progressive property movement urges greater attention to the value of collective social, cultural, distributive, and deliberative projects that require the aggregate participation of owners. Exclusion theorists focus instead on the parcel or thing itself as a lump. The tension between these approaches can be seen in debates over exclusion rights. There is consensus on some matters: once an owner opens her gate to allow in the general public, she cannot then turn around and exclude segments of the public based on protected characteristics.¹¹¹ But questions remain about the extent to which an owner should be able to open her gate in owner-specified degrees. The lumpiness of broader normative commitments of society is implicated in these debates. To take the uncontested case, if uniform application of antidiscrimination norms across communities is necessary to successfully advance equality, then allowing owners to parcel out access rights just as they please would interfere with that aggregation.¹¹² More controversial examples involve the interplay between private property rights and societal patterns of affordable housing, the rights of tenants, and access to beaches and other natural resources.

¹¹¹ See Joseph William Singer, *No Right To Exclude: Public Accommodations and Private Property*, 90 NW. U. L. REV. 1283, 1457-58 (1996) (presenting a view of public accommodations as “a form of property ownership that has limitations on the right to exclude built into it”).

¹¹² Analogous points have been raised in the context of applying subsidiarity principles to natural resources. See Graham Marshall, *Nesting, Subsidiarity, and Community-Based Environmental Governance Beyond the Local Level*, 2 INT’L J. COMMONS 75, 78 (2008) (noting that higher levels of government are required to solve some problems, including discrimination).

No doubt progressive property scholars would resist my attempt to boil down all of property's core debates to a question of production functions and nonlinearities.¹¹³ Yet putting things in those terms offers a way for proponents of different approaches to understand one another's concerns. It may seem simple for an owner to give up part of what she has in the name of social obligation, but if having "nearly all" is dramatically less valuable than having "all," her resistance can be better understood. Likewise, if a given social obligation is viewed as part of an aggregation that may be difficult to achieve through uncoordinated action, the interest in achieving it coercively, through a reconceptualization of property, may resonate with law and economics scholars.

Few would now dispute the normative correctness of the law's choice to accommodate airplane travel by overriding landowners' hard exclusion rights above a certain height.¹¹⁴ Likewise, the law's commitment to enforcing antidiscrimination norms against private landowners¹¹⁵ has won widespread acceptance. Other aggregation projects may be more controversial than these ever were, and the tradeoffs against the landowner's aggregation of property interests may be quite sharp. But framing these tradeoffs in terms of nonlinearities will help to center the debate in a more analytically useful place.¹¹⁶

IV. LEARNING FROM LUMPINESS

The issues of lumpiness raised in this Article interact with fundamental questions about choice and coercion in property arrangements. Viewing these problems through the lens of lumpiness offers useful analytic guidance.

¹¹³ Nonetheless, it is interesting indeed that Gregory Alexander, one of the primary proponents of the "progressive" or "social obligation" school of property, has recently invoked Charles Taylor's notion of "complementarity"—among aspects of an individual's life—in discussing a pluralistic, social obligation vision of property. See Alexander, *supra* note 108, at 1046-49 (citing Charles Taylor, *Leading a Life*, in *INCOMMENSURABILITY, INCOMPARABILITY, AND PRACTICAL REASON* 170, 178-82 (Ruth Chang ed., 1997)).

¹¹⁴ See, e.g., STUART BANNER, *WHO OWNS THE SKY? THE STRUGGLE TO CONTROL AIRSPACE FROM THE WRIGHT BROTHERS ON* 296 (2008) ("In the end, every country in the world settled on the same basic rules. Everywhere the government was sovereign over the airspace, and the property rights of landowners ended where planes flew.").

¹¹⁵ For example, the federal Fair Housing Act prohibits both public and private actors from discriminating along protected dimensions in providing access to housing. 42 U.S.C. §§ 3601-3619 (2006).

¹¹⁶ See *infra* Section IV.C (discussing choices among lumps).

A. Empty and Constructed Lumps

This Article has emphasized that many property doctrines are descriptively lumpy. It is a separate question, however, whether the legally constructed discontinuities track underlying indivisibilities in consumption or production. Doctrines that make property law chunky may create or entrench a lumpiness that would not otherwise be present, or they may sustain a lumpiness that is no longer congruent with the way property is produced or consumed. Where this is the case, we should at least consider the possibility of “unchunking” certain aspects of property law.¹¹⁷

It is easy to appreciate the potential costs of such a move, in confusion, complexity, destabilization of expectations, administrative toil, and overall hassle. But there are costs on the other side as well. Lumps are not always valuable, or even benign: not only can they rule out choices that some parties value highly, they can also keep society from gathering information about preferences for interstitial goods. Some doctrinal lumps make societal choices less than optimally sensitive to behavioral inputs, while others can misdirect coercive force. Even those who view the current configuration of property rights as nearly ideal should be concerned with identifying features of the status quo that make property’s lumpy architecture sensible and understanding how changes in empirical conditions would render that configuration less sensible.

A central problem is that we often lack information about private valuations of elements in various property packages, and have little idea how that value grows or shrinks as a function of the aggregation or disaggregation of entitlements. One approach would involve finding ways to let owners and nonowners supply credible information on the question of complementarity. Indeed, I have argued elsewhere that the law could be involved in providing platforms for eliciting just this sort of information.¹¹⁸ Given the degree to which property’s value as a social institution depends on getting aggregations right, we should

¹¹⁷ Proposals to “continuize” the law have been advanced in a variety of doctrinal areas. See KATZ, *supra* note 87, at 145-51. The unchunking I refer to here bears a family resemblance to proposals that attempt to break down doctrinal notches or cliffs in an effort to make law more responsive to an underlying continuous variable, such as degrees of certainty or culpability. See *id.*

¹¹⁸ See, e.g., Lee Anne Fennell, *Property and Precaution*, 4 J. TORT L., no. 2, 2011 at 1, 4 (proposing an option system that would induce low-valuing holders of certain entitlements to self-identify).

be interested in finding mechanisms that can improve its performance on this dimension.

We may also wonder to what degree the law itself—and its various decisions to entrench, accommodate, or ignore certain concerns—encourages people to recognize and value certain lumps *as* lumps.¹¹⁹ For example, does the legal enforcement of discontinuities at the property's edges entrench a notion of property as an inviolable thing? If so, does this entrenchment make property lines more focal for owners than they otherwise would be, hardening the parcel-as-lump in ways that make larger aggregations more difficult and costly?¹²⁰ The possibility that law is not merely responding to, but also shaping, the chunks in which property delivers utility interestingly complicates questions of applying coercion in defense or pursuit of lumps, or of choosing between lumps of value.

B. *Compelling Lumps*

Lumpiness usually goes unnoticed. We buy tires for our cars in sets of four, shoes in sets of two, and complete rather than partial houses, all without remarking on the complementarities or indivisibilities involved. When and why must the law get involved?

The literature on the production of lumpy public goods offers a starting point for answering these questions.¹²¹ If we need everyone to contribute a bridge segment in order to span a gap, then it becomes necessary to coordinate behavior. Depending on the number of contributors, the number of necessary segments, and the associated individual and group payoffs, the collective action problem may take any number of forms.¹²² Such collective action problems are not unique to lumpy goods, although the step nature of the bridge does change the nature of the strategic interaction.¹²³ The potential sticking point is

¹¹⁹ See, e.g., Steven R. Munzer, *A Bundle Theorist Holds On to His Collection of Sticks*, 8 *ECON J. WATCH* 265, 268-69 (2011) (critiquing Merrill and Smith's account of property as "discrete assets" on the grounds that it "encompasses only valued resources that a given legal system and a given community of economic actors already recognize").

¹²⁰ See generally Nash & Stern, *supra* note 79.

¹²¹ For analyses of the collective action problems surrounding the production of lumpy public goods, see HARDIN, *supra* note 1, at 55-61, and Hampton, *supra* note 6, at 247-250.

¹²² See, e.g., Taylor & Ward, *supra* note 5, at 353-54.

¹²³ See, e.g., LEVI, *supra* note 10, at 57 ("[L]umpy goods certainly affect individual strategy."); Hampton, *supra* note 6, at 259-72 (examining the different strategic interactions associated with step goods and incremental goods). Public goods with more linear qualities (such as landscaping that may be added to a public thoroughfare in any

that many of the benefits of individual contributions will be externalized to the rest of the group if the bridge is (within the relevant group) nonrival and nonexcludable.¹²⁴ Public provision is not invariably required in such cases,¹²⁵ but the collective action problems associated with public goods provide a familiar rationale for coercion.¹²⁶

Suppose instead that we have a private party who is ready to construct a toll bridge and who needs only to buy segments from the various individuals holding them. This party may also face a problem that requires compulsion. If all the bridge segments are necessary, unique, and unavailable other than from the specific individuals who now hold them, there may be a severe holdout problem. If, instead, there are n segment-holders and $n - 1$ necessary segments, the problem is eased considerably. Indeed, each owner might hurry to avoid being the one whose segment is left out of the assembly rather than strive to be the last holdout, especially if the bridge segments hold little intrinsic value for their owners.¹²⁷ Thus, compulsion may be unnecessary even when goods are lumpy, if there is some degree of competition among input-

amount) generate somewhat different collective action problems. A linear production function will often produce a Prisoner's Dilemma in which each party will prefer not to contribute, regardless of what everyone else does. An exception to this rule applies if each person's contribution generates marginal returns that are so large that the person herself is made better off even if nobody else contributes. See Oliver et al., *supra* note 11, at 533-34 (explaining that, depending on the slope, a linear production function will induce every player to "contribute either everything possible or nothing"); Fennell, *supra* note 11, at 956-58 (discussing this point and providing examples that illustrate it).

¹²⁴ In other words, if the bridge has the characteristics of a local public good. See RICHARD CORNES & TODD SANDLER, *THE THEORY OF EXTERNALITIES, PUBLIC GOODS, AND CLUB GOODS* 32-33 (2d ed. 1996) (explaining that local public goods provide nonrival and nonexcludable benefits within "a small jurisdiction such as a municipality or a town").

¹²⁵ See, e.g., R.H. Coase, *The Lighthouse in Economics*, 17 J. L. & ECON. 357, 375 (1974) ("The early history [of the British lighthouse system] shows that, contrary to the belief of many economists, a lighthouse service can be provided by private enterprise.").

¹²⁶ Coercion might be applied even where the good is not publicly provided; those who enjoy the benefits of a particular good might simply be required to reimburse the provider. See generally Ariel Porat, *Private Production of Public Goods: Liability for Unrequested Benefits*, 108 MICH. L. REV. 189, 205-09 (2009) (proposing an "expanded duty of restitution" that would widen the circumstances in which recipients of benefits must compensate the party who has provided them).

¹²⁷ Cf. Parchomovsky & Siegelman, *supra* note 64, at 119-24 (presenting an example in which a similar dynamic might present normative concerns, given the potential for early sales to unravel a community).

providers or if the inputs are not strictly complementary.¹²⁸ This point has obvious applications to the exercise of eminent domain.¹²⁹

Property lumps might also be compelled by the government to advance its own production efficiencies or to safeguard consumption utility in situations where individuals will have difficulty doing so themselves. Consider first production efficiencies. If property came in just four standard flavors because of the high start-up costs to the government of inventing and specifying new forms, post-production customization would not be a problem. It would be no different than a Model T owner painting her car yellow after she buys it.¹³⁰ But if there are ongoing costs that the government bears as a continuing producer of property law—and these cannot be easily shifted to the customizer¹³¹—then coercion in the name of cost savings might seem justified. Where private decisions impose public costs, however, a prohibition is only one possibility—and often not the most efficient one.

We might wonder, for example, whether Pigouvian taxes for property customization would be an effective alternative in instances where customizations make the property system marginally more difficult to administer.¹³² Pigouvian taxes might work well if customizations merely added some degree of incremental strain to a system, as by marginally increasing the workload associated with recording and tracking interests in land.¹³³ But taxes are not likely to be a suitable response if each new tweak in property entitlements will require a large, discontinuous input (a new full-time worker, say) which will then leave a standing supply of excess capacity in treating that particular variation. If the problem is not with new property forms as such, but rather with getting

¹²⁸ For further exploration of the issues surrounding complementarity, see generally Kominers & Weyl, *supra* note 61.

¹²⁹ See *supra* subsection II.C.1.

¹³⁰ See *supra* note 20 and accompanying text.

¹³¹ The analog in the private context would be a car manufacturer who voids the warranty of any consumer who modifies the vehicle, on the ground that modifications raise the costs of keeping the vehicle in running order.

¹³² Pigouvian taxes (and subsidies) seek to align private payoffs with social ones by internalizing externalities. See A.C. PIGOU, *THE ECONOMICS OF WELFARE* 172-203 (4th ed. 1932); see also Maureen L. Cropper & Wallace E. Oates, *Environmental Economics: A Survey*, 30 J. ECON. LITERATURE 675, 680 (1992) (defining Pigouvian taxes in the pollution context).

¹³³ In fact, the system of land recordation in the United States largely privatizes the costs of tracking interests in land, as through the work of title insurance companies. See DUKEMINIER ET AL., *supra* note 87, at 714-15. The fact that much of the public good of keeping titles straight is privately produced does not alter the analysis, though it does affect the distributive impact of any externalities that the customizations produce.

many people to agree on the *same* new forms, the law could take the lead in offering platforms for coordinating their launch.¹³⁴

Similar problems of coordination may exist on the consumption utility side of the equation. Suppose informational externalities produced by one owner's isolated act of customization would disrupt an entire property system, yet a new property form could be accommodated if it were adopted by a significant segment of the population.¹³⁵ If property packages become more valuable for both owners and nonowners when many people are consuming the same property packages, a lumpy property package may itself produce a second-order lumpy good: a network of consumption patterns that exhibit certain kinds of uniformity. The question then becomes whether and why compulsion might be necessary to achieve this public good.

Setting a property menu might on one account be a pure coordination game, akin to deciding on which side of the road to drive; nobody has any independent preference on the matter but only wishes to select the same choice as everyone else to avoid a crash.¹³⁶ In such cases, the law can perform an important coordination function by making a particular choice focal; enforcement is generally unnecessary because it is in everyone's interest to comply.¹³⁷ A somewhat different story is presented if people have different preferences about what to consume, notwithstanding their overriding preference to consume the same thing.¹³⁸ Here, settling on a single package (or a limited set of packages) will require not just coordination, but also substantive concessions by at least some players. In the property context, the law's

¹³⁴ A small but illustrative analogue can be found in Department of Motor Vehicles programs that let customers conditionally commit to purchase a new license plate design—one that will be produced only if enough others commit to that same design. *See, e.g.,* VA. CODE ANN. § 46.2-725(b)(1) (2005) (requiring 450 prepaid applications for a special license plate within thirty days of the plate's authorization).

¹³⁵ This is a hyperbolized version of the account adopted by Merrill and Smith. *See* Merrill & Smith, *supra* note 41, at 47 ("The one out of one hundred who adopts a non-standard form for property rights can increase the costs of processing the rights of ninety-nine others."); *id.* at 40 (observing that the *numerus clausus* principle does allow new property forms to be legislatively created, and thus "permits some positive level of diversification in the recognized forms of property").

¹³⁶ *See* Richard H. McAdams, *A Focal Point Theory of Expressive Law*, 86 VA. L. REV. 1649, 1667 (2000).

¹³⁷ *See id.* at 1667-68.

¹³⁸ The game theoretic paradigm for this situation is "The Battle of the Sexes" (now often renamed "Bach or Stravinsky"), in which a couple has an overriding desire to spend an evening out together, but each member of the couple has a different preferred form of entertainment. *See, e.g., id.* at 1672-74, 1673 n.56.

insistence on a limited menu might operate like an in-kind tax system that compels each person to contribute their “frustration costs”¹³⁹ to the larger good of uniformity.

A further inquiry is whether this uniformity is worth the cost of these compelled inputs—and, even if it is, whether we could achieve it at a lower frustration price by recalibrating the menu to include different, or additional, entries. These questions bring us back to the problems of demand revelation that plague the provision of public goods. The Tiebout hypothesis famously posits that jurisdictional variation can elicit information about the public goods and services that various households desire.¹⁴⁰ To the extent that some of the benefits of uniformity can be achieved at a relatively small scale, Tiebout’s insight may have interesting implications. For example, if social or political benefits were thought to flow from everyone in a given neighborhood or private community holding the same tenure form, local variation capable of inducing localized sorting could achieve small-scale uniformity without requiring a fixed tenure menu at the state level.¹⁴¹

C. *Choosing Lumps*

I have already emphasized that property law must often choose between competing assemblages. I offer here a few brief thoughts on how the task might be approached. Most fundamentally, choosing among competing chunks requires knowing which sets of entitlements stack together in a highly complementary way, and which do not. In other words, it requires knowing something about the relevant production functions. Sometimes the degree of complementarity simply informs or explains how a single owner of the relevant inputs chooses between possible ways of aggregating those inputs. For example, if bridges are built by a governmental entity that has only a certain number of linear feet of bridge material, we will understand why it chooses

¹³⁹ Merrill & Smith, *supra* note 41, at 35-38.

¹⁴⁰ See Charles M. Tiebout, *A Pure Theory of Local Expenditures*, 64 J. POL. ECON. 416 (1956).

¹⁴¹ Cf. Christopher Serkin, *Local Property Law: Adjusting the Scale of Property Protection*, 107 COLUM. L. REV. 883, 905-27 (2007) (making an analogous argument for local variation in levels of property protection). The example in the text brackets many important normative and empirical questions, including the possibility that sorting along tenure lines could impede other valuable aggregations, such as the production of desirable housing patterns across income lines.

to allocate those linear feet to the production of complete rather than partial bridges (and we will have cause to complain if it fails to do so).

If different parties own the necessary inputs, however, they must be convinced—or coerced—to contribute them to valuable aggregations. Where strict complementarity is present, the strategic holdout problem may be so severe as to make some form of coercion unavoidable. The use of coercion to create a valuable assembly, however, always entails uncertainty about the private valuations of the separate inputs, and thus presents the possibility that the assembly does not generate surplus after all. I will not revisit here the various mechanisms that have been discussed in the literature for eliciting better valuation information from owners. One component of the valuation story, however, deserves independent attention: private valuations may exceed market values as a result of other, identifiable aggregations.

Consider a land assembly that would break up a neighborhood, or one that would interrupt a lengthy period of possession for one or more occupants. If most people value possession of a home in a fairly linear way, enjoying a steady stream of benefits each year regardless of whether the total number of years is few or many, then ending possession abruptly will not cause disproportionate harm. Likewise, if the social benefits in a neighborhood are accrued block by block in a modular manner that does not depend on the existence of neighboring blocks, then carving away part of the neighborhood (as long as blocks are left intact) will do little harm. If, however, the production functions take different forms, the problem becomes a complicated one in which the value added by a coercive spatial aggregation must be compared with the surplus that will be lost by coercively breaking up other aggregations.¹⁴² Even small changes in assumptions about complementarity can make large differences. For example, if we soften the assumption of strict complementarity for the spatial aggregation—suppose the project will deliver most of its value if eighty percent of the available pieces are supplied—then the nature of the collective action problem changes dramatically and, potentially, so does the need for coercion.

Although normative judgments are an unavoidable part of choosing between lumps, empirical judgments about valuations are central

¹⁴² For further exploration of community aggregations as they relate to eminent domain, see Parchomovsky & Siegelman, *supra* note 66, at 113-24, 133-42.

to the inquiry as well. Finding mechanisms for collecting information about the likely shape of the production functions at issue should be an important focus for empirical work.¹⁴³ We must also confront the possibility that the law itself may influence how various aggregations are valued, and the related potential that legal changes could reshape those valuations.¹⁴⁴

CONCLUSION

Legal theory has paid insufficient attention to the role of lumpy or discontinuous production functions. This omission is particularly striking in the field of property, given the institution's doctrinal and conceptual focus on "things" as indivisible repositories of value. This Article has sketched how lumpiness matters for property law, and has considered some of the doctrinal and theoretical implications of explicitly recognizing this aspect of property's architecture. It has also raised questions about the mutability and desirability of lumpy thinking in property law and theory.

A particular concern is whether some aspects of property's lumpiness are historical artifacts that no longer correspond to what is currently most valuable about the institution. Leaving lumps alone is not costless, especially where the chunks that make up individual property holdings conflict with other aggregations that society may wish to undertake on a broader scale. Indeed, some of property's most important conflicts can be most usefully framed in terms of competing lumps. Explicitly framing things in this way makes clear that the question is not so much *whether* property will be lumpy, but rather *how* it will be lumpy.

¹⁴³ For example, Stephanie Stern has recently noted the relative dearth of psychological evidence indicating that people who are displaced from their homes suffer a dire and lasting welfare loss—a finding contrary to the strong assumptions that have been employed by many legal scholars and social commentators. Stephanie M. Stern, *Residential Protectionism and the Legal Mythology of Home*, 107 MICH. L. REV. 1093, 1109-19 (2009).

¹⁴⁴ Jonathan Nash and Stephanie Stern have empirically investigated the degree to which the framing of ownership as bundles or as "discrete assets" influences attitudes toward entitlements. Nash & Stern, *supra* note 79. They have suggested that the law might consciously craft property conceptualizations to modulate the strength of ownership claims. *Id.* at 453-55; cf. Ian Ayres & Eric Talley, *Solomonic Bargaining: Dividing a Legal Entitlement to Facilitate Coasean Trade*, 104 YALE L.J. 1027, 1102 (1995) (positing that endowment effects might be weaker in a liability rule regime); Jeffrey J. Rachlinski & Forest Jourden, *Remedies and the Psychology of Ownership*, 51 VAND. L. REV. 1541, 1572-74 (1998) (discussing experimental results on the influence of the available legal remedy on the endowment effect).

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I must leave to future work a fuller explication of these points, as well as a broader look at the significance of lumpiness for law across other doctrinal areas. I hope, however, that the chunk of analysis that I have taken on here forms a useful lump.