THE ASYMMETRIC COASE THEOREM:
DUAL REMEDIES FOR UNIFIED PROPERTY

ABSTRACT: This paper builds upon the existing literature on non-conforming property rights, suggesting that property is affected by a one-directional bias leading towards increasing fragmentation. This bias is the result of asymmetric transaction and strategic costs. In this context, the paper offers a revised formulation of the normative Coase theorem to define more precisely optimal remedies in situations characterized by asymmetric transaction and strategic costs. I formulate an efficiency hypothesis, suggesting that courts and legislators consider the asymmetric effects of property fragmentation when choosing among alternative legal remedies. This framework further explains some of the apparent anomalies in the comparative law of remedies.

Property division creates asymmetric transaction costs: unlike ordinary transfers of rights from one individual to another, reunifying fragmented property rights usually involves transaction and strategic costs higher than those incurred in the original deal (Parisi, Schulz and Depoorter, 2000). Such costs increase monotonically with the extent of fragmentation. In the realm of non-conforming property arrangements, this monotonicity generates a one-directional stickiness in the transfer of legal entitlements. Even reversing a simple property transaction can result

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in monopoly pricing by the buyer-turned-seller; reunifying property that has been split among multiple parties engenders even higher costs given the increased difficulty of coordination among the parties and the increased opportunity for strategic pricing by the multiple sellers.

This paper revisits the normative implications of the Coase theorem and considers the choice of optimal rules and remedies in the presence of asymmetric transaction costs. According to the normative Coase theorem(s) (e.g., Calabresi and Melamed, 1972), in the presence of positive transaction costs the efficiency of the final allocation depends upon (a) the initial assignment of rights, and (b) the choice of remedial protection. The desirable assignment of rights and remedies is that arrangement which minimizes the effects of such transaction costs.

This paper is structured as follows. In Section I, I briefly refer to the recent literature showing that dysfunctional dismemberment of property often leads to suboptimal utilization of resources and suggest that fragmentation leads to an asymmetry in the positive-transaction-cost environment of the normative Coase theorem. Hold up problems and asymmetric transaction costs create a one-directional stickiness in the reallocation of property rights.¹ The strategic behavior of the owners of the divided property often results in asymmetric transaction costs. As an illustration, I refer to the models of fragmented property presented by

¹ Non conformity between use and exclusion rights (and more generally, between any two complementary elements of a property right) often give rise to asymmetric transaction and strategic costs.
Buchanan-Yoon (2000) and Parisi-Schulz-Depoorter (2000), in which property owners are faced with an anticommons problem. In that setting, externalities and strategic behavior produce deadweight losses and transaction costs that increase monotonically depending on the extent of fragmentation and the forgone complementarities between the property fragments. An important implication of such monotonicity is the fact that it is easier to fragment property than to rebundle it. Put differently, we can think at the limit case of a single owner deciding whether to fragment his property. In making such decision, the owner has full control of the outcome and faces no strategic problems. But, once fragmentation takes place, reunification requires the involvement of two or more parties, with positive strategic costs. These costs increase monotonically for the more severe forms of fragmentation and with a larger number of parties, creating a one-directional stickiness in the process of property fragmentation.

In Section II, I posit that courts and legislators, consciously or unconsciously, take the asymmetric effects of property fragmentation into account when considering the best legal rules to apply in a given situation. This efficiency hypothesis further predicts the emergence of a dual regime of remedies to compensate for the one-directional stickiness in the parties’ exchanges in several situations related to contract and property law. According to this hypothesis, when transaction costs are asymmetric, legal systems take into consideration their “direction” (i.e., the relative cost of reallocating entitlements from one party to the other),
rather than the total transaction costs faced by all the parties. This is done in order to minimize the welfare losses occasioned by such asymmetric stickiness. On the basis of this hypothesis, I formulate an asymmetric version of the normative Coase theorem, evaluating (a) the optimal initial assignment of rights, and (b) the most desirable choice of remedies for situations characterized by the asymmetric frictions identified in Section I.

In Section III, I illustrate this efficiency hypothesis with examples from comparative property law, specifically comparing the ideal choice of remedies (presented in Section II) with those that are granted in situations of asymmetric transaction and strategic costs. I look at several apparent anomalies in property law through the lens of asymmetric transaction cost minimization. Examples from both Common law and Civil law systems reveal the robustness of the efficiency hypothesis in different legal environments.

1. **Fragmented Property and Asymmetric Transaction Costs**

Asymmetric transaction costs characterize a variety of legally relevant relationships, including the case of dysfunctional fragmentation of property, which has been considered by recent research in law and economics. (Heller, 1998; Buchanan-Yoon, 2000; Parisi-Schulz-Depoorter, 2000). The qualification of “dysfunctional” in the present
context refers to the cases where closely complementary fragments of property are attributed to different owners.\textsuperscript{2} The reunification of these kinds of fragmented rights usually involves transaction costs greater than those incurred during the original fragmentation of the right. In spite of the complementarities between those fragmented rights, it is often harder to reunite separated property bundles than it is to break them apart.

Surmising the reason for such asymmetry is quite straightforward. A single owner faces no strategic costs when deciding how to partition his property. Conversely, as shown in Parisi-Schulz-Depoorter (2000), multiple non-conforming co-owners are faced with a strategic problem in their unification decisions. These strategic impediments increase the transaction costs of any attempted reunification of the original property, now diffusely controlled by a group of non-conforming owners. Reunification costs increase monotonically depending on both (a) the extent of fragmentation; and (b) the synergies and complementarities between the property fragments.

Once fragmentation takes place, reunification requires the involvement of multiple parties, with transaction and strategic costs increasing with the number of parties. This creates a one-directional stickiness in the process of reallocating property among different levels

\textsuperscript{2} Not all division of property is dysfunctional: the fragmentation of a large estate into lots that can be developed may well be desirable. Difficulties arise when closely complementary property rights, such as the right to use land and exclude others from it, are separated.
of fragmentation. Likewise, the resulting level of deadweight losses is a function of the degree of complementarity between the property fragments. In the presence of strategic hold-up problems, valuable synergies may remain unexploited.

1.1 The Problem of Fragmented Property

In the traditional law and economics literature, the expression “partitioning of property rights” refers to both spatial and functional forms of fragmentation, but during the last couple of years the interest in atypical forms of property fragmentation (Smith, 2000; Merrill and Smith, 2000; Parisi, 2001) has grown. The simple intuition developed in these studies can be summed up as follows: unlimited access to a commons results in over consumption, and, conversely, multiple exclusion rights result in too little use of a resource. Subsequent extensions of this insight have focused on the efficiency of the commons

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3 In a related paper Parisi (2001) suggests that property is subject to a fundamental law of entropy, namely that it is affected by a one-directional bias leading towards increasing fragmentation. The paper further suggests that the application of the laws of entropy to property indicates that the one-directional tendency towards fragmentation can be avoided only in the purely abstract world of zero transaction costs.

4 See, e.g., Alchian (1977) describing situations where several people each possess some portion of the rights to use the land. Alchian also provides examples of private land-use arrangements such as servitudes (e.g. the right to grow wheat on land, to dump ashes over it, etc.).
and on examples of successful coexistence of common and private property regimes (e.g. Heller & Dagan, 2000; Smith, 2000). Other scholars have shown that functional and spatial partitioning of property lead to different results with respect to deadweight losses due to under exploitation (Heller, 1998; Banner, 1999; Depoorter-Parisi, 1999). A final group has considered the role of legal doctrines in limiting the extent of property fragmentation (Heller, 1999; Merrill-Smith, 2000). The main conclusion of these recent contributions is that atypical forms of property fragmentation can result in the inefficient use of resources, unless the costs of dividing the property in question are less than the possible externalities that the concentrated use of the property would create.

Subsequent models of the anticommons (Buchanan-Yoon, 2000; Parisi-Schulz-Depoorter, 2000) have further shown that anticommons deadweight losses result from a lack of conformity between use and exclusion rights or, more generally, from splitting two or more complementary elements of a property right. A dysfunctional fragmentation of property, in which different agents hold complementary fragments of the original right, always cause the risk of inefficiencies. The nature of the fragmentation, rather than its mere extent, has a direct impact on the resulting deadweight loss.6

5 In a related paper, we utilize this conception of unified property to explain the rise and fall of functional conceptions of property in Western legal history (Depoorter, Parisi and Schulz, 2000).

6 The relevant variable along the commons-anticommons continuum is given by the degree of substitutability, or complementarity, between the various components of the
1.2 In Search of a Unified Conception of Property

The natural structure of a property right aptly illustrates the essence of the problem of dysfunctional property fragmentation. According to the traditional conception of property, owners enjoy a bundle of rights over their property which include, among other things, the right to use their property and to exclude others from it. In such a framework, the owner’s rights of use and exclusion are exercised over the same domain. The right to use and to exclude are complementary attributes of a unified bundle of property rights.

A model of fragmented property allows us to link the welfare losses due to the lack of unity in the internal content of property. For example, a dismemberment of property with a resulting discrepancy between the rights of use and exclusion held by the various owners produces welfare losses. Such problems are not confined to situations of

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7 The problem as defined here extends beyond the usual understanding of the tragedy of the commons as a consequence of ill-defined or absent property rights (e.g., Cheung, 1987).
insufficient or excessive physical fragmentation of ownership (such as those considered in the traditional economic literature), but also result from the dismemberment – and resulting non conformity – between the internal functional or legal entitlements of the property.

As shown by Parisi-Schulz-Depoorter (2000), the qualitative results of the commons and anticommons models represent limit points along a continuum, each characterized by different levels of discrepancy between use and exclusion rights, with welfare losses varying accordingly.

1.3 Rational Owners and Property Fragmentation

Given an array of exploitation opportunities, a single property owner will choose the optimal level of fragmentation that maximizes the discounted present value of property; in contrast, the model of fragmented property highlights the cost of dispersed decision-making power and exclusion rights. If each property owner has exclusive authority to decide whether to contribute his or her property fragment to a joint value-enhancing project, then these uncoordinated decision rights create a problematic friction in the reallocation of resources, and, consequently, a suboptimal level of reunification.

Each of the owners of the fragmented property rights wants to maximize his total revenue from participation in the joint project. By pursuing this goal, each person does not fully consider the effect of his
participation choice on the other owners, leading to an overall under-exploitation of the joint investment opportunity.\textsuperscript{8}

Even though in the present papers I focus on examples of functional or legal fragmentation of property, there are some interesting similarities between situations of fragmented ownership and situations of joint ownership. In the usual joint ownership situation (e.g., joint ownership of a parcel of land), either owner can exclude, with an effect that may be likened to the anticommons problem of fragmented ownership. This similarity is interesting, considering that joint ownership and fragmented ownership seem superficially opposite. But, from the point of view of asymmetric transaction costs, there are some significant economic differences between joint ownership and fragmented ownership that should be anticipated explicitly at this point.

For this purpose, it is important to observe that the strategic impediments to property reunification are the result of a “veto” power held by property owners.\textsuperscript{9} Whenever joint owners are subject to a unanimity rule for deciding on the use of their jointly held property, the

\textsuperscript{8} The misalignment of incentives results from positive externalities that are not captured in calculating the interests of the right holders (Parisi-Schulz-Depoorter, 2000). This result has been first illustrated by Buchanan-Yoon (2000), with respect to joint property owners who can independently sell “permits” concerning the use of the commonly owned resource. In order to use the property, third party users need to obtain a permit which is independently priced and sold by each co-owner.

\textsuperscript{9} We can think of the consent of each veto holder as a strict complement (or a fixed-proportion input) in the joint reunification decision.
veto problem arises, in spite of the different apparent structure of joint and fragmented ownership. But important differences remain, due to the different incentives of joint versus fragmented owners in the face of a value enhancing use opportunity.  

This logic rests on the tragedy of the anticommons. Like for a typical anticommons case, none of the parties has an opportunity to internalize the full benefit and costs of his control over the common resource, leading to an inefficient result. As pointed out by Parisi-Schulz-Depoorter (2000), if individual co-owners, acting under conditions of individualistic competition, have concurrent controls on entry, they will exercise exclusion rights, even when the use of the common resource by one party could yield net social benefits. To put it differently, some common resources will remain idle even in the economic region of positive marginal productivity because the multiple holders of

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10 To illustrate, we can think of the different “pricing” incentives of joint and fragmented owners. The decision of joint owners on whether to sell a common resource to a third party—even if subject to a unanimity rule—would be very different from the decision of fragmented owners selling, and independently pricing, their respective fragments to a third party. The reason for this difference is quite straightforward. Joint owners, have control on the sale of the joint property, but once the sale to a third party takes place, the revenue from the sale is divided in proportion to their respective shares of ownership. Conversely, fragmented owners price independently, controlling both the feasibility of the global sale to a third party and the distribution of surplus among the various fragmented owners. Absent sustainable price coordination, the equilibrium pricing of the fragmented owners would be different from that of the joint owners.

11 As pointed out in Parisi, Schulz and Depoorter (2000), if the common resource is subject to multiple anticommons-type exclusion rights, each co-owner will have
exclusion rights do not fully internalize the cost created by the enforcement of their right to exclude others.

A fragmented property problem leads to two kinds of externalities. First, the exercise of a right of exclusion by one member reduces or eliminates the value of similar rights held by other individuals, causing static (or current) externalities. In price theory terms, one can think of this externality as the cross price effect of the various exclusion rights. Second, withholding productive resources may create dynamic (or future) externalities, because the underuse of productive inputs today has consequences for the future, as standard growth theory suggests.

The analysis of these conditions reveals that the uncoordinated choices and the strategic costs faced by the fragmented property owners lead to under exploitation of the joint project opportunities, compared to the unified ownership alternative.

incentives to withhold resources from other users to an inefficient level. This is implied by the fact that none of the investing parties obtains the full increment of the resulting revenue from an increase in their investment. Therefore all invest less than the efficient level. The problem of underutilization is exacerbated if the right is fragmented into more than two exclusion rights, with more than two agents deciding independently on their activity or price (Schulz, 2000). Buchanan and Yoon (2000) show that an increase in the number of agents with exclusionary rights enhances the problem of underutilization in their price-driven anticommons example. In more general form, Schulz (2000) shows that similar results are obtained in a quantity-driven anticommons setting. The results are consistent with the exacerbation of commons problem with an increase in the number of users. E.g., in the symmetrical commons case, the Libecap and Wiggins (1984) study on common pool oil resources documented the positive correlation between the number of involved parties and the preemptive exploitation of the common pool resource.
2. The Asymmetric Coase Theorem

In a world of zero transaction costs, an efficient allocation of resources occurs regardless of 1) the initial allocation, or degree of fragmentation, of the legal entitlement and 2) the choice of remedies to protect the resources in question. The Coase theorem suggests that if all rights are freely transferable and transaction costs are zero, an inefficient initial partitioning of property rights will not prevent an efficient final use of the resources. If the property is inefficiently divided, the owners of the various property fragments will reunify them, automatically maximizing the total value of the resource.

Once the ideal conditions of the positive Coase theorem are relaxed, however, the efficiency of the final allocation depends on the initial division of resources and on the availability of remedies that facilitate the reunification of fragmented property, when necessary. As for the general case, the dual objective is to allocate entitlements initially in a way that minimizes the effects of the positive transaction costs and, if the rights and entitlements are already assigned, choose legal rules to reduce the social welfare losses by facilitating optimal levels of reunification.

I will proceed by considering the related questions of (a) optimal allocation of rights; and (b) optimal remedial protection, given asymmetric transaction costs.
2.1 Allocating Entitlements in the Presence of Asymmetric Transaction Costs

The social problem of optimal allocation of rights in a situation with asymmetric transaction costs is qualitatively similar to the single owner’s dilemma of dividing his property among different uses when he faces subsequent reallocation costs.

In a world with perfect information, the single owner would always select an initial allocation that results in an efficient final use of the resource. With perfect foresight and information, the single owner would thus be able to optimize the use of his property, in spite of the positive transaction (or transfer) costs, reaching the same equilibrium that could be achieved in a world of zero transaction costs. Under these ideal conditions, transaction (or transfer) costs do not impede the optimal final allocation of resources.

Not surprisingly, this result changes if we introduce imperfect information. With uncertainty, the efficiency of the final allocation will in fact depend on (a) the likelihood that any feasible initial assignment coincides with the optimal final allocation, and (b) the costs of reallocating rights in the event of an initial mistaken allocation.

From a policy perspective, the central lawmaker will use the one-agent equilibrium as a benchmark for the optimal allocation of resources. According to this simple extension of the Normative Coase theorem, the
optimal allocation of rights under: (i) imperfect information, and (ii) asymmetric transaction costs would follow the logic below.

Assume a finite set of possible initial allocations, $I$, and a finite set of possible final allocations, $J$. For the sake of this qualitative argument, allocations of rights will be mapped into unique integers $i$ and $j$, represented in the sets $I$ and $J$ respectively. $P(i)$ is the exogenous frequency with which allocation $i$ is the most efficient final allocation. $N(i)$ is the endogenous frequency with which allocation $i$ is chosen as the initial allocation (i.e., our policy control variable). The notation $C_{ij}$ denotes the cost of moving from allocation $i$ to allocation $j$. More generally, let reallocation costs vary from case to case. I allow for one-directional stickiness in the reallocation costs generating asymmetric transaction costs.

The reallocation cost function can thus be defined as

\begin{equation}
C_{ij}(\phi, \rho, p) = K(1-\delta_{ij}) \cdot g(\rho, Np(j)\phi(i))
\end{equation}

$C_{ii} = 0$, \hspace{1em} as \hspace{1em} $\delta_{ij} = 0$, \hspace{1em} $i \neq j$, \hspace{1em} $\delta_{ij} = 1$, \hspace{1em} $i = j$

$C'_{\phi} > 0$, \hspace{1em} $C''_{\phi} > 0$; \hspace{1em} $C'_{\rho} > 0$, \hspace{1em} $C''_{\rho} > 0$

The index $\delta_{ij}$ is Kronecker’s delta function; there are no costs when reallocating a right to its current use. $C$, the reallocation costs, are
The expected number of ex post reallocation for any initial allocation \( i \) is given by the product of the (exogenous) probability \( p(j) \) (i.e., the probability that \( j \) would be the optimal final allocation) and the chosen frequency of allocation \( i \), \( N(i) \).

With linear cost functions, we would expect the most efficient final allocation to be always coinciding with the chosen initial allocation and all other alternative initial allocations to be chosen with probability zero. If there are convexities in the cost function (or other non-linearities in the owners’ utility functions) we may expect some mixed allocations with values of the control variable in the range \( 0 < N(i) < 1 \).

The factor \( K \) captures the one-directional stickiness of the allocation process so that different costs \( C_1 \) and \( C_2 \) will be faced when reallocation from \( i \) to \( j \) and from \( j \) to \( i \), respectively:

\[
(2) \quad K = \begin{cases} 
C_i & (i \rightarrow j) \\
C_j & (j \rightarrow i) \text{ and } C_1 < C_2 
\end{cases}
\]

For any initial allocation \( i \), the expected cost of moving to the efficient outcome, at any given level of property right protection, \( D \) is:

\[ g(D) \text{ assumed to be an increasing function, } g, \text{ of the level of property-type protection, } D. \] 

As usual, I assume that there are increasing marginal costs for reallocating rights. Marginal administrative costs thus increase with the total expected number of the mistaken allocations requiring judicial intervention, \( Np(i)A\bar{N}(j) \). This implies that marginal costs increase with an increasing frequency of ex post reallocations.\(^{12}\) The function \( g \) has therefore positive second derivatives in both arguments.\(^{13}\)

\(^{12}\) The expected number of ex post reallocation for any initial allocation \( i \) is given by the product of the (exogenous) probability \( p(j) \) (i.e., the probability that \( j \) would be the optimal final allocation) and the chosen frequency of allocation \( i \), \( N(i) \).

\(^{13}\) With linear cost functions, we would expect the most efficient final allocation to be always coinciding with the chosen initial allocation and all other alternative initial allocations to be chosen with probability zero. If there are convexities in the cost function (or other non-linearities in the owners’ utility functions) we may expect some mixed allocations with values of the control variable in the range \( 0 < N(i) < 1 \).
Faced with a choice among alternative allocations of limited resources, a benevolent policymaker would carry out the same cost-benefit analysis that would be undertaken by the single owner of multiple entitlements. In selecting the optimal allocation, any rational agent would estimate the expected values of the $n$ alternative allocations, $E(i)$, and would select the initial allocation yielding the highest net value.

In order to minimize the expected costs of future transfers, the optimal initial allocation minimizes equation (1) with respect to the control variable $N(i)$. The minimization of the expected costs will inform the selection of an initial allocation designed to minimize both the expected aggregate cost of its potential inefficiency and the transaction costs of changing to a more efficient allocation.

For a multidimensional problem with asymmetric transaction costs, the optimal social allocation is the one that maximizes the expected value of the final allocation at the net of the expected transaction costs, if reallocation is necessary.

$$
\begin{equation}
E(i|\bar{p}) = \sum_{j \in J} p(j)C_{ij}
\end{equation}
$$

$$
\begin{equation}
\min_{i} E(i|\bar{p}) = \sum_{i \in I} \{ \phi(i) \sum_{j \in J} p(j)C_{ij} \} \quad \text{if } C_{ij} \neq C_{ji}
\end{equation}
$$
This minimization requires the estimation of $p(j)$, i.e., the respective probabilities that each alternative allocation may coincide with the desired final allocation, and $C_{ij}$, i.e., the directional reallocation costs among different uses.

It is worth noting that this optimization process requires both the assessment of the likelihood of different situations arising in the future, and the evaluation of the impact of asymmetric transaction costs in the context of the uncertainty over the optimal final allocations. To solve the allocation problem under uncertainty in our case, it would be necessary to consider: (a) the relative cost of reallocating from the initial allocation $i$ to the efficient allocation $j$, which we have denoted $C_{ij}$; and (b) the probability $P(i)$ that allocation $i$ is the most efficient final allocation, among the $n$ possible alternative allocations.

The presence of asymmetric transaction costs renders the present optimization problem different from the usual case of the normative Coase theorem. In the usual formulation of the Coase theorem under symmetric transaction costs, $C_{ij} = C_{ji}$, the optimization problem is simplified and ends up with an optimal choice determined by the respective probability of alternative efficient final allocations. The optimal initial allocation coincides with the most likely efficient final allocation (i.e., $i^* = \text{Max} \{P(i)\}$).

In the presence of asymmetric transaction costs, $C_{ij} \neq C_{ji}$, the optimal initial allocation is derived considering the costs and benefits of alternative allocations, taking such asymmetry into account.
2.2 Choosing the Optimal Remedy

According to the well-known normative formulations of the Coase theorem, if the initial allocation of rights and resources has already been made, deadweight losses depend on the choice of remedial protection for such rights. Most notably, Calabresi and Melamed (1972) point out that, in the presence of positive transaction costs, the choice between property-type and liability-type remedies has important efficiency consequences. When an entitlement is protected by a property-type remedy, its transfer can only occur with the owner’s consent, at the price he demands, creating the conditions for hold-up problems. In the presence of high transaction costs, liability rules are thus more likely to induce efficient reallocations of rights and resources.

These well-known considerations have provided the basis for much of the common wisdom during the last twenty-five years in the law and economics profession. Over the same period, however, several scholars have challenged the validity of the Calabresi-Melamed framework, pointing to the limitations of liability-type protection. These critiques have led to various refinements of the original Calabresi-Melamed (1972) framework, which shall be taken into consideration in

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14 In spite of such challenges the gist of the original proposition remains standing. Richard Epstein (1997), an eloquent exponent of the property right school, while advocating the general preferability of property-type remedies, concedes that liability rules dominate as the appropriate remedy for cases of necessity and large-scale holdout problems, subject to appropriate institutional safeguards.
Kaplow and Shavell (1996) explain why liability rules are often employed in cases of harmful externalities, while property rules are more commonly utilized to protect ownership and title, preventing non-consensual transfers of possessory interests in things.

In studying the design of optimal remedies in cases of asymmetric transactions costs, one must recognize that the law and economics literature identifies several arguments to refute the hypothesis that liability-type and property-type remedies are equivalent in low transaction cost environments. Most recently, Kaplow and Shavell (1996: 768ff) have identified several factors, each casting doubt on such equivalence. These scenarios include: (a) the threat of sequential takings under a liability rule to undermine the owner’s bargaining power, as his remaining entitlements would be vulnerable to attack; (b) the risk of reciprocal takings, leading to a destructive contest between owner and the taker to retain final control of the asset; (c) the rent dissipation that will result from costs that both owners and takers would incur in both protecting their property and in an attempting to acquire control of their opponent’s assets; (d) inefficiencies resulting from the limited liability, and resulting suboptimal incentives, of judgment-proof takers; and (e) the increased administrative costs of enforcing a liability-type rule.

The alternative remedies force the parties involved to reveal different amount of information. As suggested by Ayres and Talley (1995), property-type and liability-type remedies have different effects on the incentives of the parties to reveal information in the bargaining process. Kaplow and Shavell (1996) explain why liability rules are often employed in cases of harmful externalities, while property rules are more commonly utilized to protect ownership and title, preventing non-consensual transfers of possessory interests in things.
process. Under a property-type remedy, the owner will never receive less than the value he places on his entitlements and will on average be able to extract part of the buyer’s surplus. In contrast, under a liability-type remedy, the owner will not be able to extract the taker’s surplus. Kaplow and Shavell (1996: 771) mention this issue when discussing the causes of differential distribution of income under the two remedies. The different mechanisms at work, however, have more than merely distributional consequences, given the inability of liability-type remedies to capture the owner’s subjective value of the entitlement. Transfers under a liability rule do not guarantee the efficiency of the final allocation, because it is impossible to know for certain that the taker actually values the entitlement more than the original owner, who may have unquantifiable sentimental value in the property.\(^{16}\)

As a result, non-consensual transfers further reduce an owner’s incentive to undertake specific investments that would increase his subjective value of the property. Most liability rules, in fact, do not compensate the sunken costs or owner-specific investments, increasing the victim’s subjective loss, but rather base payment on average market values and so partially ignore the foregone consumer surplus of the victim. Threatened by a non-consensual takings, an owner is unlikely to make specific investments in his property. The same is true of the foregone “endowment effect” of the current owner (Kahneman & Tversky, 1979; Hanemann, 1991). In as much as the risk of non-

\(^{16}\)The point is already present in the analysis of Calabresi and Melamed (1972:1125).
consensual takings results in a non compensated loss of “endowment valuation,” a liability rule would create a reduction in bondage opportunities with a loss of consumer surplus.

Finally, as pointed out by Krier and Schwab (1995) liability rules tend to reduce the incentives of people to learn how to bargain through property rules.

2.3 Optimal Remedies in the Presence of Asymmetric Transaction Costs

In light of the previous considerations, I now consider the optimal choice of remedies in the context of asymmetric transaction costs. I assume that, ceteris paribus, property-type remedies encourage owner-specific investments, thereby increasing the value of the entitlement for the current owner and producing a socially preferable result to liability-type responses. In order to maintain the general applicability of the analysis, I consider the property-liability nature of the remedy as a continuous variable, denoted as $D$. I model the value of property entitlements for the owner, $V_i$, as an increasing function of the property-type protection, $D$, granted to those rights. This assumes that the private and social value of the entitlement is a monotonically increasing function of the property-type remedial variable, $D$, with decreasing marginal benefits (i.e., $V_i \uparrow > 0$ and $V_i \downarrow < 0$).
Following the traditional wisdom in the law and economics literature, I recognize that property-type remedies increase the transaction costs whenever a reallocation of resources is necessary. I assume the usual cost curvature, \( C_{ij} \mathbf{N} > 0 \) and \( C_{ij} \mathbf{O} > 0 \). Given the continuous remedial variable, \( D \), I model the choice of property protection as an optimization problem that changes the remedy both in terms of (a) the value of property in its status quo allocation, and (b) the transfer costs and possible allocational inefficiency, if a different allocation becomes necessary. Such optimization problem can be formulated as follows:

\[
\begin{align*}
\max_{\rho} W(\rho \mid N \phi (i) \cdot p(j)) = & \sum_{i \in I} \sum_{j \in J} \{ V_i(\rho) - \phi_i \cdot p_j C_{ij}(\rho) \} \\
V_i > 0, \quad V''_i > 0; \quad C'_{ij} > 0, \quad C''_{ij} > 0
\end{align*}
\]

The ex ante choice of an optimal remedy should balance the expected marginal costs and benefits of alternative levels of remedial protection, taking into account the effect of asymmetric transaction costs. For the reasons expressed above, the value of the current property allocation, \( V_i(D) \), increases with the level of property-type protection. An increase in property protection, however, increases the expected costs of reallocating the use of fragmented property, \( C_{ij}(D) \). Such ex post reallocations become necessary with frequency \( \mathbf{N} \mathbf{A}_{ij} \), i.e., the product of the probabilities of the respective initial and final allocations for all \( i \mathbf{O} j \).
Comparing the first order conditions of the optimal remedies for the reallocation of rights between \( i \) and \( j \), we can see that, given the one-directional stickiness in the exchange process, asymmetric remedies are desirable. For example, if the transfer cost from allocation \( i \) to allocation \( j \) is lower than the cost of the transfer back from \( j \) to \( i \), allocation \( j \) may be granted a lower level of property-type protection, \( D_j \) compared to allocation \( i \). This result can be easily confirmed by inspection of the first order conditions of the social value function (5):

\[
(6) \quad \sum_{i \in I} \sum_{j \in J} \left( \frac{\partial V_i}{\partial \rho} p_j \frac{\partial C_{ij}}{\partial \rho} \right) = 0 \quad \text{at } D^*
\]

For (6) to characterize a maximum, the first order conditions should be interpreted to require a balancing of the marginal benefit of a change in \( D \) (i.e., the marginal increase in the value of property in its current allocation) with the discounted marginal cost of such increased protection (i.e., the marginal change in reallocation costs). Optimization thus requires:

\[
(7) \quad \frac{\partial V_i}{\partial \rho} = p_j \frac{\partial C_{ij}}{\partial \rho} \quad \forall i
\]

It is possible to note from (7) that any change in costs \( C_{ij} \) must be discounted.
Note that with high litigation costs, a liability rule effectively turns into a property rule favoring the injurer. See Kaplow and Shavell (1996: 755). But the same may be said of property-type remedies that are too costly to enforce.

The solution of our optimization problem thus implies that asymmetric optimal remedies $D_{ij}^* \leq D_k^*$ are necessary for all cases of asymmetric transaction costs $C_{ij} \leq C_{ji}$. Optimal remedies are thus determined by the expected directional costs in the contractual or property relationship, as opposed to the average or total transaction costs in the relationship.

2.4 The Dilemma of Fragmented Property

By articulating the problem of non-conforming property rights in terms of choosing the optimal remedy, we can revisit the three commonly enlisted solutions. Entitlements can be protected by property rules (transfer of the entitlement requires a voluntary sale by its holder), liability rules (another party may destroy the entitlement if he is willing to pay an objectively determined value for it), or rules of inalienability (transfer of the entitlement is not permitted, even between a willing seller and a willing buyer).

In our model we can think of the three alternatives as different values of $D$, where $0 \leq D \leq 1$. The value $D = 0$ characterizes a world with liability-type remedial protection, which minimizes the transaction and strategic cost of reallocating the right, $C_{ij} (D = 0) = 0$. The value $D = 1$ characterizes a world with property-type remedial protection, which maximizes the transaction and strategic cost of reallocating the right, $C_{ij} (D = 1) = \infty$.

Note that with high litigation costs, a liability rule effectively turns into a property rule favoring the injurer. See Kaplow and Shavell (1996: 755). But the same may be said of property-type remedies that are too costly to enforce.
Di = 1 characterizes the inalienability regime with infinite costs for any prospective reallocation \( C_{ij} (D = 1) = 4 \). The intermediate values of \( D \) represent liability-type regimes, with transaction costs ranging from zero to infinity, according to the degree of strategic bargaining between the parties.\(^{18}\) In our specific context, the choice of remedy should take into account the peculiar asymmetry of the transaction costs created by a dysfunctional fragmentation of property. Choosing a remedy in such an asymmetric scenario requires balancing a wide range of concerns.

Calabresi and Melamed (1972) showed that for the general case of positive transaction costs, property-type remedies may impede efficient reallocations of rights. Likewise, inalienability rules foreclose value enhancing property arrangements because courts and legislatures are unable to evaluate the subjective value and idiosyncratic preferences of the parties. Therefore, liability rules emerge as the best candidate for the difficult task of balancing individual autonomy against efficiency concerns when there are positive transaction and strategic costs.\(^{19}\)

In the realm of non-conforming property arrangements, positive

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\(^{18}\) Parisi-Schulz-Depoorter (2000) specify the variables that are likely to determine the extent of strategic dissipation, which include (a) the number of fragmented owners; (b) the degree of complementarity between the property fragments; and (c) the existence of effective price coordination mechanism and/or existence of outside competitive market constraints.

\(^{19}\) This is consistent with the general result of Calabresi and Melamed (1972), who have shown that, under most circumstances, liability-type remedies achieve a combination of efficiency and distributive results which would be difficult to attain under the alternative property-type and inalienability-type solutions.
transaction costs often generate a one-directional stickiness in the transfer of legal entitlements. As discussed above, externalities and holdouts are two major impediments to transfers, which are directly related to each other in the anticommons setting. The optimal legal remedy will minimize the net social cost of both externality and holdout costs in any particular institutional setting.

Quite interestingly, the asymmetry may justify the selective use of different remedies for the same entitlement or relationship, as this hybrid approach is a potential instrument for correcting the asymmetric frictions encountered in the transfer of such rights. In this setting, legal rules may offer different remedial protection in two legal situations that first appear equivalent because the asymmetric strategic and transactional impediments to the transfer of such rights justify the differing treatment of apparently identical legal positions.

This paper submits that courts and legislators, consciously or unconsciously, account for the asymmetric effects of property fragmentation with a selective use of remedies to compensate for the one-directional stickiness of the voluntary exchange. Likewise, legal systems take into account the asymmetric transaction costs caused by right fragmentation and select default rules designed to minimize the total deadweight losses of property fragmentation.

In the following section I will briefly discuss some of the areas of the law where this hypothesis can be applied.
3. Asymmetric Remedies and the Principles of Unified Property

I suggest that legal systems have in different ways developed rules that are consistent with the solution to the asymmetric Coase theorem. Legal systems attempt to identify the optimal choice of rules and structure of remedies that will minimize the total deadweight losses from dysfunctional property fragmentation.

Modern legal systems avail themselves of different dogmatic constructs, but three main approaches generally are employed to balance the effects of these non-conforming property arrangements: (a) the creation of rules promoting reunification mechanisms for neglected or outmoded property rights; (b) granting selective remedial protection for atypical property rights; and (c) jurisprudential creation of a general principle of *favor libertatis*, namely a strong presumption in favor of unified and unrestricted ownership. These legal instruments will be discussed next.

3.1 Reunification Mechanisms for Fragmented Property.

In recent years, the proliferation of atypical property arrangements (such as private communities and residential subdivisions) has necessitated reunification mechanisms to deal with anticommons
problems. Modern property law includes a sort of “gravitational force” which joins property fragments and terminates obscure, neglected, or outmoded property claims. As pointed out by Rose (1999), legal systems pursue this goal in a variety of ways, disposing of unduly burdensome claims against property and limiting the right to oppose property transactions only to the original parties and to third parties who had sufficient notice of the arrangement. Recording systems are a key factor: unrecorded or unregistered claims, for example, are forfeited against innocent third party buyers. Other contractual limitations on the use of property that are not visible or properly recorded also cannot be enforced against subsequent purchasers.\textsuperscript{20}

Similarly, rules of liberative and acquisitive prescription (at civil law) and statutes of limitation (at common law) are also frequently used to extinguish outmoded property claims. In some common law jurisdictions, real covenants automatically expire after a statutorily fixed period of time unless renewed (Dwyer and Menell, 1998). In civil law jurisdictions, full property rights are not subject to liberative prescription,\textsuperscript{21} but limited property rights often are. For example, the term for the prescription of nominate property rights is usually 20 or 30

\textsuperscript{20} Rose (1999) further observes that this creates incentives to publicize and to record their claims and, most importantly, to use standard-form property packages.

\textsuperscript{21} Property is obviously subject to acquisitive prescription (i.e., adverse possession).
years. In contrast, one must bring action for injunction or damages if an innominate or atypical property right (such as building restriction or subdivision covenants) is violated in a much shorter period of time. In all these cases, statutes of limitation do not merely bar the action to enforce the atypical property right, but rather extinguish the real right itself, in essence reunifying the fragmented property with respect to third parties. Upon prescription of the rights, the restrictions are treated as if they never existed, and the property is permanently freed of all the burdens that had been violated.

22 See, for example, Article 617 of the French Civil Code, setting a 30 year prescription term for usufruct. Likewise, Paragraph 195 of the German BGB establishes a general 30 year prescriptive period applicable to real actions. Conversely, Articles 970 and 1014 of the Italian Civil Code establish a 20 year prescription, for emphyteusis and usufruct rights, respectively.

23 For example, according to Article 781 of the Louisiana Civil Code (as revised in 1977), “no action for injunction or for damages on account of the violation of a building restriction may be brought after the lapse of two years from the commencement of a noticeable violation.” See also the official Comment (a) under Article 781, which states that this provision does not change the law, when instead it has been emphatically noted by Yiannopoulos (1983) that such prescriptive terms depart substantially from the general rules governing the prescription of contractual obligations (with a 10, rather than 2 year prescription).

24 These prescription terms are often surprisingly short. See for example the case of the Louisiana statute of limitations extinguishing the real rights after two years from the commencement of the violation. Note that, in the same jurisdiction, a personal action for the enforcement of restrictions would be subject to a much longer 10-year term of liberative prescription. See La. Civil Code Article 3499, as revised in 1983; (formerly Article 3544 of the 1870 code). Also see Yiannopoulos (1983).

These rules have been applied quite liberally. For example, according to traditional civil law principles, liberative prescription can only accrue against actual violations to which there has been no response for the entire duration of the statute of limitation. This approach is consistent with the conception of *usucapio libertatis*, namely the reinstatement of complete freedom of use after the extinction of preexisting restrictions on the property. But courts are often much more active, freeing the property from other related limitations.\textsuperscript{26} Likewise, courts have construed the prescription of a restriction against a given property parcel as tantamount to abandoning the restriction for the entire community or subdivision,\textsuperscript{27} resulting in an exponential increase in the reunification of fragmented property.

From a policy perspective, these doctrines are problematic, since they undermine the force and stability of the original contract to restrict

\textsuperscript{26} According to long standing legal principles, the extinction of one type of a restriction due to the lapse of a statute of limitation does not affect the enforceability of other types of restrictions, nor does it extend to other situations (e.g., freeing other lots from the type of restriction that have been violated). Nonetheless, as Yiannopoulos (1983) points out, courts have recently held that when an owner uses his property for commercial purposes contrary to subdivision covenants during a period in excess of two years, the property is freed of all restrictions pertaining to commercial use.

\textsuperscript{27} According to Article 782 of the Louisiana Civil Code, building restrictions terminate “by abandonment of the whole plan” or by “a general abandonment of a particular restriction.” Abandonment, like prescription, does not merely bar the right of action for the enforcement of restrictions; it extinguishes the real right. See La. Civil Code Article 782, as revised in 1977, extensively discussed in Yiannopoulos (1983).
the use of the land. Such doctrines, however, can be explained as attempts to mitigate the effects of asymmetric transaction costs and resulting inefficiencies of fragmented property.\textsuperscript{28} In most cases, the availability of these ex post reunification mechanisms protects the integrity of the ex ante fragmentation of property: because the dangers of entropy in property and anticommons welfare losses are eliminated, the value of the initial decision to fragment the property is maintained.

### 3.2 Asymmetric Transaction Costs and the Selective Use of Remedies

Selective remedies also minimize the effect of fragmentation and anticommons losses. Quite interestingly, even legal systems that have recognized new forms of atypical property provide them less remedial protection. In contrast to other real rights (e.g., affirmative or negative easements) at common law, atypical real rights (such as real covenants)

\textsuperscript{28} Along similar lines, a survey of American property law by Michael Heller (1999) reveals what he terms a ‘boundary principle’ which limits the right to subdivide private property into wasteful fragments. Property law responds to excessive fragmentation with the use of a variety of rules and doctrines such as the rule against perpetuities, zoning and subdivision restrictions, property taxes and registration fees, etc. See Heller (1999, pp. 1173-1174), citing zoning and subdivision restrictions such as minimum lot sizes, floor areas and setbacks that prevent people from spatially fragmenting resources excessively. Heller suggests that, by making the creation and maintenance of fragments more costly, such as through annual disclosure expenses, excessive fragmentation into low-value fragments will be deterred and existing fragments will be abandoned so that the state can afterwards rebundle them.
are enforceable only with damages.\textsuperscript{29} Indeed, although it is now recognized that covenants transfer with land, an individual still cannot obtain an injunction to enforce his rights even upon proof of a valid covenant. The right holder can obtain a judicial declaration of his rights, but the defendant can persist in the violation simply by paying damages.

The limited protection given to atypical (or innominate) rights still characterizes the modern-day law of remedies in both common law and civil law jurisdictions. Professors of Property law often cite this fact as one of the many unexplained puzzles of their field,\textsuperscript{30} assuming that availability of liability-type remedies for certain categories of real rights is merely coincidental. In a popular textbook on property, Dwyer and Menell (1998, p. 760) observe that “because of one of the many historical accidents that plague property law, real covenants are enforced by a damages remedy only.” I suggest that these anomalies are not merely happenstance.

As discussed above, the asymmetrical effects of entropy in property dictate that remedies should be determined based on the expected directional costs, as opposed to the average or total transaction costs in the contract or property relationship. This justifies a system that favors more liberal use of property-type remedies when redressing claims of owners of non-fragmented property and that requires limited liability-

\textsuperscript{29} In case of a breach of a real covenant, for example, the dominant landowner can only obtain relief through damages.

\textsuperscript{30} See also Stoebuck (1977).
type protection in response to claims concerning dysfunctional property. This selective use of remedies is analogous to a gravitational force that can overcome entropy in property. These legal mechanisms promote the reunification of rights and privileges that should naturally be held by a single owner, given their complementarity. This reunification regenerates the natural conformity between the complementary attributes of a right (e.g., between use and exclusion rights), even though, because of the natural laws of entropy, the restoration of the *status quo ante* requires additional expenditures.\(^{31}\)

Interestingly, most of these default reunification mechanisms do not apply with respect to typical property rights,\(^ {32}\) which, in fact, already are internal consistent, thereby eliminating the need to favor reunification over preserving the *status quo*. Conversely, non conforming property arrangements (i.e., those that dismember the closely complementary attributes of a property right) are either (a) subject to time limitations, or (b) enjoy the effect of automatic reunification mechanisms discussed in the previous section. In addition, application of selective remedies can minimize the welfare loss occasioned by dysfunctional fragmentation of

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\(^{31}\) Restoring the original natural arrangement requires legal and transactional efforts (just like rolling the stone back up the hill requires physical efforts with an increased expenditure of energy). In short, after the reunification things may look like they did before, but the journey is not without social costs.

\(^{32}\) Merrill and Smith (2000) pose the interesting question as to why such preoccupations arise only with respect to atypical real rights. The authors’ conclusion dismisses Heller’s (1999) anticommons explanation of the *numerus clausus* doctrine and suggests that the goal of such rules is the minimization of information costs.
property.

Only substantial and systematic asymmetries in transaction costs, could justify the use of directional remedies.33 Examples of such asymmetries include those produced by (a) structural attributes of the relationship; (b) an uneven number of parties; or (c) asymmetric strategic incentives among the contracting parties. Whenever such systematic differences are expected, remedies might be chosen in order to minimize the expected social deadweight loss that could vary within the same relationship in response to a wide range of concerns.

3.3 “Favor Libertatis” and the Natural Conception of Property

The recognition of new forms of property rights further necessitated the articulation of general principles to minimize the risk of entropy in property. These principles are derived from the concepts of absolute property, advocated by 18th century jurists, and most are simple applications of the ideals of unity in property.

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33 The implementation of a paradigm of “directional remedies” obviously requires ex ante information concerning the magnitude of directional costs. The choice of remedies undertaken in the previous section, in fact, refers to ex ante choices of optimal remedies. Remedies are selected on the basis of the expected directional costs, and would not be applicable in situations where no systematic directional differences can be expected. An ex post evaluation of such costs, while potentially improving upon the allocational efficiency, would increase the uncertainty of the available remedial protection for the current owners, reducing the incentives for value-enhancing investments for rational, risk-averse owners.
The resulting conception of property as an absolute right suggests that owners enjoy property through a direct relationship with the thing they own, without any need for cooperation by third parties. This characterization of an absolute right distinguishes it from the nature of a relative right (such as personal obligations and credit rights) the fulfillment of which depends on the active cooperation of another party. This classification of rights has given succeeding generations powerful rhetoric in which absolute rights (such as property and right of the person) only create negative obligations enforceable *erga omnes*, effectively equating property with (negative) freedom.\(^\text{34}\) During the 20th century, the equation between the structure of absolute rights and freedom became commonplace in legal, economic, and political theory.

Civil law courts have also subscribed to this general principle, developing an interpretive presumption in favor of a unified property that is often referred to as the *favor libertatis* principle. It suggests that restrictive burdens on property must be interpreted to promote, to the extent possible, the freedom of the burdened property.\(^\text{35}\) This presumption is clearly related to the post-French Revolution ideals of unity in

\(^{34}\) Mattei (2000, p. 123) observes that the “taxonomy requiring the object of ownership to be a tangible material thing can be explained as an expulsion from the domain of property law of those powers not related to a physical relationship with land, as used to be the case with most feudal property rights.”

\(^{35}\) As an application of this principle, documents that establish restrictive covenants must be interpreted in favor of, rather than against the freedom of the servient estate Yiannopoulos (1983).
property. From a purely interpretive perspective, however, it departs from the general principles governing the interpretation of contracts, which mandate that the contracts should be interpreted to ensure that they can produce some effects, even if such effects limit the property’s freedom.

Absent a general presumption of favor libertatis, common law courts have taken another approach to unity, enshrined in the doctrine of “changed circumstances.” This allows courts to eliminate restrictions that have lost their original purpose and value, without having to obtain the unanimous consent of the various right holders (Rose, 1999). A subdivision restriction, for example, might require the use of outmoded architectural details or the use of outdated and inefficient building materials. A contractual abrogation of such subdivision covenant may prove difficult because of the likely holdout problems of the various property-holder’s rights.

Traditionally, common law jurisdictions enforced real covenants at law even though changes in the surrounding environment (e.g., gradual transformation of a residential subdivision into a commercial or industrial area) undermined the original purpose and value of the parties’ covenant. In recent years, however, the majority of states have adopted a different rule to deal with obsolete real covenants, holding that the doctrine of changed circumstances is a defense to a claim for damages and may be used to terminate a real covenant.36

36 Hess v. Country Club Park, 213 Cal. 613, 2 P.2d 782 (1931); Restatement of Property § 564. For a more extensive discussion, see Dwyer and Menell (1998) and
If a sufficient number of covenant restrictions have been violated, courts tend to consider the general subdivision plan as abandoned. At that point, all other covenant restrictions are extinguished and the use of the property is freed for all general purposes (Yiannopoulos, 1983).

3.4 Rational Owners and the Relevance of Alternative Remedies

The ideal choice of remedy for entropy should consider the effects of a dysfunctional fragmentation of property, balancing a wide range of


In the Louisiana jurisprudence, the abandonment of a particular restriction is construed as an abandonment of a real covenant, affecting all parties to the original covenant. Changes in the vicinity of the subdivision, but not within it, are thus without effect on the validity of the building restrictions in the subdivision (Yiannopoulos, 1983).

Article 783 of the Louisiana Civil Code declares that doubt “as to the existence, validity, or extent of building restrictions is resolved in favor of the unrestricted use of the immovable.” According to Louisiana courts, since servitudes and covenant restrictions often have effects similar to those of other building restrictions, any covenant that establishes restrictions on property use ought to be interpreted in favorem libertatis. Yiannopoulos (1983). Thus, when there is doubt as to the content or validity of a restriction (e.g., a question on the validity of a subdivision plan or real covenant), the doubt is resolved favoring the unrestricted use of property. Yiannopoulos also provides several cases and examples explaining that when a particular subdivision restriction has been abandoned, the properties in the same subdivision are freed from that restriction only. Thus, a change in the neighborhood from residential to commercial does not automatically affect other functionally unrelated restrictions (e.g., setback from property lines) but may affect other functionally related limitations.
concerns. As for the general case, policymakers should consider that the choice of alternative remedies has both prospective and retrospective effects.

Prospectively, alternative remedies would lead rational owners to make different decisions under property as opposed to liability rules. Differently from what argued by Epstein (1982), I suggest that, absent an appropriate choice of remedies, the rationality of the property owners will not be sufficient to minimize the cost of entropy in property. Rational parties – it is conceded – will anticipate any devaluation from fragmentation and would take into account the expected present value of forgone opportunities when fragmenting the entitlement. But the (rationally chosen) level of fragmentation will differ under different remedies. In a liability-type regime, owners would choose a level of fragmentation of their property, considering the lower expected reallocation costs induced by the liability remedy. Conversely, under a property-type rule, owners would choose a different (and lower) level of fragmentation, given the higher costs of rebundling property at a later stage. In sum, the choice of different remedies affects the social loss occasioned by the rational choices of property owners, simply because rational owners would make different choices under different remedies.

Retrospectively, the choice of different remedies has an important effect on the control of entropy in property. In the realm of non-conforming property arrangements, entropy generates a one-directional stickiness in the transfer of legal entitlements. As discussed above,
In the field of contracts, a more liberal use of specific performance may be expected with respect to contracts that are aimed at reunifying non-conforming fragments of property, rather than contracts that are aimed at creating such fragmentation. Recontracting is, in fact, substantially cheaper in the latter case, reducing the need to conserve the original agreement.  

The hypothesis that legal systems would grant a less extensive property-type protection in favor of non-conforming property arrangements seems to find some support in the comparative study of real remedies. Likewise, other legal rules may create default reunification mechanisms. Time limits, statutes of limitation, liberative prescription, rules of extinction for non-use, etc., can all be regarded as legal devices to facilitate the (otherwise costly and difficult) reunification of non-conforming fragments of a property right.

These legal solutions can be analogized to a gravitational force, reunifying rights that, given their strict complementarity, would naturally be held by a single owner. This tendency towards reunification works to rebundle property rights in order to regenerate the natural conformity between use and exclusion rights (and, more generally, between any two complementary fragments of property).

39 In the field of contracts, a more liberal use of specific performance may be expected with respect to contracts that are aimed at reunifying non-conforming fragments of property, rather than contracts that are aimed at creating such fragmentation. Recontracting is, in fact, substantially cheaper in the latter case, reducing the need to conserve the original agreement.
4. Conclusions

Dysfunctional property fragmentation generates a one-directional stickiness in the transfer of legal entitlements.

The recognition of such one directional friction lays out a promising research agenda for the study of laws and institutions designed to cope with such asymmetry. Along the lines of other well known efficiency hypotheses of the common law, a positive hypothesis can be formulated according to which courts and legislators, consciously or unconsciously, account for the asymmetric effects of property fragmentation in designing default rules and remedies. This tendency may be reflected in the legal system's reluctance to grant extensive property-type protection in favor of non-conforming property arrangements and in the creation of default reunification mechanisms for atypical property right arrangements.

If any normative corollary should be articulated, it should be a note of caution in the current trend of towards diffuse and fragmented "propertization." The formulation of a unitary framework of property is extremely valuable in this respect, pointing to the critical content of the traditional dogmas of unified and absolute property.

The reformulation of the Coase theorem for the case of asymmetric transaction costs reveals that the adoption of dual remedies allows for a more liberal use of property-type remedies in some high-
transaction-cost relationships, without creating inefficient impediments to the optimal reallocation of rights.
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