

FIRST POSSESSION VERSUS OPTIMAL TIMING: LIMITING THE DISSIPATION OF ECONOMIC VALUE

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Richard Epstein's paper¹ addresses a number of interesting and important ways that time is woven into the law. One way is through a rule of first possession,² whereby priority of possession establishes priority of legal title. Epstein notes many apparently attractive features of first possession, but one can argue that the attractions are illusory. In this paper I address the doctrine's flaws.

As Epstein remarks, priority appears to have the appealing property of uni-dimensionality; it anoints a unique owner for each entitlement according to who got to it first, setting aside the relatively rare tied races.³ But any uni-dimensional rule will facilitate uniquely defined ownership, and as a positive, predictive matter other candidates seem stronger than the doctrine of first possession. For example, a rule of *mightiest* possession is uni-dimensional; empirically it is much more important than first possession, considering all regions and epochs of this world. When the Normans invaded England they knew but did not care that the Saxons were there first. Nor did the Saxons care that the Britons had been there even earlier, and so on into the mists of prehistory. True, naked might requires resources to threaten, if not actually to assault, competitors.⁴ But first possession also requires coercion to prevent violations; it is in effect a civilized form of mightiest possession.

Moreover, first possession is flawed even as a normative (efficiency)

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1. Epstein, *Past and Future: The Temporal Dimension in the Law of Property*, 64 WASH. U.L.Q. 667 (1986).

2. Epstein, *supra* note 1, at 669-74.

3. Epstein, *supra* note 1, at 670.

4. See Umbeck, *Might Makes Rights: A Theory of the Formation and Initial Distribution of Property Rights*, 19 ECON. INQUIRY 8 (1981), and Friedman, *Private Creation and Enforcement of Law: A Historical Case*, 8 J. LEGAL STUD. 399 (1979). Both authors argue that such resources serve to threaten harm, but rarely inflict it. Of course, that does not imply that the behavior is not costly.

construct when the assumptions of the model are relaxed a bit. Even if violence is suppressed, costly competition will occur in more subtle ways whenever first possession yields economic rents. Consider patent and copyright, where profitable first possession encourages encroachment; or successful new medications followed closely by other medications, "innovated" at some cost, that differ in arguably trivial ways from the original; or successful new themes in film, literature, or music that raise a plethora of imitators. In a model that I discuss below, the cost of these other forms of competition will match the cost of the competitive threats of violence that has been replaced.

Occasionally the simplest versions of either first possession or mightiest possession will be appropriate for a society interested in its own welfare. In the vast majority of instances, however, some other model will be preferable. The interesting issues as they relate to Epstein's paper involve sorting out the instances when a doctrine of first possession makes sense, and when it does not, asking what modifications may be appropriate. Barzel⁵ has discussed very plausible instances in which first possession not only fails to be the best, but will, in fact, lead to the total dissipation of the value of newly useful resources. Mortensen,⁶ and Dasgupta and Stiglitz⁷ have furnished more general models, but in their models first possession also seems rarely to be best, even in the face of the information and transactions costs with which the real world must cope.

I rely heavily on the Barzel model in rejecting Epstein's strong presumption in favor of first possession. I do not try to outline a fully general argument, but instead offer what I believe is sufficient evidence to cause one to doubt Epstein's position. I also mention one particularly important complication of the real world, partial information, that *does* support the modified version of first possession implicit in patents, copyrights, and related branches of law. But even here, the doctrine is severely, and appropriately, constrained by time limits during which rights can be enforced.

I. THE PROBLEM OF PREMATURE OCCUPATION

Securing possession of an entitlement is costly, and the resources ex-

5. Barzel, *Optimal Timing of Innovations*, 50 REV. ECON. & STATISTICS 348 (1968).

6. Mortensen, *Property Rights and Efficiency in Mating, Racing and Related Games*, 72 AM. ECON. REV. 968 (1982).

7. Dasgupta and Stiglitz, *Uncertainty, Industrial Structure, and the Speed of R&D*, 11 BELL J. ECON. 1 (1980).

pended in this process have alternative uses, so premature possession is undesirable. Awarding entitlements by first possession leads to just such premature expenditures. It does not matter whether the entitlement is a "free" student ticket to a college football game, which (if the team is popular) induces wasteful pre-dawn occupation of places in line at the ticket office; a patent or copyright; a "free" farm on the frontier; a legal monopoly over the provision of cable television services; or lobsters taken from the sea. The anticipation of capturing property of future value induces abandonment of alternative pursuits of positive current productivity.

There are policies that curtail premature occupation, although it is not obvious how often they are used with such a purpose explicitly in mind. For example, the sovereign can claim title to all unoccupied lands (mightiest possession), and then sell plots to "speculators." Neglecting the international competition for the sovereign's title, such a policy assures that the plots reach their highest valued uses. This policy was in fact utilized in the United States to distribute much of its interior land, although "squatters" sometimes were able to obtain *ex post* political awards based on first possession. Legally, the interior was unowned simply because earlier first possessors, the American Indians, were not recognized as legal owners. First possession presupposes standing to call on the enforcement powers of the law, so again, as a practical matter, an effective coercive legal authority (mightiest possession) is a prerequisite for a rule of first possession. The Indians did not have mightiest possession, so *ipso facto* they could not support their claims by first possession either. Because we must have coercive legal authority, the issue is when do we also want to rely on a doctrine of first possession. There is a choice of doctrine available once mightiest possession is established.

A benevolent legal authority that was powerful enough to police its assignments of entitlements, and one that also knew everything that ultimately would have positive value, could today assign title to each asset and later avoid the resource drain that comes from individuals trying to establish title. But comprehensive benevolence, power and knowledge do not characterize human institutions. Unowned and formerly worthless items (the deep-sea floor) or previously unknown ones (the electromagnetic spectrum) later become attractive assets. If there are no restraints, a rent-seeking race to establish title ensues. At the margin, expenditures to capture title will equal the value of the asset whose title is sought, so

marginal rents are completely dissipated.⁸ Those rules of the race that lead to marginal rent exhaustion with the smallest total expenditure on the race itself are the rules that will maximize the inframarginal rents.

Epstein does not ignore such problems, but rather underestimates them. "The first possession rule does give rise to serious problems in the case of common-pool assets, such as oil, gas and fish. Yet even here it furnishes a baseline of entitlements which permits the state to organize forced exchanges that on average work to the long-term advantage of persons with interests in the pool."⁹ But whenever *any* asset is (1) valuable, (2) unclaimed, and (3) available to the first possessor, then it *is* a common-pool asset—that is the definition. The more narrowly defined subset Epstein seems to have in mind, so-called "migratory resources," is only one part of a larger and more general common-pool problem.

The lynchpin is a measurement problem—the definability of a resource before it is ready to be exploited. Some resources have insufficient value today to tempt anyone to bear the present costs of establishing and enforcing title, but are recognized to be of increasing value in a growing economy. At the end of World War II nobody owned the floor of the North Sea, but today it is one of the world's most active oil fields. No one owns the Moon's surface today, but it will not surprise me if commercial mining occurs there within my lifetime. Such resources are definable, and for them first possession is a particularly wasteful means of establishing title when compared to alternatives. Not surprisingly, title by first possession is rarely recognized in such instances.

However, other resources cannot even be described at present, for example, many of the next decade's most significant patentable inventions, and as to these resources some of the alternatives to first possession may be unworkable. But two points are crucial: First, before first possession is judged to be an appropriate rule, the sort of informational failing that I have described must be present. Second, even when first possession is an appropriate rule, it will generally be constrained, often by legal limitations on the life of the entitlement.

Notice that I am not saying that first possession should be rejected retrospectively. If today's title is well-defined, there are strong efficiency grounds for enforcing that title however it was established. Only then

8. See Barzel, *supra* note 5, and Cheung, *A Theory of Price Control*, 17 J. L. & ECON. 53 (1974). Barzel, *A Theory of Rationing by Waiting*, 17 J. L. & ECON. 73 (1974), while narrower in focus, also is to the point.

9. Epstein, *supra* note 1, at 670.

can useful further investment be carried to the proper margin. Consequently, strong countervailing arguments are required before an efficient legal system should overturn long-recognized titles. This is true even if the original entitlement was established in a wasteful manner; the wasted resources are sunk; they now represent no foregone opportunity. Instead, I am considering the problem of establishing entitlements to the flow of newly valuable assets.

II. RETURNS AND CAPTURE COSTS: THE THEORY

In one way, a rule of first possession has analytically distinct impacts on migratory resources as opposed to resources such as land or ideas. But in another very important way, the impacts are the same. It is inappropriate to limit consideration to the distinctions while ignoring the similarities.

A. *Distinct Impacts: First Possession's Impact on Returns*

First possession, in the guise of the law of capture, can damage the source of migratory assets and reduce its present value. For example, fractionated ownership of a geological dome containing petroleum creates private incentives to drill wells too closely and to pump too rapidly, for only capture establishes title to the petroleum itself.¹⁰ Drilling fewer wells would increase the discounted stream of *gross* recovery from the field, as would operating each well more leisurely.

Overly avid fishing or trapping also reduces the long-run value of the pool, both by disrupting breeding patterns and by prematurely interrupting the growth of individual animals. Such losses sometimes induce societies that we consider primitive to establish fairly sophisticated property-rights systems that override a tradition of first possession. Demsetz has described the evolution of one such system among fur-trapping Indians in colonial Quebec.¹¹ Johnsen argues that wealth transfers implicit in the peculiar custom of potlatching among the Kwakutil of coastal British Columbia are one aspect of a property-rights system over a fishing resource that, geographically, was unusually variable for climatological

10 Libecap and Wiggins, *Contractual Responses to the Common Pool: Prorationing of Crude Oil Production*, 74 AM. ECON. REV. 87 (1984); Libecap and Wiggins, *The Influence of Private Contractual Failure on Regulation: The Case of Oil Field Unitization*, 93 J. POL. ECON. 690 (1985); and Wiggins and Libecap, *Oil Field Unitization: Contractual Failure in the Presence of Imperfect Information*, 75 AM. ECON. REV. 368 (1985).

11. Demsetz, *Toward a Theory of Property Rights*, 57 AM. ECON. REV. 345 (1967).

reasons.¹²

The losses caused by overly rapid depletion of migratory resources are only part of the picture. Gordon examines the returns-diminution argument with respect to modern maritime fisheries, but convincingly rejects it as a major loss. Much more deleterious are the cost consequences of the rule of capture itself, which is to say, the rule of first possession.¹³ The next section shows that the capture costs are analytically the same for migratory resources as for any other common-pool resource subject to a rule of first possession.

B. Similar Impacts: First Possession's Impact on Capture Costs

Even if the amount of an unowned asset is fixed, the marginal reward for capturing a unit will never exceed the opportunity cost of the resources required to capture it. Restraints that seek to optimize the number of units taken may increase returns from capturing a unit initially. But if those returns rise above those available elsewhere, additional resources will be tempted into the race. Because, by assumption, the additional resources cannot be used to claim more units of the asset in aggregate, the inputs will be used instead to try to establish claims to units before competitors can. Hence, additional resource costs are incurred in a race to claim a stock of fixed size. Such expenditures will grow until the marginal rate of return from claiming title has been driven back to levels available if the resources used for the capture were used elsewhere.

This unappealing result can be completely avoided only if some entity simultaneously controls both the rate and the technique of capture, which is to say only if full ownership is established over the stock. Establishing ownership is a matter of transforming a resource from its initial state into one that has measurable legal attributes. The transformation is costly.

III. THE PREMATURE OCCUPATION MODEL CONTRASTED WITH A MONOPOLY MODEL

To avoid confusion, I will distinguish the premature occupation model

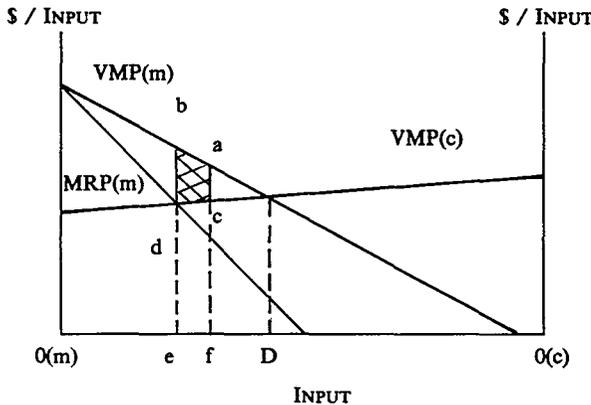
12. Johnsen, *The Formation and Protection of Property Rights Among the Southern Kwakwilt Indians*, 15 J. LEGAL STUD. 41 (1986).

13. Gordon, *The Economic Theory of a Common Property Resource: The Fishery*, 62 J. POL. ECON. 124 (1954).

discussed here from a single-price monopoly model. Monopoly revenues exceeding those available elsewhere attract entrants. In that instance, as in the present one, the entrant's private gains are less than the aggregated losses imposed on existing firms. Yet we applaud entry in a monopolized industry because deadweight losses are reduced. The entrant expands industry output, which drives down price. The losses of the other firms translate into even larger gains for buyers. But with common-pool assets, entry imposes losses on the entrant's competitors by increasing real resource costs. There is a real economic loss, not a transfer to others. Indeed, entry-related costs sometimes actually curtail output, driving prices up, not down as with entry into a monopolized industry.

Suppose a certain input is used in both a fully competitive industry and an industry that is monopolized. The total input available is shown along the horizontal axis of Figure One. The value of the input's marginal product in the monopolized industry, $VMP(m)$, is measured to the right from $o(m)$.¹⁴ The value of marginal product in the competitive industry, $VMP(c)$, is measured to the left from $O(c)$. The value maximizing division of the input between the industries is at D .

FIGURE ONE: INPUT DISTORTION WITH OUTPUT MONOPOLY



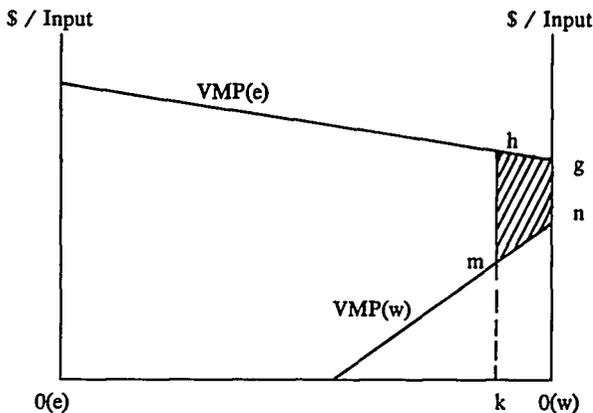
But a non-price discriminating monopoly takes less than $O(m)D$ units of the input, because marginal revenue in the output market is less than the price. The monopoly's demand for the input is the marginal revenue

14. The value of marginal product is the marginal physical product of the input times the reservation value of the output to the marginal buyer, and that reservation value will be the market price of the output in a competitive industry or a non-price-discriminating monopoly.

product, shown as $MRP(m)$.¹⁵ The marginal cost of the input to the monopolist is the input's opportunity cost in the competitive industry, because competitors offer the value of marginal product per unit of input. Consequently, the monopoly uses too little input, $O(m)e$, and the competitive industry uses too much, $O(c)e$. If ef units of input are transferred from the competitive industry to the monopoly, competitive industry output worth $cdef$ is sacrificed, but monopoly output worth $abef$ is gained, for a net gain for the economy of $abcd$. So we applaud.

Figure Two shows the situation under a rule of first possession. Both industries, call them "Eastern" and "Western," are assumed to be fully competitive. The curve showing the value of the marginal product of inputs potentially used in the Western industry is today everywhere below that in the Eastern, so no inputs should be diverted to the West. However, assume $VMP(w)$ is shifting up and to the left over time. In order to be the one to capitalize on the shift, some individual is induced today to divert to the West, say, $O(w)k$ units of input in order to establish title. The value of foregone Eastern output this period, $O(w)ghk$, exceeds the value of this period's new Western output, $O(w)kmn$, by the cross-hatched area. This diversion of inputs deserves no applause; all inputs should remain in the East until a segment of $VMP(w)$ lies above $VMP(e)$.

FIGURE TWO: INPUT DISTORTION WITH FIRST POSSESSION



15. Marginal revenue product is marginal physical product times marginal revenue in the output market. For a non-price-discriminating monopolist, marginal revenue is less than price, which is still the marginal buyer's reservation value for the output. Although the monopolist receives the market price for the marginal unit, the price of other units that could have been sold at higher prices to more eager buyers must be reduced ever further below those buyers' reservation values if more and more units are to be sold.

IV. OPTIMAL TIMING: APPLYING THE THEORY TO LAND

It may seem unlikely that the output of a plot of land will be reduced significantly by a rule of first possession.¹⁶ But that doctrine will increase the *cost* of establishing title. In brief, the rule causes withdrawal of resources from alternative pursuits too soon. The issue is timing.

Timing is also a concern when modeling innovation and the sometimes valuable patents and copyrights that follow. Recognition that the analytical problems are the same suggests that models of innovation are also applicable to first possession of other assets. Yoram Barzel has presented a sophisticated discussion of the timing of innovations.¹⁷ With minor changes in vocabulary, Barzel's analysis is directly applicable to resources other than knowledge.

Consider a group of Eastern farmers eyeing an unoccupied plot of Western land that is adequate for one farm. Assume that the Western population is gradually growing, so the value of the output of a potential Western farm is increasing from year to year. To take up a new farm requires an investment by the farmer, and those resources have alternative uses on Eastern farms. Suppose the resources are worth 200 per year if used on an Eastern farm. On a new Western farm, the same resources would be worth 200 in year t , but that yearly return is increasing by ten per year.¹⁸ Barzel's Table One, slightly altered here, illustrates the situation described. The time path that maximizes returns from aggregate investment leaves the Western farm unoccupied until year t . Then some of the resources are withdrawn from the East, where they realize a return of 200 per year, and are reinvested in the West, where they realize a higher return every year after t .

But a different result will be realized under a rule of first possession. The return on a Western investment will exceed the market return after t , which means that by t other farmers will already possess the Western plot. To move West in $t-1$ will entail a lower output, 200 to 190, but at a rate of discount of, say ten percent, any farmer will gladly sacrifice ten units in $t-1$ to obtain the land and its surplus from $t+1$ onward. But that

16. Notice, however, that the slash-and-burn agriculture of some tropical economies may cycle more rapidly than would maximize aggregate output, because title to fallow but previously farmed tracts that presently are regaining fertility is captured through first (re)possession.

17. Barzel, *supra* note 5.

18. If the value of the potential Western farms is not increasing relative to Eastern ones, the Western farms either will be occupied already if that constant value exceeds 200, or will never be occupied if the value is less than 200.

TABLE ONE: EARNING STREAMS FROM THREE ALTERNATIVE INVESTMENT POLICIES

POLICY	YEAR												
	—	t-5	t-4	t-3	t-2	t-1	t	t+1	t+2	t+3	t+4	t+5	—
Establish Western Farm Immediately	—	150	160	170	180	190	200	210	220	230	240	250	—
Retain Eastern Farm Indefinitely	—	200	200	200	200	200	200	200	200	200	200	200	—
Best Combination	—	200	200	200	200	200	200	210	220	230	240	250	—
	—	—	Eastern Farm			—	t	—	Western Farm			—	—

farmer should also be willing to sacrifice twenty units in $t-2$ for the land, knowing that it will be occupied in $t-1$, and so on. Indeed, at a ten percent rate of discount the Western land will be occupied in $t-10$, at which date the discounted value of aggregated losses from $t-10$ to t just equals the discounted value of the surplus from t to infinity. Hence, the entire value of the potential surplus will be dissipated by competition for property rights.

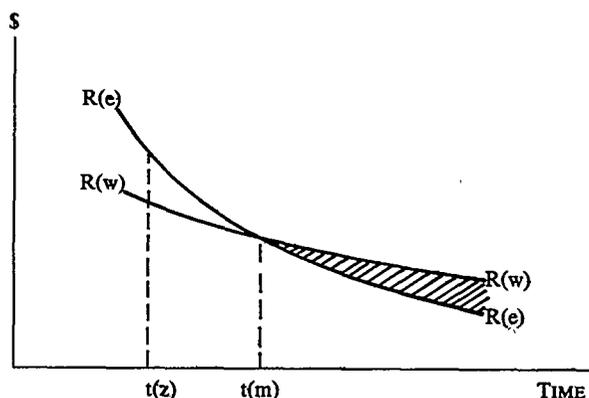
Epstein remarks, "first possession . . . can encourage the premature acquisition of interests, but that cost is tolerable in light of the alternatives."¹⁹ That implies that a dissipation of the entire benefit of bringing additional land into the economy is tolerable. As I show shortly, land is a good example of a situation with better alternatives. Land rarely displays the attributes that make a (modified) rule of first possession attractive.

Barzel illustrates his discussion with a figure similar to Figure Three. The line here labeled $R(w)$ represents the flow of discounted returns through time arising from an investment in the Western farm. $R(e)$ rep-

19. Epstein, *supra* note 1, at 672.

represents the flow of returns from the best alternative use of those resources, here assumed to be on an Eastern farm.²⁰ The value of Western produce grows from year to year, so $R(w)$ does not decline as rapidly as $R(e)$ even though they are discounted at the same rate. Resources should be shifted from East to West at $t(m)$ if the returns are to be maximized. But the possessor gets the surplus after $t(m)$ as shown by the cross-hatched area. That surplus attracts premature interregional reinvestment at some time such as $t(z)$, where discounted losses between $t(z)$ and $t(m)$ equal the discounted surplus after $t(m)$.

FIGURE THREE: OPTIMAL REINVESTMENT VERSUS FIRST POSSESSION



What a discouraging outcome. Fortunately, there are several alternatives that are more attractive than the doctrine of first possession.

A. Differential Taxes

One obvious possibility is to impose higher taxes on Western farms. With a tax rate increasing precisely at the rate of increase of the value of Western produce, the cross-hatched area in Figure Three will go to the treasury, not to the first possessor. There remains no incentive to occupy the Western farm prior to $t(m)$.

20. $R(e)$ is downward sloping because it represents a constant flow of returns discounted ever further into the future. $R(w)$ will be downward sloping if the rate of growth of Western returns is less than the rate of discount. If $R(w)$ was not downward sloping, the Western land would already be occupied and the issue of entitlement resolved, because the Western land would then be of infinite present value.

Such a "solution" may be obvious, but it is not particularly attractive. One difficulty is that it requires detailed information collected solely for the purposes of calibrating the taxes. Otherwise, productive investments by farmers will be discouraged because returns from such investments cannot easily be disentangled from differential growth between the regions. Information is costly, which offsets the savings in the capture costs obtained by imposing the tax. Moreover, costly information makes it unlikely that members of the general public will be able to monitor the taxing officials closely, so slovenly administration or more overt abuse may be a problem. Fortunately, there are superior alternatives.

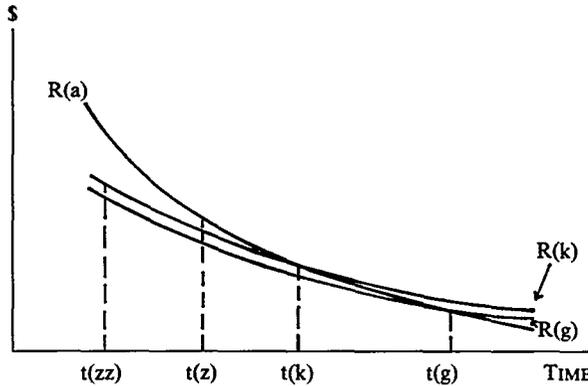
B. Sovereign's Title with Auctions

Another solution to the common-pool problem, one that has more or less been adopted for mineral rights on the continental shelf of the United States, is for the sovereign to usurp title, and then auction it off as the assets become economically usable. Competing bidders drive the price to the present discounted value of the expected surplus, eliminating any private incentive to invest prematurely in exploitation.²¹

Moreover, individuals are encouraged to use private knowledge, just as they are with a rule of first possession. Suppose that Figure Three represents general beliefs, but that some individual knows the plot of Western land is worth more. This is illustrated in Figure 4. $R(g)$ represents general expectations, $R(k)$ represents the knowledgeable individual's expectations, and $R(a)$ represents the discounted flow of returns from alternative investments. Clearly, the knowledgeable individual will wish to exploit the asset earlier than will the ignorant individuals, at $t(k)$ rather than $t(g)$, and the aggregated returns to the economy will be enhanced if he does so. Assuming there are no strategic complications, and that bidding is opened by $t(k)$, the knowledgeable individual will be able to use the site appropriately, because he will outbid competitors.

21. Of course, to the extent that the ability to usurp title over common-pool resources increases a national sovereign's wealth, that will entice other national sovereigns to compete to be the one to usurp title. This will increase the dissipation of wealth on an international basis. Usurpable titles are a common-pool on a grander scale, and there mightiest possession still determines entitlement.

FIGURE FOUR: REINVESTMENT WITH DIVERSE EXPECTATIONS



With a rule of first possession, however, the knowledgeable individual must occupy the site before $t(z)$, because that is when other individuals will foresee a normal rate of return over the life of the entitlement. Although $t(z)$ may sometimes be later than $t(k)$, that will be a happenstance that requires that the second-best informed party does not have even a ballpark notion of the true value of the plot. A knowledgeable but risk-averse individual, who knows his own expectations but not those of every other member of society (a likely scenario), may occupy the site at $t(zz)$, when its private rate of return as estimated from his private information equals that elsewhere. Otherwise, he cannot be sure that another individual will not deprive him of the opportunity to claim an asset with a normal rate of return. By this process, however, we see once again that the entire net increase in the potential wealth of the economy may be dissipated by premature occupation.²²

C. Temporally Limited Title

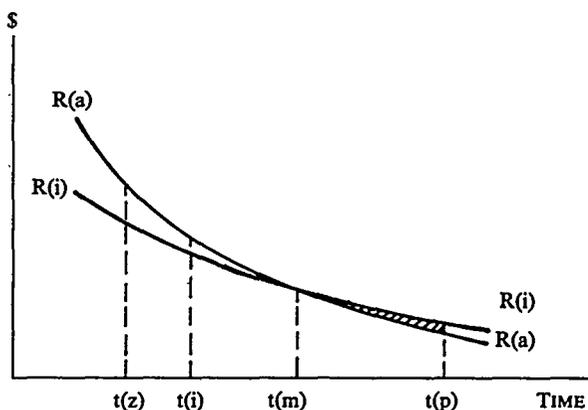
An auction worked in the above example because the asset was well-defined, which is crucial to understanding why a constrained doctrine of first possession is sometimes used despite its otherwise obvious failings. An auction requires defining what is being exchanged but prior definition is not always practical. For example, how could the right to develop and exploit the electromagnetic spectrum have been assigned in the 1700's before its existence was even imagined? Clearly, when an asset cannot be

22. See French and McCormick, *Sealed Bids, Sunk Costs, and the Process of Competition*, 57 J. BUS. 417 (1984) for a discussion of the privately optimal moment for an individual to strike when he does not know whether or not his knowledge is superior to that of competitors.

defined in advance, the first person to identify, define, and possess it, will reap a windfall. The ensuing race for knowledge will dissipate the value on an expectational basis, just as a race dissipated the value of our hypothetical Western farm.

This is the innovation problem, and it concerns the creation of knowledge, not things known to exist and to be evolving toward positive net economic value. Yet even for innovations a part of the value can be saved. In modern patent and copyright systems entitlements are claimed by first possession, but they are of limited duration. Figure Five illustrates the impact. As the part of the cross-hatched area that accrues to the innovator is reduced, for example to the portion from $t(m)$ to $t(p)$ rather than that from $t(m)$ to infinity, the willingness to absorb losses prior to $t(m)$ in order to establish a claim is also reduced. The date of innovation is moved from $t(z)$ toward $t(m)$, in the present instance to $t(i)$. The private and social losses between $t(i)$ and $t(m)$ match the private rewards from $t(m)$ to $t(p)$, which, of course, fall short of the social benefits aggregated from $t(m)$ to infinity.

FIGURE FIVE: REINVESTMENT WITH NONPERPETUAL FIRST POSSESSION



Does this mean that the appropriate life of the entitlement is zero, which would seem to drive the innovation date right to $t(m)$? To see why this is incorrect requires making explicit one factor that is implicit in the Barzel model. This is the task of the next section.

V. COSTLY KNOWLEDGE

Suppose a foolish Fifteenth Century European monarch had declared (a) that all lands discovered in the future would be taxed so highly they would be no more attractive than presently known lands, or (b) that the lands, although unknown, already belonged to the sovereign and would be auctioned to the highest bidder following discovery, or (c) that the new lands would be the discoverer's for a duration of zero, and then would be public domain. Clearly efforts by that sovereign's subjects to discover lands would have been scanty. This seems to imply that none of the above suggested solutions to the common-pool problem would have proven adequate.

But that does not argue for an unbounded rule of first possession of land. The problem arose because the land was unknown, not because it was unowned. Moreover, the land may have been defined well enough for a more appropriate response by a sufficiently powerful and trustworthy monarch, who could have auctioned title prior to discovery. Would-be explorers could have bought discovery rights to be exploited whenever it seemed appropriate. Land is simply not *that* ephemeral. The pace of exploration would not have been inefficiently rapid, given the distribution of expectations.

Clearly some problems can arise with new entitlements to land. After all, it was not widely believed in 1400 that a discovery right to all new lands west of Spain was in fundamental conflict with a right to all new lands east of Spain. Nor was it recognized how important a claim's dimensions above and below the surface would become. But as Epstein notes, "No legal rule can solve all borderline cases where individuals act in ignorance. . . ." ²³

These are problems of development of knowledge, not of occupation of land. It is immaterial whether this knowledge is attached to land or is instead embodied in another tangible or intangible object. But where new knowledge is at issue, finding appropriate solutions becomes more complex. In such situations, one cannot define an entitlement because one cannot imagine what one has not imagined. With something as ephemeral as knowledge, it is often necessary to resort to a limited, but not unbounded, rule of first possession.

There are two distinct problems: (1) how to award title to one of the many hopeful claimants, and (2) how to know that something is there to

23. Epstein, *supra* note 1, at 671.

be claimed in the first place. A rule of first possession has some appeal when one focuses only on incentives for resolving the second problem, if only because it is hard to conceive of an alternative. But first possession is an unappealing solution to the first problem. Because the technique for awarding entitlement must cope with both problems, the solution selected ordinarily will be a compromise. One should strive to understand the nature of the compromise, however, not to ignore a large part of the problem.

There is an appropriate time to search, and an appropriate way. Even if the search is efficient it will be costly. Moreover, even after the outlines of the discovery are defined, exploitation may require a long period of costly further development, which should be undertaken in a timely and coordinated fashion. Kitch argues that the details of modern American patent law facilitates such coordinated development of initially ephemeral ideas.²⁴ He calls those provisions the "prospect function" of patents.

But Kitch does not explain why the initial idea is not covered by a permanent patent—an unbounded rule of first possession. After all, proper development of some ideas takes a very long time indeed. Perhaps Kitch believes, as do I, that Barzel has answered that problem.²⁵ Kitch merely notes that once the boundaries of a new idea have been vaguely defined, an entitlement should vest. That halts further costly competition for that entitlement, and facilitates timely propagation of relevant knowledge to dispersed researchers. Although Kitch does not raise the question of how vague is too vague, the answer presumably is a function of measurement costs, and will fluctuate over time with the system's ability to distinguish spurious rent-seeking claims from those arising from actual investment and discovery.

If innovation is costly even at an efficient pace, then the innovator must expect a reward for success or he will not incur the cost. Kitch terms this the "reward function" of patents. An ideal life of a patent for a proper reward is not infinite, but will permit efficient final development plus a period of exclusive entitlement just adequate to generate a competitive return on all the pre- and post-patent research, providing that research was conducted at the proper time, at the proper pace, and using the proper techniques.²⁶ Such a duration would remove incentives to

24. Kitch, *The Nature and Function of the Patent System*, 20 J. L. & ECON. 265 (1977).

25. Barzel, *supra* note 5. See also Mortensen, *supra* note 6, and Dasgupta and Stiglitz, *supra* note 7.

26. Because many individuals may undertake initial research, whereas only one receives a pat-

perform research too rapidly or too early.

But now reality intrudes. Many research costs are poorly quantifiable and highly variable across projects. The same is true of the social value of innovations. Consequently, it is unlikely that our present uniform seventeen-year patent life is ideal in the sense that the word was used above. But although that patent life is not ideal, except perhaps in light of the overwhelming informational burden implied by the ultimate ideal, an infinite patent life is assuredly not ideal either. Infinite duration induces total dissipation of the innovation's value. Even for innovations, first possession is, and should be, constrained. If boundary definition is not an issue, the doctrine is inferior in any of its forms to alternative methods of bringing assets into the economy.

VI. CONCLUDING REMARKS

I have argued that a prospective rule of first possession has little to recommend it, at least as a rule providing that new entitlements henceforth run in perpetuity to the first party to occupy a property, broadly defined. There are two distinct circumstances in which valuable assets are unowned. First, items previously known, but of no value, acquire value when the economy changes. A rule of first possession in this context induces premature occupation, with returns foregone elsewhere that equal the discounted present value of the returns from the newly acquired asset. In effect, the rule of first possession dissipates the asset's entire net worth.

This accords with the circumstances during the period of occupation of the American continents by European immigrants. Alternatives superior to first possession existed and were used. Commonly, the sovereign claimed title prior to settlement, then sold or bartered the land to settlers or intermediaries.²⁷ That technique had long been used to expand the

ent, the ideal return will yield a competitive risk-adjusted expected return on research investments aggregated over all researchers. Consequently, the ultimate patent owner may realize a bonanza, while unsuccessful researchers suffer losses. Regardless of the patent life selected, resources will move into or out of innovative activities so that such conditions will obtain at the margin.

27. For example, the United States government bartered a great deal of Western land to railroad companies in exchange for new rail construction. The new trackage would not have been profitable without the land grants, and much of the land was worthless without a source of transportation. Due to the new construction, both the railroad companies and the government were able to sell off land that otherwise would have lain idle for some time. There were occasional aberrations, but little of the land was given away through a rule of first possession. Although the prices charged for the government land may strike modern scholars as a ridiculously low token fee, deflating those

European homelands whenever the sovereign was strong enough to enforce such claims. Abuses can arise when such authority is seized by a sovereign, but usually that dissipates only part of an asset's value—legislators and kings have a private incentive to maximize the net value of the realm they govern; it is their tax base.

A second circumstance where one finds valuable unowned assets concerns innovation, which compounds the difficulty of efficiently establishing entitlements. The asset cannot be well-defined soon enough to avoid all capture costs while still retaining individual incentives to finance research. In these circumstances, a modified rule of first possession is sometimes adopted because alternatives are unworkable. Although such circumstances occasionally apply to unoccupied land, this is the exception rather than the rule.

Finally, regardless of any efficiency aspects it may or may not have, a rule of first possession is an inadequate positive basis for a theory of law. Mightiest possession explains more that has happened and more that has become law than does first possession. Mightiest possession may well be efficient (though not necessarily *equitable*) due to the sovereign's incentive to maximize the value of his realm and thus his tax base. In contrast, an unconstrained rule of first possession is a rule of stagnation.

Now that mankind is contemplating mining Antarctica and the deep-sea floor, the prospective aspects of a doctrine of first possession are very modern issues.

prices by a price index or contrasting them with other land prices of the day makes them seem more reasonable.