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# THE EVOLUTION OF PROPERTY RIGHTS: A STUDY OF THE AMERICAN WEST\*

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SINCE Ronald Coase's work on "The Problem of Social Cost,"<sup>1</sup> economists have increasingly turned their attention to the effects of property rights on market operations.<sup>2</sup> The way in which property rights are assigned, enforced, and transferred affects the allocation of resources and hence, the amount and distribution of output. Who controls what resources? Who receives the benefits and bears the costs of various actions? How clearly are the property rights specified? How are they exchanged and how are these exchanges enforced? The answers to these questions clearly influence the consequences of the market processes at any given time.

But the structure of these rights in any society and hence the answers to the above questions are continually changing. Recent literature has paid increasing attention to the structure of property rights at some point in time and to the consequences of these rights.<sup>3</sup> However, much less attention has been given the question of how the property rights structure comes into being.<sup>4</sup> It is our purpose to combine economic theory and history to help shed light on this important question.<sup>5</sup> We present below a perspective of the

\* We wish to thank our colleagues Richard Stroup and James Buchanan for their constructive criticism on preliminary drafts. While their efforts have improved the quality of the paper, we retain responsibility for its deficiencies.

<sup>1</sup> R. H. Coase, *The Problem of Social Cost*, 3 *J. Law & Econ.* 1 (1960).

<sup>2</sup> Throughout this paper we shall refer to property rights as the sanctioned behavioral relationships among men which governs their interaction and their use of resources. Such rights may be formal or informal, expressed or implied, written or unwritten but do not refer solely to real property.

<sup>3</sup> For an excellent survey of this literature see Eirik G. Furnbotn & Svetozar Pejovich, *Property Rights and Economic Theory: A Survey of Recent Literature*, 10 *J. Econ. Lit.* 1137 (1972).

<sup>4</sup> Most recent work on the evolution of property rights is of an historical nature. For example, see Douglass C. North & Robert Paul Thomas, *The Rise of the Western World: A New Economic History* (1973); *id.*, *The Rise and Fall of the Manorial System: A Theoretical Model*, 3 *J. Econ. History* 777 (1971); Lance Davis & Douglass C. North, *Institutional Change and American Economic Growth* (1971); Clyde Reed & Terry L. Anderson, *An Economic Explanation of English Agricultural Organization in the Twelfth and Thirteenth Centuries*, 26 *Econ. History Rev.* 134 (1973).

<sup>5</sup> The challenge for such an undertaking was recently issued by Armen A. Alchian & Harold Demsetz, *The Property Rights Paradigm*, 33 *J. Econ. History* 16 (1973).

dynamic process of property right development which enumerates the variables responsible for changing definition and enforcement activity and which explains the timing of these changes. Our theory will be tested in the context of property rights as they evolved on the American Great Plains. Although the analysis applies to rights in general, we shall concentrate on the set of economic and social relations which define the position of individuals with respect to the utilization of land, water, and cattle on the Plains.

Our interpretation of changes taking place on the Great Plains is perhaps not new. Indeed, many historians have examined the relationship between ownership institutions and the economic and social institutions of the area.<sup>6</sup> Our interpretation does, however, formulate the variables in terms of economic theory. Furthermore, it provides a general explanation of how and why existing institutions change in response to changes in variables such as demand, factor endowments, and technology. In this sense, the theory is extremely useful for explaining contemporary problems involving property rights.

#### A THEORY OF PROPERTY RIGHTS EVOLUTION

If we are to extend the traditional neo-classical model to include the institutional structure of society, it is imperative that we focus upon the economic variables that affect property rights. Works by North and Davis, and North and Thomas emphasize the role of primary and secondary institutions but provide only a broad framework for analysis in terms of benefits and costs.<sup>7</sup> Other works by economists such as Cheung, Demsetz, North, and Pejovich have posited theories of property rights change.<sup>8</sup> Demsetz, for example, suggests "that property rights arise when it becomes economic for those affected by externalities to internalize benefits and costs."<sup>9</sup> Furthermore, Professor Pejovich states that "the creation and specification of property rights over scarce resources is endogenously determined" and that "some important factors which govern changes in the content of property rights are asserted to be: technological innovations and the opening of new

<sup>6</sup> For example, see Walter Prescott Webb, *The Great Plains* (1931); and Carl Frederick Kraenzel, *The Great Plains in Transition* (1955).

<sup>7</sup> Lance Davis & Douglass C. North, *supra* note 4; Douglass C. North & Robert Paul Thomas, *supra* note 4.

<sup>8</sup> See for example, Steven N. S. Cheung, *The Structure of a Contract: The Theory of a Non-Exclusive Resource*, 13 *J. Law & Econ.* 49 (1971); Harold Demsetz, *Toward a Theory of Property Rights*, 57 *Am. Econ. Rev.* pt. 2, at 347 (Papers & Proceedings, May 1967); Douglass North, *The Creation of Property Rights in Europe, 900-1700 A.D.* (unpublished manuscript Univ. of Wash., Dep't of Econ. 1972); and Svetozar Pejovich, *Towards an Economic Theory of the Creation of Property Rights*, 30 *Rev. Soc. Econ.* 309 (1972).

<sup>9</sup> Harold Demsetz, *supra* note 8, at 354.

markets, changes in relative factor scarcities, and the behavior of the state."<sup>10</sup> All of these works suggest that property rights decisions basically depend upon the marginal benefits and costs of such activities. None, however, explicitly specifies what is meant by "more private property" or what variables determine the benefits and costs. If the relevant economic variables are to be used for more than *ad hoc* theorizing, they must be developed into functional relationships which predict and are capable of being tested.

To narrow the analysis and overcome these deficiencies we have chosen to focus specifically on property rights definition and enforcement activities expressed in terms of the traditional marginal decision model of neo-classical economics. Establishing and protecting property rights is very much a productive activity toward which resources can be devoted. But, like any other activity, the amount of this investment will depend upon the marginal benefits and costs to investors of allocating resources to these endeavors. Our problem is to discern the nature of the benefit and cost functions. By expressing the amount of property rights definition and enforcement activity as a function of marginal benefits and marginal costs, and by specifying the shift parameters for each function, it is possible to explain the existing structure of property rights in a society and provide a vehicle with which we can analyze changes in property rights over time.

Figure I illustrates a hypothetical marginal benefit and marginal cost curve for property rights definition and enforcement activity. The vertical axis measures traditional values in terms of benefits or costs. The horizontal axis, however, requires some further clarification. On this axis we are measuring the amount of activities aimed at defining and enforcing property rights. In other words, a rightward movement along the abscissa implies an increase of inputs into the production of property rights and not necessarily an increase in the degree of private property.<sup>11</sup> This distinction is crucial because the same amount of activity may yield different levels of private property under different circumstances. For example, under the penalty of capital punishment, the activity of locking one's house may effectively deter burglars and insure a high degree of private property while under the penalty of a \$5 fine, the same activity may deter no one. It should be realized, however, that in the final analysis it is the degree of private property rights that determines efficient resource allocation. But, since the level of property rights is not directly observable and since there is some question over just what constitutes more or less private property, we have confined our

<sup>10</sup> Svetozar Pejovich, *supra* note 8, at 310 & 316.

<sup>11</sup> Our unit of measure on the x-axis is essentially the same as that used in information theory where a rightward shift implies an increase in search activity and not necessarily an increase in information. See for example, Armen Alchian & William Allen, *University Economics* 137-155 (3rd ed. 1972); or Paul Heyne, *The Economic Way of Thinking* 86 (Sci. Res. Associates, 1973).

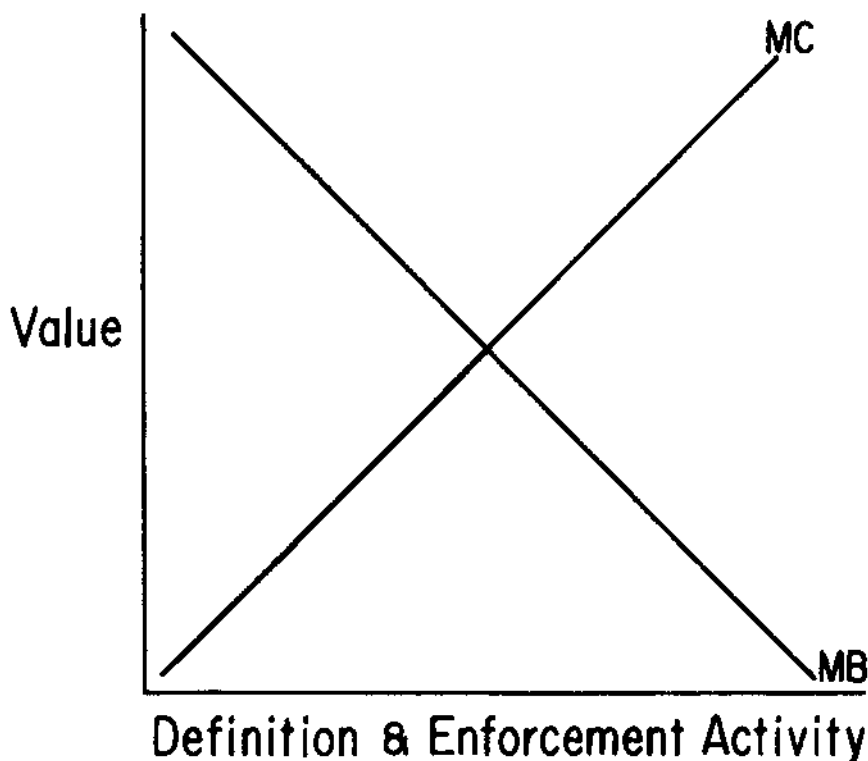


FIGURE I

analysis to definition and enforcement activities which are observable variables.

The slopes for the marginal gain and marginal cost curves in Figure I can be defended on theoretical grounds. The benefit from increasing levels of definition and enforcement activity accrues because of the increased probability of appropriating the worth of the asset. The rate of increase in total benefits, however, occurs at a decreasing rate for much the same reasons that the marginal physical product of any input declines. The marginal cost increases because of the increased opportunity cost of resources used in property rights activities.<sup>12</sup>

The equilibrium level of definition and enforcement activity occurs at the point where the curves intersect, but the more important question is why

<sup>12</sup> We have drawn the MB and MC curves, with negative and positive slopes, respectively, but the sufficient condition for stable equilibrium only requires that the MC curve cross the MB curve from below. Hence it is permissible that over some range the marginal benefits may be rising and the marginal costs may be falling.

does this level of activity vary over time and between areas? The answer to this question necessitates specifying the nature of the parameters which influence the cost and benefit functions. The benefits depend upon the value of the asset and the degree to which the activity insures that the value will be captured by the owner. Any change in the price of a well defined and enforced bundle of rights changes the return on resources devoted to property rights questions. "The higher market value attaching to goods with strong ownership rights spurs individuals to seek laws that would strengthen private property rights."<sup>13</sup> This is witnessed by the fact that as our air, water, and scenery have become increasingly scarce, individuals or groups of individuals have attempted to better define their rights to these resources through legal action. Furthermore, any increase in the productivity of a definition and enforcement activity will shift the marginal benefit curve outward. An increase in the probability of loss of an asset will usually result in an increase in the productivity of property rights activity and thus will result in such a shift.<sup>14</sup> An increase in the neighborhood crime rate means that locks, burglar alarms, and watch dogs all will have higher benefits than previously because each does more to insure appropriation of an asset's value. In addition to the crime rate, the probability of loss is affected by variables such as population density, cultural and ethical attitudes, and the existing "rules of the game" or the institutional structure. These in turn will be directly influenced by the political structure, historical precedent, the decision making rule (majority, plurality, etc.) the nature of the court system, and the penalty for infringements upon another person's property rights.<sup>15</sup>

The marginal cost of property rights reorganization is a function of the quantity of resources necessary for a given amount of activity and the opportunity cost of those resources. Hence, anything which reduces the quantity of resources or lowers the opportunity cost will shift the marginal cost curve. Changes in technology, changes in resource endowments, and changes in the scale of operation all could cause such a shift.

The above discussion offers a starting point for explaining why we ob-

<sup>13</sup> Armen Alchian & William Allen, *supra* note 11, at 141.

<sup>14</sup> We say "usually" will increase the productivity, because, although one would expect that an increased probability of loss would make a given activity more productive, it is possible to conceive of situations where that does not happen. For instance, if one discovered that one lived on an earthquake fault, the probability of loss would be greater, but one also might entirely cease definition and enforcement.

<sup>15</sup> As Professor Douglass North has stated, "a theory of property rights and of their creation is certainly incomplete without a theory of the state." It is our contention that the evolution of institutions which influence the marginal gain from private definition and enforcement activity fits into the theory of the state. However, as a foundation for this theory of collective decisions regarding property rights, an understanding of individual decisions is imperative. See Douglass C. North, *supra* note 8.

serve varying degrees of definition and enforcement activity and, *ceteris paribus*, why we observe levels of property arrangements covering the spectrum from "completely common" to "completely private" property rights. Furthermore, it provides a basis for assessing the importance of parametric shifts which influence the evolution of property rights.

It should be noted that this formulation of decision making with regard to property rights has been solely in terms of private benefits and private costs while many activities regarding property rights definition and enforcement involve economies of scale and hence may lead to group action. Though the benefits from economies of scale through collective action are evident, the free rider problem and the burden of costs often preclude such action. Because of this divergence between private and social costs and benefits associated with definition and enforcement activities, property rights will not always be redefined in accordance with social welfare. Indeed, the gainers from reorganization may be able to make others bear the costs through a coercive device such as the government.<sup>16</sup> Institutionally organized externalities do play an important part in what actually happens to the property rights structure.

#### APPLICATION OF THE MODEL

In the above section it was argued that the neo-classical model, with institutional considerations taken as given, is seriously lacking in explanatory power. By extending this model to include the costs and benefits of defining and enforcing rights, the existence and change of institutions can be explained. The following is a test of our extension of the neo-classical model with historical data from the Great Plains.<sup>17</sup>

This region provides a good test for a theory of property rights evolution since property rights questions are at the heart of most issues discussed in the historical literature of the region. The Great Plains was one of the last regions of the United States to be settled and climate and topography were considerably different from other regions. Webb captures the impact of these forces on the institutions of the region in the following quote:

The Easterner, with his background of forest and farm, could not always understand the man of the cattle kingdom. One went on foot, the other went on horseback; one carried his law in books, the other carried it strapped round his waist. One represented tradition, the other represented innovation; one responded to convention, the other responded to necessity and evolved his own conventions. Yet the man of

<sup>16</sup> See Armen Alchian & William Allen, *supra* note 11, at 141.

<sup>17</sup> Most of our information is from Montana and Wyoming but many of the same trends were experienced throughout the region between the 98th meridian and the Rocky Mountains.

the timber and the town made the law for the man of the plain; the plainsman, finding this law unsuited to his needs, broke it and was called lawless.<sup>18</sup>

In terms of our theory, the intersection of the marginal benefits and cost functions dictated different levels of property rights activity in the West than in the East. Therefore, opportunities for gain existed from the reorganization of institutions which were aimed at defining and enforcing property rights. Since much of the formal (legal) decision-making apparatus which controlled these institutions was centered in the East, it was often very costly to use the normal channels of change. As a result, various alternatives developed, including voluntary local agreements and extra-legal institutions. As will be illustrated, these alternative activities are consistent with and predicted by our theory of property rights change.

Our theory will be tested by focusing on the property rights governing the three important productive factors on the Great Plains; land, livestock, and water.<sup>19</sup> Since some combination of these three resources was used in nearly every economic endeavor on the Plains, how they were controlled was crucial to the amount and distribution of output. The model suggests that the changing scarcity of these factors over time changed the benefits from establishing and enforcing exclusive rights to each factor's share of total output. Furthermore, it will be shown that it was these changing benefits in combination with the changing costs of ownership that determined the system of property rights governing land, livestock, and water in the American West.

#### *Land:*

Land in the Great Plains had several characteristics that affected its productive use. First, the mean average rainfall over much of the area did not exceed 15 inches annually,<sup>20</sup> precluding the use of land for farming as practiced in the East. Second, the forage was mainly short grass, implying a land intensive type of output. And finally, the lack of trees over much of the Plains meant that it was difficult to fence with natural materials.

There was little precedent for the type of agriculture appropriate to the Great Plains. It has often been noted that the resource endowments of the arid, treeless West forced the farmer to alter drastically the productive process. That these same characteristics also provided the impetus for a change in methods of defining and enforcing property rights has not been so readily

<sup>18</sup> Walter Prescott Webb, *supra* note 6, at 206.

<sup>19</sup> There are other property rights questions of interest in the Plains that we do not consider here. For instance, the conflict between the Indian and the settler was obviously a question of defining property rights. Likewise, the near extermination of the buffalo is a good example of what can happen to a common property resource.

<sup>20</sup> Walter Prescott Webb, *supra* note 6, at 17.



recognized. Initially land on the Great Plains was not a scarce resource and little attention was paid to the property rights questions. "There was room enough for all, and when a cattleman rode up some likely valley or across some well-grazed divide and found cattle thereon, he looked elsewhere for range."<sup>21</sup> For much of the 1860's and 1870's "squatter sovereignty" was sufficient for settling land ownership questions. But the growing demand for land by cattlemen, sheepherders, and grangers eventually caused the value of land to increase and hence increased the benefits from definition and enforcement activity.<sup>22</sup> To remedy the situation, attempts were made to establish some extra legal claims to property. "As yet, no ranchman owned land or grass; he merely owned cattle and the camps. He did possess what was recognized by his neighbors (but not by law) as range rights."<sup>23</sup> These rights provided some exclusivity over use of land, but as population increased (see Table 1), settlement became more dense and land values rose

TABLE 1  
POPULATION OF THE GREAT PLAINS<sup>a</sup> 1850-1900

1850	274,139
1860	872,892
1870	1,481,603
1880	3,549,264
1890	6,044,884
1900	7,377,091

Source: U.S. Census Bur., Historical Statistics of the United States, Colonial Times to 1957, 12-13 (1960).

<sup>a</sup> This series includes the states and territories of North Dakota, South Dakota, Kansas, Nebraska, Texas, Montana, Wyoming, Colorado and New Mexico.

even more. Individuals and groups began devoting more resources toward the definition and enforcement of private property rights. Early laws provided for punishment for those who drove their stock from the accustomed range. The idea of accustomed right on the basis of priority rights is also reflected in the claim advertisements run in local newspapers. Such activities certainly cost very little, but the benefits derived therefrom were also quite low because such advertisements were unenforceable in any court of law. They did not preclude sheepherders from also claiming some right to the land.

The inelastic supply of land meant that as demand increased the rental value of the asset rose rapidly and hence made the rate of return on definition and enforcement activity even more attractive. To capture these returns, cattlemen organized in groups and used the coercive authority of the government. By banding together in stock growers' associations, cowmen

<sup>21</sup> Ernest Staples Osgood, *The Day of the Cattleman* 182 (1929).

<sup>22</sup> For a discussion of crowding on the open range see *id.* at 181-83.

<sup>23</sup> Walter Prescott Webb, *supra* note 6, at 229.

attempted to restrict entry onto the range through control of access to the limited water supplies. Furthermore, groups were able to put pressure on state and territorial governments to pass laws providing punishment for those who drove stock from their "accustomed range." In 1866, the Montana Territorial Legislature passed a law attempting to control grazing on public land and in 1884 a group of cattlemen meeting in St. Louis suggested that the federal government allow leasing of unclaimed land.<sup>24</sup> To the extent that they were successful, such actions moved the West toward private property by restricting entry on to commonly owned land.

This influence of these associations remained strong until the winter of 1886-87. This winter was "the severest one the new businesses on the northern plains had yet encountered, with snow, ice, wind and below-zero temperatures gripping the area from November to April, in a succession of storms that sent the herds drifting helplessly, unable to find food or water."<sup>25</sup> Cattle numbers decreased dramatically because of the storm and numerous ranchers went broke and left the area. The temporary decline in land values which accompanied the reduction in herds shifted back the marginal benefit curve for enforcement activity.<sup>26</sup> As the theory predicts, decreases in activity were observed. Associations established with the objective of enforcing property rights experienced decline. From 1886 to 1889 membership in the Wyoming Stock Growers' Association dropped from 416 to 183.<sup>27</sup> Similar results of the winter were evident in the Montana Stock Growers' Association. In his 1887 presidential address to only one-third of the members, Joseph Scott stated that, "had the winter continued twenty days longer, we would not have had much necessity of an Association; we would not have had much left to try to do."<sup>28</sup>

While all of the laws and restrictions on land use did provide a step toward exclusive ownership, they still did not stop livestock from crossing range boundaries. Only physical barriers could accomplish this but in the grasslands of the West where wood and rock were scarce, the cost of fencing

<sup>24</sup> Ernest Staples Osgood, *supra* note 21, at 21 & 201.

<sup>25</sup> Maurice Frink, W. Terrentine Jackson & Agnes Wright Spring, *When Grass was King* 98-99 (1956).

<sup>26</sup> Although the activities of the stock growers' association are being treated in the section on property rights activity in land, it is obvious that the organizations were created to define rights in both land and livestock. The winter of 1886-1887 had the effect of decreasing enforcing and definition activity in both assets. For instance, W. Turrentine Jackson points out that because of the decreased lobbying power of the stock-growers many stock laws were repealed in the legislature of 1888. See W. Turrentine Jackson, *The Wyoming Stock Growers Association, Its Years of Temporary Decline, 1886-1890*, 22 *Agricultural History* 269 (1948).

<sup>27</sup> *Id.* at 265.

<sup>28</sup> Ray H. Mattison, in *Minutes of the Montana Stockgrowers Association, 1885-1889* as quoted by *The Hard Winter and Range Cattle Business*, 1 *Mont. Magazine of History*, Oct. 1951, at 18.

was high. Fences of smooth wire did not hold stock well and hedges were difficult to plant, grow and maintain.

But in the 1870's the introduction of barbed wire greatly reduced the cost of activities aimed at enclosing one's land. To the homesteader whose land was invaded by cowboys and their herds which trampled down crops, barbed wire "defined the prairie farmer's private property."<sup>29</sup> Some stockmen, however, ridiculed the new fencing material, but others saw the advantage of controlling their own pastures. In Texas, for example, "they began buying land with good grass and water and fencing it. In 1882, the Frying Pan Ranch, in the Panhandle, spent \$39,000 erecting a four-wire fence around a pasture of 250,000 acres."<sup>30</sup> Other cattlemen turned to enclosing their "accustomed range" with cheap and easily erected, barbed wire. Such actions, however, were forbidden by a federal law of 1885 which provided for the "prosecution of those who stretched fences out upon the public domain."<sup>31</sup> The ensuing ownership conflicts were settled through range wars as well as legal institutions.

Between 1860 and 1900, changing land values and changing costs caused individuals and groups to devote more resources to definition and enforcement activity in order to capture potential rents to land. As a result of these activities, the institutions governing land ownership on the Great Plains moved successively toward exclusivity. Measures were enacted which attempted to control grazing on the public domain and efforts were made to lease from the government unclaimed communal property. During the 1870's and 1880's many acres were privately claimed under the homestead, preemption, and desert land laws. And finally, land was granted outright to the transcontinental railroads who in turn transferred much of it into private hands.

#### *Livestock:*

While the lack of rainfall made tillage impractical over the majority of the Great Plains, native grasses of the area could support livestock. By combining sheep, cattle, and horses with large amounts of arid land, settlers produced a marketable commodity. However, before the value of these assets could be captured, property rights definition and enforcement was again necessary. Although the livestock were in many ways similar to those used in other areas of the United States, the way that they were combined with other factors of production in the West, that is, the form of the production function,

<sup>29</sup> Alistair Cooke, *America* 237 (1973).

<sup>30</sup> *The Book of the American West* 292 (Jay Monaghan ed. 1963).

<sup>31</sup> Ernest Staples Osgood, *supra* note 21, at 192-93.

<sup>32</sup> *Id.* at 33.

meant previous methods of defining property rights were no longer appropriate.

In eastern regions where farms were much smaller, it was easy to watch one's animals and to know when they strayed from one's property. Positive identification by natural marking was also feasible on farms with only a few head of livestock. Furthermore, the lack of common property and the availability of rails for fencing made enforcement of property rights less costly. The western livestock producer, however, not only had to run his cattle over a large acreage, but also had to pasture them on lands over which he did not have exclusive control. These factors, combined with the difficulty of fencing the large areas where wood was scarce, made eastern methods of enforcement of livestock property rights costly on the Plains.

Since the eastern methods of property rights definition and enforcement produced a low if not negative rate of return, settlers on the Plains searched for alternatives. During the 1860's sheepmen turned to herding while "property rights in unbranded cattle were established by the fact that they ran on a certain range. . . ."<sup>32</sup> As long as individuals agreed upon the ownership of animals there was little need to devote valuable resources to the definition and enforcement questions. However, increasing human and cattle populations in the region did shift the marginal benefit curve and thus changed the equilibrium level of definition and enforcement activity. "The questions arising over the ownership of cattle and the rights of grazing, difficulties that have bothered the pastoral industry from the beginning of time, were intensified as the number and value of the herds increased."<sup>33</sup> This in turn raised the marginal physical product of enforcement activity and shifted the marginal benefit curve to the right.

The predicted response to this shift is increased property rights activities. Although branding has existed from the beginning of the settlement of the region, the laws governing branding activity changed.

There was a time when brands were relatively few and a man could easily remember who owned the different ones, but as they grew more numerous it became necessary to record them in books that the ranchers could carry in their pockets. Among the first laws enacted by territorial legislatures were those requiring the registration of brands, first in counties and later with state livestock boards.<sup>34</sup>

The laws enacted by the early territorial legislatures of Wyoming and Montana provided for the central registration of distinctive brands,<sup>35</sup> but as the population increased, the benefit curve continued to shift to the right. In

<sup>32</sup> *Id.* at 114.

<sup>34</sup> Maurice Frink, *et al.*, *supra* note 25, at 12.

<sup>35</sup> Act of Feb. 1, 1865, Laws of the Montana Territory 1864-1865, Sess. I, at 401; Act of Nov. 24, 1869, General Laws of Wyoming Territory 1869, Sess. I, ch. 62, at 426-27.

the following quote, Osgood captures the effect of this shift on enforcement activity in cattle.

In a country of limited ranges and small herds, the legal protection would have been sufficient. Wherever and whenever the range-cattle industry developed, such laws were found to be wholly inadequate. In Wyoming, the arrival of the Texas herds in the seventies resulted in each legislature passing laws to adjust the grand system to the changing character of the business. The drover who brought cattle to or through the Territory must see to it that every head in his herd was branded. He must frequently examine his herd and drive away any cattle not his own. Because whole brands of cattle were changing hands, provision was made for the lawful purchase of a brand. Penalties were provided for those who failed to brand any animal over a year old, who used a "running brand," who failed to obtain a bill of sale with a full list of the brands of the animals purchased, who killed an unbranded calf, or who skinned an animal carrying another's brand, unless he could produce evidence of purchase. Conflicts over brands, which had been left to the county clerk for decision, were, in 1877, turned over to a committee composed of the clerk and two resident stock growers of the county; for with the increase of herds, the brand system became so intricate that it required the knowledge of the community to administer it. All owners bringing cattle into the Territory, were required to lay the brands of these cattle before the committee, which was instructed to reject all brands that were duplicates of existing brands. The addition of a circle or a half circle, a bar or a box, did not create a new brand and must be rejected. In 1879, all drovers were required to brand with a road-brand before driving over any portion of the Territory. Such a brand would distinctly set off trail cattle from all others. At the same time, the law on illegal branding was strengthened by making such an offense a felony with a penitentiary term attached. Similar legislation in Montana as to the recording of brands, the changing of brands, and the driving off of stock was passed at about the same time. Not until 1881, however, when the arrival of thousands of Texas stock in eastern Montana made it imperative, did the Montana legislature pass a road-brand law.<sup>36</sup>

A cross-sectional comparison provides further evidence of differences in the benefits and costs of branding between the West and other regions. As early as 1864, laws were enacted in Western territories which specified brands as legal proof of ownership. However, in many Midwestern states, central brand registration is still absent and brands are not a requirement for proof of ownership.

Although many efforts to define and enforce property rights in livestock were undertaken by individual ranchers, group activity was not absent. Voluntary collective action afforded cattlemen the opportunity to capture gains from economies of scale in certain activities. The roundup is a case in point. Originally each rancher conducted his own gathering and branding of cattle. On the open range, this meant that herds were gathered as many

<sup>36</sup> Ernest Staples Osgood, *supra* note 21, at 125-27.

times as there were individual operators in an area. However, as the number of operators increased, the costs of handling the cattle in this fashion increased proportionally and cooperation between independent operators became profitable. The returns from these joint roundups were so high that cattlemen's associations found it worthwhile to elicit statutes such as a Wyoming law of 1883 which provided for a legal roundup.

By the law of that year, no stock could be branded between February 15 and the commencement of the general spring roundup of the Association. In practice, this meant that the calf roundup was wholly in the hands of the Association. Since the chief reasons for rounding up in the spring was to brand the calves, and since any roundup before February 15 was dangerous to the cattle, the stock grower was practically prohibited from an independent roundup.<sup>37</sup>

Technological change also decreased the cost of definition and enforcement activity in livestock. As noted above, in the 1870's homesteaders and ranchers alike began using newly invented barbed wire to define and enforce their rights to land. In addition, cattlemen saw the value of barbed wire for enforcing one's rights to livestock. By confining cattle to a certain range, the losses from strays and the costs of roundup could be reduced. Furthermore, once cattle were separated, controlled management and breeding of herds could be practiced. Use of the wire started in 1874 when 10,000 pounds were sold. By 1880, just six years later, over 80,500,000 pounds were sold and fencing was being used all across the West.<sup>38</sup> The rightward shift in the cost curve for fencing greatly increased definition and enforcement activity in both land and livestock.

All of the changes in activity that have been discussed with regard to livestock have been in one direction, that is, the shifts in the benefit and cost curves have been such that increased definition and enforcement activities have been forthcoming. The theory predicts that decreases in activity should also be observed if the shifts were in the other direction. In the 1920's in Eastern Montana an example of this occurred. From 1918 till 1926 horse prices in Montana dropped dramatically, from 98 dollars to 29 dollars per head (see Table 2). This occurred because mechanization on farms was replacing horses and particularly in the West, because the U.S. Cavalry at the end of World War I was no longer buying horses. The sharp decline in the price of horses shifted the marginal benefit curve to the left and significantly lowered the optimum level of definition and enforcement activity. Finding it unprofitable to define and enforce these rights, many horse owners allowed their animals to run the open range. The wild horse herds increased so

<sup>37</sup> *Id.* at 187.

<sup>38</sup> For a complete account of the use of barbed wire over time see Walter Prescott Webb, *supra* note 6, at 309.

TABLE 2  
VALUE OF HORSES, MONTANA, 1918-1926

	Price Per Head
1918	\$98
1919	94
1920	61
1921	50
1922	42
1923	39
1924	33
1925	32
1926	29

Source: U.S. Ag. Dept., Ag. Econ. Bur., *Livestock on Farms, January 1, 1867-1935*, at 117 (1938).

rapidly during this period that community roundups were held in an attempt to clear the range of the unclaimed property.

#### *Water:*

Water presented special problems with respect to ownership. Unlike land and livestock it moves freely across many different pieces of real estate and can change its course over time. Furthermore, the quantity of water can vary from season to season and even from day to day. This is especially true in the Great Plains states where average rainfall ranges between 15 and 20 inches annually. The ever changing physical nature of the resource makes definition and enforcement of rights most difficult and as such led Blackstone to say: "For water is a moving, wandering thing, and must of necessity continue common by the law of nature; so that I can only have a temporary, transient, usufructuary property therein."<sup>39</sup>

To the frontiersman entering the Plains, it was clear from the start that access to water was a prime consideration when locating. Hence, initial settlement patterns can be traced to the river and stream bottoms.<sup>40</sup> As in the case of land, if an individual found a stream location taken, he simply moved on to another water supply. Under these circumstances the right to the use of the water accrued to the one who owned the bank of the stream and who had access to it by virtue of position. That such riparian water rights, whether implicit or explicit, were adopted by the frontiersmen is not difficult to understand. First of all, these rights found historical precedent in Eastern laws which were in turn borrowed from English common law. Early judges and lawyers were familiar with nothing but Eastern law and thus transferred it to the legal system of the West.<sup>41</sup> Secondly, riparian rights

<sup>39</sup> As quoted *id.* at 434.

<sup>40</sup> For a discussion and map tracing settlement along streams see *id.* at 433.

<sup>41</sup> For a discussion of the importance of this historical precedent see *id.* at 447.

were appropriate to the factor endowments of the region at the time. Initially, land with adjacent water was abundant relative to the number of settlers, that is, water was not a relatively scarce factor. As long as these conditions continued, rights which granted all riparian owners equal use of the flowing stream sufficed for resource allocation. The benefits from changing the existing institutions governing water were not sufficient remuneration for the time and effort required to initiate the change.

As the settlement pressure increased, however, so too did these benefits. Especially in the states on the western edge of the Plains, land with available water became increasingly scarce. The value of water rights were rising in this arid country where water was an absolute necessity for raising any crops or livestock. Moreover, in areas where gold mining was prevalent, water was required at the mine site, which was often far from the nearest stream. The value of the marginal product of water in mining was high. Our theory predicts that these conditions would induce individuals to devote more resources to the redefinition of property rights in water and indeed they did. For example, in the mining regions (especially California) there were no established customs of mining and no recognized laws. Hence, the miners set up mining districts, formed miners' associations, and established mining courts which provided laws.

These miner's rules and regulations . . . were very simple and as far as property rights were concerned related to the acquisition, working, and retention of their mining claims, and to the appropriation and diversion of water to be used in working them . . . There was one principle embodied in them all, and on which rests the "Arid Region Doctrine" of the ownership and use of waters, and that was the recognition of discovery, followed by prior appropriation, as the inception of the possessor's title, and development by working the claim as the condition of its retention.<sup>42</sup>

Though advised by Eastern lawyers, the miners recognized the need for an alternative system of water law in the West and worked hard in the California and United States courts to have their customs and regulations regarding water recognized.<sup>43</sup>

While precedent established in California in 1850 lowered the cost of establishing new property rights in water, the increasing relative scarcity of water increased the benefits to definition and enforcement activity on the Great Plains. Settlers moved toward a system of water laws which:

1. Granted to the first appropriator an exclusive right to the water and to later appropriators rights conditioned upon the prior rights of those who have gone before;

<sup>42</sup> Clesson S. Kinney, 1 *Law of Irrigation and Water Rights* §598 (1912).

<sup>43</sup> Walter Prescott Webb, *supra* note 6, at 444-48.



2. Permitted the diversion of water from the stream so that it could be used on nonriparian lands;
3. Forced the appropriator of water to forfeit his right if the water was not used, and;
4. Allowed for the transfer and exchange of rights in water between individuals.<sup>44</sup>

Our theory predicts that activities designed to establish and enforce exclusivity will be strongest in areas where water is most scarce. Hence it is not surprising to find that in the states of Montana, Wyoming, Colorado, and New Mexico where rainfall averages 15 inches per year, the common law was eventually abrogated while in North Dakota, South Dakota, Nebraska, Kansas, Oklahoma, and Texas, the common law was retained in a modified form.<sup>45</sup> The evolution of water law on the Great Plains was a response to the benefits and costs of defining and enforcing the rights to that valuable resource.

#### CONCLUSION

The analysis herein suggests that a comparison of the benefits and costs of defining and enforcing property rights explains and predicts the evolution of property institutions. We have argued that the social arrangements, laws, and customs which govern asset ownership are established on the basis of variables endogenous to the economic system. On the benefit side of an individual's investment decision are the value of the asset and the productivity of the activity designed to establish or enforce property rights. The higher the value of the asset and the higher the probability of losing the right to the use of that asset, the greater the degree of definition and enforcement activity. On the cost side are the "production function" for such activities and the opportunity costs of resources devoted to definition and enforcement. Technological change or lower resource prices will increase property rights activity.

Such a theory allows the formulation of testable hypotheses regarding the evolution of property rights. To test these hypotheses we examined data from the history of the American West and found it consistent with our theory. When the benefits increased or costs decreased, individuals increased the amount of time and resources they devoted to definition and enforcement of rights to land, water, and livestock. Furthermore, when declining livestock and land values decreased the marginal gain, there was a reduction in enforcement activity. A more rigorous test of our theory re-

<sup>44</sup> For a discussion of the rights of property under prior appropriation see Wells A. Hutchins, 1 *Water Rights Laws in the Nineteen Western States* 442-54 (U.S. Ag. Dep't, Misc. Pub. No. 1206, Nat'l Resources Econ. Div., 1971).

<sup>45</sup> See Walter Prescott Webb, *supra* note 6, at 446.

quires further qualitative and quantitative research on asset values, resource prices, production functions, laws and their dates, and court decisions. The collection of such data from other times and places will further test our theory that the evolution of property rights is a function of the marginal decision making process.