Economic Development and Property Rights: Time Limits on Land Ownership

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October, 1999
Revised: May, 2002

Abstract

This paper discusses the relationship between economic development and one aspect of property rights, a statute of limitations defining time limits on ownership claims. The analysis centers on property rights in land. This paper argues that the available development opportunities shape the time limits on ownership claims that maximize property values, which in turn creates an inherent underlying tension among the owners of different types of property in the economy. An implication for positive analysis is that economic growth and successful development create demands for changing this dimension of property rights. Other characteristics of the economy like the efficiency of the legal system, the quality of the public sector bureaucracy, and corruption, also affect the value-maximizing time limitations for different types of property. This paper discusses implications of these relationships for developing countries and for property redevelopment in declining central cities in the US.

Keywords: Economic development; Property rights; Urban vs rural land; Central city redevelopment

JEL Classification Numbers: O18, O20

1. Introduction

How property rights are defined in an economy plays an important role in the economic development process. Well-defined property rights enhance efficiency and liquidity in asset markets, which in turn promote efficient economic development [North and Thomas (1973), Rosenberg and Birdzell (1986), Besley (1995), Alston, et al. (1996)]. As important, but less visible, is the notion that the standard of proof for competing claims to property rights and the structure of the institutions or rules used to resolve conflicting claims also profoundly affect the pace and pattern of economic investment [Ellickson (1993), Miceli, et al. (1998, 2000)]. This paper examines the relationship between economic development and one such set of rules used to resolve conflicting ownership claims, the statute of limitations for property rights.

The important works by economic historians such as North and Thomas (1973) and Rosenberg and Birdzell (1986) stress the role of property rights for economic growth and development, and the strong influence of secured property rights on the stability and prosperity of the Western world. In spite of the difficulty associated with devising quantitative measures of property rights, a small but growing literature has begun to study the empirical relationship between property rights and economic development across countries. For example, Scully (1988, 1992) and Scully and Slottje (1991) develop an empirical proxy for property rights that includes freedom of the press and media in addition to other private property rights. They find a significant positive relationship between their measure of property rights and economic growth. Furthermore, Barro (1991) and Alesina et al. (1996) construct empirical proxies to estimate the potential effect of political instability on property rights. Their results suggest a significantly negative relationship between these variables and economic development. Tortensson (1994) uses data from Gastil (1987) to examine how the practice of arbitrary government seizure of private property relates to economic development and concludes that this source of insecurity in property rights retards growth in developing countries.

Taking a somewhat different perspective, the single country studies by Besley (1995) and Alston, et al. (1996) conclude that the evolution of land property rights from the vaguely defined communal or tribal forms toward the modern individualistic concept of private property increased the efficiency of investment in capital improvements applied to land, a result consistent with the cross-country studies of property rights and growth. Thus, the empirical evidence appears to support the broad conclusions of North and Thomas (1973) and Rosenberg and Birdzell (1986); well-defined and

defended private property rights enhance growth and economic development.

Although the notion that how private property rights are defined affects development is intuitively appealing and empirically relevant, it nonetheless leaves one half of the property rights-development question unanswered. Private property rights represent a complex set of institutional characteristics whose details often differ across countries and sometimes even across states or provinces within countries.[1] So the question remains: what economic forces, if any, shape the precise definition of property rights in a developing economy? One possibility is that developing countries simply adopt the property rights regimes of the former colonial powers. But this answer is unsatisfying at least in part because it neglects that, even in developed countries like the US, the functional definition of property rights has changed over time, albeit slowly. This give rise to another relevant question pertaining to development issues: how do the specific attributes of a property rights regime affect the value of investments in real assets in the economy?

This paper focuses on the relationship between the development process and property rights; we find that the available development opportunities shape the preferred characteristics of the property rights in the particular province, state, region or country. Put differently, not only does the specific form of property rights in a region affect the pace and pattern of its economic development, but the pace and pattern of feasible development possibilities in turn also affect the form of property rights desired by current owners. This paper sheds light on the relationship between economic development and one narrow aspect of property rights, the statute of limitations defining the legal durability of ownership claims over time. The analysis centers on property rights in land. A significant part of the economic development process is tied to the shifting of land from one use to another; therefore, without loss of generality, the focus remains at the microeconomic level, viewing the broader process of economic development reflected in the transfer of land from agricultural, forestry, or other non-urban uses to the urban sector or the transfer of land from one urban use to another more highly valued use. This transfer of land from one sector to another or one use to another is accomplished by site preparation (including demolition of existing structures, where appropriate) and building structures and other capital improvements to make the land usable for residential, commercial, or industrial purposes.

Although the focus of much of the literature studying the relationship between property rights

[1]The precise definition of property rights for a given type of asset sometimes varies even across regions within a single country. For example, Miceli, Sirmans, and Turnbull (1998) show how the various land deed recording systems that are used across regions in the U.S. effectively create different sets of property rights for landowners.

and economic development is geared toward developing countries, the implications remain relevant for the redevelopment process within central cities and the older declining industrial suburbs in the US. The potential for conflicting claims to real estate arising from poor tax administration practices, functional abandonment, urban squatting, etc., is amplified when redevelopment requires either the assembly of individually-held smaller plots of land or the subdivision of large tracts of formerly industrial or commercial land in the interior of urban areas. The statute of limitations for pressing ownership claims affects the market value of such property. This paper explains why the statute length that is most beneficial for such property is also likely not the type of statute that prevails in the state.

The statute of limitations represents one dimension of how property rights are defined in an economy. The statute establishes a time limit on the ability to challenge–or protect from challenge– an individual's claim of ownership. Land and its improvements represent the most durable economic assets in an economy. It is therefore not surprising that real estate represents the class of assets for which conflicting ownership claims often arise in market economies. The life-span of land greatly exceeds the life-span of any individual, so the property rights to a particular parcel of land must necessarily change hands many times. Institution changes arising over time from governmental abrogation of prior land grants, the destruction of records from natural disasters, revolution and war, etc., are all possible sources of conflicting claims to land ownership. But even in an economy that has not experienced these disruptions, the fallibility of record keeping in general and poor record keeping practices in particular, as well as the complications of tax and inheritance laws, the possibility of fraud, and the practice of boundary encroachment or outright squatting each can give rise to questions of rightful ownership. The question most relevant to property owners is simply: how long should claims against property title be honored?[2]

Given that the possibility of conflicting ownership claims appears to be inevitable for durable private property like land, this paper derives the efficient window of opportunity that should be left open for such claims to ripen. It shows that the statute length that maximizes land value balances two ownership risks endemic to land. One source of risk arises from the potential claims from individuals who, because of errors in official records, errors in legal judgements, or complicated tax

[2]There is an extensive law and economics literature on property rights in general and adverse possession rules for various types of property. This paper ignores many of the subtleties in that literature in order to focus on the key economic forces within the context of a model of economic development. See, e.g., Cooter and Ulen (1997), Ellickson (1993), and Netter, et al. (1986) for relevant background from the law and economics perspective.

or inheritance laws, did not adequately exercise their prior ownership claims. The probability that such individuals might press their claims at a future date creates ownership risk to current good faith owners. Another source of ownership risk arises from events that might occur in the future, like squatting, boundary encroachment, or other sources of adverse possession. Left unchecked, these activities are another source of potential future claims that are adverse to the current owner's interests.

The analysis illustrates a relationship that is particularly relevant to the study of economic development; the available development opportunities shape the efficient time limitation for asserting property rights. One result is that the practical necessity of establishing a single statute length within a jurisdiction creates an underlying tension among the owners of the different types of property. In the US, for example, these types of statutes are established and enforced by state governments; the single statute length within an economically diverse state cannot fulfill the needs of all types of property owners at all times. An implication for positive analysis is that, to the extent that legal institutions respond to economic forces, the model predicts that economies in which most individuals' interests are tied to developed or developable property will tend to establish shorter statute lengths than developing economies in which a relatively greater number of individuals' interests are tied to agricultural, forestry, or mining activities. Of course, other factors enter as well, and the analysis shows how the efficiency of the legal system, the quality of the public sector bureaucracy, and corruption, each affect the optimal statute of limitations for different types of property. Nonetheless, even within developed economies, the varying mixes of economic interests across regions lead to different statutes. Looking at individual states in the US, for example, a survey of Leiter (1999) reveals adverse possession statute lengths ranging from five to sixty years in duration.

The paper is organized as follows. Section 2 presents a partial equilibrium model of the efficient or value-maximizing statute of limitations for individual parcels of property. Section 3 uses the model to illustrate how different characteristics of the legal and economic environments affect the value-maximizing statutes for each property type. Section 4 discusses the implications of this study for developing economies in general and for US urban areas in particular. Section 5 provides a summary and conclusions.

2. The Value-Maximizing Statute of Limitations

This section presents a simple model that helps explain why the temporal dimension of property rights, in the form of a statute of limitations, arises in the first place. The premise is that, like any other attributes of private property rights, temporal restrictions or time limits on property rights have both benefits and costs to individual owners. Our economic model of such restrictions is therefore essentially a demand model, depicting the limitations that an individual property owner would most prefer after weighing the benefits and costs of longer or shorter time restrictions on pressing ownership claims. Comparing the "optimal" statue length for each individual owner with the single uniform statute set by the government (or determined by court decisions) for the entire jurisdiction reveals the types of property that benefit the most under existing statute provisions and the types of property that benefit the least. The intent is not to present a formal model of how the actual statute length is determined in each jurisdiction; the framework nonetheless provides insight into the role of individuals' demands in determining the shape of this aspect of private property rights. This insight is also important for understanding why economically pressed areas of metropolitan regions in the US cannot generally expect to enjoy the statute lengths that would most enhance the market value of redeveloped property.

In order to keep the analysis as simple as possible, ignore for the time being the owner's decision of when to develop or redevelop land. A more complete framework is presented in an appendix for interested readers. The appendix demonstrates that all of the conclusions presented informally here hold as well in the more general model including investment timing decisions. Here, we focus on the one dimension of interest, the statute length.

In what follows, we label land that is ultimately destined to be used for urban residential, commercial, or industrial purposes as "urban" or developable land, whether currently in urban use or not. We label land being used for agricultural, forestry, mining, or simply fallow, that is not destined for future conversion to some urban use, as non-developable or "rural." We begin by envisioning an individual landowner's general problem of weighing the benefits and costs of longer or shorter statute length in order to determine the statute that will maximize the value of a particular piece of property. This statute of limitations represents that particular individual landowner's "demand" for this characteristic of the property rights regime. The general problem is to ascertain how different economic situations will lead to different value-maximizing statute

lengths.

When in its undeveloped state, the parcel of land will earn the agricultural rental return. Land destined for urban use will generally earn a greater return once developed for that purpose. Given the general characteristics of declining urban land rent with greater distance from the central business districts or economic cores of an urban area, the return to land in the interior of an urban area is greater than for urban land situated less advantageously.[3] It is worth emphasizing this aspect of land markets at this point: location rents ensure that different parcels of land earn different returns once developed; denoting R as the present value of the net return to land (per acre), this rental return is greater for urban land than for rural land and greater for urban land in the interior of the city than urban land at its fringe.

Consider the implications of ownership risk. There are two risks to ownership recognized here. The first is the risk of a claim from a previously dispossessed owner: adverse possession arising from pre-existing boundary encroachment, title recording or transfer errors that were made in the past, or squatting. The second is the risk that the current owner will be dispossessed as a consequence of present or future adverse possession by encroachment or squatting. The appendix presents a more formal hazard rate or survival model of these risks. The framework presented here is less formal but captures the essence of the important relationships sufficiently well to discuss the main implications of the more formal model.

The first source of risk is reflected in the probability that a previously dispossessed owner or encroacher will claim ownership of the plot of land sometime within the allowed window for such claims. Denote this probability $P(L)$, where L is the statute length or the time limit for pressing a claim (measured in years). The longer this window of opportunity for pressing past claims remains open, the greater the probability that such a claim will be discovered by another party and will be pressed. Using prime to denote derivative, this probability of a past claim surfacing increases with statute length, or $P' > 0$. This is a reasonable characterization. There is a positive probability of losing ownership prior to the expiration of the legal time limit for asserting such a claim. From the current owner's perspective, the statute of limitations extinguishes all claims arising from more than L periods ago. Thus, once the current owner has held the property for longer than L, the statute is in force and the probability of losing ownership to a prior claimant falls to zero. As

[3]Higher returns to inframarginal parcels of urban land is typical in both static and dynamic models that distinguish land by urban-rural sectors. For example, see Brueckner (1987) for the static case and Turnbull (1988) for the dynamic case.

explained in the appendix, our assumed probability function allows for the possibility that the greater the passage of time–even without a statute of limitations–the less likely it is that a claim from a previously dispossessed owner will arise; that is, stale claims are less likely to surface than are fresher claims. The important property for what follows is that, because extending the time limit or statute length increases the window of opportunity for individuals to press prior claims against the current owner, increasing the time limit increases the probability of losing the land ownership at any given point in time. Lengthening the time limit increases the probability that there will be a claim forthcoming sometime during the current owner's holding period.

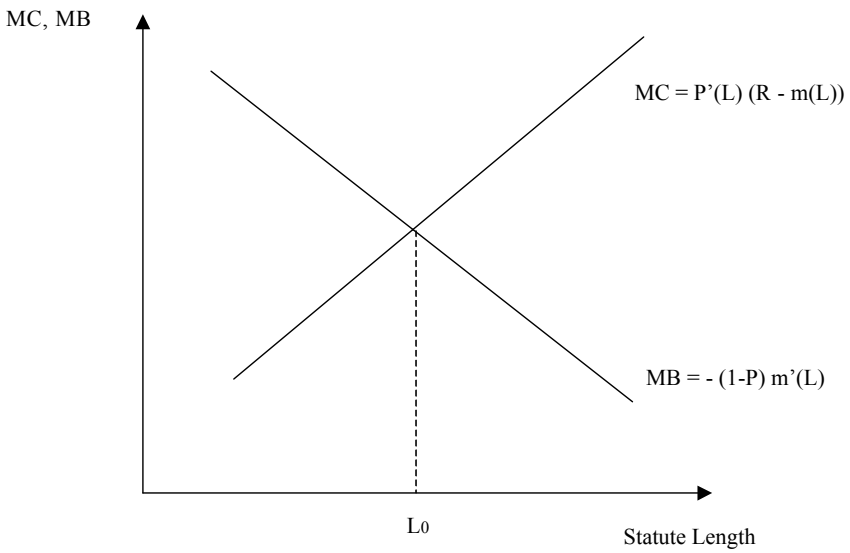
The second source of risk to ownership of the property arises from dispossession of the current owner, possibly by adverse possession, squatting, or encroachment initiated by another party in the future. These actions may create future claims adverse to the current owner. The current owner, however, can mitigate this particular risk by monitoring the property periodically, verifying that squatting, encroachment, etc., is not being undertaken, and engaging in the appropriate legal actions to protect his ownership claim when these activities are detected. Assume the cost of monitoring and/or remediation actions is $m(L)$ per period. Because courts will honor the current owner's claim against dispossession only if expressed within the time limit established by the statute of limitations, a longer time limit reduces the monitoring cost by reducing the frequency at which such monitoring or legal corrective action must be taken to protect the title to the property. For example, if the statute length is ten years then the current owner need only monitor and enforce his claim to the property every nine years in order to forestall potential future claims. If the statute length is 20 years then the current owner need enforce his claim only every 19 years. Clearly, longer statutes reduce the present value of monitoring and enforcement costs to forestall future claims. Thus, the monitoring cost is decreasing in L, or $m' < 0$.

The expected present value of net returns to a particular parcel of land is the probability that a past claim will not arise or be pressed before the time limit is up, $(1 - P)$, multiplied by the rental return net of monitoring costs $(R - m)$, or

$$V = (1 - P(L))(R - m(L))$$

The statute duration L that maximizes the land value satisfies the necessary condition $dV/dL = 0$,

Figure 2.1: Individual owner's optimal statute length



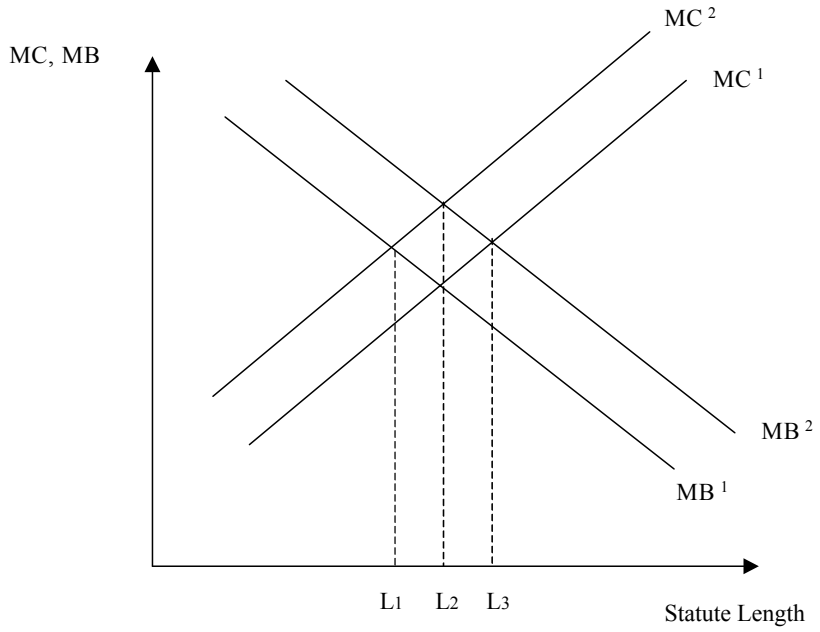
which yields the equilibrium condition[4]

$$P'(L)(R - m(L)) = -(1 - P)m'(L)$$

The left hand side of the above condition is the decrease in expected return from the greater probability of a claim from the past being made because the window of opportunity for such claims is lengthened. This is the marginal cost of lengthening the statute from the individual owner's perspective, $MC = P'(L)(R - m(L))$. The right hand side is the expected monitoring and enforcement cost savings that the owner will realize when the statute length is lengthened. This is the marginal benefit of lengthening the statute, $MB = -(1 - P)m'(L)$. This condition for the individual owner's optimal statute length is depicted in Figure 2.1. For this parcel of land, then, the owner's optimal statute length is L_o; when weighing the benefits and costs of the statute of limitations, this is the owner's "demand" for statute length.

[4]Note, however, that the welfare of non-paying property encroachers or squatters is not included in the owner's objective function V, so the efficient statute length $dV/dL = 0$ will not necessarily maximize social welfare. In a different context, Hoy and Jimenez (1991) argue that, because institutional restrictions prevent landowners from collecting rent from squatters, the eviction of squatters by landowners (analogous to the level of monitoring in our model) will in general exceed the social welfare optimum.

Figure 3.1: Optimal statute lengths for rural and urban property



3. Statute Determinants and Effects

The first set of results from the model can be seen in Figure 3.1 comparing the optimal statute lengths for rural and urban property. As explained above, the net rent to urban land exceeds the rent to rural land in general; the greater R for urban land leads to a greater marginal cost of statute length, say MC^2, when compared with the marginal cost for rural land, say MC^1 in the figure. Given the same MB^1 curve for both types of land, the value-maximizing statute for rural land is L_2 while the value-maximizing statute for urban land is L_1. Clearly, the greater urban land rent implies that *the efficient or value-maximizing time limit or statute length for urban or developable land is shorter than that for rural or non-developable land:* $L_1 < L_2$.

This conclusion is intuitively appealing. Since urban or developable land enjoys a greater present value of land rent, the potential loss to the landowner from a prior claim in the form of forgone rents is greater than for rural land. This greater potential cost of exposure to such claims lowers the optimal statute duration for urban land when compared with rural land. But this rationale easily extends to all types of property: For any two different parcels of land, the land with the larger future net rent has a shorter optimal statute of limitations than does land with a smaller

future net rent. As a result, *the value-maximizing statute length for land in the interior of an urban area is shorter than that for land nearer the urban periphery.* Also, it can be shown in a more general version of the model that the anticipated growth rate in rents over time matters as well. In particular, *faster growth in land rents shortens the value-maximizing statute length for a given parcel of land.*

Note that the above results yield a consistent general relationship: since greater returns to land, whether urban or rural, tend to reduce the value-maximizing time limit for claims, the greater the urban land rent or the growth rate in the urban rent relative to rural land rent, the greater the disparity between the efficient statute lengths for urban and rural land. A parallel conclusion holds for central city urban land relative to land in the periphery. However, given that there is only one statute length applying to all land within each state in the US, regardless of type, the above results illustrate a source of conflicting interests between owners of different types of land. There is a natural tension between owners of developable land and owners of rural or non-developable land. Developable land is likely to be located in or around settled urban areas. Thus, this model implies that the stronger the political power of the agents in the urbanized sectors of the economy, the shorter the prevailing statute of limitations on claims to land title. On the other hand, for an economy that more strongly reflects the interests of individuals in agricultural, forestry, and other non-urban sectors of the economy, the model predicts a longer prevailing statute of limitations.

But there is also a natural tension between owners of different types of urban or developable land. Location rents by themselves imply that owners of land in central cities or older suburbs would benefit from a shorter statute length while owners of land farther out toward the fringe of urban areas would benefit from a longer statute. Regardless of the specific pattern, though, it is clear that the natural tension among different types of property identified by the model extends to within the broad class of urban property as well. This observation has ramifications for the redevelopment of declining urban cores in US cities, ramifications to be addressed in the next section.

Now consider how changes in the functions capturing the effects of ownership risk or monitoring and enforcement costs, $P(L)$ and $m(L)$, alter the demand for statute of limitations duration by individual property owners. First, we find that *lower probabilities of claims arising from prior interests or pre-existing encroachment or squatting, increase the value-maximizing statute length; greater probabilities of prior claims decrease the value-maximizing statute length.* This result is

illustrated in Figure 3.1. A lower probability of a prior claim arising is reflected in a smaller probability $P(L)$ at each L; this lower probability decreases the marginal benefit of a longer statute from MB^1 to MB^2 in the figure, which in turn lowers the value-maximizing statute length from say L_3 to L_2 for a given MC^1

Second, we find that *higher monitoring, enforcement, or ownership title remediation costs increase the value-maximizing statute length; lower costs decrease the optimal statute length for all types of land.* To see the intuition for this result, note that a higher monitoring cost or cost of protecting claims arising from contemporaneous or subsequent encroachment, squatting, etc., is captured by an upward shift in the monitoring cost function $m(L)$. This reduces the present value of net land rent expected in the future, $R - m(L)$, which in turn shifts the marginal cost of statute length downwards from MC^2 to MC^1 in Figure 3.1. The value-maximizing statute increases from L_1 to L_2 for the land parcel with given MB^1 in the figure.

4. Discussion

Because conflicting ownership claims inevitably arise for durable private property like land, the relevant question facing a property owner is, how long should competing claims to land title be entertained in the legal system? The approach taken here emphasizes that, from the current owners' perspective, the efficient statute length takes into account the development opportunities as well as balancing the countervailing effects of the two different risks to land ownership, potential claims from previously dispossessed owners or past encroachment and potential claims from future encroachment. We first discuss the results as they apply to developing economies and then as they apply to questions of urban redevelopment within a developed economy like the US.

4.1. Implications for developing economies

One key result found here is that there is simply no way to impose a uniform statute length in an economy without arbitrarily redistributing wealth from one sector to another. Longer statutes tend to benefit the owners of non-urban land while shorter statutes tend to benefit the owners of urban land. And within the urban sector, even shorter statutes tend to benefit inner city property while somewhat longer statutes benefit land nearer the outer limits of urban development. Thus, the basic need to define temporal restrictions on property rights claims creates an underlying tension

among the owners of different types of property. The available development opportunities affect the efficient statute length for the different types of land; the prevailing statute that has been adopted in turn has different affects on the market values of different types of land in the economy.

The nature of the political system plays a key role, too. The prevailing single statute of limitations will depend in part by how the political system in each country balances the competing interests for longer or shorter statutes. This observation has broad implications. From the positive perspective, to the extent that legal institutions are responsive to economic forces, developed economies in which a relatively greater number of individuals' interests are tied to urban property will tend to establish shorter statute lengths than developing economies in which relatively more individuals' interests are tied to agricultural, forested, or mining property. In addition, the model reveals how the efficiency of the legal system, the quality of the public sector bureaucracy, etc., systematically affect the optimal statute of limitations for each property type and hence, the prevailing statute.

From the normative perspective, this result implies that, because the statute of limitations must apply uniformly to all land within a jurisdiction, a federal system of multiple jurisdictions (states, departments, or provinces) each responsible for setting its own statute length will be more efficient than a single national uniform law. This resembles the federalism rule for local public goods; the optimal jurisdictional boundaries for the purposes of establishing a uniform statute should entail the minimum mixing of land types (that is, urban versus rural) that is consistent with efficient administration. The normative rule is reflected in US practice, where statute lengths are determined by individual states rather than the federal government.

The results derived in the previous section represent important relationships for understanding how development opportunities as well as the characteristics of the legal system shape the prevailing statute of limitations in an economy. For the broader economy, dominant urban economic interests in the political arena tend to shorten the statute duration while dominant rural interests have the opposite effect. On the other hand, countries with more efficient bureaucracies responsible for keeping public records run by personnel with better training, which results in fewer administrative errors or errors in records, have a lower probability of prior claims against current owners and thus a higher P. These countries have a longer demanded statute of limitations for all property types. In contrast, a lower standard of proof for successful ownership challenges in the courts leads to a lower probability of the current owner retaining the land. In this case, we expect to find that

countries whose legal systems require lower standards of proof have a shorter efficient statute from all property owners' perspectives, regardless of the type of property they own.

The result relating monitoring or enforcement costs to the value-maximizing statute is relevant to the issue of corruption in developing countries. A number of recent empirical and theoretical papers investigate the relationship between corruption and economic growth and development. Mauro (1995, 1998) provides a novel empirical proxy for corruption and estimates its effect on aggregate investment, education spending, and growth. His results suggest that corruption bears a significantly negative relationship with each of these variables. In the theoretical literature, Murphy, Shleifer and Vishny (1991), and Shleifer and Vishny (1993), for example, are concerned with the effects of corruption on economic development. Note that, even though most of the literature concerned with corruption and development reviewed by Shleifer and Vishny (1993) argue for a negative effect of corruption on development, it is not a universal conclusion. For example, Huntington (1968) suggests channels through which corruption can increase growth.

Our view is consistent with the corruption-development nexus literature, but we suggest an alternative channel of influence for corruption; through its effects on the time limit for pressing ownership claims for land. We argue that less efficient or more corrupt legal systems lead to greater costs for individuals who have to resolve property rights issues using the legal system. In the context of our model, resorting to the legal system leads to greater costs of defending the owner's title to the land in response to squatting, boundary encroachment, or other means of adverse possession. The higher costs increase the efficient statute length for all types of land.

Although the result that greater corruption leads to a longer desired statute of limitations may seem counter-intuitive at first, recall that a longer statute reduces the frequency with which a landowner must deal with the courts to defend his own claim against possession by encroachers or squatters. The greater the cost of such defense, the greater the cost savings to the land owner of having to conduct such defenses less frequently, that is, the greater the cost savings to landowners of a longer statute length. It is this increased marginal benefit of a longer statute to the landowner that is responsible for the desire for longer statutes in response to greater corruption in the legal system.

Finally, recognizing that institutions are endogenous in the long run (at least to some extent), this study suggests another feature of the system of property rights in a developing economy. Successful economic development itself creates economic pressure for revising some aspects of how

property rights are defined. For example, if the political power of the owners of developed and developable land grow in strength over time as the economy matures then economic development creates growing support for shorter time limits on claims. The analysis here also shows that this tendency is likely to be reinforced by technological advances in the record-keeping system, the development of more sophisticated property markets, and growing strength in the rule of law or other improvements in the efficiency of the legal system over time. The difficultly here is that an effective property rights regime requires that any fundamental changes in the nature or definition of those rights be infrequent. Frequent changes create uncertainty about the future course of the property rights, with the ensuing effect of slowing economic development identified by North and Thomas (1973), Rosenberg and Birdzell (1986), Besley (1995), and Alston et al. (1996). In the US, for example, changes in the adverse possession statutes (a statute of limitations of the type discussed here) have been few and infrequent even though the US has enjoyed a rapid rate of technological growth and unprecedented changes it its economy over the past eighty five years. Baker et al. (2001) identify only nine US states that have changed their statute lengths during the eighty five year period from 1916 to 1999.

Regardless of how often changed once established, one of the lessons from the previous two sections is that changing one aspect of the property rights regime, like the statute of limitations, will yield a capricious reallocation of wealth in the form of capital gains and losses among property owners, as the values of their property adjust to the new statute length.

4.2. Implications for central city redevelopment in the US

The model also has implications for redevelopment issues in US central cities. The largest questions confronting urban policy makers often concern how to deal with the relative decline of central cities and older industrial suburbs. Redevelopment of existing property plays an important role in the economic revitalization of these locales. Redevelopment, however, presents special problems for private investors. For one, the presence of structures implies substantial demolition or site preparation costs, costs that lead to longer waiting time to justify redevelopment. At the same time, demolition or site preparation costs lower the net rental return and imply a longer value-maximizing statute. Therefore, blighted areas that are most in need of an infusion of private capital are also the parts of cities that would benefit from longer statutes than would other areas. Given the relatively small part of a state's economy involved in redevelopment, the existing statute of limitations likely

diverges significantly from the value-maximizing length for such property. This further reduces the market value of central city property otherwise ripe for redevelopment. As a consequence, not only does such redevelopment occur later than otherwise identical new development undertaken elsewhere in the urban area, it also yields a smaller increment to the central city's property tax base.

Another problem confronting central cities and older industrial suburbs arises from land assembly required for some redevelopment efforts. Redevelopment projects can require the assembly of many smaller parcels of land formerly owned by a fairly large number of individuals or the subdivision of a large existing parcel. The private assembly of land or subdivision can lead to future title problems from divergent unrecorded histories, liens, as well as previous boundary encroachment or squatting even on small parts of the previously vacant tract of land. Recall that a higher probability of future adverse claims leads to a shorter optimal statute length for the property. The exercise of eminent domain coupled with sale or lease to private developers can mitigate some of the potential future problems associated with land assembly and can therefore increase development efficiency–provided the city government can function as an efficient adjunct to the market rather than taking on the role of a driving force steering the redevelopment effort.

Relatedly, Hill and Nowak (2000, 2002) emphasize that some of the urban neighborhoods most in need of redevelopment are also located in local jurisdictions that suffer from inept public management and over-regulation by an entrenched and inefficient bureaucracy. In the context of our model, these characteristics are reflected in greater redevelopment and monitoring and enforcement costs, each of which lead to a longer optimal statute length. The combined effects of private land assembly problems and high enforcement costs have opposite effects on the optimal statute length for such property. Thus, it is not clear whether or not the areas that could benefit from redevelopment will benefit from the statute of limitations that best serves the rest of the economy. More importantly, the net effects of land assembly related problems and higher enforcement costs will generally vary across local government jurisdictions–even within the same metropolitan area. The effects of any single statute of limitations for property rights will have varying effects on market values of different parcels of redevelopable properties, depending upon the extent to which each requires land assembly, subdivision, etc. This is important, for it implies that no single special-purpose modification of property rights for redeveloping urban land will meet the needs of all neighborhoods in need of redevelopment.

Another aspect of urban decline and re-investment surrounds the treatment of vacant property. It is not always clear whether or not such property is functionally abandoned or being held unused for its interim option value. While vacant, of course, buildings and other improvements degrade, reinforcing the general decline of the surrounding locale. One method of forestalling or counteracting the inevitable cycle of neighborhood decline triggered by vacant property is to allow urban "homesteading." Amsterdam's urban homesteading scheme, as an example, essentially shortens the statute of limitations for property rights when squatting. Regardless of its efficacy for forestalling the property decline that comes with prolonged periods of vacancy, the shorter statute affects the monitoring costs for all property, with the greatest impact of the value of property that is being privately held in anticipation of future redevelopment.

State governments in the US are responsible for setting time limits on expressing land ownership claims. Local governments are constrained by these laws. A key result from our analysis is that different types of property would most benefit from different statute lengths. So, why not allow local governments to obtain special exclusions for land within their jurisdictions? There has been some limited experimentation in the US with local variation in property rights regimes. For example, a handful of locales in the US have employed "registration" title rules instead of the more common "recording" rules used throughout most of the US.[5] There are many differences between these two title systems, but for the purposes of our discussion the relevant difference is that the registration system in effect eliminates the risk of many prior claims as well as those of potential future squatters. In a sense, these uses of the registration title rules represents a local variation in the state's statute of limitations for exercising such claims. Although limited, the US experience therefore suggests that local variations in the statute of limitations (perhaps at the county level) are feasible. Nonetheless, one of the main implications of this study is that, even at the city or county level, a given statute of limitations cannot fully meet the needs of all of the various types of property contained within the jurisdiction.

Finally, changing the statute length leads to capricious reallocation of wealth. Giving the power of setting the statute to local governments can lead to frequent changes. And frequent changes,

[5]See Miceli, et al.(1998) for a more complete description of the two title systems and the property rights each implies. Most of the US and Scotland use the recording system. England and the Commonwealth use the registration system, as do most European countries. In the US, there are relatively small communities in the Minneapolis-St. Paul metropolitan area and Massachusettes that use the registration system. Cook County, Illinois, used a dual system with some property in the registration system and other property in the recording system until the state repealed the former in 1992. The State of Hawaii has had a long history of using a registration system.

regardless of motivation, create property rights uncertainty even for a developed country like the US. Even easing transitions from one statute length to another using "hold harmless" or grandfather clauses need not ensure that such transitional periods are efficient. The recent studies by Innes (1997) and Turnbull (2002) are suggestive on this point; they show how uncertainty in the exercise of eminent domain or land use regulations by local governments can lead to inefficient investment in capital improvements and development timing even when property owners are protected by transitional compensation schemes.

5. Conclusion

This paper examined the economic development-property rights nexus for time limitations on pressing ownership claims for land. The basic principle emphasized throughout our discussion is that the available development opportunities shape the time limits on ownership claims that maximize property values. This in turn creates an inherent underlying tension among the owners of different types of property in the economy, urban and rural as well as inner city and suburban. Further, successful economic growth and development creates demands for changing this dimension of property rights. The characteristics of existing economic institutions in the economy matter, too. The efficiency of the legal system, the competency of the public sector bureaucracy and the level of corruption in the public sector also affect the optimal time limitations on ownership claims for different types of property.

This paper also discussed the implications of these relationships for developing countries and for property redevelopment in declining central cities in the US. For example, location advantages imply that the most valuable land in an urban area, in terms of either the level or growth rate in location rents, benefits from shorter statutes while less advantageously placed land benefits from longer statutes. In addition, though, land located in parts of central cities that require redevelopment has neighborhood-specific statute needs. This, in conjunction with the notion that changes in property institutions create property rights uncertainty with its own deleterious effects on redevelopment, suggests that allowing local governments to obtain jurisdiction-wide statutes that differ from the rest of the state is not likely to be a fruitful avenue for state policy.

In a different vein, this paper also suggests additional directions for future research in development economics. First, the theoretical literature can benefit from detailed studies of the rela-

tionships between specific aspects of property rights (such as the statute of limitations, corruption, political instability, etc.) and economic growth and development. For this to be successful, it is important to link the existing economic development literature with the public finance, industrial organization, and political economy literatures, to name a few. Second, even though our analysis reveals several important issues concerning the property rights-economic development nexus, the model is a partial equilibrium model and so does not provide a complete theory of the development process. Recent work by Tornell (1997) and Acemoglu and Verdier (1998) is encouraging on this point, suggesting that it is possible to embed the structural model of property rights within the context of a general equilibrium growth model. Extending our model along these lines is likely to yield additional valuable insights.

Appendix

This appendix derives the landowner's demand for the statute of limitations length within the context of a standard land development timing framework and shows that the results offered in the text for the simpler model generalize to the development timing framework. Retain the distinction between urban and rural land made in the text. When in its undeveloped state, the parcel of land will earn the agricultural constant rental return, w, each period. The owner incurs the constant cost c to develop the land. Once developed for urban use, the parcel of land will earn $R(t)$ in period t. Without loss of generality, assume that the return to undeveloped land is constant over time and the return to developed land is increasing over time, $R_t > 0$, using subscripts to denote derivatives. The constant w and c assumptions simplify the notation. Allowing these values to vary over time does not qualitatively affect the results derived below. The rental growth assumption, $R_t > 0$, is therefore a simplification of the general condition that growth in the urban-rural rent differential, i.e., $R_t - w_t > 0$, drives the continuing process of land development in the two-sector land use model. See, e.g., Turnbull (1988) and the references therein. The interest rate is r.

Recall that there are two risks to ownership. The first is the risk of a claim from a previously dispossessed owner or adverse possession arising from pre-existing encroachment or squatting. The second is the risk that the current owner will be dispossessed as a consequence of present or future adverse possession by encroachment or squatting. The first source of risk is reflected in a hazard or survival framework. The probability density that a previously dispossessed owner or encroacher will claim ownership of the plot of land by time t with statute limit L is given the cumulative density $g(t, L)$. The probability of losing ownership during time t due to a forthcoming claim is the change in this density over time, $g_t(t, L)$. There is a positive probability of losing ownership prior to the expiration of the time limit so that $g_t > 0$ for $t < L$. The statute of limitations extinguishes all claims arising from more than L periods ago. Thus, once $t \geq L$, the statute is in force for prior claims and the probability of losing ownership to a dispossessed prior owner is zero (i.e., $g_t = 0$ for $t \geq L$). We assume that the greater the passage of time–even without a statute of limitations–the less likely it is that a claim from a previously dispossessed owner will arise; that is, $g_{tt} \leq 0$. Further, extending the time limit or statute length increases the window of opportunity for past claimants to present their claims against the current owner, increasing the time limit increases the probability of losing the land ownership for each $t < L$, or $g_{tL} > 0$, while $g_{tL} = 0$ for $t \geq L$. Finally, lengthening the time limit increases the cumulative probability that there will be a claim forthcoming by t; that

is, $g_L(t, L) > 0$ for all $t \geq 0$. Bringing these assumptions together yields the survival probability, the probability that the owner still retains the land by $t > 0$ as

$$h(t, L) = 1 - g(t, L) \tag{5.1}$$

for which $h_t < 0$, $h_{tL} < 0$, for $t < L$; $h_t = h_{tL} = 0$, for $t \geq L$; and $h_L < 0$, $h_{tt} \geq 0$, for all t.

The second source of ownership risk arises from dispossession of the current landowner, possibly by adverse possession, squatting, or encroachment initiated by another party during $t \geq 0$. These actions may create future claims adverse to the current owner. As explained for the simpler model in the text, the current owner can mitigate this particular risk by monitoring the property periodically, verifying that squatting, encroachment, etc., is not being undertaken, and engaging in the appropriate legal actions to protect his ownership claim when these activities are detected. The cost of monitoring and/or remediation actions is $m(L)$ per period. Because courts will honor the current owner's claim against dispossession only if expressed within the time limit established by the statute of limitations, a longer time limit reduces the monitoring cost by reducing the frequency at which such monitoring or legal corrective action must be taken to protect the title to the property. This means that the monitoring cost is decreasing in L, or $m_L < 0$.

Urban Land. Given the risks to ownership reflected in $h(t, L)$ and $m(L)$, the present value of the expected land rent for the parcel of land that the owner plans to develop at time τ is the sum of the expected returns net of monitoring costs for the land, in the undeveloped and in the developed states. The expected land returns to the current owner takes into account that if a claim arises then he receives compensation for capital improvements that he put into place but loses the earnings from the land thereafter. When applied to the redevelopment decision, the "undeveloped" state is interpreted as the pre-redeveloped state. Otherwise, the model structure remains unchanged.

The probability that the current owner will obtain the land rents during time period t is $h(t, L)$ so that the expected net return for any t prior to the development time is simply $h(t, L)[w - m(L)]$. The expected net return at the development time is the expected rent to the developed land less the cost of capital improvements or $h(\tau, L)[R(t) - c - m(L)]$. The expected net rent for each t after development time τ is $h(t, L)[R(t) - m(L)]$. However, in the event that such a claim is made after the land has been developed, the claimant compensates the current owner for the fixed capital improvements. Since the probability of a claim being made is $-h_t(t, L)$, the expected compensation for each t after the development time is $-h_t(t, L)c$. Discounting each of these terms and integrating

from the initial time forward yields the current owner's present value of the expected net return to the land as

$$\begin{aligned} V(\tau, L) &= \int_0^{\tau} h(t,L)[w - m(L)]e^{-rt}dt + \int_{\tau}^{\infty} h(t,L)[R(t) - m(L)]e^{-rt}dt \\ &\quad -h(\tau,L)ce^{-r\tau} - \int_{\tau}^{\infty} h_t(t,L)ce^{-rt}dt \end{aligned}$$

This expression can be simplified further. Apply integration-by-parts to the last term to get

$$\int_{\tau}^{\infty} h_t(t,L)ce^{-rt}dt = c\left[\int_{\tau}^{\infty} h(t,L)re^{-rt}dt - h(\tau,L)e^{-r\tau}\right]$$

Substituting the above expression for the last term in $V(\tau, L)$ and simplifying gives the expected return to the current owner as

$$V(\tau,L) = \int_0^{\tau} h(t,L)[w - m(L)]e^{-rt}dt + \int_{\tau}^{\infty} h(t,L)[R(t) - m(L) - rc]e^{-rt}dt \tag{5.2}$$

In this form, the expected return to developable land takes the intuitively appealing form: the discounted land rent in the undeveloped state less monitoring costs plus the discounted rent in the developed state less monitoring costs and the user cost of the capital improvements applied to the land, with each period weighted by the appropriate probability that the current owner still has control of the land.

The development time and statute length maximizing V satisfy the necessary conditions

$$V_{\tau} = h(\tau,L)[w - R(\tau) + rc]e^{-r\tau} = 0 \tag{5.3}$$

$$\begin{aligned} V_L = \int_0^{\tau} h_L we^{-rt}dt + \int_{\tau}^{\infty} h_L[R(t) - rc]e^{-rt}dt - \int_0^{\infty} h_L m(L)e^{-rt}dt \\ - \int_0^{\infty} h(t,L)m_L e^{-rt}dt = 0 \end{aligned} \tag{5.4}$$

Under the assumption $V_{LL} < 0$, it can be shown that the sufficient conditions for a maximum hold: $V_{LL} < 0$, $V_{\tau\tau} < 0$, $V_{LL}V_{\tau\tau} - (V_{L\tau})^2 > 0$. Equation (5.3) gives the development timing condition, which implies that optimal waiting time τ is where the foregone rental return differential net of monitoring costs, $R(\tau) - w$, equals the foregone outlay for the rental cost of improvements, rc.

Equation (5.4) represents the optimal statute condition. The first three terms capture the negative effect of a longer statute of limitations on the expected net return to land, because it lowers

the probability of retaining ownership at each time, t. The fourth term captures the reduced expected present value of monitoring costs from a longer statute of limitations. The optimal statute of limitations for urban or developable land, L_u, balances the marginal cost of a longer statute of limitations, given by the first three terms, against the marginal benefit, given by the last term.

The land value maximizing τ and L satisfying (5.3) and (5.4) represent the efficient solution fully reflecting the interests of current owners.

Rural Land. The expected present value of returns to rural land is simply the expected present value of the returns to undeveloped land less the monitoring cost incurred each period for protecting ownership from dispossession, or

$$W(L) = \int_0^\infty h(t, L)[w - m(L)]e^{-rt}dt \tag{5.5}$$

The land value-maximizing L_r for rural landowners satisfies the first order condition

$$W_L(L) = \int_0^\infty h_L[w - m(L)]e^{-rt}dt - \int_0^\infty h(t, L)m_L(L)e^{-rt}dt = 0 \tag{5.6}$$

where $W_{LL} < 0$ is assumed to hold. The first term in (5.6) is the reduction in the present value of net returns, $w - m(L)$, arising from the greater probability of some past claim forthcoming as a result of the increased window of opportunity for such claims. The second term is the expected present value of monitoring cost savings as a longer statute length reduces the frequency with which monitoring or title remediation resources must be expended by the owner.

Comparative Statics. In order to compare the demands for statute length by the owners of the two different types of property, note that the marginal value of the statute length to the owner of urban land is $V_L(\tau(L), L)$, where $\tau(L)$ is the implicit solution to (5.3). Observing, however, that $V_{L\tau} = h_t(\tau, L)[w - R(\tau) + rc]e^{-r\tau} = 0$ by (5.3), reveals that V_L does not depend upon τ and $V_{LL} < 0$ ensures that the marginal value of the statute duration is a decreasing function of L alone, $V_L(L)$. Rearrange V_L as

$$V_L = \int_0^\infty h_L[w - m(L)]e^{-rt}dt - \int_0^\infty h(t, L)m_L e^{-rt}dt - \int_\tau^\infty h_L[w - R(t) + rc]e^{-rt}dt \tag{5.7}$$

so that substituting W_L from (5.6) for the first two terms yields

$$V_L = W_L - \int_\tau^\infty h_L[w - R(t) + rc]e^{-rt}dt \tag{5.8}$$

PROPOSITION 1: *The efficient or value-maximizing time limit or statute length for urban or developable land is shorter than that for rural or non-developable land:* $L_u < L_r$.

Proof: From (5.3), the assumption that the return to developed land is growing over time, $R_t > 0$, ensures $[w - R(t) + rc] < 0$ for all $t > \tau$. This implies that the integral term in (5.8) is positive, so that (5.8) reveals $V_L(L) < W_L(L)$ at every L. Using $V_{LL} < 0$, this implies that the demanded statute duration of developable land owners is less than the demanded statute duration of rural land owners. ■

The relationship in (5.8) underlies the intuition for this result. From (5.6) for rural land, the marginal benefit of increasing the statute length is the monitoring cost savings that come from being able to monitor or apply to the courts to remediate the title against adverse possession less frequently as the statute of limitations is lengthened. The marginal cost of increasing the statute length is the decreased expected value of rental returns that arises because the probability of retaining ownership over the entire planning horizon declines. For rural land, the optimal statute length balances these two factors. From (5.8), though, it is clear that the owners of urban land confront an additional marginal cost of statute duration not faced by owners of rural land; as the last integral term indicates, owners of urban land must also balance the expected loss of the future return differential for developed land over undeveloped land. It is this additional marginal cost that prods the owners of urban land to prefer a shorter statute of limitations than their rural counterparts.

PROPOSITION 2: *Decreases (increases) in ownership risk arising from prior interests or pre-existing encroachment or squatting, increase (decrease) the value-maximizing statute length for both urban and rural land but does not affect the pace of land development.*

Proof: A lower risk of claims from previous titleholders is captured by a vertical shift in the $h(t, L)$ function. Let θ_h denote a shift parameter and use $h(t, L, \theta_h)$ in (5.6) where $\partial h/\partial \theta_h > 0$. Differentiating, we obtain

$$\frac{\partial L_r}{\partial \theta_h} = \frac{\int_0^\infty (\partial h/\partial \theta_h) m_L e^{-rt} dt}{W_{LL}} > 0$$

Similarly, implicitly differentiating the system of equations describing the optimal statute of limitations and development timing for urban land yields

$$\frac{\partial L_u}{\partial \theta_h} = \frac{\int_0^\infty (\partial h/\partial \theta_h) m_L e^{-rt} dt}{V_{LL}} > 0 \tag{5.9}$$

$$\frac{\partial \tau}{\partial \theta_h} = 0 \qquad \blacksquare \tag{5.10}$$

PROPOSITION 3: *Increases (decreases) in monitoring, enforcement, or title remediation costs do not affect the pace of land development but increase (decrease) the land value-maximizing statute length for both urban and rural land.*

Proof: A higher monitoring cost or cost of protecting claims arising from contemporaneous or subsequent encroachment, squatting, etc., is captured by an increase in the $m(L)$ function for any given L. Let θ_m denote a shift parameter so that the monitoring cost function is $\theta_m m(L)$. Implicitly differentiate (5.6) and evaluate the resultant expression at $\theta_m = 1$ to get

$$\frac{\partial L_r}{\partial \theta_m} = \frac{\int_0^\infty [h_L m(L) + h(t,L) m_L)] e^{-rt} dt}{W_{LL}} > 0 \tag{5.11}$$

where the sign of this term follows from $h_L < 0$ and $m_L < 0$. Similarly, differentiating the system (5.3) and (5.4) and solving in the usual way, we find

$$\frac{\partial L_u}{\partial \theta_m} = \frac{\int_0^\infty [h_L m(L) + h(t,L) m_L] e^{-rt} dt}{V_{LL}} > 0 \tag{5.12}$$

$$\frac{\partial \tau}{\partial \theta_m} = 0 \tag{5.13}$$

so that the above proposition pertains. ■

PROPOSITION 4: *Higher (lower) agricultural land rents decrease (increase) the optimal statute of limitations for both urban and rural property and slow (hasten) the pace of land development.*

Proof: The effect of greater returns to undeveloped land on the efficient statutes follows from equation (5.6) and the simultaneous equations (5.3) and (5.4), respectively, and simplify to

$$\frac{\partial L_r}{\partial w} = -\frac{\int_0^\infty h_L e^{-rt} dt}{W_{LL}} < 0 \tag{5.14}$$

$$\frac{\partial L_u}{\partial w} = -\frac{\int_0^\tau h_L e^{-rt} dt}{V_{LL}} < 0 \tag{5.15}$$

$$\frac{\partial \tau}{\partial w} = -\frac{h(\tau, L) e^{-r\tau}}{V_{\tau\tau}} > 0 \qquad \blacksquare \tag{5.16}$$

PROPOSITION 5: *Higher (lower) urban land rents or faster (slower) growth in urban land rents hasten (slow) the pace of land development and decrease (increase) the efficient statute length for urban land while having no effect on the efficient statute length for rural land.*

Proof: Derive the effects of greater returns to developed land by defining the urban land rent shift parameter θ_R, such that $R(t, \theta_R)$, and $\partial R/\partial \theta_R > 0$. Implicitly differentiating the system (5.3) and (5.4) gives

$$\frac{\partial L_u}{\partial \theta_R} = -\frac{\int_\tau^\infty h_L(t, L)(\partial R/\partial \theta_R)e^{-rt}dt}{V_{LL}} < 0 \tag{5.17}$$

$$\frac{\partial \tau}{\partial \theta_R} = \frac{h(\tau, L)[\partial R(\tau, \theta_R)/\partial \theta_R]e^{-r\tau}}{V_{\tau\tau}} < 0 \tag{5.18}$$

The result for rural land, from (5.6), is $(\partial L_r/\partial \theta_R) = 0$. ■

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