The Effect of Titling Systems on the Enforcement of Property Rights in Land[*]

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First Version: March, 2001
This Version: February, 2002

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Abstract

This paper analyzes the choice of the socially optimal titling system assuming rational individual choices about recording, assurance and registration decisions. It focuses on the enforcement of property rights on land under private titling and the two existing public titling systems, recording and registration. When the reduction in likelihood of eviction compensates the higher cost of registration, it is more efficient to introduce a registration system rather than a recording system. The development of private 'title assurance' improves the standing of recording as compared to registration. This improvement depends, however, on the efficiency of the assurance technology and, also, on corrective taxation that is needed to avoiding that individual optimization, which disregards the transfer element in eviction, drives consumption of assurance services much above its socially optimal level.

1 Introduction

A distinguishing feature in the functioning of legal systems of land law is how they allocate property rights in the case of dispute over title. When title to land (i.e., a right *in rem*) is rightfully disputed by a claimant who, by assumption, is the *true* owner,[1] legal systems apply one of two adjudication rules: property or liability (Calabresi and Melamed, 1972). In a 'recording' system (such as those used in France and the USA - frequently known as 'registers of deeds'), title is awarded to the claimant. In principle, wrong owners get only a personal obligation against the original grantor if she provided warranties of title. Thus, prospective owners usually purchase a variety of 'title assurance' services that, first, inform them about the title they are acquiring, and, second, provide them with additional sources of compensation in the event of eviction (mainly notaries' or lawyers' liability and US-style title insurance). In a 'registration' system (including the German-style registration systems operating in most of Europe and its Torrens version, applied in Australia and in some USA jurisdictions - more technically 'registers of rights'), it is the registered owner who keep the title while the claimant gets a personal obligation. This obligation usually materializes as an indemnity

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[1] We will use the terms 'ownership' and 'owner' to refer to the variety of property rights and right holders in real estate. In any case, the term 'possessor' would be inadequate, and specially so for those rights which are necessarily of abstract character, e.g. mortgages. Also, the true owner may frequently but not always be prior in time, e.g. in disputed heritages. Similarly, we will refer as 'eviction' to the loss of the *in rem* standing of a property right (caused, e.g., by the loss of priority of a mortgage) even if, strictly speaking, this term is only applicable to ownership. Rights *in rem* have been paid scant attention in both the Law and Economics and Property Rights literatures. This has changed recently, however, with a series of works focusing mainly on the constraints that legal systems impose on their creation (the so-called 'numerus clausus' problem), dealt with by Heller (1998, 1999), Buchanan and Yoon, (2000), Merrill and Smith (2000, 2001a, 2001b), and Hansmann and Kraakman (2001).

paid by a registration fund (Australia), the Government (Germany and most of Europe) or the registrars (Spain), usually after and in addition to the liability the grantor more often has to the true owner.

Land registration and recording systems solve two main problems. First, they enforce land titles, that is, current property rights. Second, they facilitate trade of land, that is, create new property rights. The present paper follows previous work by Miceli et al. in focusing on the effect of land titling systems on the enforcement of current property rights in land. This amounts to assume that the level of trade in land ('trade' including all kinds of transactions, not only sales but also leases, first and second order collateralization, etc.) does not change across titling options. By doing so, we do not deal with the moral hazard problem generated by the asymmetries of information between buyer and seller concerning the quality of the land title. This corresponds, e.g., to situations in which title uncertainty is exogenous to the parties.[2]

We assume, however, that ex ante (i.e., before any recording or registration) the probability of eviction is exogenous. In the model, individual decisions are driven by the objective of avoiding eviction, but the initial incidence of eviction is itself given (except when individuals can engage in assurance activities that reduce eviction). Our results should then be interpreted as applicable to the analysis of the enforcement effects of titling systems, without any explicit consequence for trade (even though part of it can be captured by our specification of transaction costs).

In a series of articles, Miceli et al. model the consequence of the applica-

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[2]A more comprehensive but somehow less formal view is given by Arruñada (2001b).

tion of the property and liability rules for different situations. In particular, Miceli and Sirmans (1995), argue that (a) if transaction costs after adjudication are low (most notably, zero transaction costs), both systems are efficient - that is, under both systems, the land ends up with the party who values it most; (b) if transaction costs are high and the current owner values the land more than the claimant does, registration is usually superior because it awards the land to the party with higher valuation; (c) both the current and the true owner prefer the system that awards each of them the land rather than monetary compensation equal to the market value.

In a related work, Miceli, Sirmans and Turnbull (1998) argue for the superiority of registration because it induces optimal investment on land improvement. On the contrary, investment on land improvements is claimed to be suboptimal under a recording system because with some probability returns on investment will be received by the claimant. Further extending this framework, in a more recent article, Miceli, Sirmans and Turnbull (2000) show that registration is more efficient than recording because the potential for legitimate adverse claims tends to inefficiently hasten land development more in recording than in registration. In the long run, even if the current owner values the parcel of land less than the claimant, registration is more efficient because of the gains in land improvements.

Generally speaking previous literature has not recognized that registration and recording do not face equal costs and provide the same benefits in terms of lowering the probability of eviction. Also, the basis for efficiency of registration has been driven by the assumption that the current owner values more the land than the claimant.

Our paper provides an alternative view concerning these assumptions. On the relative values of the relevant cost and eviction probability parameters, we have a model which is closer to the production functions that experts claim the two systems are able to offer, with registration incurring higher operating costs than pure recording but providing higher benefits. Also, we drop the assumption that current owners necessarily value more land than the claimants.

Understandably, dropping these assumptions produces less striking results, even if we assume that the land has the same value for both parties. Our results suggest that, contrary to previous findings (e.g., contrary to Miceli et al.), the relative efficiency of the different titling systems is unlikely to be (or can hardly be) resolved (and decided) on purely theoretical grounds. Our model also suggests a useful framework for identifying which are the crucial dimensions to consider when evaluating both systems empirically.

In our basic model, recording *could* be more efficient than registration for two reasons. The first reason is the higher marginal cost of registration over recording. The second reason lies in the fact that, because registration is more costly, some parcels of land that could be recorded if such a system was introduced, will remain out of the public system of land titling and not actually registered (they would remain in what we designate by private titling).

The paper goes as follows: in the next section, we present the model and discuss the basic assumptions (section 2). In the following section, we consider the possibility of 'title assurance' (section 3). Final remarks conclude the paper. In an Appendix an extension of the analysis to include land

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improvements is presented.

2 The Model

2.1 The Assumptions

The substantial difference in results presented here and those developed by Miceli et al. is caused by our use of different assumptions about how both public titling systems work:

(a) We consider the possibility of keeping property rights private as an alternative to titling systems, both of which make property rights public. At both individual and social levels, privacy of property rights provides the benchmark for the other alternatives. At the individual level, we assume that current owners do not necessarily record or register their titles. Instead, they may rely on keeping them private. Their decision will depend on a trade-off of individual costs and benefits.

At the social level, we model the decision to introduce a titling system, assuming freedom to register on the part of right holders. This freedom is commonly found in reality except in the few jurisdictions in which registration is in fact mandatory, given that it is required to create or transmit rights on property. Registration and recording is usually required, however, for abstract rights, such as mortgages, in all jurisdictions.

(b) A second difference is related to the fact that Miceli et al. analyze recording together with title insurance. In our work, recording is analyzed both with and without title assurance activities.

(c) We assume that titling systems reduce the probability of eviction in different degrees. This reduction is positively correlated with the different costs of each system, thus it differs across the different titling and assurance systems. By allowing for the possibility that each landowner decides how much titling assurance is individually rational, we also consider a continuum of likelihood of eviction.

(d) The cost of running each system is explicitly included, the marginal cost of registration being higher than that of recording. This is consistent with the assumed probabilities of eviction under the two systems. In choosing this set of assumptions our purpose is to model the essential features of the different titling technologies (i.e., their different costs and effectiveness in reducing title uncertainty). Assumptions about costs and effectiveness are, of course, open to criticism. We struggle in this respect to introduce in the model those parametric differences we confidently think are generally accepted in the literature. The scant empirical evidence available also supports that registration incurs higher costs but reduces the probability of eviction more than recording does (Janczyk 1977; Miceli, Munneke, Sirmans and Turnbull 2000).

Our assumption on the higher effectiveness of registration in reducing the probability of eviction is also supported by the consideration that without a very low probability of eviction the use of liability rule becomes unsustainable. Without a negligible number of claims, the application of a liability rule bankrupts the registration system and it is eventually abolished (as it happened with the Torrens registers in many jurisdiction of the USA).

(e) The source of social cost in our model lies on the assumption that

eviction is by itself a costly process, incurring transaction costs. In Miceli et al., the social cost emerges, instead, from the different preferences of the current owner and claimant. Arguments based on individual preferences seem inadequate because the party in possession might well be the true owner instead of the current owner, reversing both the effects and the results. Furthermore, our rationale is applicable to all kinds of property rights, even those in which possession plays no role (as is the case, mainly, of mortgages) rather than only to ownership rights.

(f) Our model does not rely on particular assumptions about who indemnifies the losing party (i.e., the wrong owner under recording, the true owner under registration). From a social viewpoint, it is not important because we consider a pure utilitarian social welfare (thus, the indemnification to the losing party cancels out with the payment borne by the winning party). From an individual viewpoint, we can interpret the loss from eviction as a loss after indemnification.

(g) Costs of both recording and registration do not vary with land value. Consistently, prices charged for both kinds of service also remain constant with land value. The results should not be affected by this assumption. Once we allow costs to vary with land value, prices should also vary with land value. In this case, we should look for the appropriate two-tier tariff (which in practice are usually applied), instead of the appropriate fixed price.

(h) The likelihood of eviction is assumed to be independent of the value of the land. Presumably, higher valued parcels of land are subjected to a higher probability of eviction for a given level of title assurance. Consideration of this characteristic would make the exercise more cumbersome, but

there are no reasons to think that the results obtained should not replicate those we suggest.

We also assume that the probability of eviction is the same for all parcels given the titling system. With this, we miss the opportunity of modeling self-selection along this dimension in the registration decisions, of the kind modeled by Miceli, Munneke, Sirmans and Turnbull (2000), who find that landowners with riskier titles opted for the safer titling system when two were available in Cook County. We think that this simplification does not cause a substantial loss of generality, to the extent that self-selection along the probability of eviction presents the same properties as that along land value, which is indeed explicitly modeled.

(i) There are no fixed costs connected to the creation of register or recording offices. Only variable costs are considered. Creating a registration system is surely more costly than a recording system without assurance services. However, this cost difference lies mainly in higher variable costs at the time of the initial registration, not in the fixed costs of starting up the system.

Indeed, it is generally thought that, with respect to recording, registration is more costly to put in place.[3] This is due, however, to the fact that a full purge of title is needed before the first registration of a parcel of land. In terms of our model, this is captured by the fact that the unitary cost of registration is higher than the unitary cost of recording.

The history of existing systems provides empirical support for our as-

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[3]See on this respect, Janczyk (1977) and Shick and Plotkin (1978). Also see Arruñada (2001b) for discussion.

sumption of constant fixed costs across recording and registration systems. Both need similar physical capital that is essentially fixed (facilities, computers). In some cases, recording even needs more physical capital, as with storage and classification capacity. The development of a cadastre certainly has a fixed component, but its importance here is lessened because it is mainly a fiscal instrument. Furthermore, the use of cadastral information to identify parcels is not indispensable, as shown by the correct functioning of the many European registers for more than a century. For human capital, registration needs more and better qualified resources. However, registration is usually designed in a way that makes possible to have these resources only partially dedicated to the register.[4] This transforms them, in fact, into variable costs.

When title assurance is added to recording, it may even incur larger fixed costs than registration, due to the duplication of title plants. At the same time, private titling may also incur in higher costs due to the higher number of times that the same title has to be examined.

(j) As in most of the work by Miceli et al., individuals are assumed to be risk neutral. Thus, there is no risk motivation for insurance. As to strategic motivation for insurance, since we deal with enforcement of current property rights in land, it is also absent. Thus we prefer to designate by 'title assurance' activities that reduce the probability of eviction for other reasons that risk and signaling.[5]

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[4]Typical solutions in this regard consist of making their function compatible with judicial or legal activities [Germany, Spain] and applying registration sequentially to different geographic areas with different demand [England].

[5]See Kirstein (2000) for a theory of strategic motivation for insurance.

2.2 The Basics

In this section we model individual titling decisions and the social choice of the optimal land titling system in the presence of uncertainty about the legal quality of titles. We start by considering three classes of title systems for dealing with title claims, leaving aside the possibility of private title assurance for the time being.

Private Titling

Let $0 < \theta_0 < 1$ represent the probability of eviction.[6] If the current owner does not record or register the deeds, the expected value of ownership would be $(1 - \theta_0)V$, where V is the value of the land.

Recording

Let $0 < \theta_1 < \theta_0 < 1$ represent the probability of eviction conditioned on recording. We assume $\theta_1 < \theta_0$ because recording eliminates part of the otherwise possible future claims; in particular, those originated by later deeds who might grant the former grantor.

The expected value of ownership would then be $(1 - \theta_1)V - R$, where R is the price charged for recording.

The choice between private titling and recording is determined by comparing the gain from recording in terms of reducing the likelihood of eviction,

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[6]This is the notation used in the models by Miceli et al., except for Miceli, Sirmans and Kieyah (2001), where our θ is equivalent to their variable $1 - p$.

$(\theta_0 - \theta_1)V$, with the cost of recording, R.

Registration

On the other hand, if the owner, instead of recording its title, has it registered, he will get $V - P$, where P is the price for registration.

Given that individuals are assumed to be risk neutral, they will prefer

(a) private titling if $(\theta_0 - \theta_1)V < R$ and $\theta_0 V < P$;

(b) recording if $(\theta_0 - \theta_1)V > R$ and $\theta_1 V < P - R$;

(c) registration if otherwise.

As Figure 1 shows, if the three options are available, an individual owning land of value V would rely on private titling when the land is not very valuable, will record if its value is within a given interval, and will register if the land is highly valuable.[7]

INSERT FIGURE 1 HERE

Let us now consider the socially optimal solution. Suppose the value of land V in a given economy is distributed with a probability density function $f(V)$, a cumulative density function $F(V)$, with support $[0, \bar{V}]$. Let us normalize the quantity of land to one.

If land is transferred from the current owner to a claimant, we assume there is a social deadweight loss measured by λV, where $0 < \lambda < 1$. This

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[7]In Figure 1, it is assumed that $\theta_0 R < (\theta_0 - \theta_1)P$. Otherwise, recording is never preferred.

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assumption relies on the evidence that there are substantial rent-seeking and, generally, transaction costs associated with eviction-related land transfer (costs to commit fraud are part of them). Note that our rationale is analytically equivalent, but does not rely on, Miceli et al. (1998) assumption of current owners valuing land more than claimants. Putting it in different words: Both rationales are formally similar but ours is grounded on costs instead of preferences. More importantly, in Miceli et al.(1998), this assumption is critical to derive the result that a registration system is more efficient than a recording system. In our model, when $\lambda = 0$, the socially optimal titling system is private titling since both recording and registration generate costs and no benefit.[8]

We also consider the possibility that the probability of eviction when private titling takes place depends on the land titling system chosen by the government, θ_0^{rc} and θ_0^{rg}, with $\theta_0^{rg} \leq \theta_0^{rc}$. The rationale for this assumption is that registration is more effective in deterring potential claims than recording. Thus, private titling might benefit from the existent public titling system. In other words, private titling may free ride on the benefits provided by a given public titling system.

When the government chooses a recording system, social welfare is given by:

$$W^{rc} = \int_0^{R/(\theta_0^{rc}-\theta_1)} (1 - \theta_0^{rc}\lambda)V\,dF(V) + \int_{R/(\theta_0^{rc}-\theta_1)}^{\bar{V}} [(1 - \theta_1\lambda)V - r]dF(V) \quad (1)$$

The two integrands represent the social net benefits from private titling and recording, where r is the social cost for each recorded title.

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[8]That is no longer true when land improvements are considered as we do at the end of the paper. When λ is zero, private titling is not necessarily superior because the incentives for land improvement are diminished.

Similarly, when the government chooses a registration system, social welfare is given by:

$$W^{rg} = \int_0^{P/\theta_0^{rg}} (1 - \theta_0^{rg}\lambda)VdF(V) + \int_{P/\theta_0^{rg}}^{\bar{V}} (V - \rho)dF(V) \tag{2}$$

where $\rho > r$ is the cost of each registered title.

The socially optimal pricing vector $< R, P >$ is given by $< r/\lambda, \rho/\lambda >$ after solving the appropriate first-order conditions. Two important conclusions should be emphasized. First, from a social welfare maximizing viewpoint, the price for registration should be higher than the price for recording since $\rho > r$.

Second, in both services, recording and registration, prices should be higher than marginal costs as long as $0 < \lambda < 1$. The reason is that current owners do not take into account that, if eviction happens, the social loss is less than the private loss.[9] Thus, too many owners will file their titles rather than relying on private titling.

Suppose for sake of exposition that land transfer is socially costless (i.e., transaction costs are zero). It must be the case that private titling is the best system from a social viewpoint since there is no cost to it. Therefore, prices should be so high as to eliminate any alternative titling system. Consider now the opposite scenario: land transfer is socially very costly (i.e., λ goes to infinity). Prices should be zero in order to guarantee that most individuals prefer recording or registration than just private titling. In this case, the social loss is would be much higher than the private loss. Consider finally a

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[9]We have here a version of the familiar problem of excessive level of care when its private benefits are higher then its social benefits. See for example Shavell (1997).

third case, where the social loss is equal to the private loss (i.e., $\lambda = 1$). Each price should then equal the corresponding marginal cost since the private decision is necessarily socially optimal.

When choosing between introducing a recording system or a registration system, the government should compare W^{rc} and W^{rg}. The limits of integration in (1) and (2) are important for this comparison. Let us define $V_0 = r/[\lambda(\theta_0^{rc} - \theta_1)]$ and $V_1 = \rho/(\lambda\theta_0^{rg})$, which are the socially optimal critical land values, conditional on optimal pricing, at which the marginal current owner is indifferent between keeping the title under private titling or, respectively, recording or registering it. Notice that it is not clear which of the two critical values is higher. The price for registration is higher than that of recording, but the reduction in the likelihood of eviction is also higher under a registration system than under a recording system.

1) Let us suppose that the critical values are such that $V_0 \leq V_1$. A recording system should be preferred to a registration system if and only if:

$$W^{rc} - W^{rg} = \int_0^{V_0} (\theta_0^{rg} - \theta_0^{rc})\lambda V dF(V) + \int_{V_0}^{V_1} [(\theta_0^{rg} - \theta_1)\lambda V - r]dF(V)$$
$$+ \int_{V_1}^{\bar{V}} (\rho - r - \theta_1\lambda V)dF(V) \geq 0 \qquad (3)$$

The first term in (3) refers to those parcels of land that will be just privately titled under both public titling systems. The second term in (3) is the net increase in value associated to those parcels of land that will be recorded in a recording system and just privately titled in a registration system. The last term in (3) refers to those parcels of land that will be recorded in a recording system and registered in a registration system.

In (3), the first term is negative because the likelihood of eviction is lower

in a registration system. The second term is positive: a recording system is better for these parcels of land because under a registration system, only private titling takes place for them. The last term is very likely to be negative if the more valuable parcels tend to be registered rather than recorded, as it would be if they incurred higher transaction costs, what seems likely. Thus, if the second term dominates the other two, recording is socially preferred to registration.

INSERT FIGURE 2

2) Consider the opposite case, when $V_0 > V_1$. A recording system should be preferred to a registration system if and only if:

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\begin{aligned}
W^{rc} - W^{rg} &= \int_0^{V_1} (\theta_0^{rg} - \theta_0^{rc}) \lambda V dF(V) + \int_{V_1}^{V_0} (\rho - \theta_0^{rc} \lambda V) dF(V) \\
&+ \int_{V_0}^{\bar{V}} (\rho - r - \theta_1 \lambda V) dF(V) \geq 0
\end{aligned}
\tag{4}
$$

In (4), the first term refers to those parcels of land that will be just privately titled under both public titling systems. The second term refers to land that will be privately titled in a recording system and would have been registered if a registration system were available. The last term refers to those parcels of land that will be recorded in a recording system and would have alternatively been registered.

The first is negative as before, and the second term is now negative: a registration system is better for these parcels of land because, under a recording system, owners have to rely on private titling without access to the public titling system. The last term is also negative for the same reason: they have to use recording when it would be worthwhile to register. In this case, registration is unambiguously preferred to recording.

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INSERT FIGURE 3

Notice that introducing a recording system could be better in the first case, but not in the second case. In Miceli et al. (1998), recording is always inferior because $r = \rho = 0$, $\theta_0^{rc} = \theta_0^{rg}$, and more critically $V_0 = V_1 = 0$, since the possibility of private titling is ignored.

Our general conclusion points out that if $V_0 \leq V_1$, recording *could* be socially optimal; otherwise, registration is socially optimal. In other words, if $r/\rho < (\theta_0^{rc} - \theta_1)/\theta_0^{rg}$, we contemplate the possibility that recording is socially optimal. Notice that our condition means that recording is much cheaper than registration for two reasons, both of them ignored in the Miceli et al. framework. The first reason is the higher marginal cost of registration over recording. The second reason lies in the fact that, because registration is more costly, some parcels of land that could be recorded if such a system was introduced, will be privately titled and not actually registered.

3 Title Assurance

In the previous model we have ignored the possibility that current owners can buy 'title assurance' services. We understand title assurance as the private production of information that reduces the probability of eviction.

We consider it not available under private titling. With private titling, hidden conveyances and charges are legally enforceable as real rights. This makes practically impossible to produce meaningful information on them. On the contrary, in recording systems all potentially valid titles are publicly available in the register. This is usually achieved by the courts using a rule

of priority in recording to eventually define good title. In any case, the publicity of titles, even if potentially contradictory, makes it possible to privately produce information about their validity. Information is worthless, however, when its quality is not guaranteed. The obvious guaranteeing mechanism is to make liable the agent producing the information, be s/he the notary in France or the title expert in the USA; the insurers of the agent's professional liability for negligence; or even the title insurer, to the extent that it also acts as an enforcer of the professional liability of those producing the information.[10]

Title assurance is also the purpose of registration, but its method of production is very different. First, it is automatically provided by the register when it identifies the different rights and right holders for any parcel.[11] Second, it has legal effects, with special enforcement attributes, as a consequence of changing the adjudication rule from property to liability. While the guarantee of private title assurance is a personal obligation on the party producing the information, the guarantee provided by registration is a real right. Current owners keep their property even when true owners emerge.

For sake of exposition, and without loss of generality in the sense that it would only make our results mathematically less cumbersome, let us assume that $\theta_0^{rc} = \theta_0^{rg}$.

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[10]More obviously, also when the title insurer itself produces the information. However, when it does so, it is exceeding the functions of title insurance, which in the sake of clarity it is better to consider as covering only against purely actuarial risks. Notice that under our assumption of risk neutrality, there is no demand for this kind of insurance. On these different roles of title insurers, see Arruñada (2001a).

[11]It could be argued that real registration systems suffer more or less from incompleteness in this function. All in all, it exists a very substantial difference with respect to recording in this regard. Specially in those registration systems (e.g., the German Grundbuch) that show very complete performance in this identification.

A provider of title assurance investigates the standing of the title, reducing the likelihood of eviction. The reduction of the probability of eviction is measured by $0 < \theta(n) < \theta_1 < \theta_0 < 1$, where n is effort (cost) to reduce the possibility of eviction, $\theta(0) = \theta_1$, $\theta' < 0$, $\theta'' > 0$. The price for title assurance is S.

As in Miceli et al. (1998), it is assumed that title assurance is coupled with recording. When a current owner (possessor in their terminology) registers the parcel of land, there is no reason to buy assurance, since a registration system itself provides full title assurance. In the case of private titling, we assume title assurance is not available because of the difficulties of producing information when hidden real rights are legally enforceable.

The expected value of a current owner who buys title assurance is $(1 - \theta(n))V - R - S$. Thus, an owner decides for title assurance if the gain $(\theta_1 - \theta(n))V$ is more than the cost S.

Any current owner will prefer:

(a) private titling if $(\theta_0 - \theta_1)V < R$, $\theta_0 V < P$, and $(\theta_0 - \theta(n))V < R + S$;

(b) recording if $(\theta_0 - \theta_1)V > R$, $\theta_1 V < P - R$, and $(\theta_1 - \theta(n))V < S$;

(c) recording with title assurance if $(\theta_0 - \theta(n))V > R + S$, $\theta(n)V < P - R - S$, and $(\theta_1 - \theta(n))V > S$;

(d) registration if otherwise.

It is easy to show that the current owner of a parcel of land valued at V who were offered the full variety of institutional solutions would just rely on private titling when the land is not very valuable; would record if its value

is within a given interval; would buy title assurance services if the land is valuable but not sufficiently so to justify registration; and would register if the land is highly valuable.[12]

The profits for an provider of title assurance services are $S - n$ per parcel of land 'assured.' In a perfectly competitive market, we will have $S = n$ (zero profit constraint). Thus, the expected value of an owner who buys title assurance is $(1 - \theta(n))V - R - n$. The amount of assurance bought by a owner with a parcel of land valued V is n^* given by $-\theta'(n^*) = 1/V$, where n^* is increasing in V. Owners with more valuable parcels of land will want to buy more title assurance. Moreover, the likelihood of eviction is endogenous and varies negatively with V.

Define V^* as $-1/\theta'(0)$. It is of course the case that every owner such that $V \leq V^*$ does not buy title assurance because it is not worthwhile. On the other hand, every owner such that $V > V^*$ buys title assurance. We can think of V^* as measure of assurance technology. The lower is V^*, the more efficient is this technology.

When the government chooses a recording system, social welfare is now given by:

$$
\begin{aligned}
W^{rc} &= \int_0^{R/(\theta_0 - \theta_1)} (1 - \theta_0 \lambda) V \, dF(V) + \int_{R/(\theta_0 - \theta_1)}^{V^*} [(1 - \theta_1 \lambda) V - r] dF(V) \\
&\quad + \int_{V^*}^{\bar{V}} [(1 - \theta(n^*(V))\lambda) V - n^*(V) - r] dF(V) \qquad (5)
\end{aligned}
$$

where we assume that $V^* > r/[\lambda(\theta_0 - \theta_1)]$, otherwise everyone who records necessarily buys title assurance.

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[12]It is assumed that $(\theta_1 - \theta(n))R < (\theta_0 - \theta_1)S$ and $\theta_1 S < (\theta_1 - \theta(n))(P - R)$. Otherwise recording or title assurance are never preferred by the current owner because the price to be paid is not compensated by the consequent reduction of the likelihood of eviction.

When the government chooses a registration system, social welfare is given by (2) as before since there is no private title assurance. The socially optimal pricing vector $< R, P >$ is given by $< r/\lambda, \rho/\lambda >$ as before. The possibility of title assurance does not affect optimal pricing because the owner at the margin between recording and private titling does not buy assurance.

The choice of assurance by individuals is not socially optimal because owners ignore land transferring (unless of course transaction costs are so high that $\lambda = 1$). Thus, an individual will choose more assurance than socially desirable. The government would need to tax or regulate private pricing of assurance services in order to reach the socially optimal level.[13]

Let us modify the expected value of an owner who buys title assurance to take into account taxation: $(1 - \theta(n))V - R - (1 + t)n$, where t is the tax rate. The amount of resources bought by a owner with a parcel of land valued V is now given by $-\theta'(n^*)V = 1 + t$. Social welfare is the same as in (5) since taxes are assumed to be a (neutral) transfer from individuals to the government. It can be easily checked that the social optimal value for n should satisfy $-\theta'(n^*)V\lambda = 1$. Consequently, the tax rate should be given by $-\theta'(n^*)(1 - \lambda)V$.

Taxation is socially optimal as long as $\lambda < 1$. Moreover, the lower is λ,

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[13]There is some casual evidence of overspending and special taxation. It is seems that in Spain the Register frequently exposes forgotten minor rights and encumbrances, perhaps causing more trouble than benefit. This is probably the case with title assurance, what differs only in its more private nature. There is also some evidence of special taxation. The industry is heavily regulated both in the USA and France. Explicit special taxation takes the form of documentary, mortgage, and transaction taxes who are frequently connected or associated to the use of assurance, recording and registration services. Private assurance is indirectly taxed this way, because in a world of anonymous traders it is hardly viable without recording.

the higher the tax rate will be. Another important observation is that owners of more valued land should pay higher taxes because the difference between the private value (V) and the social value (λV) of assurance is increasing in V.

Once the appropriate tax rate is set, the individual choice of assurance is socially optimal. Furthermore, V^* should be re-defined as $-1/(\theta'(0)\lambda)$. The measure of assurance technology is negatively affected by λ. The rationale is that as λ goes down, assurance is socially less valuable, fewer owners should buy it, thus V^* should go up.

When modeling the choice of a government who takes into account the possibility of private title assurance when deciding between recording and registration, we face three possible cases depending on the limits of integration. Define as before $V_0 = r/[\lambda(\theta_0 - \theta_1)]$ and $V_1 = \rho/(\lambda\theta_0)$.

1) Let us suppose that $V_0 \leq V_1 < V^*$, where assurance technology is highly inefficient and registration is relatively costly. A recording system should be preferred to a registration system if and only if:

$$
\begin{aligned}
W^{rc} - W^{rg} &= \int_{V_0}^{V_1} [(\theta_0 - \theta_1)\lambda V - r]dF(V) + \int_{V_1}^{V^*} (\rho - r - \theta_1\lambda V)dF(V) \\
&\quad + \int_{V^*}^{\bar{V}} [\rho - r - n^*(V) - \theta(n^*(V))\lambda V]dF(V) \geq 0 \qquad (6)
\end{aligned}
$$

The first term in (6) refers to those parcels of land that will be recorded without assurance in a recording system and just privately titled in a registration system. The second term in (6) refers to those parcels of land that will be recorded without assurance in a recording system and registered in a registration system. Finally, the last term in (6) refers to those parcels of land

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that will be recorded with assurance in a recording system and registered in a registration system.

INSERT FIGURE 4 HERE

In (6), the first term is positive: a recording system is better for these parcels of land because under a registration system, only private titling takes place. The second term could be negative or positive, depending on how much more expensive is to register rather than just record with assurance. The last term is eventually negative because highly valuable parcels of land should be registered rather than recorded (even though with assurance). Thus, if the first term dominates the other two, recording is socially preferred to registration. Notice that this the case we have described before as highly inefficient assurance technology and relatively costly registration. In this case, assurance services alleviate what according to (3) is a main deficiency of pure recording: leaving titles on highly valuable land subject to too much uncertainty.

This case is very similar to the first case when title assurance is not available, where (6) is similar to (3) when V^* tends to $\bar{V}$.

2) Consider the opposite case, when $V_1 < V_0 < V^*$, where registration is relatively inexpensive. A recording system should be preferred to a registration system if and only if:

$$
\begin{aligned}
W^{rc} - W^{rg} &= \int_{V_1}^{V_0} (\rho - \theta_0 \lambda V) dF(V) + \int_{V_0}^{V^*} (\rho - r - \theta_1 \lambda V) dF(V) \\
&\quad + \int_{V^*}^{\bar{V}} (\rho - r - n^*(V) - \theta(n^*(V)) \lambda V) dF(V) \geq 0 \qquad (7)
\end{aligned}
$$

The first term in (7) refers to those parcels of land that will be regis-

tered in a registration system and just privately titled in a recording system. The second term in (7) refers to those parcels of land that will be recorded without assurance in a recording system and registered in a registration system. Finally, the last term in (7) refers to those parcels of land that will be recorded with assurance in a recording system and registered in a registration system.

INSERT FIGURE 5 HERE

In (7), the three terms are negative: registration is preferred to recording. This case is very similar to the second case when title assurance is not available, where (7) is similar to (4) when V^* tends to $\bar{V}$.

3) Now consider the case that $V_0 < V^* \leq V_1$, where assurance technology is reasonably efficient and registration is relatively costly. A recording system should be preferred to a registration system if and only if:

$$
\begin{aligned}
W^{rc} - W^{rg} \ = \ & \int_{V_0}^{V^*} [(\theta_0 - \theta_1)\lambda V - r]dF(V) \\
& + \int_{V^*}^{V_1} [(\theta_0 - \theta(n^*(V)))\lambda V - n^*(V) - r]dF(V) \\
& + \int_{V_1}^{\bar{V}} [\rho - r - n^*(V) - \theta(n^*(V))\lambda V]dF(V) \geq 0 \quad (8)
\end{aligned}
$$

The first term in (8) refers to those parcels of land that will be recorded without assurance in a recording system and just privately titled in a registration system. The second term in (8) refers to those parcels of land that will be recorded with assurance in a recording system and just privately titled in a registration system. Finally, the last term in (8) refers to those parcels of land that will be recorded with assurance in a recording system and registered in a registration system.

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INSERT FIGURE 6 HERE

It is (8) that is new from the previous section. The first term is positive and the last term is eventually negative as in (6). The second term could be negative or positive, depending on how much more expensive is to record with assurance rather than just privately titled. Thus, if the first term dominates the other two, recording is socially preferred to registration.

In conclusion, the possibility of title assurance improves the standing of a recording system as compared to a registration system. However, the final result depends on the efficiency of assurance technology. A further problem is the fact that individuals tend to buy more than what is socially optimal (because they ignore land transferring), and so there is a need for corrective taxation.

4 Conclusion

In this paper we have explored the effect of the choice of titling system for land. Our results suggest that, contrary to previous findings, the relative efficiency of the different titling systems is unlikely to be (or can hardly be) resolved (and decided) on purely theoretical grounds.

As in previous literature, registration is efficient if the reduction on likelihood of eviction (the loss of the *in rem* standing of the property right) of the most valuable properties plays a determinant role, thus more than offsetting any cost differential. Notwithstanding, recording *could* be more efficient than registration for three reasons. The first reason is the higher marginal cost of registration over recording. The second reason lies in the

fact that, because registration is more costly, some parcels of land that could be recorded if such a system was introduced, will remain out of the public system of land titling and not actually registered (what we have designated by private titling). There is an expulsion or crowding out effect: The higher cost of registration throws less valuable land out of titling and into private titling.

The last reason has to do with an assurance effect. For land with a higher value, its assurance is socially valuable and more than compensates the cost (thus, these pieces of land should be registered). However, just the opposite happens for less valuable land (recording should be enough).

The commented signs have a clear translation in empirical terms. In real life, both systems, recording and registration provide palliatives for avoiding the different costs they impose. Registration systems usually allow some kind of inexpensive filing procedure, frequently registration of possessory title, which in fact can be considered a form of recording within a register of rights. The consequence is to reduce the expulsion effect. Recording systems also provide for a solution to the suboptimal enforcement of rights in the more valuable land. This usually takes the form of a simplified judicial procedure to clear title (the French purge and the American quiet title suit).

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Appendix: Model with Land Improvements

In this appendix, we want to shown that the conclusions of our model are valid when capital improvements are considered. Most of the literature on property rights in land has been concerned with land investment and the nature and enforcement of those property rights in land.[14] Thus, it is important to show that our results are easily extended to consider investment.

Define k as level of capital improvements, $C(k)$ is the cost of capital improvements (independent of titling system), $(1+k)V$ is the return on capital improvements, where $C' > 0$ and $C'' > 0$.

Private Titling

If its owner does not record the deeds, its expected value would be $(1-\theta_0)(1+k)V - C(k)$. The choice of improvements is k_0 given by $(1-\theta_0)V = C'(k_0)$.

Recording

The expected value for the owner would be $(1-\theta_1)(1+k)V - C(k) - R$. The choice of improvements is k_1 given by $(1-\theta_1)V = C'(k_1)$.

Registration

On the other hand, if its owner, instead of recording, files in a register, he will get $(1+k)V - C(k) - P$. The choice of improvements is k_2 given by

---

[14]For example, see Anderson and Lueck (1992); Alston, Libecap and Schneider (1996); Besley (1995); Ellickson (1993); Feder and Feeny (1991) and Miceli et. al. (1998).

$V = C'(k_2)$.

Clearly $k_2 > k_1 > k_0$, i.e., there will more investment on land improvements if the parcel of land is registered than recorded or the deeds are kept private.

For sake of exposition, and without loss of generality in the sense that it would only make our results mathematically more cumbersome, let us assume that $\theta_0^{rc} = \theta_0^{rg}$.

The limits of integration are now defined implicitly because the choice of improvements depends on V:

$$[(1 - \theta_1)(1 + k_1) - (1 - \theta_0)(1 + k_0)]V_0 = R + C(k_1) - C(k_0)$$

$$[1 + k_2 - (1 - \theta_0)(1 + k_0)]V_1 = P + C(k_2) - C(k_0)$$

When the government chooses a recording system, social welfare is given by:

$$
\begin{aligned}
W^{rc} &= \int_0^{V_0} [(1 - \theta_0\lambda)(1 + k_0)V - C(k_0)]dF(V) \\
&\quad + \int_{V_0}^{\bar{V}} [(1 - \theta_1\lambda)(1 + k_1)V - r - C(k_1)]dF(V)
\end{aligned}
$$

When the government chooses a registration system, social welfare is given by:

$$
\begin{aligned}
W^{rg} &= \int_0^{V_1} [(1 - \theta_0\lambda)(1 + k_0)V - C(k_0)]dF(V) \\
&\quad + \int_{V_1}^{\bar{V}} [(1 + k_2)V - \rho - C(k_2)]dF(V)
\end{aligned}
$$

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The socially optimal pricing vector $< R, P >$ is not given by $< r/\lambda, \rho/\lambda >$, since prices should also reflect the fact that each system is associated with different levels of land improvement. Recording and registration are associated with higher capital improvements and thus generate more value than private titling.

Let us suppose that $V_0 \leq V_1$. A recording system should be preferred to a registration system if and only if:

$$W^{rc} - W^{rg} = \int_{V_0}^{V_1} \{[(1 - \theta_1\lambda)(1 + k_1) - (1 - \theta_0\lambda)(1 + k_0)]V - r + C(k_0) - C(k_1)\}dF(V)$$
$$+ \int_{V_1}^{\bar{V}} \{[(1 - \theta_1\lambda)(1 + k_1) - (1 + k_2)]V + \rho - r + C(k_2) - C(k_1)\}dF(V) \geq 0$$

Consider the opposite case, when $V_0 > V_1$. A recording system should be preferred to a registration system if and only if:

$$W^{rc} - W^{rg} = \int_{V_1}^{V_0} \{[(1 - \theta_0\lambda)(1 + k_0) - (1 + k_2)]V + \rho + C(k_2) - C(k_0)\}dF(V)$$
$$+ \int_{V_1}^{\bar{V}} \{[(1 - \theta_1\lambda)(1 + k_1) - (1 + k_2)]V + \rho - r + C(k_2) - C(k_1)\}dF(V) \geq 0$$

The results presented in section 2 do hold in a model with improvements. The only important remark is that the advantage of registration in terms of lower probability of eviction is coupled with (socially) more efficient capital improvements than recording and private titling.