

**Antichresis Leases: Theory and Empirical Evidence  
from the Bolivian Experience \***

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**Abstract.** The antichresis lease appears in many civil law countries. It requires a lump sum tenant payment that is to be returned in full at the end of the lease, where the custody of the lump sum is the property owner's compensation in the property lease. This paper develops a theory of the antichresis emphasizing the countervailing effects of the tenant liquidity risk and owner input supply moral hazard. The model predicts that the antichresis dominates when tenant activities are largely independent of owner supply of inputs whereas the periodic rent contract dominates when tenant activities depend upon the owner inputs. At the same time, the antichresis insulates owners from tenant liquidity risks while rent contracts do not, making antichresis leases more attractive for tenant populations with greater liquidity risk. The empirical evidence from Bolivian property leases supports the main theoretical predictions regarding property type and neighborhood population characteristics.

**Keywords:** Antichresis, leases, property rights

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## 1. Introduction

Leases are fundamental tools in property markets. Economists and legal scholars view property rights as a bundle of prerogatives defined for a particular asset, including rights of use, exclusion, and disposition. Leases are the means by which property owners and users can unbundle these rights to their mutual advantage, the owner relinquishing to the tenant the right of use and the right to exclude others from using the property for a set period of time without relinquishing the right to ultimately dispose of the property by sale.

The antichresis lease, which appears in many civil law countries, requires a lump sum tenant payment that is to be returned in full at the end of the lease, where the custody of the lump sum is the property owner's compensation in the property lease.<sup>1</sup> For example, in our sample, the tenant pays the landlord a sum of \$13,000 at the beginning of the lease on average and the landlord returns to the tenant the entire \$13,000 at the end of the lease. The landlord's effective rent over the term of the property lease is the interest or investment earnings on this sum, which amounts to approximately \$108 per month. In our sample, in contrast, the average monthly rent paid by the tenant to the landlord under the familiar periodic rent lease is about \$150.

This paper offers an explanation of why civil law countries, unlike common law countries, continue to allow property owners to choose either antichresis leases or monthly rent leases. The theory identifies key factors driving property owners' choices of lease type in order to explain the observed differences in the mix of antichresis and

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<sup>1</sup> Briefly, in common law legal systems, court decisions are driven by precedent and legal rules are judge-made in the sense that decisions can establish new precedents that supercede previous doctrine when the previous doctrine does not adequately deal with new situations. In civil law legal systems, in contrast, court decisions strictly follow the written code established by legislation; there is no role for precedent hence no judge-made law. See Eisenberg (1989) and Merryman (1985) for in depth descriptions of common and civil law systems, respectively.

monthly rent leases across property types and market segments. The empirical analysis uses property lease data from Bolivia to test the model predictions.

There are several casual explanations for why the antichresis lease continues to be used, one popular notion being that antichresis contracts are motivated by high inflation or by large spreads in lending and borrowing interest rates. Other justifications for the antichresis are based on local institutional factors. For example, one argument is that lease taxes and fees create relative advantages or disadvantages of the antichresis for different types of property owners and tenants (Farfan, 2002, 2004; Durand-Lasserve, 2006). Similarly, Ambrose and Kim (2003) argue that the attraction of the chonse lease, the South Korean cousin of the antichresis, represents an attempt by property owners to avoid the rent controls that apply to periodic rent leases. Finally, some assert that the variety of contract types serve the different needs of high and low income tenants (Farfan, 2002; Payne, 2002, 2005), although the source of the specific advantages have not been fully described. None of these rationales adequately explains why both antichresis and rent leases co-exist in the same market nor do they explain the existence of antichresis leases across a wide swath of civil law countries. These are the questions addressed in this study.

Bolivia is one of the largest Latin American users of antichresis leases as an alternative to the familiar periodic rent lease. However, as shown below, the popular rationales for antichresis as responses to inflation, credit conditions, or taxes do not hold up empirically in Bolivia. Motivated by these results, this paper develops a theory of the antichresis lease emphasizing the countervailing effects of the tenant's liquidity risk and owner input supply moral hazard. The stylized framework focuses on the characteristics of the real estate technology defining how property is used in different applications as well as the incentives and implicit enforcement implications of the different types of leases. The model predicts that antichresis leases dominate for tenant activities that are largely independent of the owner's supply of inputs, like commercial uses or single family detached housing; periodic rent contracts dominate for tenant activities that are sensitive to the owner's supply of inputs, like multi-unit housing. At the same time, antichresis leases eliminate owners' consequences of tenant liquidity risks while rent contracts do not, making the antichresis more attractive in locales with a larger proportion

of tenants with greater liquidity risk. The empirical evidence, using lease data from Cochabamba, Bolivia, generally supports the theoretical predictions regarding the prevalence of antichresis and rent contracts across property types and neighborhood population characteristics.

This study contributes to the growing urban and regional economics literature focusing on the economic role of property rights and legal institutions, with particular attention to how different types of leases affect or are affected by the pace and pattern of urban development (Ambrose and Kim, 2003; Brueckner, 1993; Cho and Shilling, 2007; De Meza and Gould, 1992; Grenadier, 1995; Hoy and Jimenez, 1991; Miceli and Sirmans, 1995; Miceli et al., 2001, 2009; Turnbull, 2008). Much of this literature is motivated by the fact that legal systems, whether common law or civil law systems, restrict the range of lease provisions that courts consider enforceable. As a practical matter, this eliminates the possibility that owners and tenants can structure complete contracts to efficiently deal with all contingencies. The self enforcement features of lease agreements structured to elicit credible commitments by both parties take on even greater importance in developing countries in which squatting and informal property rental markets leave participants with little or no access to legal redress in courts (Turnbull, 2008). The recurring lesson from this literature is that property and lease laws have real effects on resource allocation by systematically altering land use patterns and the pace of urban development.

The rest of this paper is organized as follows. Section 2 presents a brief history of antichresis contracts. Section 3 addresses several casual hypotheses regarding antichresis contracts—the roles of inflation, interest rate differentials, contract taxes and fees, and differences in enforcement costs. Section 4 offers a stylized model of lease form, focusing on the roles of moral hazard and tenant liquidity risk characteristics. Section 5 describes the empirical model and the data and presents the empirical tests of the theory. Section 6 concludes.

## 2. A Brief History of the Antichresis

The word “antichresis” is from the Greek “anti” (against) and “chresis” (use) denoting the action of giving a credit “against” the “use” of a property.<sup>2</sup> The antichresis is a mechanism through which an owner gives the rights of use of a property to a tenant in exchange for a fixed amount of money payable at the signature of the contract.<sup>3</sup> The antichresis establishes a tenant usufruct, the right to use the property for a limited term, usually for one required year and one optional year agreed by both parties, after which the owner returns the lump sum of money and the tenant returns the property.

Despite the Greek origins of its name, clay tablets from the 15<sup>th</sup> century b.c. establish that antichresis contracts were commonly employed in the Sumerian and Akkadian Mesopotamian cultures (Purves, 1945). Babylonian law, considered a main precursor of western law, incorporated the antichresis contract, modifying the basic form to combine it with the mortgage pledge; in Babylonian law a mortgage pledge could become an antichretic pledge if not promptly repaid (Lobingier, 1929).

We know little about how and to what extent the Greek culture used the antichresis except that it entered Greek law in the time of Demosthenes (Cohen, 1950). The antichresis was introduced into Roman Law toward the end of the classical period (*Tulane Law Review*, 1938). Roman Law adopted the convention that the tenant usufruct had to be exactly compensated by the interest on the lump sum payment (Silva, 1996).<sup>4</sup>

Canon Law repudiated the antichresis during the Middle Ages; Pope Alexander III forbade it in 1163, in part because the antichresis contract was considered a form of usury (Cohen, 1950). Silva (1996) attributes the emergence of contracts serving the same purpose of the antichresis contract in this period to the ban—for example, a contract to purchase with an agreement to resell at the same price.

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<sup>2</sup> Some authors claim that chresis stands for “credit” (Payne, 2002), but this is a faulty translation. Chresis or chrisi (in modern Greek) means “use.”

<sup>3</sup> Property rights include the rights to use, exclude, and dispose. The antichresis contract gives the tenant the rights to use and exclude (which is a usufruct in civil law) for a limited period of time. The rights to dispose stay with the property’s original owner. The usufruct resembles the interpretation of the lease as the “conveyance” rather than a contract in common law countries. See Miceli et al. (2001) for explanation of the factors that determine whether a common law lease is interpreted as a conveyance or contract.

<sup>4</sup> Civil codes today sometimes allow the property owner to take part of the lump sum as a part of his payment.

In modern law, the antichresis contract reappears in the Napoleonic Code established in 1804, incorporating a practice popular in southern France at time the code was being drafted (Silva, 1996). Among others, Spain, Italy, and most Latin American nations were influenced by the Napoleonic Code and adopted most of its contents including the antichresis contract. In the United States, the antichresis contract only appears in the State of Louisiana, following the format established in the French code and the original Louisiana Code of 1808 (Slovenko, 1958).<sup>5</sup>

Today, the antichresis contract is represented in nearly all Latin American civil codes. Minor differences exist but the core provisions in all countries resemble the basic form from pre-Babylonian times. Table 1 summarizes key antichresis characteristics as specified in the civil codes of selected countries.

The fact that antichresis contract has a long history and appears in a wide variety of countries suggests that it effectively solves a problem inherent in leasing property. If it engendered particular disadvantages, it would have disappeared from use long ago. One interesting aspect is that antichresis contracts coexist with periodic rent contracts in many property markets.<sup>6</sup> Some authors argue that its current popularity in Bolivia is because it improves poor households' access to housing in markets that also use periodic rent contracts (Farfan, 2002; Payne, 2002, 2005). We find, however, no attempts in the mainstream literature to uncover why certain individuals should prefer antichresis as opposed to other contractual agreements as well as why other individuals prefer other lease contract forms over the antichresis. This is a fundamental question that needs to be answered before we can claim to understand how the use of antichresis can benefit (or hurt) the poor much less understand how different policies affect its use and benefits. The next section explores this question, introducing a theoretical model to help explain the incentives characteristics inherent in antichresis agreements as well as why it coexists with the monthly rent contract in modern property markets.

### **3. The Antichresis in Bolivia**

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<sup>5</sup> The antichresis lease has seen only limited use in Louisiana (*Tulane Law Review*, 1959).

<sup>6</sup> The ability to choose whether leases establish property or contract relations is not available to owners and tenants in common law countries. In common law countries, the interpretation of leases is established by legal doctrine underlying court decisions (Epstein, 1986; Miceli et al., 2001).

As mentioned earlier, the antichresis contract appears in the civil codes of some European countries and most Latin American countries. Housing tenure statistics, however, show that Bolivia is one of the few countries where the contract is widely used for residential housing (Rivera, 2005). Table 2 shows how housing under antichresis tenure increased over 1992-2001 in Bolivia's 10 largest cities. While the Bolivian Civil Code (Article 716) prohibits the use of mixed antichresis-rent contracts, mixed contracts are used in most cities but are relatively small in number. Table 2 also shows that rental contracts represent the largest proportion of leased or rented housing.

It is a common belief among Bolivians that the antichresis system is popular because of Bolivia's traumatic experiences with high inflation and because high interest rates force landlords to finance their projects using antichresis contracts. Others suggest that taxes and registration costs also create incentives for using antichresis leases (Farfan, 2002, 2004; Durand-Lasserve, 2006). This section explores the validity of these claims, each in turn.

### **3.1 Inflation**

The first hypothesis considered here is that high or volatile inflation motivates antichresis use. Bolivia's experience, however, does not show a strong relationship between current inflation, past inflation, or inflation rate volatility and the percentage of homes under antichresis tenure. Table 3 shows that the percentage of homes under antichresis rises whether inflation is increasing (e.g., 1976-1992) or decreasing (e.g., 1992-2001). The relationship with inflation rate volatility is also weak. As volatility dramatically decreases from 1976 to 1992, the percentage of homes under antichresis increases slightly. However, the opposite occurs in the 1992-2001 period where the inflation rate volatility increases and the percent of homes under antichresis increases as well by 2.85 percentage points.

The weak relationship between inflation rates and volatility and the use of the antichresis contract might be explained by the fact that most antichresis contracts are made in US dollars. Nonetheless, it turns out that the use of contracts in foreign currency is not exclusive to antichresis leases in Bolivia. Most monthly rent contracts are also

signed specifying the rental payments in US dollars.<sup>7</sup> Thus, the choice of antichresis contracts over rental contracts is likely related to factors other than inflation or international currency risk.

### 3.2 Interest rates

Another widely held belief is that real interest rates drive the use of the antichresis contract. This assertion is based on the notion that landlords and tenants have different returns for investments. Otherwise, other things being equal, the antichresis contract only exists if both landlord and tenant are indifferent between the two contractual arrangements. To see this, assume that both landlord's and tenant's best investment option for the antichresis amount was the same banking savings real interest rate  $rs$ . Everything else being equal, tenants would take the property under antichresis instead of monthly rent only if the opportunity cost of the antichresis amount  $A$  is lower than what they would have to pay in monthly rents  $R$  (that is,  $A \cdot rs \leq R$ ). On the other hand, landlords would only choose antichresis over monthly rent if the gains from the use of the antichresis amount were higher than what they would receive in monthly rental payments ( $A \cdot rs \geq R$ ). As a result, the only way antichresis would exist is if  $A \cdot rs = R$  in which case both landlord and tenant are indifferent between the two contract forms.

Now consider the case where the landlord has a better investment option than the tenant for the antichresis amount  $A$  and the tenant faces the same participation constraint as before ( $A \cdot rs \leq R$ ). In this new case, the landlord could borrow  $A$  from the banking system and face the lending interest rate  $rl$  (with  $rl > rs$ ) or could finance the investment by putting his property under an antichresis contract and obtaining  $A$  from the tenant. The participation constraints for landlord and tenant become  $A \cdot rl \geq R$  and  $A \cdot rs \leq R$  respectively. Under this new set up, the antichresis contract is beneficial for the landlord even if  $A \cdot rs < R$  as long as the monthly rent payments are lower than the cost of borrowing  $A$  from the bank at the prevailing lending rate ( $A \cdot rl \geq R$ ). This suggests that large differences between  $rl$  and  $rs$  and different rates of return for landlords and tenants may explain the use of the antichresis contract. If so, we expect to observe that an

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<sup>7</sup> In the sample of antichresis and monthly rent contracts used in the empirical section of this study, 100% of the antichresis and 80% of the monthly rent leases were listed in US dollars.

increase in the interest rates spread (difference between the lending and savings interest rates) increases the use of antichresis contracts.

Table 4 shows the percentage of homes under antichresis in Bolivia's largest cities and the country's interest rate spread for the latest census years. The observed relation between the use of antichresis and the interest rate in spread is exactly the opposite of the prediction above. As the interest rate spread decreases by 12 percentage points, the percentage of homes under antichresis actually *increases* by 2.85 percentage points. Thus, it appears that the interest rate spread does not explain the popularity of the antichresis lease in Bolivia.

### **3.3 Taxes and registration costs**

Farfan (2002) argues that contract registration costs and other taxes affect the contract choice. Bolivia uses the registration title system, which requires the antichresis contract to be a public document (Civil Code, Article 1430) registered in the office of real estate registry.<sup>8</sup> The registry ensures that the property involved in the antichresis contract has a clean title registered to the person signing the antichresis contract as owner, and that the property has no legal claims to it such as mortgages or other legal claims that might dilute the antichresis contract. The real estate registry office charges 0.4% of the antichresis amount and a fixed charge of \$US 6 (\$50 Bs.) for administrative processing.

In case of a dispute, courts can only intervene and give the tenant the first claim on the antichresis amount  $A$  if the contract is notarized and registered. Otherwise, tenants have to go through ordinary debt collection legal procedures, which take considerably longer and are subject to disputes of payments with other claimants. Nonetheless, unregistered antichresis contracts are common. In these cases tenants run the risk of losing their antichresis amount and untimely eviction if the property is foreclosed by a bank with a preexisting mortgage claim (La Razon, 2002; Farfan, 2002).

Monthly rent contracts need not be registered. Under Bolivian law rent contracts can be verbal. Thus, the registration costs for antichresis can be one factor that deters agents from using these contracts in lieu of periodic rent (Farfan, 2002). There are,

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<sup>8</sup> See Miceli et al. (1998, 2000) for an explanation and analysis of the differences between registration and recording title systems.

however, other factors affecting the choice between contracts. One of these is the value added tax.

Economic structural reforms enacted in Bolivia to combat the rampant hyperinflation in 1985 included a comprehensive tax reform that replaced the old tax system for a Value Added Tax (VAT) system in 1986.<sup>9</sup> The Bolivian VAT rate is 13%.

Firms or individuals who are involved in commercial and or leasing activities are required to pay the VAT 13% on gains every month. Complementing the VAT tax, salaried individuals are required to pay the Complementary Regime VAT (CR-VAT) that acts like a tax on earnings and is applied to an individual's taxable income minus the expenses the individual made in the current or previous tax periods.

Individuals receive a receipt for every transaction. At the end of the tax period they pay 13% of their taxable salary (which is the salary minus two minimum salaries). However, individuals can use the receipts to discount their taxable base. If their receipts are equal to the taxable base, their CR-VAT taxes would be zero, if their receipts add up to more than the taxable salary they will have a credit equal to the exceeding amount for the next taxing period. If their receipts add up to less than their taxable salary they will be taxed on that difference. Table 5 calculates the different impacts of the VAT and CR-VAT on rental and antichresis contracts by separating the tax burdens for landlords and tenants under both contractual agreements.

For rent contracts, the landlord is obligated to pay the VAT (13%) on rent revenues ( $R$ ) but can discount the taxable revenues with receipts of all the expenditures made on the property (denoted  $y$  in the table). The VAT for the landlord is  $0.13(R-y)$ . The landlord is also required to pay the CR-VAT. This tax is applied to 87% of the rent revenue minus 2 minimum salaries per month (about \$125). However, with the CR-VAT the landlord can deduct his taxable base using expenditure receipts of any expense not included in his VAT declaration. Note that for monthly rent contracts of \$US 143 per month or less, the taxable base for the CR-VAT zero even if the taxpayer does not

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<sup>9</sup> The tax reform (Law 843) was signed by President Victor Paz Estensoro in May 1986 and was later amended in 1994 under President Gonzalo Sanches de Lozada. The major change introduced in the 1994 amendment was to raise the tax rate from 10% to 13%.

present any expenditure receipts.<sup>10</sup> Finally, the landlord has to pay the transaction tax (TT) equal to 3% of the rents before VAT and CR-VAT taxes.

Tenants are not required to pay any taxes related to their monthly rent contract. Tenants are only required to pay CR-VAT on their earnings and they can use the monthly rent expenditures to deduct their taxable base.

It is important to note that courts require proof of IVA tax payments in order to establish a monthly rent contractual relationship in the event of a breach of contract. As a result landlords need to have their taxes paid before they can start an eviction procedure. This requirement serves as an incentive for landlords to comply with tax regulations. However, tax authorities estimate that fewer than 20 % of monthly rent contracts pay the VAT (Torrico, 1999).

For the antichresis contract, both parties are subject to the CR-VAT taxes on a supposed yearly income equivalent to 10% of the lump sum amount (denoted  $A$  in Table 5). As with other CR-VAT taxes, the taxable base is calculated by subtracting 2 minimum salaries from the monthly income and then subtracting expenditures made previous to the tax payment date not claimed in other taxes or taxing periods.

The calculated of tax burdens in Table 5 assume that neither landlords nor tenants present any receipts to obtain CR-VAT credits or VAT credits in the rental contract case so that they are fully taxed. Using the formulas in table 5 for different amounts of  $R$  and  $A$ , we can observe the total tax burden on both contracts. Figure 1 depicts these tax burdens using yearly rents for monthly rent contracts and an equivalent antichresis lump sum  $A$  assuming a return of 10% ( $r = 0.10$ ). The figure shows that monthly rent contracts where the specified yearly rent is below \$7,000 have a greater tax burden than antichresis contracts with equivalent yearly rents ( $rA$ ). Our data from the city of Cochabamba shows that 93% of monthly rent contracts are signed for amounts below \$7,000; the tax and registration fee system appears to favor the antichresis form of lease for most of the market.<sup>11</sup> Taxes and fees alone do not explain the presence of rental contracts in the market; their advantages over antichresis leases must arise from other sources.

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<sup>10</sup> This is because 87% of a monthly rent of a \$142.6 contract is equivalent to 2 minimum salaries: \$125, which is the automatic deduction for the taxable base in the CR-VAT.

<sup>11</sup> The sample is drawn from antichresis and monthly rental ads posted in the “Los Tiempos” news paper in 2005. In this sample 60% of the antichresis ads specify antichresis lump sums below \$15,000 and 95%

#### 4. A Model of the Antichresis Lease

The ownership of an asset refers to a bundle of rights that includes use, exclusion and disposition. The ability of owners to transfer some of the rights to others for periods of time can create economic gains from specialization (Miceli, 2004). For this reason, legal systems usually allow these transfers. In the case of a lease or an antichresis contract, the owner temporarily transfers the rights of use and exclusion to the tenant but retains the right to dispose of the property.

While this division of property rights can be the source of gains to society, it also introduces incentives for inefficient behavior by both landlord and tenant (Epstein, 1986). These inefficiencies arise from two sources, adverse selection and moral hazard. In the real estate lease context considered here, the adverse selection problem arises from landlords' inability to ascertain tenants' probability of temporary or permanent breach the lease due to illiquidity. The moral hazard problem arises from the possibility that certain contract terms are not incentive compatible.

In this sense, institutions governing the division of ownership have the potential to serve an important role in society as long as potential inefficiencies are corrected by creating the appropriate incentives in a world with transaction costs. This is where the body of law comes into play. Economic agents will make decisions under a particular legal framework comprising doctrines that favor the use of some contractual agreements as opposed to others. We offer a stylized model that explains how agents choose between contracts based on their inherent incentives structure when faced with the typical problems arising from temporal division of property rights.

We begin with the sequence of events and payoffs. In the first stage, a risk neutral tenant and risk neutral landlord agree on the terms of the contract: the payments expected from the tenant and the inputs to be supplied by the tenant and landlord,  $x$  and  $y$ , respectively. If an antichresis contract, the tenant gives the landlord the antichresis lump sum  $A$  at the time the contract is signed; the landlord agrees to return the sum at the end of the lease period but earns the return  $rA$  during the contract period.

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lump sums below \$30,000. Among the monthly rental units, 48% are offered below \$1500 and 93% below \$7000 in annual terms.

In the second stage the tenant and landlord choose their inputs investments,  $x$  and  $y$ , respectively.

In the third stage, the rent  $R$  is due for tenants who chose the rental contract. However, the tenant faces a probability  $p$  of being illiquid at this point. If illiquid, the tenant cannot pay rent  $R$  so he is forced to abandon the property and move to an alternative place that yields housing services  $T_0$  net of rent for the new place.<sup>12</sup> In case of abandonment tenants lose any resource investment  $x$  they made in the property and landlords face the costs of re-renting the property to a different tenant,  $C$ , which may include the forgone income and eviction procedures. The foregone tenant investment  $x$  is not appropriable by the replacement tenant.

In the fourth stage, the tenant enjoys housing services  $T$ , which are a function of the maintenance investments  $x$  and  $y$ , and a shift parameter  $\lambda \geq 0$  that reflects the marginal effect of landlord supplied inputs on the tenant's enjoyment of the property. Thus, the tenant enjoyment of the property is

$$T(x, y; \lambda) = f(x) + \lambda g(y) \quad (1)$$

with  $f' > 0$ ,  $g' > 0$  and  $f'' < 0$ ,  $g'' < 0$ .

Finally, the contract term expires in the fifth stage. At this point, landlords remit the antichresis amount  $A$  to the tenant (if applicable) and in return the tenant surrenders the property to the landlord. The property's reversion value to the landlord is  $L(x, y)$  at this point, which is an increasing concave function of the maintenance investments  $x$  and  $y$  made during the contract period. The condition  $L(x, y) > A$  ensures that the owner will relinquish the antichresis payment to the tenant in order to take possession of his property.<sup>13</sup>

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<sup>12</sup> Tenant abandonment is not an essential feature of the model, but it does simplify the presentation considerably. An alternative formulation in which illiquidity implies additional costs of collecting the rent for the property owner (and, possibly, additional costs for the tenant as well) yields the same predictions.

<sup>13</sup> When residual property value  $L$  is uncertain, then realized  $L < A$  is a possible outcome (which does not apply in our sample, where  $A$  is less than one third of the residual property value), the antichresis lease appears to give the landlord an option to surrender the property to the tenant by refusing to return the lump sum  $A$ . Landlord refusal to return the lump sum, however, gives the tenant the option to exercise legal rights to either take ownership of the property or to force compliance. See Ambrose and Kim (2003) for an analysis of the Korean version of this type of lease focusing on the option value under the assumption that

#### 4.1 Periodic rent contract

Before choosing a particular contract, landlords and tenants will weight their options based on their expected profits under each contractual arrangement. The expected profit for a tenant under a pure monthly rent contract is  $(1 - p)[T(x,y) - R] + pT_o - x$ . Following Eswaran and Kotwol (1985) and Miceli et al. (2001), we assume that there is a perfectly elastic supply of potential tenants so that the bid rent is the maximum a tenant is willing and able to pay in equilibrium

$$R = T(x,y) + [pT_o - x]/(1 - p) \quad (2)$$

The landlord's expected profit from a pure monthly rent contract is the sum of the net property's residual value plus the expected rental income.

$$\pi_R = L(x,y) - y + (1 - p)R - pC \quad (3)$$

Substituting the rent (2) into (3) we obtain the landlord expected profit under a pure monthly rent contract.

$$\pi_R = L(x,y) + T(x,y) - p[T(x,y) - T_o] - x - y - pC \quad (4)$$

This expression coincides with the expected social value of the contract. Thus, the landlord's return allows us to evaluate the welfare properties of each contract as well.

Now consider the efficiency of the pure monthly rent contract in terms of investments in the inputs  $x$  and  $y$ . The efficient levels of maintenance investment in a rental contract are those that maximize the expected social value of the contract (4) and yield optimal investments, denoted  $\hat{x}$  and  $\hat{y}$ . To simplify the exposition, we implicitly assume that tenants pay a security deposit at the outset, which eliminates moral hazard in

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tenants cannot respond to landlord breach. That study, however, does not address the moral hazard or selectivity incentives considered here.

the tenant's supply of inputs. The tenant's supply of inputs,  $x$ , therefore satisfies the efficiency condition

$$L_x + (1-p)T_x = 1 \quad (5)$$

In bid price equilibrium, the contract rent  $R$  drives the tenant to his reservation utility (zero). After the contract is signed, the landlord maximizes (3) taking  $R$  as given, which yields  $\tilde{y}$  satisfying the first order condition  $L_y = 1$ . But, in a pure monthly rent contract, the tenant is allowed to withhold rental payments if the landlord is not honoring the contractual agreement. As a result, the tenant has an enforcement mechanism that can constrain the landlord to credibly commit to invest the efficient  $\hat{y}$  maximizing (4) and satisfying the efficiency condition

$$L_y + (1-p)T_y = 1 \quad (6)$$

Thus,  $\hat{y} > \tilde{y}$  for  $p < 1$ , which is the moral hazard problem. In response, the monthly rent provides the enforcement mechanism to sustain the efficient  $\hat{x}$  and  $\hat{y}$  as incentive compatible contract terms in equilibrium.

Totally differentiating the system of equations (5) and (6) and using the concavity properties of  $L$  and  $T$ , we have the following result which is useful in later analysis:

$$\partial \hat{y} / \partial \lambda > 0 \quad (7)$$

## 4.2 The antichresis contract

In an antichresis contract, the lump sum payment  $A$  is made upfront when the contract is signed. This removes any consequences of tenant illiquidity for the property owner during the contractual period but also induces a tenant opportunity cost in the form of foregone earnings on the antichretic pledge. Thus the tenant's expected profit under an antichresis contract is given by  $T(x,y) - rA - x$ . Maintaining the assumption of a perfectly elastic supply of potential tenants, we obtain the maximum amount  $rA$  tenants will be willing to pay under an antichresis contract as

$$rA = T(x, y) - x \quad (8)$$

The landowner expected profit from a pure antichresis contract is the sum of the net property's residual value plus the antichresis lump sum income

$$\pi_A = L(x, y) + rA - y \quad (9)$$

Substituting the equilibrium antichresis sum (8) into (9) we obtain the landlord return under an antichresis agreement, which is equal to the social value of the contract,

$$\pi_A = L(x, y) + T(x, y) - x - y \quad (10)$$

The owner can deduct a security deposit from the antichretic pledge  $A$  if necessary, which eliminates the moral hazard problem for tenant inputs. Therefore, the tenant's supply of inputs  $x^*$  satisfies

$$L_x + T_x = 1 \quad (11)$$

In the antichresis contract the landlord can also promise to invest the optimal amount  $y^*$  at the time the contract is signed. The optimal  $y^*$  maximizes (10) and so satisfies  $L_y + T_y = 1$ . As with the rental contract, however, once the contract is signed and the antichresis lump sum is received, the landlord maximizes (9) taking  $rA$  as given. The landlord's incentive is to supply inputs  $\tilde{y}$  satisfying

$$L_y = 1 \quad (12)$$

Whereas in the monthly rent contract the tenant could force the landlord to honor the promised inputs by threatening to withhold rent, in the antichresis case the tenant loses that enforcement mechanism and as a result the landlord cannot credibly commit to invest

anything but  $\tilde{y}$  satisfying (11) and (12). As a consequence, the antichresis contract is not Pareto efficient as long as  $\tilde{y} < y^*$ , that is, as long as  $\lambda > 0$ .<sup>14</sup>

Totally differentiating the equilibrium antichresis conditions (11) and (12) and using the concavity properties of  $L$  and  $T$  reveals

$$\partial\tilde{y}/\partial\lambda = 0 \quad (13)$$

### 4.3 Comparing the two contracts

The previous section establishes that the antichresis contract is inefficient when the landlord's input has a positive effect on the tenant's enjoyment of the property ( $\lambda > 0$ ). Figure 2 shows the maximum landlord profit under each contractual arrangement as a function of  $\lambda$ . Under the antichresis contract landlord profit rises with  $\lambda$ : differentiate the landlord's equilibrium profit under antichresis with respect to  $\lambda$  and apply the envelope theorem to get

$$\partial\pi_A/\partial\lambda = g(\tilde{y}) > 0 \quad (14)$$

On the other hand, under a monthly rent agreement the equilibrium landlord returns are (4). Here, too, equilibrium returns are increasing in  $\lambda$ : differentiate the landlord's equilibrium profit under a rent contract with respect to  $\lambda$ , and apply the envelope theorem to obtain

$$\partial\pi_R/\partial\lambda = (1-p)g(\hat{y}) > 0 \quad (15)$$

Clearly,  $\pi_A(0) > \pi_R(0)$  so that the property owner's maximum profit is greater under antichresis than under monthly rent at  $\lambda = 0$  in the figure. Differentiating the difference in slopes (14) – (15) with respect to  $\lambda$  reveals that

$$d(\partial\pi_A/\partial\lambda - \partial\pi_R/\partial\lambda)/d\lambda = -(1-p)g'(\hat{y})(\partial\hat{y}/\partial\lambda) < 0 \quad (16)$$

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<sup>14</sup> Although not Pareto efficient, however, the antichresis lease may still be more efficient than monthly rent, as shown below.

using (8) and (13). Therefore, there exists a unique  $\lambda_0$  such that  $\pi_A(\lambda_0) = \pi_R(\lambda_0)$ , as depicted in figure 2.

The rental contract dominates the antichresis contract in terms of input efficiency because it does a better job dealing with the moral hazard problem. But the monthly rent contract does not solve the tenant liquidity risk problem as effectively as the antichresis contract. The probability of tenants' illiquidity in a monthly rent contract makes the expected landlord return lower than the antichresis contract for some types of property where the marginal effect of tenant's investment on tenants enjoyment of the property is low (low  $\lambda$ ). Figure 2 illustrates this result. The shaded area to the left of  $\lambda_0$  shows the region where the antichresis contract dominates the monthly rent contract. This region corresponds to properties with low  $\lambda$ . For properties that exceed the critical value  $\lambda_0$  in the figure, expected profits under a monthly rent contract exceed the profits under an antichresis contract; in this region the monthly rent contract dominates the antichresis contract. Note in the figure that either a greater probability of tenant's illiquidity  $p$  or higher costs of eviction/re-renting the property  $C$  shift the landlord equilibrium expected profit curve downward. This downward shift increases the shaded area and moves the threshold value  $\lambda_0$  to the right making the antichresis contract more attractive than the monthly rent contract over a wider range of property types.

To summarize, the division of ownership can create gains for society, but it also introduces incentives for inefficient behavior from both landlord and tenant (Epstein, 1986). The antichresis contract solves the adverse selection problem caused by landlords' inability to observing tenants' liquidity risk. By imposing a large lump sum payment at the beginning of the contractual period, the antichresis contract assures that tenants will not abandon the property and will not impose the social costs of having an unoccupied unit (or, alternatively, impose the resource costs of rent recovery). Although not formally included in the model, we expect the large lump sum to ensure that only tenants with lower liquidity risk will be able to enter this type of arrangement.

The antichresis contract's biggest shortcoming is that it cannot solve the moral hazard problem of landlords' input supply. The initial payment of the antichresis lump sum makes it impossible for landlords to credibly commit to tenants regarding their

supply of inputs. The social cost stemming from this unresolved moral hazard problem of antichresis contracts, however, is not the same for all types of property. The actual impact hinges critically on the technology governing the delivery of services from real estate assets. Properties where the supply of landlord inputs does not have a large effect on tenant value will not lose much from being in an antichresis contract when compared to the monthly rent contract. The theory therefore suggests that different types of property will self-select into the alternative lease regimes, antichresis and rent, and the sorting will reflect the underlying real estate services technology. This represents one empirical implication of the theory.

## **5. Empirical Model and Data**

Landlords will put their property under the contract form, rent or antichresis, that yields the highest expected profit. The expected profit, in turn, depends upon the real estate services technology particular to the type of property—specifically, how landlord and tenant inputs affect tenant property use and residual value—as well as the type of tenant that is likely to demand the property (in terms of probability of illiquidity). This section explains an empirical model that uses market data for property offered under antichresis and monthly rent contracts to explore the sorting mechanism of property and tenants into different contracts based on observable and unobservable property characteristics.

### **5.1 Empirical methodology**

The strategy in this section is to estimate the differences in rental prices under different contractual arrangements using a hedonic price framework modified by the selection process suggested by theory. Assuming the popular semi-logarithmic specification for the rental price models,

$$\ln(rA) = \mathbf{X}\beta_1 + \varepsilon_1$$

$$\ln(R) = \mathbf{X}\beta_2 + \varepsilon_2$$

where  $R$  is the yearly rent charged for property under a rental contract,  $r$  is a market rate of return for capital,  $A$  is the antichresis lump sum under the antichresis regime and  $\mathbf{X}$  is the vector of appropriate property characteristics. Both rent and antichresis earnings are calculated net of relevant taxes, as explained in table 5. If property were randomly assigned into rental and antichresis regimes, we could obtain consistent estimates of the parameters using OLS.

The observed landlord's decision on the preferred contractual arrangement will be based on an expected profit value  $I^*$ , a function of the expected contract gains under antichresis relative to rent.

$$I^* = \mathbf{Z}\boldsymbol{\gamma} - u$$

Where  $\boldsymbol{\gamma}$  is a vector of parameters to be estimated,  $Z$  is a set of regressors that drive the choice of contractual arrangement, and  $u \sim N(0, \sigma_u^2)$ . Thus, consistent estimates can be obtained from the three equation system, the two rental price hedonic equations and a selection equation. This is an endogenous switching regression model (Maddala, 1983) or a Tobit type 5 model (Amemiya, 1985). Properties are observed under antichresis when  $I^* > 0$  and under monthly rent when  $I^* \leq 0$ . The variable  $I^*$  is an unobserved latent variable represented by an observed indicator  $I$  taking the value 1 if  $I^* > 0$  and zero otherwise.

Heckman's two-step method is one approach to estimating the system. Assume that the errors follow a joint normal distribution with:

$$\begin{bmatrix} u \\ \varepsilon_1 \\ \varepsilon_2 \end{bmatrix} \sim N \left[ \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 1 & \sigma_{u\varepsilon_1} & \sigma_{u\varepsilon_2} \\ \sigma_{u\varepsilon_1} & \sigma_{\varepsilon_2}^2 & \sigma_{\varepsilon_1\varepsilon_2} \\ \sigma_{u\varepsilon_2} & \sigma_{\varepsilon_1\varepsilon_2} & \sigma_{\varepsilon_3}^2 \end{bmatrix} \right]$$

Under this condition, we can obtain consistent  $\beta_i$  estimates using

$$E(\ln(rA) | I = 1, X) = X\beta_1 - \sigma_{u\varepsilon_1} \frac{\phi(\mathbf{Z}\boldsymbol{\gamma})}{\Phi(\mathbf{Z}\boldsymbol{\gamma})} \quad (17)$$

$$E(\ln(R) | I = 0, X) = X\beta_2 + \sigma_{u\varepsilon_2} \frac{\phi(Z\gamma)}{(1 - \Phi(Z\gamma))} \quad (18)$$

where  $\sigma_{u\varepsilon_1}$  and  $\sigma_{u\varepsilon_2}$  are estimates of the covariance between  $u$  and  $\varepsilon_1$  and  $\varepsilon_2$  respectively, and  $\frac{\phi(Z\gamma)}{\Phi(Z\gamma)}$  is the inverse mills ratio (Maddala, 1983). Defining  $\rho_1$  and  $\rho_2$  as the correlation coefficients between  $u$  and  $\varepsilon_1$  and  $\varepsilon_2$  respectively, Breen (1996) shows that

$$\rho_1 \sigma_u \sigma_{\varepsilon_1} = \frac{\sigma_{u\varepsilon_1}}{\sigma_u \sigma_{\varepsilon_1}} \sigma_{\varepsilon_1} = \sigma_{u\varepsilon_1} \quad (21)$$

so that using Full Information Maximum Likelihood (FIML) yields direct estimates of  $\rho_1 \sigma_u \sigma_{\varepsilon_1}$  in (17) and  $\rho_2 \sigma_u \sigma_{\varepsilon_2}$  in (18). The FIML estimates also tend to be more precise for data sets with fewer observations. In any event, significant estimates of  $\rho_1$  and/or  $\rho_2$  imply the presences of an underlying selection process.

## 5.2 Data

We extracted the data from newspaper ads in *Los Tiempos*, the most important newspaper in the city of Cochabamba. The ads listed during November 2005-May 2006 were obtained in electronic form from the “Clasificados” unit of the paper. We dropped ads that did not contain property characteristics, location, or price. The final sample of 300 antichresis and 300 rent ads was randomly selected from the sampling frame. The majority of the ads did not contain specific addresses of housing units but they had sufficient information to place the units in one of the 14 municipal districts of the city of Cochabamba or in a neighboring municipality. Neighborhood characteristics are drawn from census information for 2001 aggregated to the municipal district level. Not all variables could be obtained for units located in neighboring municipalities so the corresponding observations were dropped from the sample.

Table 6 presents a summary of the types of property, characteristics, prices, and location attributes of each sample. All prices are expressed in US dollars. In the antichresis and sale samples, all the ads had prices listed in US dollars. In the monthly

rent sample 20% of the ads were listed in local currency. We converted these prices to US dollars using the average exchange rate for the November 2005-May 2006 period. We calculate the rental price for property under antichresis using an implicit 10% return on the antichresis amount.<sup>15</sup> While the advertised antichresis payments and rents are not normally negotiable, the actual payments or rents agreed to may differ from the advertised amounts. We do not know the extent to which exercised payments and rents differ from the advertised amounts in our sample, or even whether modified outcomes lead to higher or lower prices. While it would be preferable to observe final prices and rents, such data are not available--not an unusual situation in property markets of developing countries.

The neighborhood median income variable was obtained using a standardized scale constructed using confirmatory factor analysis with various census indicators.<sup>16</sup> Other neighborhood characteristics include distance from the CBD, measured in Kilometers from the heart of the CBD (*Plaza 14 de Septiembre*) to each district's centroid, and a set of binary indicators reflecting whether the neighborhood was on the northern, central, or southern part of the city in order to capture rental price differences attributed to their geographic orientation in the city. Property characteristics include the number of suites (bedrooms with bathrooms), total number of rooms and a set of binary indicators reflecting the type of property being advertised. Table 6 identifies 5 types of property under each contractual arrangement sample: apartments, chalets, houses, commercial, and single rooms. We describe each type as follows.

*Apartments:* We expect apartments to be the property type with the highest  $\lambda$ . In apartment buildings landlord presence is relatively more important because these settings generally need common area maintenance. There are more apartments than other property

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<sup>15</sup> This rate of return is based on the average real interest rates in the 2003-2005 period using data from the World Bank Development Indicators.

<sup>16</sup> We use 2001 census information at the block level to construct an income scale applying factor analysis. The variables in the factor analysis are: percent of households in the block that own a TV set, percent of households in the block that own a car, percent of households in the block that own a refrigerator in the kitchen, and percent of households in the block that own a telephone line. These 4 variables produce a highly reliable index of city block income (Cronbach  $\alpha = 0.89$ ) that explains 75% of their combined variance. The median income variable at the neighborhood level shown in table 6 represents the median value of the resultant constructed block income variable.

types in both rental property samples. Apartments are the second largest set of properties in the sales sample.

*Houses:* This type of property includes both attached and detached housing. This category has the second highest relative frequency in both rental property samples. We expect that tenants in houses generally require lower levels of landlord involvement to enjoy the property than tenants in apartment buildings. Cochabamba has recently been experiencing a growth in gated housing communities, but most houses are still in non-gated and generally in higher density areas than chalets.

*Chalets:* In the city of Cochabamba the term chalet is commonly used for up-scale detached housing.<sup>17</sup> We expect chalets to have a lower need for landlords' inputs than apartments at least in part because of the absence of common areas requiring maintenance. The extent to which houses and chalets require differing landlord inputs is unclear.

*Commercial:* This classification involves any non-housing property including offices, stores, and storage. We consider commercial property to have relatively lower needs of landlord inputs than apartments, houses, and chalets for the tenant to conduct business in this type of property, especially when the property is leased to the tenant finished to stud or an equivalent.

*Rooms:* This type of property refers to portions of other property that are offered in the rental market. Homeowners offering spare rooms in their own houses for lease to obtain extra income usually offer them to college students. In terms of our model, this type of housing is of special interest because it creates a situation where landlord and tenant live in the same property. In this setting, the tenant's need to commit landlords to make maintenance investment is obviated by the landlord's incentive to supply inputs for his or her own utility; this eliminates the moral hazard problem for landlord supplied inputs

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<sup>17</sup> The definition of a chalet as used in Cochabamba comes from private conversations with Humberto Solares in 2006 at the Institute for Architecture Research (IIA) at San Simon University.

(Glascock, et al., 1993). For this reason, we interpret single rooms as corresponding to the case of a low  $\lambda$  in our theoretical model.

Finally, we note that the identification of the switching regressions model in the estimation requires a set of instruments that have an effect on the decision to offer the property under a particular contractual regime but not on property value. For this purpose we include the proportion of children born in a hospital in the district where the property is located and this variable interacted with the proportion of individuals employed in the commerce sector of the economy. These variables are used as proxy indicators of liquidity of potential renters. Our analysis of the Bolivian data shows that 80% of commerce employment is in the informal economy. Furthermore, mothers that are not covered by insurance commonly offered in formal sector jobs tend to have their children by other means such as contracting nurse practitioners or friends. We consider that landlords that cannot observe tenants status of employment (formal or informal) will tend to prefer antichresis contracts in places where they think they are more likely to get a tenant who works in the informal sector. We include the income measure and the proportion of individuals employed in the commerce sector to control for tenant liquidity risk effects on rents while controlling for property characteristics and distance from the central business district (CBD).

Nonetheless, we will be able to test the validity of these instruments validity by introducing them into a yearly rent regression for a pooled sample of antichresis and monthly rent property. The instruments are valid if they are statistically insignificant as a group in the yearly rent regression after controlling for other property characteristics.

### **5.3 Empirical results**

As a point of reference, table 7 reports the OLS hedonic functions. While the number of explanatory variables is modest, they do provide good overall explanatory power. The two columns show the hedonic price equations for properties under antichresis and rent contracts respectively. These estimates showed differences in some coefficients across the different samples. In particular, single rooms earn less than apartments under monthly rent contracts than they do under antichresis holding other variables constant. In addition,

the number of suites and district income seem to have a larger effect on price under antichresis than under monthly rent contracts holding other variables fixed.

Table 8 reports the parameter estimates of the switching regression model estimated by FIML. The selection equation estimates are consistent with several of the model predictions proposed in the previous section. The coefficient estimates and calculated marginal effects indicate that more expensive property such as chalets are more likely to be under antichresis than apartments, but apartments are more likely to be under antichresis than commercial property and single rooms. Houses and apartments show no significant difference in their propensity to fall under antichresis contracts. Finally, while larger properties (greater total number of rooms) are not significant, a greater number of suites reduces the likelihood that the property is under antichresis.

That apartments are more likely to be let under antichresis than single rooms appears somewhat puzzling. It seems reasonable to presume that property owners' inputs supplied for their own homes are also enjoyed to some extent by tenants in single rooms in the home, which suggests little landlord input supply moral hazard for single rooms, making antichresis more advantageous. We suspect the relatively stronger antichresis tendency for apartments when compared with single rooms is being driven by the presence of individually owned apartments in our sample. These apartment units resemble condominiums in the US where we would expect the landlord input supply moral hazard to be mitigated by the building management association. Our data, unfortunately, does not identify which of the rented units are individually owned units and which are in a single owner building. Nonetheless, our analysis of net gains from antichresis presented later offers a more complete picture of the selection process at work.

Recall that greater tenant liquidity risk increases the advantage of the antichresis lease over monthly rent for a wider range of property types. In Cochabamba workers in the service sector are more likely to be in informal employment (80 percent of service sector jobs are in the informal sector). Since workers in the informal sector are more likely to exhibit greater liquidity risk, we expect a greater proportion of commerce sector employment in a particular neighborhood to increase the proportion of property under antichresis. Similarly, families who have their children born in hospitals are more likely

employed in the formal sector, hence likely to be subject to liquidity risk than are families who have their children at home. The theoretical model therefore implies that neighborhoods with larger proportions of families whose children are born in hospitals will also have a lower proportion of property let under antichresis contracts.

Looking at the last three variables in the reduced form probit equation, the estimates show that property in neighborhoods with a larger proportion of workers in the commerce sector is more likely to be under antichresis. Also, a larger percentage of children delivered in hospitals increases the likelihood of properties being under antichresis. This increase, however, is attenuated in neighborhoods with high proportion of workers in the commerce sector, as the interaction term between the two instruments reflects. In sum, these results are consistent with the prediction that antichresis contracts are generally more attractive to property owners facing a population of potential tenants with greater liquidity risk.<sup>18</sup>

Comparing tables 7 and 8 reveals several interesting differences between the OLS and the switching regression FIML estimates. The difference in rental prices in the south region of the city compared to other parts of the city disappears once we control for self-selection. Further, the differences between apartments and chalets in the monthly rent equation and apartments and commercial property tend to disappear once we control for the selection effect. The difference between apartments and single rooms is not significant in the antichresis equation once we control for the selection effect but it is still significant in the monthly rent regime. The number of suites has a similar effect on price in both regimes after controlling for selection but the number of extra rooms loses its significance in the antichresis equation once we introduce the selection effect.

Table 8 also shows the estimated correlations between the selection equation errors  $u$  and the hedonic equations errors  $\varepsilon_1$  and  $\varepsilon_2$ , denoted as  $\rho_1$  and  $\rho_2$  respectively. Statistically significant estimates of these parameters denote the presence of a selection mechanism. The negative  $\rho_1$  estimate implies a negative covariance between the error

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<sup>18</sup> In order to test instrument validity we introduced the instruments in a yearly rent regression for a pooled sample of antichresis and monthly rent property. An *F test on the instruments confirms at the  $\alpha = .05$  level that the instruments in the selection equation as a group do not enter the yearly rent regression after controlling for other property characteristics*

terms in the selection equation (i.e., property under antichresis) and the antichresis hedonic equation or  $\sigma_{ue1} < 0$ . Conversely, the positive  $\rho_2$  estimate implies a positive covariance between the error terms in the selection equation and the monthly rent equation or  $\sigma_{ue2} > 0$ . This pattern in turn implies  $(\sigma_{ue2} - \sigma_{ue1}) > 0$  and is consistent with the notion that properties are selecting into the regime in which they tend to earn the highest yearly gross income (Maddala, 1983, 258-262).

We compute the average gross benefit of choosing antichresis ( $AGB_A$ ) for each property  $i$  currently observed under antichresis using the expressions (Maddala, 1983; Cameron and Trivedi, 2005):

$$AGB_A = E(rA_i | I = 1) - E(R_i | I = 1) \quad (22)$$

$$AGB_A = X_i(\beta_1 - \beta_2) + (\rho_2\sigma_2 - \rho_1\sigma_1)\left(\frac{\phi(Z_i\gamma)}{\Phi(Z_i\gamma)}\right) \quad (23)$$

Table 9 presents the calculated average  $AGB_A$  for each type of property. The first and second columns present the first and second terms on the right hand side of the above expression, respectively. The third column presents the total effect. Interestingly, the selection effects are all positive; this means that, given the observable property characteristics in the model, these properties are self-selecting into the regime that gives them the highest yearly gross earnings.<sup>19</sup> The third column shows that the  $AGB_A$  are positive for commercial property and single rooms and negative for houses, apartments, and chalets. Of these, the commercial property, single rooms, and apartments  $AGB_A$  estimates are consistent with the implications of the theoretical model based on our interpretation of the relative importance of landlord supplied inputs for tenants' consumption of real estate services.

## 6. Conclusion

The antichresis lease appears in many civil law countries. It differs from the periodic rent lease in that the tenant gives the property owner temporary custody of a lump sum

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<sup>19</sup> The negative AGB values for some of the property types likely reflects our inability to empirically control for the tenant illiquidity risk premium that systematically inflates monthly rents relative to antichresis rents.

payment in return for use of the property. This paper presents a stylized model that draws out the economic forces driving the selection of antichresis or periodic rent leases in the market. Our explanation hinges on the properties of the real estate technology defining how property is used in different applications and how it affects the moral hazard problems inherent in property leases. Our model predicts that antichresis dominates for tenant activities that are largely independent of the owner's supply of inputs, like commercial uses or single family detached housing; periodic rent contracts dominate for tenant activities that are sensitive to the owner's supply of inputs, like multi-unit housing. The moral hazard properties of each type of lease must be balanced against the fact that the antichresis eliminates tenant liquidity risks effects on owners while rent contracts do not.

This paper used market data from Cochabamba, Bolivia, to test these theoretical predictions. The results indicate differences in the price generating functions between contractual arrangements once we control for self-selection effects. The most important implications, however, are tied to the selection mechanism that makes one lease regime more attractive than the other to the property owner. Our results confirmed that owners have larger expected gains from using antichresis leases when there is little owner input supply moral hazard or when owner supplied inputs do not strongly affect the tenant's enjoyment of the property, as in the case of individual rooms and commercial space, respectively. On the other hand, the incentive to use antichresis leases is weaker for properties for which moral hazard is stronger and the owner's supply of inputs have a more profound affect on the tenant's enjoyment of the property, as in the case of apartments, and to a lesser extent chalets and houses.

## References

- Ambrose, B. W. and Kim, S. 2003. Modeling the Korean chonse lease contract. *Real Estate Economics* 21, 53-74.
- Amemiya, T. 1985. *Advanced Econometrics*. Cambridge: Harvard University Press.
- Breen, R. 1996. *Regression Models; Censored, Sample-Selected, or Truncated Data*. London: Thousand Oaks.
- Brueckner, J.K. 1993. Inter-store externalities and space allocation in shopping centers. *Journal of Real Estate Finance and Economics* 7, 5-16.
- Cameron, A. C. and Trivedi, P. K. 2005. *Microeconometrics: Methods and Applications*. Cambridge: Cambridge University Press.
- Cho, H., and Shilling, J. 2007. Valuing retail shopping center lease contracts. *Real Estate Economics* 35, 623-649.
- Cohen, B. 1950. *Antichresis in Jewish and Roman Law*. New York: Jewish Theological Seminary of America.
- De Meza, D., and Gould, J.R. 1992. The social efficiency of private decisions to enforce property rights. *Journal of Political Economy* 100, 561-580.
- Durand-Laserve, A. 2006. Informal settlements and the millenium development goals: Global policy debates on property ownership and security of tenure. *Global Urban Development*, 2 (1).  
<http://www.globalurban.org/GUDMag06Vol2Iss1/MagHome.htm> accessed February 2007
- Editorial-Comments, T. L. R. 1938. Antichresis: An Ancient Security Device Revived. *Tulane Law Review* 13, 131-143.
- Eisenberg, M.A. 1989. *The Nature of the Common Law*. Cambridge: Harvard University Press.
- Epstein, R. 1986. Past and future: The temporal dimension in the law of property. *Washington University Law Quarterly* 64, 667-722.
- Eswaran, M. and Kotwol, A. 1985. A theory of contractual structure in agriculture. *American Economic Review* 75, 162-177.
- Farfan, F. 2002. Bolivia's land tenure experience. In: Payne, G. (Ed.). *Land, Rights and Innovation: Improving Tenure Security for the Urban Poor*. London: ITDG, 181-192.

- Farfan, F. 2004. Formal and customary housing tenure initiatives in Bolivia. *Habitat International* 28, 221-230.
- Glascok, J.L., Sirmans, C.F., and Turnbull, G.K. 1993. Owner tenancy as credible commitment under uncertainty. *Journal of the American Real Estate and Urban Economics Association* 21, 69-82.
- Grenadier, S. 1995. Valuing lease contracts: A real options approach. *Journal of Financial Economics* 38, 297-331.
- Hoy, M., and Jimenez, E. 1991. Squatters' rights and urban development: An economic perspective. *Economica* 58, 79-92.
- La Razon. 2002. Se disparan las denuncias por estafas en anticreticos. *La Razon*. La Paz, Bolivia, Oct 24th.
- Lobingier, C.S. 1929. The cradle of western law: A survey of ultimate juridical sources. *United States Law Review* 63, 572-580.
- Louisiana and West Publishing Company. 1952. Chapter 3: Of Antichresis. *Civil Code; Under Arrangement of the Official Louisiana Civil Code*. St. Paul: West Pub. Co. 13, 279-291.
- Maddala, G.S. 1983. *Limited-dependent variables in econometrics*. Cambridge: Cambridge University Press.
- Medinacelli, E. 2006. Los contratos de anticresis y alquiler en Bolivia. I. Navarro. Cochabamba, Bolivia (Personal Communication).
- Merryman, J.H., and Perez-Perdomo, R. 1985. *The Civil Law Tradition: An Introduction to the Legal Systems of Western Europe and Latin America*, 3<sup>d</sup> ed. Palo Alto: Stanford University Press.
- Miceli, T.J. 2004. *The Economic Approach to Law*. Palo Alto: Stanford University Press.
- Miceli, T., and Sirmans, C.F. 1995. Contracting with spatial externalities and agency problems: The case of retail leases. *Regional Science and Urban Economics* 25, 355-372.
- Miceli, T. J., Sirmans, C.F., and Turnbull, G.K. 1998. Title assurance and incentives for efficient land use. *European Journal of Law and Economics* 6, 305-323.
- Miceli, T. J., Sirmans, C.F., and Turnbull, G.K. 2000. The dynamic effects of land title systems. *Journal of Urban Economics*, 47, 370-389.
- Miceli, T. J., Sirmans, C.F., and Turnbull, G.K. 2001. The property contract boundary: An economic analysis of leases. *American Law and Economics Review* 3, 165-185.

- Miceli, T. J., Sirmans, C.F., and Turnbull, G.K. 2009. Lease defaults and the efficient mitigation of damages. *Journal of Regional Science*, forthcoming.
- Payne, G. 2002. *Land, Rights and Innovation: Improving Tenure Security for the Urban Poor*. London, ITDG.
- Payne, G. 2002. *Secure Tenure for the Urban Poor*. Washington, D.C.: Cities Alliance, Cities Without Slums.
- Purves, P.M. 1945. Commentary on Nuzi real property in the light of recent studies. *Journal of Near Eastern Studies* 4, 68-86.
- Rivera, A. 2005. *La Propiedad de la Vivienda Urbana en Bolivia y América*. Cochabamba, Bolivia.
- Silva, A.V. 1996. Anticresis. *Enciclopedia Jurídica OMEBA*. Buenos Aires: TOMO I, 700-706.
- Slovenko, R. 1958. Of pledge. *Tulane Law Review* 33, 60-132.
- Solares, H. 2006. *La Vivienda en Bolivia*. I. Navarro. Cochabamba, (Personal Communication).
- Torrico G. M.E. 1999. *Inquilinato en la Ciudad de Cochabamba: La vivienda en arriendo*. Tesis de Licenciatura en Sociología. Cochabamba: Universidad Mayor de San Simón.
- Turnbull, G.K. 2008. Squatting, eviction and development. *Regional Science and Urban Economics* 38, 1-15.

**Table 1**  
**The Antichresis across Civil Law Countries**

Country	Reference in Civil Code	Fruits of property	Needs to be a public contract	Who pays taxes and expenses?	Tenant rights in case of non-payment	Tenant has first right when property is foreclosed	Tenant can sublease
Spain	Chapter IV Arts. 1881-1886	Applied to interest and capital but can convene to equate interest to fruits	No	Tenant, but deducts from property fruits	Can ask for seize and sale of property	Not stated	Not stated
France	Chapter II Arts. 2085-2091	Parts can equate fruits to interests. If not convened tenant has to report fruits to landlord.  If interest on loan not stipulated fruits are taken from capital.	Yes registered in public document	Tenant, if not otherwise stipulated in contract, but deducts from property fruits	Can ask for seize and sale of property	Yes ( <i>Tul Law Rev</i> , 1939, 140)	Yes ( <i>Tul Law Rev</i> , 1939, 134)
Louisiana (USA)	Title XX Arts 3176-3181	Parts can equate fruits to interests. If not convened tenant has to report fruits to landlord.  If interest on loan not stipulated fruits are taken from capital.	No	Tenant, but deducts from property fruits	Can ask for seize and sale of property	No (Art 3181; <i>Tul Law Rev</i> , 1939, 140)	Yes
Argentina	Titulo 16 Arts. 3239-3261	Parts can equate fruits to interests. If not convened tenant has to report fruits to landlord. If interest on loan not stipulated fruits are taken from capital.	No	Tenant, but can deduct from fruits. But if he makes investments on property landlord must pay back the cost of capital, not the added value the property enjoys. (Art. 3250)	Can ask for seize and sale of property	Yes	Yes
Bolivia	Libro V, Arts 1429 - 1435	Fruits are applied first to interest then to principal	Yes registered in public document	Tenant pays taxes and all other utilities. But can deduct such expenses from fruits.	Can ask for seize and sale of property	Yes	No (Medinacelli, 2006)

Sources: Authors' compilation from civil codes, *Tulane Law Review* (1939) and personal communication with E. Medinacelli (2006).

**Table 2**  
**Housing Tenure in Bolivia's Ten Largest Cities**

CITY	CENSUS YEAR	TOTAL HOMES	% OWN	% RENT	% ANTICHRESIS	% MIXED	% GIVEN FOR SERVICES	% GIVEN BY FRIENDS	% OTHER
Santa Cruz	1992	143,531	52.04	24.24	<b>6.77</b>	0.25	5.50	10.06	1.14
	2001	247,710	48.11	27.02	<b>9.41</b>	0.58	3.77	9.45	1.66
Cochabamba	1992	86,848	45.82	27.65	<b>9.09</b>	0.17	4.31	12.07	0.91
	2001	123,391	50.60	26.87	<b>10.29</b>	0.40	2.58	8.02	1.24
El Alto	1992	91,850	54.59	27.83	<b>1.99</b>	0.29	2.93	10.93	1.45
	2001	164,634	60.81	22.59	<b>2.82</b>	0.50	1.78	9.76	1.75
La Paz	1992	170,497	44.72	27.81	<b>7.77</b>	0.28	3.44	15.12	0.87
	2001	204,090	49.71	23.45	<b>12.09</b>	0.45	2.36	10.36	1.58
Sucre	1992	29,770	45.62	31.25	<b>7.87</b>	0.15	3.41	11.15	0.55
	2001	44,815	50.01	28.59	<b>9.91</b>	0.38	2.22	7.77	1.13
Tarija	1992	19,574	52.26	29.17	<b>2.90</b>	0.18	4.13	10.53	0.82
	2001	32,135	52.35	29.88	<b>5.74</b>	0.36	2.93	7.24	1.50
Potosi	1992	25,103	43.47	31.02	<b>4.94</b>	0.08	4.57	15.51	0.41
	2001	31,885	51.37	28.89	<b>6.77</b>	0.37	2.28	9.06	1.25
Trinidad	1992	10,473	50.32	26.60	<b>1.76</b>	0.21	6.90	11.52	2.69
	2001	14,799	53.34	24.03	<b>3.73</b>	0.66	4.82	11.21	2.21
Oruro	1992	41,835	44.76	29.37	<b>7.44</b>	0.10	3.62	13.97	0.73
	2001	49,375	53.67	23.60	<b>8.79</b>	0.34	1.83	9.71	2.06

Source: Indicadores Sociodemográficos por Ciudades Capitales, Censos 1992, 2001; INE Bolivia, 2004

**Table 3**  
**Antichresis Use and Inflation**

Census Year	% Homes under Antichresis	Current year Inflation	Past year Inflation	Next year Inflation	Inflation Std. Deviation (previous 5 years)	Inflation Std. Deviation (following 5 years)
1976	7.55	4.49	7.98	8.1	23.66	16.29
1992	7.7	12.06	21.44	8.52	3.13	2.86
2001	10.55	1.6	4.6	0.92	4.01	1.88

Source: Censos de Poblacion y Vivienda 1976, 1992, 2001; INE, Bolivia

Source: (CPI Inflation) World Development Indicators CD ROM

**Table 4**  
**Antichresis Use and Interest Rate Spread**

Census Year	% Homes under Antichresis	Interest rate Spread
1976	7.55	..
1992	7.70	22.29
2001	10.55	10.24

Source: Censos de Poblacion y Vivienda 1976, 1992, 2001; INE, Bolivia

Source: (Interest rate spread) International Financial Indicators (IMF) CD ROM

**Table 5**  
**Yearly Taxes and Registration Costs for Bolivian Leases**

Tax	Monthly Rent Contract	Antichresis Contract
	$R = \text{Yearly rent}$	$A = \text{Antichresis lump sum}$
Registration costs	0	$(0.004) * A$
VAT	$(0.13) * R$	0
TT	$(0.03) * R$	0
CR-VAT (landlord)	$0.13 * (0.87 * R - 125 * 12)$	$0.13 * (0.1 * A - 125 * 12)$
CR-VAT (tenant)	0	$0.13 * (0.1 * A - 125 * 12)$

**Table 6**  
**Sample Descriptive Statistics**

	Monthly Rent ads		Antichresis ads	
	<u>N</u>	<u>Percent</u>	<u>n</u>	<u>Percent</u>
<b>Property type</b>				
Apartment	80	28.17	120	43.32
Chalet	3	1.06	10	3.61
Commercial (store, office)	47	16.55	10	3.61
House	76	26.76	113	40.79
Room	78	27.46	24	8.66
<b>Geographic Orientation</b>	<u>N</u>	<u>Percent</u>	<u>n</u>	<u>Percent</u>
North	209	73.43	221	79.86
Central	71	24.82	50	17.99
South	5	1.75	6	2.16
<b>Property Characteristics</b>	<u>Mean</u>	<u>Std.</u>	<u>Mean</u>	<u>Std.</u>
Number of Suites	0.192	0.661	0.152	0.407
Total Number of rooms	2.243	1.416	2.818	1.027
<b>Market Prices</b>	<u>Mean</u>	<u>Std.</u>	<u>Mean</u>	<u>Std.</u>
Yearly rent ( <i>R</i> ) for rental contracts	\$2,344	3,070	-	-
Yearly rent for rental contracts after tax*	\$1,849	2,260	-	-
Antichresis amount ( <i>A</i> )	-	-	\$13,486	10,035
Yearly rent ( <i>rA</i> ) for antichresis contracts	-	-	\$1,349	1,004
Yearly rent for antichresis contracts after tax*	-	-	\$1,345	995
Sale price				
<b>District variables</b>	<u>Mean</u>	<u>Std.</u>	<u>Mean</u>	<u>Std.</u>
Distance from the CBD (Km)	2.338	1.720	2.640	1.638
Median income	0.913	0.542	0.888	0.561
Proportion of population employed in commerce	0.207	0.019	0.208	0.020
Proportion of population younger than 15	0.269	0.045	0.276	0.046
Proportion of children born in hospital	0.871	0.035	0.870	0.038
<b>Number of valid observations</b>	<b>284</b>		<b>277</b>	

\* Taxes are estimated for the landlord using the highest taxable rate

**Table 7**  
**Hedonic Price Functions Estimated by OLS**

	<u>Antichresis</u> log( <i>rA</i> ) after tax	<u>Monthly Rent</u> log( <i>R</i> ) after tax
Distance from the CBD (Km)	-0.106 [0.080]	-0.062 [0.059]
North <sup>a</sup>	-0.143 [0.248]	0.409* [0.248]
Center <sup>a</sup>	-0.488** [0.212]	0.182 [0.180]
House <sup>b</sup>	0.376*** [0.076]	0.264*** [0.081]
Chalet <sup>b</sup>	0.7*** [0.154]	0.713*** [0.130]
Commercial (office, store) <sup>b</sup>	-0.283 [0.172]	-0.273*** [0.100]
Single Room <sup>b</sup>	-0.683*** [0.139]	-1.067*** [0.077]
# of Suites	0.34*** [0.070]	0.129 [0.095]
Total # of Rooms	0.25*** [0.046]	0.166*** [0.038]
Median income (scale)	0.261 [0.162]	0.053 [0.151]
Constant	6.309*** [0.303]	6.75*** [0.207]
Observations	277	284
R-squared	0.58	0.69

Robust standard errors in brackets

\* Significant at 10%; \*\* Significant at 5%; \*\*\* Significant at 1%

a. Reference group for geographical orientation dummies = South

b. Reference group for property type dummies = Apartment

**Table 8**  
**FIML Estimates of Hedonic Equations Corrected for Self-Selection**

	Selection Eq	Marginal effects <sup>a</sup> Anticretico=	Hedonic Eq (1)	Hedonic Eq (2)
	Anticretico =1	1	log( <i>rA</i> ) after tax	log( <i>R</i> ) after tax
Distance from the CBD (Km)	0.389 [0.219]*	0.241	-0.113 [0.084]	-0.062 [0.070]
North <sup>b</sup>	-0.833 [0.941]	-0.175	0.073 [0.317]	0.44 [0.306]
Center <sup>b</sup>	0.816 [0.958]	0.389	-0.278 [0.297]	0.203 [0.268]
House <sup>c</sup>	-0.075 [0.141]	0.0004	0.391 [0.083]***	0.27 [0.092]***
Chalet <sup>c</sup>	0.803 [0.416]*	0.309	0.455 [0.230]**	0.888 [0.304]***
Commercial (office, store) <sup>c</sup>	-1.179 [0.234]***	-0.382	0.138 [0.198]	-0.509 [0.124]***
Single Room <sup>c</sup>	-0.964 [0.176]***	-0.346	-0.327 [0.148]**	-1.273 [0.102]***
# of Suites	-0.453 [0.119]***	-0.077	0.478 [0.094]***	0.057 [0.056]
# of Rooms	0.067 [0.059]	0.032	0.225 [0.042]***	0.178 [0.031]***
Median income (constructed scale)	-0.985 [0.661]	-0.217	0.219 [0.170]	0.038 [0.146]
% of workers in the commerce sector	203.243 [103.912]*	0.959	6.516 [0.362]***	7.087 [0.321]***
% hosp born children*% commerce sector emp.	-250.812 [127.285]**	-0.837		
% of children born in hospital	79.616 [40.279]**	0.863		
$\sigma_{\epsilon}$			0.642 [0.052]***	0.569 [0.044]***
$\rho$			-0.797 [0.083]***	0.691 [0.109]***
Constant	-65.76 [33.557]*		6.516 [0.362]***	7.087 [0.321]***
Observations	561		561	561

\* Significant at 10%; \*\* Significant at 5%; \*\*\* Significant at 1%

a. Measures the change from 0 to 1 for property type and geographic location dummies. For continuous variables, it measures the change from 1/2 std. dev. below the mean to 1/2 std. dev. above the mean

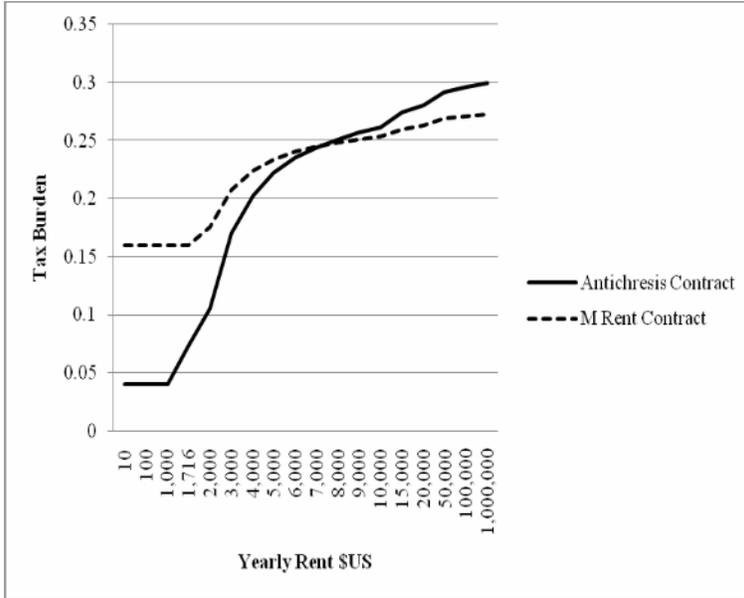
b. Reference group for geographical orientation dummies = South

c. Reference group for property type dummies = Apartment

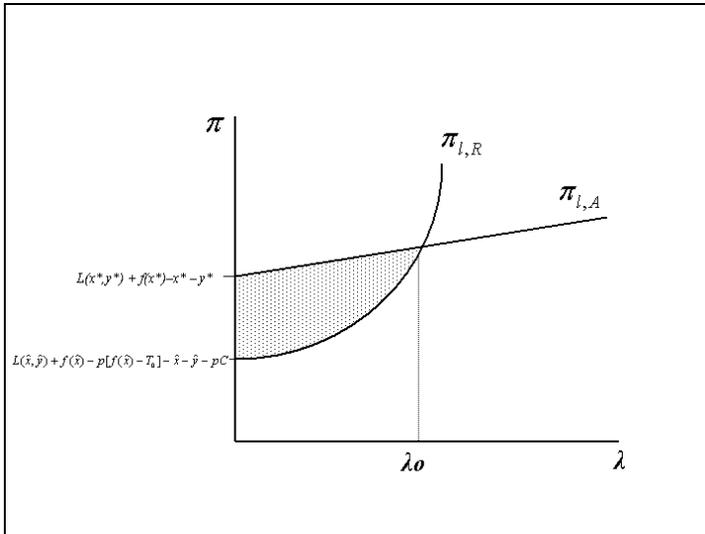
**Table 9**  
**Average Gross Benefits of Participation in**  
**Antichresis Regime by Property Type**

$\lambda$	Property type	Average $X(\beta_1 - \beta_2)$	Selection Effect	Average AGB
Low ↓ High	ROOMS	0.122	1.167	1.289
	COMMERCIAL	-0.163	1.336	1.173
	CHALET	-0.834	0.388	-0.446
	HOUSE	-0.592	0.580	-0.012
	APARTMENT	-0.739	0.554	-0.185
	All property types	-0.587	0.640	0.053

**FIGURES**



**Figure 1**  
Tax burden for Antichresis and Monthly Rent Contracts



**Figure 2**  
Landlord Profits under Antichresis and Monthly Rent Contracts as a Function of  $\lambda$