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# The Legacy Effect of Squatter Settlements on Urban Redevelopment

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**Abstract**

The paper presents a theoretical model that seeks to answer the question of why former squatter settlements tend to upgrade/redevelop at a slower pace than otherwise similar settlements originating in the formal sector. We argue that squatter settlers' initial strategy to access urban land creates a 'legacy effect' that curtails settlement upgrading possibilities even after the settlements are granted property titles. We test our model using the case of Cochabamba, Bolivia and obtain results consistent with our theoretical model prediction. Our results suggest that the commonly used 'benign neglect while keeping the threat of eviction' policy has profound impacts on how land is developed in the informal sector and this poses costly consequences for local governments after legalization.

Keywords: squatters, informal settlements, urban development, neighbourhood upgrading, urban redevelopment

JEL classification: R14, R52, O43



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## 1 Introduction

In the last decade, several developing countries have gone through great efforts to legalize squatter settlements and illegal subdivisions by providing property title to squatters. At best, however, these titling programmes seem to have only a modest effect on access to loans for upgrading housing and other property. As a result, the integration of former illegal settlements into the city requires a generous level of direct municipal government involvement.

The weak empirical relationship between title regularization and credits for upgrading housing presents a puzzling 'mystery' (*Economist* 2006). After all, most of these titling programmes were conceived following de Soto's (1989; 2000) compelling argument that lack of a formal title creates a barrier to investment. Once this barrier is lifted, by providing clear property title, upgrading should occur at a relatively rapid pace. As a consequence, we should observe the upgrading of settlements originating in the informal sector at a faster rate than similar neighbourhoods originating in the formal sector once they are legalized and the threat of eviction has disappeared. The evidence, however, seems to contradict this prediction. Calderon (2003), for example, finds that less than one quarter of households receiving formal title use bank loans to upgrade their houses in Peru. Similarly, Galiani and Schargrodsky (2006) find that only 4 per cent of owners who received title obtained mortgage loans in a former squatter settlement in Argentina. Both of these studies report that the modest housing upgrades undertaken by beneficiaries of titling programmes were executed with their own resources, as opposed to private loans that could have financed more extensive improvements. Faced with this puzzle, development institutions such as the Inter-American Development Bank (IADB) now advocate a 'change in the approach' towards informal settlements, arguing that mere legalization is not a sufficient condition for the upgrading of neighbourhoods (Brakarz *et al*. 2002). As a result, the IADB directs more resources to what they call 'integral' neighbourhood upgrading programmes.

These observations of limited property upgrading after title regularization beg the question of why clear property title is not enough to stimulate such investments. In this paper, we argue that the main barrier to investment in upgrading is not solely a function of limited household resources or even failing credit markets. Instead, we focus on how property and neighbourhood characteristics at the time of neighbourhood settlement create legacy effects that can hinder subsequent investment in improvements. This view emphasizes that the strategy used by squatters to occupy land in order to avoid eviction affects a neighbourhood's optimal upgrading/redevelopment timing after legal title is conferred. From a policy standpoint, this relationship is crucial, because it emphasizes a potential tie between the policies used by local governments to address informal land occupation and the future burden of neighbourhood upgrading.

The paper is organized as follows. The next section presents a brief review of the literature on informal settlements and urban development. Taking the results of that literature as a point of departure, the subsequent section presents a simple model that explains why an informal settlement leads to legacy effects that limit future upgrading capacity. The penultimate section uses data from Cochabamba, Bolivia, to test the model predictions. The final section discusses our findings in the light of current policies used by local and national governments to address informal settlements.

## 2 Informal settlements and urban development

This section surveys the theoretical literature, explaining informal settlements and urban development, focusing on models that predict the type of development, in terms of structural density, that results from the threat of confiscation or eviction. The property rights–urban land development nexus has been the focus of growing attention in the field of urban economics in recent years. Part of this literature concentrates on the dynamic effects of insecure property rights arising from public sources such as land use regulations and confiscation by governments, or private sources such as squatters and adverse possession. In his review of this growing literature, Turnbull (2005) argues that ownership risks arising from private sources (such as squatters) tend to prompt developers to adopt greater structural density, especially in outlying urban locations where the highest and best formal sector future uses call for decreasing structural density over time.

Jimenez (1985) offers a second type of model to explain the behaviour of entire squatter communities invading government owned lands. In his model, the squatter community decides on the number of squatters to settle as a community. Additional members in the squatting community increase government's costs of land clearance and, therefore, decrease the probability of eviction. At the same time, however, additional members in the squatting community increase the cost of providing public services and property upgrading once the community is settled. Jimenez (1985) concludes that greater government efforts to reduce squatter settlements will actually result in more populated squatter communities.

A third type of model views the squatting process as an interaction between individuals in the squatter community and the private landowner in a dynamic context (Jimenez and Hoy 1991; Turnbull 2008). In the first period, the landowner holds undeveloped land that has an expected future value once it is developed for the formal sector in the second period. The greater the future expected value of the land, the more resources the owner will spend to secure eviction when he is ready to develop it. The squatters, however, invade the land in the first period, while taking into account that the landowner might evict them in the second period. The squatters' investments in housing capital therefore reflect their anticipation of the likelihood of future eviction by the landowner. In the Jimenez and Hoy (1991) model, squatters respond to the eviction plans announced by the landowner in the first period, regardless of whether the announced strategy represents a credible threat by the landowner. In this setting, the landowner's inability legally to collect rent from squatters prompts more frequent eviction than is efficient. Because squatters' housing demands are negatively related to the perceived probability of eviction, the inefficiently frequent eviction by the landowner leads to lower than efficient levels of investment in housing by squatters. Thus, the Jimenez and Hoy (1991) model suggests that informal settlements with higher probabilities of eviction will present lower structural densities than comparable settlements with lower probabilities of eviction.

Turnbull (2008), on the other hand, assumes that squatters will believe the landowner's threat of eviction only if it is credible; that is, if the owner's benefits from evicting the squatters in the second period actually exceed the costs. By excluding the possibility of non-credible threats by the landowner in the first period of the model, Turnbull (2008) finds a different result than Jimenez and Hoy (1991) concerning the squatter's housing investment strategy. In Turnbull's (2008) model, squatters have an incentive to over-

invest in housing capital, making it more costly for the landowner to implement the eviction strategy. This leads to greater than efficient equilibrium structural densities in squatter settlements.

Navarro and Turnbull (2008) use data from Bolivia to test the prediction that the threat of eviction is positively related to structural density, and find results consistent with Turnbull's (2008) predictions. That paper uses city blocks from an entire city to measure their structural density according to the legal status of the original land occupation, while controlling for other block characteristics that might affect structural density.[1] Table 1 presents some of the key results. Mainly, the threat of eviction (third column), which follows from the illegal land occupation strategy (second column), is strongly related to a settlement's relative structural density (fourth column). In other words, city blocks in squatter settlements resulting from the violent confiscation of land (and thus having the highest relative probability of eviction) tend to have, on average, higher structural density than otherwise similar blocks that originated either in the formal sector or used other informal strategies to occupy land. Similarly, city blocks that originated as illegal subdivisions (thus having a lower probability of eviction than squatter settlements, but a higher probability of eviction than a settlement originated in the formal sector) have lower structural densities than otherwise similar blocks that originated as squatter settlements but higher densities than those that originated in the formal sector.

Table 1: Land occupation strategies and observed structural density [a]

| Settlement's legal origin | Land occupation strategy [b] | Threat of eviction | Rank in structural density |
|---|---|---|---|
| Squatter settlements 1 | Violent invasion | Highest | 1 |
| Squatter settlements 2 | Illegal settlements that had some type of government support | High | 2 |
| Illegal subdivisions | Illegal land sale | Lower | 3 |
| Formal sector development | Lawful | Lowest | 4 |

Notes: [a] = Adapted from Navarro and Turnbull (2008)

[b] = For a description of each of these land occupation strategies, see this chapter's section 4.2.

1 In a series of econometric models, Navarro and Turnbull (2008) control for location (distance from employment centres, geographical orientation in the city, and distance to major roads), level of city services (sewer system, electricity) income levels, housing tenure characteristics (percentage of owner occupied housing), and neighbourhood age.

## 2.1 Discussion

Even though the property rights and urban land development connection has been the subject of growing attention in the urban economics literature, there is no consensus concerning the relationship between expected structural density and ownership risk. The most recent theoretical work points toward a positive relation between a threat of confiscation or eviction and structural density. When applied to informal settlements, this implies that, as illegal settlers' perceived threat of eviction increases, the best land occupation strategy to avoid eviction is to increase their level of structural density at the time of settlement. Both Jimenez (1985) and Turnbull (2008) predict that the density of a squatter settlement is positively related to the vigour of the landowner's eviction strategy, whether the owner is a private party or government. This prediction is consistent with empirical evidence from Bolivia (Navarro and Turnbull 2008).

The positive relation between structural density and illegal settlers' perceived threat of eviction is fundamental for the design of policies that deal with the illegal occupation of land. We return to this issue in the last section of this paper. At this point, however, it is worth noting that the strategies used by informal settlers have a profound effect on settlement characteristics (mainly structural density) which, in turn, determine the future capacity for upgrading. Generally, settlements that originate with high densities at the outset will have slower upgrading processes than settlements that originated with lower densities. We present a stylized model that explains the connection between initial settlement structural density, and subsequent timing and density of upgrading, in the next section.

# 3 Redevelopment and upgrading of existing structures

This section explores squatters' upgrading/redevelopment decisions after they gain formal ownership rights to the land they occupy.[2] We begin the analysis by recognizing that the decision to redevelop or improve property involves expectations about the property's most profitable use in the future. Since urban growth and economic development are inherently dynamic processes, agents maximize land value by choosing the time and type of development they put on their property, basing their decisions on expectations of the city's future growth. Different plots of land will have different current and future development options, depending on their location in the urban area. For this reason, we explore informal settlement upgrading after title regularization using a partial equilibrium model of land development based on a standard spatial dynamic framework developed in a series of papers by Fujita (1982), Wheaton (1982), and Turnbull (1988). While the original formulation of the Fujita–Wheaton–Turnbull (FWT) model treats location explicitly, we focus on individual plots of land, and can therefore suppress location notation without loss of generality. The two applications here follow the approach developed in Turnbull (2005), which reconciles the FWT and Anderson (1986) land development models.

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2 One of the most common ways for squatters to obtain ownership rights is through government sponsored title regularization programmes. For the purposes of this paper, however, the legal procedures squatters use to gain full ownership rights of the plots they occupy is irrelevant.

We use the model to explore two different decisions faced by squatters once they obtain formal property rights to the land they occupy:

- A redevelopment decision that entails the replacement of an existing structure with a new one; and
- An upgrading decision that entails investing in additional capital to alter the existing structure to improve quality.

### 3.1 The redevelopment decision

Consider a residential land user facing the decision to redevelop his or her property after a land title regularization programme has granted the individual the property rights recognized by law.[3] Suppose the property has an existing structure of given quality at the time the property is regularized and formal title issued to the squatter. For convenience, the 'current' time period is indexed to 0.

If the owner wants to redevelop the land, he or she must clear the land and incur the demolition cost $D(S_o)$, which is an increasing function of the current or existing structural density, $S_o$. Of course, a greater structural density of surrounding properties might also increase the difficulty of demolition of a given property by decreasing open working space in which to complete the demolition with minimal risk to neighbouring structures. In such cases, greater neighbourhood structural density also increases demolition costs for a given property. Neighbouring structural density effects, however, do not affect our general conclusions, so we suppress them here. Once the land is cleared, the cost of constructing the new structure of quality $Q$ is $C(Q)$. Greater quality increases construction costs. Since the land is cleared by demolition prior to rebuilding, the pre-existing structural density $S_o$ does not affect the construction cost for the new structure.

Following Turnbull (2005), the redevelopment decision, how to redevelop (that is, at what structural density and quality), and when to redevelop can be separated into the interlacing density and timing decisions. First, consider the highest and best use for the property if redeveloped at time $T$. The function $Q(T)$ represents the optimal structural quality for the property owner to pursue if constrained to redevelop at $T$. This highest and best use is the new configuration that maximizes the present value of land profit from time $T$ onwards, balancing the marginal benefit of quality (the present value of incremental expected future land rents) with the marginal cost of construction. We assume that the demanded quality (reflecting the best and highest use at $T$) is rising over time, so that the optimal quality curve $Q(T)$ in the top panel in Figure 1 is upward sloped. Once the optimal redevelopment time has been chosen, the optimal redevelopment configuration can be read from the top panel in the figure.

Now consider the owner's optimal time to redevelop the property. Taking into account the highest and best use at each $T$, the marginal benefit of delaying redevelopment beyond $T$ is the value of postponing the demolition and construction costs, or $MB_T$ =

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3 The mainstream law and economics literature defines property rights as a bundle of rights accruing to an individual relative to a particular asset that include the right to use the property, exclude others from using the property, and dispose of the property.

$r[D(S_o) + C(Q(T))]$ for interest rate $r$. The marginal cost of delaying redevelopment is the foregone higher land rent from the redeveloped property over and above the lower land rent from the existing configuration, or $MC_T = R(Q(T),T) - R_o$. These $MB_T$ and $MC_T$ functions are depicted in the bottom panel of Figure 1.[4] The optimal redevelopment time for a particular property is when the marginal benefit of delay equals the marginal cost, which is at time $T^*$ in Figure 1. Given this optimal redevelopment time, the optimal quality of the replacement structure is $Q(T^*)$ in the upper panel.

So, what does this framework imply for a legalized squatter settlement? As explained earlier, as part of their survival strategy, informal settlements tend to have higher structural densities than settlements originated in the formal sector (Navarro and Turnbull 2008; Turnbull 2008). Therefore, for land originally settled by squatters, the greater initial structural density translates into higher demolition costs, which, in turn, increase the benefit of holding off on property improvements a little longer ($MB_T$ shifts rightward in Figure 1).[5] This means that property owners in former (but now legalized) squatter settlements will tend to hold off their redevelopment decision for longer periods than owners of property that originated in the formal sector; in Figure 1, land originally developed in the formal sector is redeveloped at $T^*$ while land originally settled informally is redeveloped at $T^{**}$. This implies that, for properties originally developed at the same time, formally settled property will be more likely to be redeveloped at a higher quality sooner than informally settled property.

Assuming that housing quality is a normal good, property in what were originally informal settlements serves lower income households, which is reflected in a lower land rental return to quality. Thus, under normality, we expect the optimal quality curve for informally settled neighbourhoods to be below the optimal quality curve for formally settled neighbourhoods. In the top panel of Figure 1, $Q(T)'$ pertains to the informally settled property, with $Q(T^{**})' < Q(T^*)$ illustrating a lower quality of redeveloped property for informal settlements when compared with similarly situated formal settlements.

To summarize, at any given time, property in former squatter settlements is less likely to have been redeveloped and, if redeveloped, is more likely to be redeveloped to a lesser quality than property that was legally settled.

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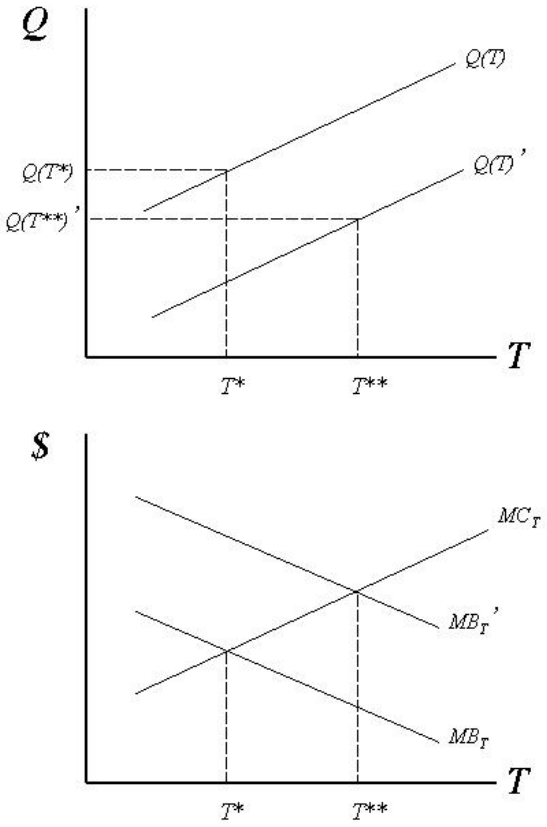
4 The slopes of the curves follow immediately from the construction cost function properties and the assumption that land rent for redeveloped property is rising relative to the land rent for the existing configuration over time. This last condition is necessary for redevelopment ever to occur. See Turnbull (2005) for formal analysis of a similar framework.

5 If the lower quality of the initial construction also leads to lower land rent from the existing configuration, then $R_o$ is lower as well. This decreases the marginal cost of waiting, further increasing $T^{**}$.

Figure 1: Legacy title effect on redevelopment timing (*T*) and quality (*Q*)




### 3.2 The decision to upgrade existing property

While redevelopment is an option open to squatters after a regularization programme, they can also choose to upgrade the structure they had when granted formal title by adding additional housing capital. If upgrading is chosen, as opposed to redevelopment, the property owner faces upgrading costs that depend on the additional housing capital being added to the existing structure, as well as the structure and quality of construction already in place. This modifies the construction cost function to $C(Q,S_o)$ with $\partial C/\partial Q > 0$ and $\partial C/\partial S_o > 0$. Substituting this revised construction cost function into the above model and setting demolition costs equal to 0, the model predicts a pattern of property upgrading that resembles the redevelopment pattern derived above. Informally settled properties are upgraded later than their formally settled counterparts, and are upgraded more modestly than property in formally settled areas.

The model explains the relationship between the initial structural density of settlements and subsequent redevelopment/upgrading patterns. Coupled with the insights presented in the previous section, the framework also explains why informal settlements tend to redevelop/upgrade at a slower and lower rate than otherwise similar settlements that originated in the formal sector. We test this predicted relationship in the next section.

## 4 Data and empirical models

This section uses data from Cochabamba, Bolivia, to test the theoretical model proposed in the previous section.[6] We begin with a brief history of the case study, the city of Cochabamba, and continue with a description of the data and econometric model used to test the theoretical propositions. We conclude the section with a discussion of the empirical findings.

### 4.1 Cochabamba

The city of Cochabamba was founded in 1574 as a centre of food production and shipment to serve the colonial mining industry in the western part of Bolivia. Situated at 8,360 feet (2,550 metres) above sea level on the fertile lands of the low valley region of the state of Cochabamba, the city is currently the third largest in the country. Cochabamba's first significant urban expansion occurred during 1900–1950, when the city began accommodating a large wave of rural migrants seeking to escape the conditions of their farm life (Solares 1990). This rapid growth prompted the need for a comprehensive growth plan to regulate the pace of development. By 1946, municipal authorities responded with a plan to regulate development over the next 50 years (Goldstein 2004). But the plan could not contain the city's rapid population growth or the pressure this growth put on the land available for formal development. Thus, by 1951 the city experienced its first wave of illegal land invasions in the south-eastern part of the city.

Municipal authorities reacted to these land invasions with forceful evictions; but many squatters persisted. Soon, with varying degrees of success, other land invasions took place in other parts of the city. Between 1945 and 1976, about 10 per cent of the land being developed in Cochabamba was occupied by illegal means, either through land invasions or illegal subdivision of rural land.

Since the 1970s, the central government and its housing ministry have tried to ease the city's housing problem by enacting public programmes that provided land for the poor at affordable prices. However, these programmes proved to be highly ineffective and extremely costly due, in part, to corrupt administration (Solares and Bustamante 1986). In most cases, these programmes were reduced to simple regularization actions of previously illegally settled plots of land (Goldstein 2004).

Between 1976 and 1992, the city experienced its highest population growth rates due to a second wave of rural urban migration taking place in the country as a whole. During this period, the city grew by about 2780 hectares, of which 30 per cent was developed in the informal sector. Most of the illegal growth that took place in this period can be attributed to *loteadores* (illegal land brokers) subdividing agricultural land or protected forest and selling it against municipal regulations as urban land. The municipal government's first reaction to this practice was to bulldoze illegal construction, but the

6 It is important to note that empirical results obtained using case of Cochabamba might not be similar to empirical results obtained in other urban contexts around the world. The theoretical model presented in the previous section is, however, general enough to be tested in other urban areas.

pervasiveness and magnitude of this type of illegal development made this policy extremely costly in terms of economic resources and political capital (Solares 1999).

To this day, illegal land subdivision remains one of the main means by which that land is developed in Cochabamba. Between 1992 and 2001, about 70 per cent of urban land was developed under this modality. Over time, a large portion of old, illegal land subdivisions and virtually all of the squatter settlements have been legalized through many regularization and titling programmes. In 2002, a new programme giving title to land was enacted in order to regularize newly created illegal settlements. Following the same lines as previous programmes that had granted title, the central government promised that this would be the last such effort. Given the previous history of such programmes, however, it is not surprising that this announcement has not slowed the rapid pace of illegal growth (Farfan 2004).

### 4.2 Data and econometric specification

The data are drawn from the 1992 and 2001 censuses collected by the Bolivian National Institute of Statistics (INE, in Spanish) for a sample of city blocks. The theoretical model predicts that home redevelopment/upgrading within a settlement is a function of that settlement's legal origin (land occupation strategy), among other settlement characteristics that are believed to be associated with home upgrading/redevelopment. More formally, we express this relation as an equation:

$$\Delta Q_i = \alpha + \boldsymbol{s}_i\beta + \Delta\boldsymbol{x}'_i\delta + \boldsymbol{y}'_i\zeta + \boldsymbol{z}'_i\theta + \varepsilon_i \qquad (1)$$

where $\Delta Q_i$ captures the change in homes from low quality to high quality in city block $i$ in a determined period of time $t$; $\boldsymbol{s}$ is an indicator of block $i$'s land occupation strategy, $\boldsymbol{\Delta x}$ is a vector of block $i$'s characteristics changing in time period $t$ and believed to affect its housing quality; $\boldsymbol{y}$ is a vector of location attributes for block $i$; $\boldsymbol{z}$ is a vector of block attributes at the beginning of time period $t$ believed to affect the change in housing quality for block $i$ during time $t$; $\varepsilon$ is a random disturbance term, and $\beta$, $\delta$, $\zeta$, and $\theta$ are parameters to be estimated by the model.

The dataset allows us to observe the changes in a sample of 1217 city blocks over a time span of a span of 9 years (that is, $t = 9$). Our dependent variable is the difference between the percentage of high quality houses in both 1992 and 2001. We apply the definition of housing quality used by the Bolivian National Institute of Statistics to obtain comparable measures of quality in 1992 and 2001.[7]

The key variable of interest is the legal origin of a block's settlement. In the case of Cochabamba, we identify four types of settlements according to their legal origin:[8]

- Legal settlements, which include settlements developed in accordance with all existing laws and regulations

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7 See the Appendix, for a detailed definition of the housing quality variables.

8 All of the informal settlements included in this empirical study were regularized in the late 1980s and early 1990s.

- Squatter settlements, which encompass settlements that originated as land invasions by breaking the laws of property, and municipal laws or land use regulations
- Illegal land subdivisions, which involve settlements in which the land was purchased legally but developed in violation of municipal laws of urbanism
- Government supported settlements, which constitute settlements that developed, in most cases, in violation of urbanism and property laws but had a level of support from the housing ministry.[9]

Table 2: Descriptive statistics

| Variables | N | Mean | Std dev. |
|---|---|---|---|
| Settlement legal origin* | | | |
| Squatters | 1217 | 0.18 | 0.39 |
| Govt supported settlement | 1217 | 0.10 | 0.30 |
| Illegal subdivision | 1217 | 0.13 | 0.33 |
| Formal sector development | 1217 | 0.59 | 0.49 |
| *Change from 1992–2001 variables* (*%*) | | | |
| High quality homes | 1217 | 7.91 | 18.44 |
| Homes with sewer system | 1217 | 35.36 | 36.44 |
| Owner occupied homes | 1217 | -2.54 | 21.83 |
| Number of homes | 1217 | 5.23 | 10.12 |
| Block characteristics in 1992 *(%)* | | | |
| Homes of high quality | 1217 | 30.35 | 31.72 |
| Individuals with college degree | 1217 | 2.08 | 4.09 |
| Location characteristics | | | |
| Distance from CBD (km) | 1217 | 3.92 | 1.49 |
| Distance to a major road (km) | 1217 | 0.44 | 0.32 |
| *Neighbourhood age** | | | |
| Consolidated between 1574–1812 | 1217 | 0.01 | 0.09 |
| Consolidated between 1812–1900 | 1217 | 0.00 | 0.07 |
| Consolidated between 1900–45 | 1217 | 0.08 | 0.27 |
| Consolidated between 1945–76 | 1217 | 0.36 | 0.48 |
| Consolidated between 1976–92 | 1217 | 0.55 | 0.50 |

* Binary indicators

9 This type of development involves settlements that invaded or illegally purchased land but had the support of a government official in the housing ministry after the actual taking of the land. In that

In order to isolate the effect of a block's legal origin on its capacity to upgrade, we control for the percentage of high quality houses in the block and the percentage of college graduates living in the block in 1992. This allows us to measure the effect of a block's legal origin on its capacity to upgrade by comparing blocks that start with the same level of resident education and housing quality in 1992. In the same manner, we use other changes in block characteristics that might affect the change in housing quality within a block over time. These included the change in the percentage of homes connected to the sewerage system, the change in the percentage of owner occupied homes, and the change in the total number of homes in the block.

Finally, we also include some location characteristics thought to have an impact on the change in housing quality, such as distance from the central business district (CBD), the age of the neighbourhood, and its distance from a major road. Table 2 reports descriptive statistics for all variables included in the analysis.

### 4.3 Results

Table 3 presents results from our econometric model. The third and fourth columns present OLS estimates, and their robust *t* statistics, respectively. Coefficients on the control variables are consistent with mainstream land development literature. Other things being equal, blocks that started with a higher percentage of high quality homes in 1992 tend to have a lower change in the percentage of high quality homes in the 1992–2001 period. City blocks that started with more educated individuals in 1992 had a higher change in the percentage of high quality homes over the period 1992–2001, a result consistent with the assumption that housing quality is a normal good. As expected, older city blocks also tend to have a slower change in the percentage of high quality homes in the 1992–2001 period. The same tendency is observed for blocks located far from the CBD and those located at greater distance from a major road.

Our indicators of legal origin are all negative and statistically significant at the 0.01 level. The reference group for the set of binary variables reflecting legal origin is 'blocks originated in the formal sector'. Thus, each coefficient in the legal origin set of variables could be interpreted as the difference in the rate of change in percentage of high quality homes during 1992–2001 between blocks in each of the respective informal origin categories and those that originated in the formal sector. The estimates show that city blocks that originated as squatter settlements (violent land invasions), on average, increased their percentage of high quality homes at a rate of 17.42 percentage points lower than otherwise similar blocks that originated in the formal sector. Similarly, blocks that originated as illegal subdivisions (illegal land sales), on average, increased their percentage of high quality homes at rate of 5.85 percentage points lower than that of otherwise similar blocks originated in the formal sector.

The negative sign on the coefficients for our main variables of interest follow our theoretical model predictions. Overall, settlements originated in the informal sector tend to upgrade at a slower pace than otherwise similar settlements originated in the formal sector. The coefficient magnitudes also follow our theoretical prediction. The negative

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sense, their strategy was somewhat similar to that of the squatters, but required lower structural density than a squatter settlement to avoid eviction.

legacy effect for upgrading is stronger for squatter settlements (-17.2) than it is for government supported informal settlements (-8.77) and informal subdivisions (-5.84).

Table 3: OLS regression results

| Change in % of high quality homes 1992–2001 | | |
|---|---|---|
| | Estimate | t[a] |
| Squatters | -17.42 | -11.16 |
| Govt supported settlement | -8.77 | -5.66 |
| Illegal subdivision | -5.84 | -3.75 |
| Change in homes with sewer system, 1992–2001 (%) | 0.05 | 3.35 |
| Change in owner occupied homes, 1992–2001 (%) | 0.02 | 0.54 |
| Change in the number of homes 1992–2001 (%) | -0.05 | -0.64 |
| High quality homes in 1992 (%) | -0.40 | -16.11 |
| Individuals with college degree in 1992 (%) | 1.02 | 5.55 |
| Distance to a major road (km) | -2.62 | -1.5 |
| Distance from CBD (km) | -2.55 | -3.8 |
| Consolidated between 1574–1812 | 1.29 | 0.27 |
| Consolidated between 1812–1900 | -3.86 | -0.87 |
| Consolidated between 1900–45 | -0.22 | -0.09 |
| Consolidated between 1945–76 | -4.50 | -2.9 |
| Constant | 33.87 | 8.74 |
| Number of observations (city blocks) | 1217 | |
| R-squared | 0.27 | |

Note: [a]Heteroscedasticity robust.

## 5 Discussion

Over the past 50 years, governments in developing countries have applied different combinations of policies to deal with the rapidly growing presence of slums in urban areas. In Latin America, for example, squatter policies ranged from virtual neglect until the 1950s, to forceful evictions during military regimes during the 1970s and 1980s, to a current policy characterized by relative tolerance and eviction followed by programmes of regularization (the granting of title to land) for settlements that survived attempts at eviction (Solares 1999; Smolka 2003).

Some studies find that issuing property titles to informal owners improves beneficiaries' wellbeing. Studies in Peru and Argentina show that owners of informal settlements receiving property titles tend to have relatively higher housing quality and better child education (Galiani and Schargrodsky 2006), better child health (Galiani and Schargrodsky 2004), and greater labour supply than informal settlers with no formal property title (Field 2003); interestingly, however, there is no strong evidence of a positive relationship between formal title provision and greater access to bank loans (Calderon 2003; Galiani and Schargrodsky 2006). Further, evidence from Peru and Argentina also shows that housing upgrades undertaken by beneficiaries of titling programmes tended to be modest, and are accomplished by drawing from household resources rather than loans that could have financed more significant improvements (Calderon 2003; Galiani and Schargrodsky 2006).

These and other studies are now being portrayed as evidence of a missing link between formal titles and access to financial markets and, therefore, a big weakness in the philosophy of large-scale, de Soto-style titling programmes (*Economist* 2006). This paper provides additional evidence regarding the relationship between the legal status of the original development, and subsequent redevelopment and upgrading. The theoretical model helps explain why beneficiaries of titling programmes tend to withhold significant investment when upgrading their property longer than their counterparts in formal settlements. The model shows that, the greater the initial density of development in a settlement, the longer the optimal time for redevelopment/upgrading tends to be. It predicts that squatter settlements that go through a title regularization programme will not make investment in serious upgrading or redevelopment at the same rate that property originated in the formal sector does, largely because they originate with a greater density of lower quality housing. Our empirical study finds this redevelopment and upgrading pattern for Cochabamba, Bolivia. Thus, the model identifies one reason why former squatters do not rely on bank loans to upgrade their properties to the same extent as owners of formally originated property.

### 5.1 Policy implications

Our findings raise serious concerns about the practice of relative tolerance towards informal development. Keeping a threat of eviction latent with the possibility of granting a title to those settlements that avoid eviction creates incentives that can lead to negative future consequences. As explained by the theoretical models in the second section of this paper, the threat of eviction induces squatters to over-invest in housing capital in order to reduce the credible threat of eviction, and to increase the likelihood of receiving formal title in the future. However, our model suggests that this strategy creates a legacy effect that leads owners to postpone large investments in upgrading housing for longer periods of time. As a result, the incentives created by current policies drive future squatters to build high density and low quality housing, and curtails the incentive to upgrade their property after they receive title for these properties. In a sense, a policy that seems benevolent and pro-poor in the long run has adverse effects for poverty alleviation strategies, and increases future local government costs of integrating these settlements into their surrounding urban areas. It is important to note that this research does not question titling programmes *per se*. Nonetheless, it raises questions about the costs of a policy that combines relative tolerance towards squatter settlements with the expectation of title in terms of future quality of housing for the poor.

This paper raises an issue previously ignored when designing policies to enhance land access for the poor. It shows important negative legacy effects of informal settlements in terms of long-term living conditions for the poor, and upgrading costs faced by local governments. These findings call for a shift in policy concerning informal settlements from a 'dealing with informal settlements' paradigm to a 'helping the poor obtain housing in the formal sector' paradigm. This shift, in turn, calls for innovative tools to acquire and develop land that can subsequently be accessed by the poor, or a 'get ahead of the curve approach'. This paper does not present policy prescriptions for dealing with existing or potential informal settlements. However, in terms of legacy effects that undermine potential future upgrading that have so far been overlooked in the mainstream urban land and housing policy literature, our findings highlight some of the costs associated with the current policies of relative tolerance followed by regularization. It also offers a novel empirical study of how informal development strategies shape urban form in developing countries. This represents an important contribution for the design of effective policy that enhances land access for the urban poor, and to the understanding of the mechanisms through which property rights affect economic development in general.

## Appendix

### Construction of the housing quality variable

For the purpose of this paper, housing quality refers exclusively to construction materials employed in the housing structure. Construction materials are classified into low, medium or high quality, using the Bolivian National Institute of Statistics as shown in Table A1. The next step is to construct a set of housing quality variables that reflect the percentage of houses in a city block in the high, medium, or low classification according to the construction materials employed in the housing structure. We classify houses with high quality materials in at least two parts of their structure as high quality houses. Similarly, houses with low quality materials in at least one part of their structure are classified as low quality houses. Finally, all houses in neither the high nor low quality categories are classified as medium quality houses. The same methodology and material quality classification is used for both 1992 and 2001 censuses in order to construct our dependent variable.

Table A1: Classification of housing construction quality by main materials used in walls, roof, and floors

| Quality | Wall materials | Roof materials | Floor materials |
|---|---|---|---|
| High | Bricks, cement, concrete | Tiles (cement, clay fibre-cement) | Treated wood<br>Carpets<br>Tile, ceramic |
| Medium | Rock<br>Adobe (covered) | Zinc plates | Brick<br>Cement |
| Low | Adobe (not covered)<br>Cane, palma<br>Other | Palma, cane, dirt<br>Other | Dirt<br>Other |

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