Land Values, Property Rights, and Home Ownership: Implications for Property Taxation in Peru

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Abstract

This research studies land values and the associated property tax implications of formal property rights, informal property rights, and squatting. Using the Peruvian Living Standards Measurement Survey data from 2007 to 2012, the research provides estimates of the land value and property tax losses associated with property rights and squatting. We use a hedonic model to obtain these estimates which are then used to provide the implied value of property taxes that are not being collected as a result of informal property rights. The policy implications of the results suggest improved methods for property right assignment that would led to enhanced property tax collections that may lead to funds for the provision of infrastructure in the affected communities.

Keywords: Property rights, Squatting, Property taxation, Hedonic price function.

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Empty land sitting useless – if homeless people can live there, what's wrong?

Rohinton Mistry

Introduction

For the first time in recorded history, the majority of the world's population lives in an urban area. This demographic change was largely driven by rapid urbanization in developing countries. Latin America exemplifies this trend. Currently, 78 percent of the Latin American and Caribbean population live in urban areas. This makes Latin American and Caribbean countries more highly urbanized than Europe, Africa, or Asia (USAID 2010). The migration of people from rural to urban areas in the region has overwhelmed the capacity of municipal governments to provide both infrastructure and social services. The result has been the development of large squatter communities in the sprawling metropolitan areas of the region.

The conventional definition of squatting is the occupation of an unoccupied space or building without the legal permission to do so. The United Nations (UN) estimates that there are nearly a billion squatters in the world and that they constitute nearly a third of the world's urban population. The numbers are similar for Latin America. There are an estimated 130 million squatters in the region. This is nearly a third of the urban population and nearly a quarter of the total population. The phenomenon is so common that it is arguably the largest property rights problem in the region. Squatting has become a typical form of housing for the poor and the rural migrants making their way to urban areas over the past 30 years. Virtually any large city in Latin America is ringed by squatter settlements as the value of land diminishes with the distance from the center of the city. While the problem of squatting in the region is large, the literature on squatting in Latin America is not extensive. Quite understandably, the existing research primarily focuses on the human development aspects of squatting such as health and education outcomes. The research on squatting and land values is quite small. The rationale for the current research is that there is virtually no information on the effects of squatting on municipal tax revenues.

To begin, this paper provides information on the land value and property tax implications associated with squatting and property rights in Peru. In Latin America, property rights have long been a contentious issue.[1] As pointed out by De Cesare (2012), squatting complicates the administration of property taxes in the region. On the other hand, municipalities in the region are struggling to generate sufficient revenues to provide basic public services such as water and sewer. At the moment, there is no information on the tax consequences of property rights or squatting in Latin America. To address this problem, we use data from the 2007 – 2012 Living Standards Measurement Survey (LSMS) and the traditional hedonic method to estimate the potential changes in land value from the provision of property rights. Using the implicit prices for squatting and property rights, we estimate property tax losses associated with informal

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[1] Squatting in Latin America has a tradition dating back to the colonial period. For more detail, see Dye (2006).

settlements. Our results suggest that there is a positive correlation between the strength of property rights and property values. As a result, we can obtain estimates of the tax revenues that can be derived from property taxes. Our results indicate that the lost revenue for the municipal authorities in Lima is not trivial.

The next section of the paper reviews the previous literature on the relationship between property rights and property values. This is followed by a discussion of how tax authorities in Lima both value property and deal with informal property rights. This is followed by a description of the data, the estimation technique, and the estimated results. The paper concludes with the implications our results have for the administration of property taxes and their importance in a wider context of municipal finances in a developing country such as Peru.

Informal Land Use, Property Values, and Public Finance

A large portion of the population in developing countries lives on land that it does not formally own. Known as squatters, these residents either occupy land through invasion or purchase use rights informally. The literature on property rights tends to focus on the economic and social aspects of obtaining government supported right of use. The seminal work of Hernando de Soto (2000) discusses how the institution of property rights affects the efficiency of a capitalist system in the context of developing countries. De Soto shows that the lack of leverageable capital due to poorly defined property rights is a major hurdle to the proper functioning of capitalism outside the developed countries. He sees clarifying land use rights as crucial for developing countries. However, economic analysis of informal land use is difficult due to the severe data constraints. As a result the number of papers included below is almost a complete review of the existing economic literature for the Latin America region. These papers can be categorized into two broad groups. First, there is a set of papers that focus on the broader social impacts of squatting. We briefly summarize this literature as it has some bearing on our current research. The broader literature on squatting indicates that the provision of property rights improves a number of social outcomes. While it is difficult to determine to what extent these improvements affect property values it is implausible to assume they would lead to lower values. As a result, these studies should be viewed as complementary to more narrowly focused research on property rights and property values. The second category of papers which is most relevant to our research reports numerical estimates of the effects of providing formal property rights for squatters.

As mentioned above, the broader literature on squatting is relevant to our research in the sense that researchers have consistently found that providing squatters with property rights tends to produce positive social outcomes in squatter communities. This matters for previous research and our research on property rights and property values. There is no tidy theoretical model that specifies precisely how the provision of property rights increases property values. However, if the provision of property rights results in a variety of improvements in the welfare of squatter communities, then this literature provides at least one channel linking property rights with higher property values.

The literature on social welfare and property rights can be broken into two main categories. A number of researchers have emphasized a variety of positive outcomes from the provision of

property rights. Field (2003) showed that Peruvian women who participated in titling programs were more likely to be involved in household decision making and had lower fertility rates. Galiani and Schargrodsky (2004) find titled households are more likely to show improvements in child health as measured by weight-for-height scores and lower teen pregnancy rates. Field (2007) finds titling leads to increases in work hours, movement to work outside the home, and a substitution of adult for child labor. The latter effect is interesting as the research shows that without property rights adults spend more time in the household to prevent loss of the informal property and substitute child labor for the income loss. Galiani and Schargrodsky (2010) find that titling tends to improve educational outcomes. In general, the research indicates that there are positive impacts on poverty from titling. Not surprisingly, Payne et al. (2009) point out the limitations and drawbacks of simply relying on titling programs alone to combat poverty. In and of themselves, property rights seem to be a useful part of a larger set of policies designed to reduce poverty in Latin America. In another vein that is closer to our research, a number of papers have shown that the provision of property rights to squatters is linked to an increase in investment in the property. Field (2005) and Galiani and Schargrodsky (2010) find that the provision of property rights increases investment in both urban and rural environments, respectively. However, Field and Torreo (2006) find that the increase in investment does not come from greater access to credit markets as posited by de Soto. The complete effects of titling programs are still under research, but researchers clearly have linked assigning formal land use rights to poverty alleviation.

From this more general literature we can now move to the literature that more directly estimates the effect of the provision of property rights on land values. In an early paper, Jimenez (1984) uses a Box-Cox transformed hedonic price equation to obtain a value for tenure security in Davao, Philippines. An extensive data set includes 3,344 households of which 1,505 are squatters. In addition, the data indicates if the property is occupied by an owner or a renter. This allowed for separate estimating equations for the two groups. The results of the estimations provided implicit prices which could be used to predict the sales price or rental value of squatter's dwellings. These implicit prices could then be compared to actual prices or rents. The difference was a premium of 18 percent or 58 percent for renters and owners, respectively.

Alston et al. (1996) use three datasets to show the impact of property rights on land values in two Brazilian agricultural areas. The authors focus on micro-level survey data to determine individual impacts, but also use census data at the county level to report on more general impacts. The empirical results support their theoretical predictions that land values and investments would increase with titles. The survey data includes four components and in total the sample includes 206 farmers at various distances from four market communities. The authors find an increase in land values of between 35 percent and 71 percent depending on the distance from market. The increase in investment as shown by an increase in the share of farm land in pasture and permanent crops rose by 21 to 48 percentage points. The census data results are broadly consistent with the survey data findings.

Lanjuow and Levy (2002) examine the effects of property rights on squatters' welfare. Using data from a 1996 survey of 400 households in Guayaquil, Ecuador they investigate the impact of titling on tenure security, facilitating transactions, and property values. The results show that having an ownership document increases tenure security, or lowers the expectation of a

household being evicted. The authors also find titling increases the ability to contract (rent or sell) with someone outside the family or community. When examining the effects of titling on property values, the sample size is reduced to 51 observations, but the data are quasi-experimental in design and include self-reported constructed property values for each household under both property rights scenarios (having title and not having title). The authors find that titling increases values and report the unconditional mean difference as 23.5 percent of untitled property values. This within-subjects method avoids some pitfalls (endogeneity of property rights and unobservable differences in housing quality) of the hedonic method, but the sample size is small and may not be representative of the country or region. The authors do not make any attempt to calculate the impacts of titling on local government finance.[2]

Galiani and Schargrodsky (2011a) examine the effect of titling on property valuation, appearance, investment, and liquidity. The authors use a natural experiment on approximately 1,000 squatter households in suburban Buenos Aires, Argentina where over 400 squatters (randomly) received title for the land from the government after it was purchased from the original owners. Other squatters did not receive title as the original owners entered a long legal battle over the valuation of the parcels. This characteristic of their data is important as it removes endogeniety concerns. In other words, the assignment of treatment (title) is orthogonal to the outcomes of interest. Most research cannot make this strong causal claim, thus the findings become something approaching a benchmark for comparison. The authors find increases in property values of approximately 19 percent from titling. Other positive effects of titling include increased investment, smaller households, and better education outcomes for children. Again, access to credit markets was not affected by titling. The authors conclude that a titling policy may reduce poverty not through access to credit but through long-term investment in housing and human capital.

From the summary of the existing literature above, we now are able to put our current research into context. We extend this literature in three relevant ways. First, we look at a much larger sample of households (20,000 per year) in a different country, Peru. At this time, the literature on squatting and property values is restricted to only a few countries. Adding another study from a different country in the region would be useful. Peru has had substantial migration from rural to urban areas. In the 1960s, the percentage of people living in urban areas was 47 percent; while in 2007, nearly 80 percent lived in urban areas. In addition, the previous studies are based on samples that while not unacceptably small, perhaps would be of more significance if the results could be compared to a study using a much larger sample. Second, we are able to control for a fine level of geography, the neighborhood. Third, we focus on the change in property values which results from a change in property rights as in the previous literature. However, we extend the analysis to include a new consequence of titling, the change in property tax revenues. The literature has largely ignored or discussed this impact only in passing. In our work, the potential increase in property tax revenues is an important outcome of our research.

De Cesare (2012) provides a description of the broad outlines of collecting property taxes in Latin America. By any standard property tax collections in Latin America are low, about two

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[2] They do mention that local governments can use additional revenues from property taxes to finance infrastructure improvements.

percent of government revenue. This compares to an average of 2.4 percent for developing countries and about four percent for OECD countries. Institutional issues such as taxation responsibilities, the tax base, the universality of the tax, tax rates, and the distribution of revenue all play a role in hindering property tax collections. What is missing from the existing literature is the extent to which informality reduces the ability of subnational governments to collect property taxes. Understandably due to data constraints, the issue of the informal housing market has been left unaddressed.

As a result, our study provides additional data on the difference between titled and untitled properties. More specifically, we use our estimates to address the implications for property taxation in an important country in Latin America. Moreover, Peru is not only an important country but it is also a very "average" country which is useful in the current context. Using data from the World Bank (2015), in 2013 Peru had a total GDP of $202 billion. It was the seventh largest economy in the region between the large economies of Brazil and Mexico and the smaller economies of Central America. In the same year, GDP per capita was $10,307 which is only slightly above the average for Latin America. In the continuing efforts to increase property tax collections, local tax officials may be able to use this information as a rough proxy for the initial value of property that is being moved from informal to taxable status. Second, the results may provide a more complete picture of the losses being generated by informal land arrangements in developing areas.

The literature connecting hedonic models and property tax revenue estimates is surprisingly sparse. However, some local governments use hedonic models when implementing mass appraisals as this method may lower the number of appraisal appeals (Arnott 2005). The use of hedonic models to measure the change in property values is common but the literature does not frequently estimate the property tax revenue effects of the additional value. This added step is useful and may shed light on costs versus benefits of a particular policy or program. Geoghegan et al. (2003) use a hedonic framework to estimate the added value of open space to nearby residential properties. The authors use the estimates to find the additional tax revenue from a hypothetical increase in open space. They compare the added revenues to the cost of purchasing the added space in the market and find the overall cost of such programs is only about 40 percent of the total land costs after the first year of additional revenues alone. The calculation of property tax revenues enlightens the policy discussion by clarifying the costs and benefits. The addition of information on the relationship between changes in property values and tax revenues where so little is known about this issue is important in its own right. Given the difficulties of collecting tax revenue in a developing country environment, estimates of changes in tax revenues derived from policy driven changes in property values arguably is of much greater importance.

Informal Land Use in a Peruvian Context

In Peru, perpetual fee simple ownership of real property is typical. However, the current law states owners' absolute right over the real estate can be lost due to two circumstances. First, if the owner abandons the property for more than twenty years, the real estate is transferred to the Peruvian government (Peru Civil Code, Article 968). Second, the possessor who is not the owner of the real estate may acquire the property if the possession is continual, peaceful, and public. If

the possessor is in good faith, the time needed to obtain ownership is five years. If the situation is not in good faith, the time required is ten years (Peru Civil Code, Article 950). It may be that a possessor or squatter uses the property tax as a way to satisfy continual, peaceful, and public control of the real estate. In other words, the squatter, believing no one owns the land, registers the location and pays the taxes in good faith. In this situation, the squatter is in a strong position to establish legal ownership after five years.

It is important to mention that a key urban property-rights reform was implemented in 1996 by the COFOPRI, Organization for Formalization of Informal Property. COFOPRI had important results until 2007. It distributed nearly 1.2 million property titles to squatters on public land. Roughly 6.3 million of the approximately 10 million urban residents received property rights recognized by formal law and registered with the state. As a result, 30 percent of urban land plots were titled by 2007. In 2007 the program underwent major changes and it was merged with the rural land titling program.

Defining Various Categories of Formal and Informal Land Use

Peruvian squatter settlements form quickly and with the support of large numbers, as is typical around the globe. The initial inhabitants use invasion to acquire the use of the land and numbers to lower the probability of eviction. If the settlement is successful, the tenure security of the residents is increased but still short of those with property rights. At this point, many of the initial squatters sell their dwellings in the informal market and move to new squatting opportunities. While the new owners pay for the house through installments or outright and may view themselves as owners, many of the new owners do not have title to the land. Thus, the informal real estate market muddles the notion of squatter and owner.

We define two types of households through property rights, those with title and those without. We also can classify the household by how they acquired the property which is an important ownership measure. As mentioned above, some households do not self-identify as a squatter but as an owner even though they do not have property rights. This group of households we categorize as informal owners. An informal owner resides on land for which they do not have formal property rights but did not acquire the land through invasion. It is likely that the land of the informal owner was originally acquired by invasion but then sold in the informal market after a critical level of tenure security was achieved. Those that self-identify as a squatter disclose they acquired the property through invasion and we categorize them as invaders. It is important to remember that formal owners may have been invaders before they acquired title.

Property Valuation in Peru

Residents register their living location with local governments and property tax departments.[3] Those registered with the property tax departments are signaling ownership of the property to the

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[3] We focus on residential housing in this paper. The zoning board (a separate department from the property tax division) typically oversees the use of the land and makes sure the current use is legal. Squatter settlements typically do not worry about zoning issues when establishing location; however, should a property owner need to change the use and thus the current zoning of the property, the process is straight-forward and follows the market. The owner

local municipality even if they do not have legal ownership. The local municipality is not charged with titling so the property tax department is not concerned with determining legal ownership only with collection of taxes owed. In other words, individuals may pay property taxes for property they do not legally own.[4]

The appraisal system includes two main components—land and improvements. The land is taxed at a specified rate per square meter which varies by region and is set by the national government.[5] The land portion of the appraisal is typically small, 10-20 percent of the total valuation. The majority of the appraisal is based on several characteristics of the improvement on the land.[6] Each characteristic is graded into a category (typically designated with letters: A through G for example). These categories determine the value per square meter of roof area for the property. Metropolitan Lima, the coastal areas (except Lima), the highlands, and the Amazon region have slightly different categories and values. Each characteristic is graded into a category with a corresponding value, and then the total value of the property is calculated by summing the values of each characteristic. For example, one component of the appraisal is flooring. In Lima, the highest category (A category) includes imported marble, natural stone, or imported porcelain and the corresponding value is 235.90 soles per square meter of roof area. The lowest category (I category) designates compacted earth and is valued at 4.15 soles per square meter of roof area. This value is added to the other characteristics' values to determine the total appraised value of the property.[7]

At this point the value is depreciated based on the age, type of structure, and quality of upkeep. This depreciation rate varies. A concrete home with very good upkeep that is less than 6 years old receives a depreciation rate of 0 percent. An adobe style home with poor upkeep that is 25 to 30 years old is depreciated at 90 percent of the appraised value.[8]

Finally the tax rate is applied to the appraised value (less depreciation) to obtain the tax amount owed. The tax rate is progressive and based on appraised value. The first $15,000 of appraised value is taxed at 0.2 percent, the next $45,000 in value is taxed at 0.6 percent, and any value over $60,000 is taxed at 1 percent.[9] The elderly, if they own only one property and that property is registered in their name only, receive a reduction in property taxes. They do not pay taxes on the first $50,000 of appraised value. In other words if the property is worth $50,000 or less they have zero property tax burden, but if the value is above $50,000 they pay 0.6 percent for the first $10,000 above the $50,000 and 1 percent for any amount above $60,000.

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simply needs to convince the zoning board and the effected neighbors that the property is better suited for a different use and the change is made.

[4] As discussed above, some squatters use this method to establish proof of residency to obtain property rights at a later date.

[5] Peru is divided into 25 regions and Lima province. Each region has an elected government.

[6] Characteristics of a typical appraisal include walls and columns, ceilings, floors, doors and windows, finishings, bathrooms, and electrical and sanitation installations.

[7] Resolution number 367-2014-Vivienda provides a full description of the characteristics and categories.

[8] Resolution number 266-2012-Vivienda provides a full description of depreciation rates.

[9] The tax rates are applied based on the appraised value in terms of Unidad Impositiva Tributaria (UITs) or tax units. One UIT is typically pegged to $1,000 US dollars. The actual law states the rates in terms of UITs but for simplicity we use the US dollar conversion at the current exchange rate.

As an example, we construct a simplified version of an appraisal. This fictional example uses two characteristics and highlights the wide range of categories and values for each of the characteristics evaluated. Our 100 square meter property in metropolitan Lima has a sloped concrete roof with basic tile finished bathrooms and is owned by a young family. The roof (category B) is valued at 174.28 soles per square meter and the bathroom (category D) adds 24.43 soles per square meter. The total appraised value of the home is 19,871 soles ((174.28+24.43)*100). The property is of concrete construction and 9 years old with regular upkeep, thus the depreciation rate for this property is 10 percent. The final net of depreciation appraised value is 17,883.90 (19,871*0.9) which corresponds to $4,645.[10] The taxes due are $9.29 ($4,645*0.002) or around 36 soles.

Once the appraisal is complete, each individual's local municipality or rural district property tax division delivers a property tax bill to the registered owner. The property tax bill is detailed and clearly describes the property, appraisal (including the categories within which each characteristic is graded), and the amount due. At this point the property tax acts almost like a negotiation where both parties must agree to the appraisal.[11] The simplest result is the owner signs the bill signifying agreement with the appraisal and tax responsibility. If owners do not agree with the appraisal they can ask for an appeal and an appraiser from the local district comes to the property and re-evaluates the appraisal.

Data

The data for this project come from the Living Standards Measurement Survey (LSMS). The LSMS (or Encuesta Nacional de Hogares), is a cross section of households collected annually by the National Statistics Office (Instituto Nacional de Estadistica e Informatica or INEI). The main purpose of this survey is to reveal the evolution of poverty, welfare, and living conditions of households.[12] Data from this project is available from 2007 through 2012 and consists of a stratified household sample representative at the national and regional level. Among other things, the sampling considers environmental conditions (coast, highlands, or forest), geographical location (north, central, or south), and urban or rural status.

For our purposes, the key components of the LSMS are measures of property rights, squatter status, and the value of the property. The survey asks heads of households about ownership[13], if they possess property rights[14], and the monthly rental price of the property[15]. Table 1 shows that

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[10] This example uses the 2015 UIT conversion of 3850 soles to one UIT.
[11] The appraisal system dates from the 1950s, and the categories are vaguely or loosely defined and outdated in some cases. This leads to misinterpretations between owners and property tax departments and thus higher appeal rates. However, the districts are not making large changes to the appraisal system even though some call for the categories to be updated or the entire appraisal system to be overhauled.
[12] Specifically, this survey includes modules on housing, characteristics of the household members, education, health, employment, income (from formal and informal sectors), expenditures, social programs, community, and opinions (for example governance, democracy, and transparency). The survey started in May 2003.
[13] The survey asks if the property is rented, owned outright, owned but still paying installments, owned through squatting (invasion), or a courtesy of work or another household.
[14] Property rights imply having a title to the property or in the process of obtaining a title.

the data include approximately 130,000 observations with 70 percent of those owning the domicile have paid in full, five percent own through invasion, and about 0.5 percent own by paying installments. Almost 54 percent of households have property rights, 42 percent do not have a title to the property, and four percent are in the process of obtaining a title.

Table 1. Ownership and property rights status of dwellings.

Ownership status	N	% of total sample	Property rights status		
			With	Without	In process
Owned, outright	92,399	69.60%	48,921 (52.95%)	39,611 (42.87%)	3,867 (4.19%)
Owned, by invasion	6,628	4.99%	3,936 (59.38%)	2,235 (33.72%)	457 (6.89%)
Owned, paying installments	769	0.58%	320 (41.61%)	407 (52.93%)	42 (5.46%)
Rented	10,986	8.27%	.	.	.
Transferred by employer	1,549	1.17%	.	.	.
Transferred by other household or institution	20,301	15.29%	.	.	.
Other	134	0.10%	.	.	.
Total	132,766		53,177 (53.29%)	42,253 (42.34%)	4,366 (4.37%)

Notes: Renters, household with transferred ownership, or households that acquired the property in other ways were not asked in the survey to provide information about property rights. The survey includes 34,521 responses without information about ownership. Property right status percentages by ownership status given in parentheses. Property rights totals may not sum to sample totals as some respondents may not have answered or did not know about their property rights situation. Source: ENAHO data from 2007-2012.

Table 2 provides means of observables as well as differences in means by property rights status. In the full sample, the average monthly rent is just over 155 Nuevo Soles with 90 percent of the households residing in an independent house. There are 3.5 rooms on average and 80 percent of the dwellings have electricity. Urban households account for 56 percent of the full sample and Lima accounts for 10 percent of the full sample. Table 2 shows there are statistically significant differences in monthly rents reported across property rights status. Those with a title estimate monthly rent at an average of 215.58 soles; whereas, households without property rights only expect a monthly rent on average of 80.12 soles. When property rights are in process the monthly rent climbs to 162.14 soles, much greater than without property rights but less than with property rights. There are also significant differences in the characteristics of the structure as well. Concrete, running water and sewage, electricity, and electric or gas cooking methods are more prevalent in households with property rights or titles in process. Property rights also lead to higher average investments to improve the property.
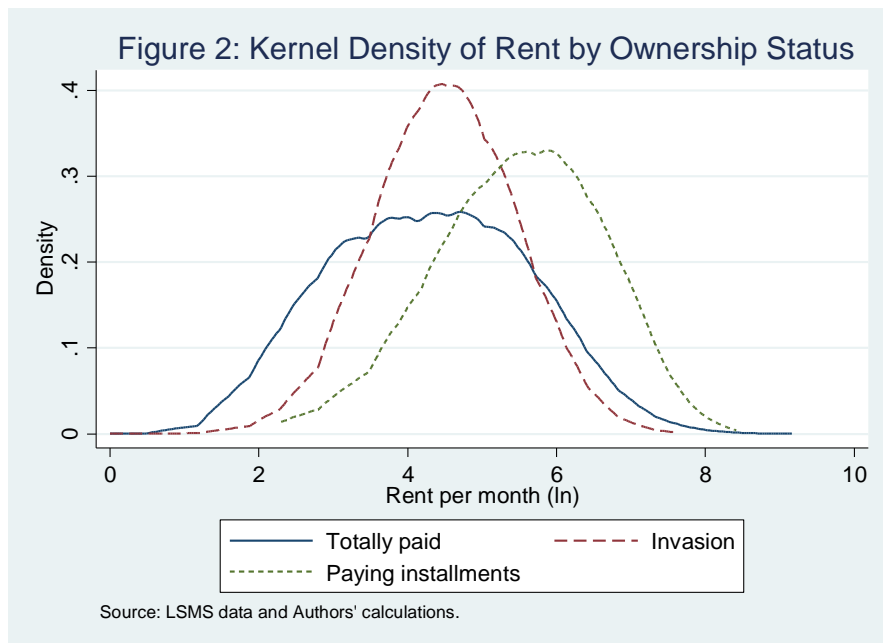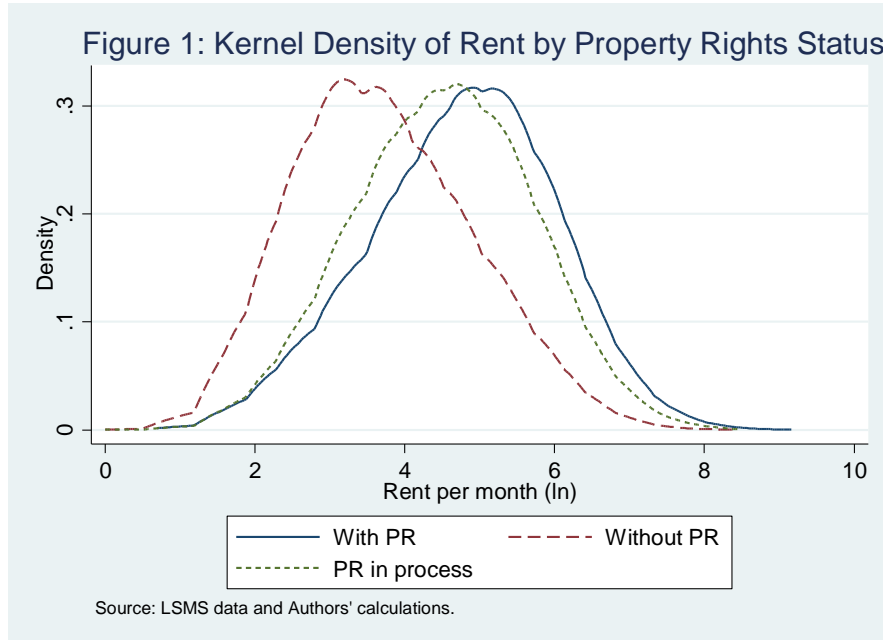
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[15] Specifically, the survey asks if the property was rented, what would be the monthly rent. The reported rent is in Peruvian Nuevo Soles.

Table 2. Variable means by property rights status.

Variable	(1) Total sample	(2) With property rights	(3) Without property rights	(4) Property rights in process	(5) Difference (2)-(3)	(6) Difference (2)-(4)	(7) Difference (4)-(3)
Housing characteristics							
Montly rental value	155.89	215.58	80.12	162.14	135.46***	53.44***	82.02***
Independent house (1=yes)	0.90	0.92	0.88	0.91	0.04***	0.01***	0.03***
Apartment building (1=yes)	0.01	0.02	0.01	0.01	0.01***	0.01***	0.00
Number of rooms	3.49	3.85	3.03	3.51	0.82***	0.34***	0.48***
Concrete external walls	0.36	0.52	0.16	0.40	0.36***	0.12***	0.24***
Concrete floor	0.55	0.70	0.36	0.62	0.34***	0.08***	0.26***
Concrete roof	0.25	0.37	0.09	0.25	0.28***	0.12***	0.16***
Waterpipe and Wastepipe in dwelling	0.32	0.46	0.14	0.38	0.32***	0.08***	0.24***
Electricity	0.80	0.90	0.66	0.88	0.24***	0.02***	0.22***
Electricity metered solely for household (1=yes)	0.63	0.73	0.49	0.65	0.24***	0.08***	0.16***
Electric or gas cooking	0.55	0.71	0.35	0.67	0.36***	0.04***	0.32***
Improvement spending [a]							
Investment in amplifications	4,530.53	6,244.24	2,431.78	4,321.73	3,812.46***	1,922.51***	1,889.95***
Investment in modifications	2,532.58	3,184.72	1,663.09	2,749.10	1,521.61***	435.62	1,086.01***
Investment in new construction	7,599.06	11,036.43	4,570.10	8,662.03	6,466.33***	2,374.40	4,091.93***
Household characteristics							
Members per household	4.24	4.16	4.35	4.25	-0.18***	-0.09***	0.10***
Total household expenditures	4,955.76	6,084.67	3,499.77	5,296.51	2,584.90***	758.34***	-1,826.55***
Total household income (net)	6,271.62	7,814.25	4,283.42	6,723.92	3,530.83***	1,009.95***	-2,520.87***
Household in extreme poverty (1=yes)	0.10	0.04	0.18	0.05	-0.13***	-0.01*	0.13***
Household in poverty (1=yes)	0.23	0.17	0.31	0.21	-0.14***	-0.04***	0.10***
Location characteristics							
Urban	0.56	0.75	0.32	0.68	0.43***	0.07***	0.36***
Coast	0.27	0.35	0.16	0.30	0.19***	0.05***	0.14***
Highlands	0.41	0.34	0.50	0.33	-0.16***	0.01	-0.17***
Lima	0.10	0.13	0.06	0.17	0.07***	-0.04***	0.11***
Jungle	0.22	0.18	0.27	0.20	-0.09***	-0.02***	-0.07***
North Coast	0.14	0.17	0.10	0.12	0.07***	0.05***	0.02***
Central Coast	0.07	0.10	0.04	0.10	0.06***	0.00	0.06***
South Coast	0.06	0.08	0.02	0.07	0.06***	0.01***	0.05***
North Highlands	0.07	0.06	0.08	0.04	-0.02***	0.02***	-0.04***
Central Highlands	0.19	0.13	0.26	0.16	-0.13***	-0.03***	-0.10***
South Highlands	0.15	0.14	0.16	0.13	-0.02***	0.01*	-0.03***
N	99,796	53,177	42,253	4,366	.	.	.

Notes: All monetary amounts in Peruvian nuevos soles. The survey is missing 234 response values for the number of rooms variable. [a]Improvement spending statistics only for dwellings with improvements. We consider the property in an urban area if there are at least 401 dwellings in the area. ***, **, * signifies statistical significant difference (ttest) at the 99%, 95%, and 90% level, respectively.

Figures 1 and 2 present kernel density plots of monthly rents; these figures provide a visual representation of differences in rents by property rights and ownership status. The rent density of those without property rights is centered about a lower rent when compared to households with property rights or titles in process. Interestingly, households who acquired ownership through invasion have a tighter density centered just below the mean monthly rent; whereas, owners who have fully paid for their property are much more evenly spread across the rent distribution. Not surprisingly, those who are paying installments view their properties as more valuable in terms of rent than other owner types.

Figure 1: Kernel Density of Rent by Property Rights Status

Density (y-axis), Rent per month (ln) (x-axis)

Legend: With PR — Without PR — PR in process

Source: LSMS data and Authors' calculations.

Figure 2: Kernel Density of Rent by Ownership Status

Density (y-axis), Rent per month (ln) (x-axis)

Legend: Totally paid — Invasion — Paying installments

Source: LSMS data and Authors' calculations.

The LSMS data include geographical information for each household. The survey identifies the area in which the dwelling is sampled. For urban and rural areas, the sampling area includes 120 households on average and follows closely (if not exactly for urban areas) with Manzanas. The data also include the latitude and longitude for the centroid of the Manzana for the urban households. Conveniently, a Manzana is quite similar to the familiar U.S. Census block. The rural location identifiers are not as precise, but the latitude and longitude information is provided for the centroid of the rural population center (or Centro Poblado), or the adjacent area comprising a center city of between 500 and 2,000 residents or in very rural areas of approximately 100 households. We use the sampling areas as location identifiers to control for

unobservable differences across space. For our purposes, they essentially become neighborhood fixed effects and capture variations in education, income, and health status, among other things. Including these fixed effects is comparable to controlling directly for similar neighborhood characteristics from the 2007 Peruvian Census data. The only difference is uncovering which characteristics of the neighborhood have a significant influence on the rental value.[16]

Methodology and Results

We use hedonic estimation methods to elicit the effects that squatting and property rights have on monthly rental values. Following Rosen (1974), the hedonic price function uncovers implicit prices for observable dwelling characteristics. By using this method, we are assuming the characteristics of the house are perceived by all consumers. The market for housing must also provide a large amount of choices or variation in units that cannot be unpackaged and sold for parts. These are reasonable assumptions for a typical housing market. When the market clears, buyer value and seller offer functions reveal implicit marginal prices for the characteristics of the dwelling.

Researchers use these implicit prices to determine the marginal impact from changing a wide range of housing or neighborhood characteristics. A few recent examples include school quality (Zahirovic-Herbert and Turnbull 2008), neighborhood ethnic preferences (Yinger 2014), and forced sales (Campbell et al. 2011).[17] We focus on determining the implicit prices and resulting incremental property value effects attached to the status of property rights (with, without, and in process) and the impact of invasion.

We estimate the following equation:

$$\ln(rent)_{ijt} = \alpha + \beta_1 Invasion_{ijt} + \beta_2 PropertyRights_{ijt} + \delta Z_{ijt} + \varphi X_{ijt} + \varepsilon_{ijt} \tag{1}$$

The dependent variable is the natural logarithm of the monthly rental value for property i at location j in year t while the independent variables of interest are invasion and property rights status. The estimands, β_1 and β_2, return the implicit prices for various property rights and invasion characteristics. In some specifications, we include a complete set of interaction effects between invasion and property rights in the model, Z. The model includes a vector, X, of observable dwelling characteristics such as concrete use and water and sewer connections. These control variables help identify more precisely the marginal value of the rent derived directly from ownership and property rights.

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[16] At the moment, the Peruvian Census data are not available at the Manzana level with spatial references nor are digital maps of the Manzanas or the sampling areas available.

[17] An additional important feature of the hedonic method is its ability to generate a price index. Though not the central focus of this paper, a price index is informative for local governments and real estate professionals.

Table 3. Hedonic estimation results.

Dependent variable: Ln(rent)	(1)	(2)	(3)	(4)
Property rights (PR)	0.131***	0.128***	0.069***	0.069***
	(0.005)	(0.005)	(0.005)	(0.005)
PR in process	0.102***	0.108***	0.057***	0.057***
	(0.011)	(0.011)	(0.010)	(0.010)
Invader	-0.111***	-0.109***	-0.057***	-0.059***
	(0.009)	(0.009)	(0.009)	(0.015)
PR * invader				0.003
				(0.017)
PR in process * invader				-0.005
				(0.032)
Housing and household characteristics				
Concrete walls	0.201***	0.210***	0.187***	0.187***
	(0.007)	(0.007)	(0.007)	(0.007)
Concrete floors	0.256***	0.261***	0.186***	0.186***
	(0.006)	(0.006)	(0.006)	(0.006)
Concrete roof	0.210***	0.233***	0.190***	0.190***
	(0.007)	(0.007)	(0.008)	(0.008)
Number of rooms	0.125***	0.124***	0.116***	0.116***
	(0.001)	(0.001)	(0.001)	(0.001)
House indicator	-0.038***	-0.054***	0.120***	0.120***
	(0.008)	(0.008)	(0.009)	(0.009)
Apartment indicator	0.162***	0.146***	0.105***	0.105***
	(0.020)	(0.020)	(0.022)	(0.022)
Water	0.195***	0.197***	0.070***	0.069***
	(0.006)	(0.006)	(0.006)	(0.006)
Electricity	0.246***	0.257***	0.159***	0.159***
	(0.006)	(0.006)	(0.007)	(0.007)
Electric or gas cooking fuel	0.254***	0.260***	0.163***	0.163***
	(0.006)	(0.006)	(0.006)	(0.006)
Number of household members	0.040***	0.039***	0.033***	0.033***
	(0.001)	(0.001)	(0.001)	(0.001)
Total annual expenditures	0.060***	0.059***	0.039***	0.039***
	(0.001)	(0.001)	(0.001)	(0.001)
Total annual income	0.002***	0.002***	0.002***	0.002***
	(0.000)	(0.000)	(0.000)	(0.000)
Lima	0.026***	0.009	15.459	15.475
	(0.009)	(0.009)	(12,564.783)	(12,558.355)
Urban	0.496***	0.486***	-0.313	-0.313
	(0.006)	(0.006)	(0.230)	(0.230)
Constant	2.501***	2.517***	-10.948	-10.964
	(0.011)	(0.011)	(12,564.783)	(12,558.355)
Year fixed effects	Yes	Yes	Yes	Yes
Region fixed effects	Yes	No	No	No
Detailed region fixed effects	No	Yes	No	No
Neighborhood fixed effects	No	No	Yes	Yes
Observations	99,561	99,561	99,561	99,561
R-squared	0.727	0.729	0.798	0.798

Note: Expenditures and income are measured in thousands of Neuvo Soles. *, **, *** designate statistical significance at the 0.1, 0.05, and 0.01 level respectively.

Table 3 shows the estimation results of equation (1). We estimate four specifications varying the detail of location fixed effects and the inclusion of interaction terms. Specification (1) includes basic region fixed effects (central, highland, jungle, and coast), whereas specification (2) uses more detailed region fixed effects. Specifications (3) and (4) include over 4,000 fixed effects for each sampling area, an area including approximately 100 homes around the observed dwelling. Specification (4) also includes the interaction terms between invasion and property rights.

The results yield a consistent benefit of having a title and being in process to obtaining property rights. The effect ranges in magnitude from 6.9 percent to 13.1 percent; these estimates are conservative when compared to the previous literature. This is likely due to the much larger sample size, detailed covariates, and fixed effects. The impact on rental values translates into 5.5 to 10.5 soles more per month on the average dwelling without property rights.

Table 3 also shows the impact invasion has on property values. Individuals who acquire parcel through invasion have rental values of between six percent and 11 percent less than those who are squatting but did not invade on the land. This first generation squatter effect is almost as large as the impact of property rights. The interaction effects between invasion and property rights are not significant, implying an individual, who acquired the land through invasion and then obtained property rights, does not see additional impacts on value.

The implicit prices of the remaining housing characteristics are logical and mostly steady throughout the specifications with only slight differences in the estimated magnitudes. As expected, the use of concrete in construction, connections for water, sewer, and electricity, and size measured by number of rooms are all statistically significant and increase the value of the dwelling. The magnitudes of these impacts are one to three times the effect of property rights. In other words, connecting a basic need, water, to the dwelling has a similar impact on values as gaining title. The only estimand that changes sign is the house indicator, and this may indicate the importance of finer geographically defined fixed effects.

We also estimate equation (1) for just the properties within the Lima metropolitan area. Table 4 shows the results and follows the same specifications as table 3, excluding specification 2. Housing and household characteristics are included in all specifications, while neighborhood and interaction effects are included in specification 3 and 4, respectively. As expected, the impact of property rights is larger for properties in Lima; the effect ranges from 7.3 percent to 9.3 percent. Likewise, the discount for invading is more severe—8.8 percent to 22.9 percent. The interaction terms are not statistically significant.

Table 5 shows the differential impact of title and invasion by utility status of the dwelling. Informal real estate markets may value utility connections in combination with property rights or perceive these utilities as signals of tenure security. In these estimations, we consider the effects of water and utility connections on property values both jointly and separately. Interestingly the results are indicating that the provision of water has a larger impact than electricity. The results indicate some synergy between the two. The provision of both water and electricity has a much larger impact than separate provision of the two.

Table 4. Hedonic estimation results: Lima metropolitan sub-sample.

Dependent variable: Ln(rent)	(1)	(3)	(4)
Property rights (PR)	0.073***	0.093***	0.084***
	(0.015)	(0.016)	(0.017)
PR in process	0.046*	0.051**	0.048*
	(0.025)	(0.023)	(0.026)
Invader	-0.229***	-0.088***	-0.122***
	(0.017)	(0.018)	(0.030)
PR * invader			0.052
			(0.035)
PR in process * invader			0.014
			(0.058)
Housing and household characteristics			
Concrete walls	0.248***	0.202***	0.201***
	(0.021)	(0.021)	(0.021)
Concrete floors	0.199***	0.145***	0.146***
	(0.021)	(0.020)	(0.020)
Concrete roof	0.359***	0.237***	0.238***
	(0.019)	(0.018)	(0.018)
Number of rooms	0.129***	0.104***	0.104***
	(0.004)	(0.004)	(0.004)
House indicator	-0.153***	0.131***	0.130***
	(0.031)	(0.033)	(0.033)
Apartment indicator	0.084**	0.112***	0.111***
	(0.038)	(0.039)	(0.039)
Water	0.310***	0.136***	0.135***
	(0.019)	(0.021)	(0.021)
Electricity	-0.049	-0.002	-0.007
	(0.064)	(0.058)	(0.058)
Electric or gas cooking fuel	0.116***	0.093***	0.093***
	(0.026)	(0.024)	(0.024)
Number of household members	0.026***	0.027***	0.027***
	(0.003)	(0.003)	(0.003)
Total annual expenditures	0.037***	0.022***	0.022***
	(0.002)	(0.001)	(0.001)
Total annual income	0.003***	0.002**	0.002**
	(0.001)	(0.001)	(0.001)
Constant	3.755***	4.248***	4.265***
	(0.070)	(0.534)	(0.534)
Year fixed effects	Yes	Yes	Yes
Neighborhood fixed effects	No	Yes	Yes
Observations	10,151	10,151	10,151
R-squared	0.617	0.720	0.720

Note: *, **, *** designate statistical significance at the 0.1, 0.05, and 0.01 level respectively.

Table 5. Heterogeneous effects of property rights by utility provision.

Dependent variable: Ln(rent)	No water or electricity	Water but no electricity	Electricity but no water	Water and electricity
	(4)	(4)	(4)	(4)
Property rights (PR)	0.070***	0.124	0.070***	0.043***
	(0.013)	(0.156)	(0.007)	(0.010)
PR in process	0.075**	0.071	0.055***	0.030*
	(0.032)	(0.328)	(0.015)	(0.016)
Invader	-0.027	-0.497	-0.065***	-0.081**
	(0.044)	(0.828)	(0.019)	(0.033)
PR * invader	0.084	-0.141	0.001	0.026
	(0.076)	(0.957)	(0.023)	(0.035)
PR in process * invader	0.076	.	-0.031	0.014
	(0.116)	.	(0.041)	(0.065)
Housing and household characteristics	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Region fixed effects	No	No	No	No
Detailed region fixed effects	No	No	No	No
Neighborhood fixed effects	Yes	Yes	Yes	Yes
Observations	19,739	314	47,785	31,723
R-squared	0.481	0.893	0.752	0.714

Note: The utility "Water" implies the housing unit is connected to both water and sewage. The utility "Electricity" implies the dwelling is connected to a power grid. Expenditures and income are measured in thousands of Neuvo Soles. *, **, *** designate statistical significance at the 0.1, 0.05, and 0.01 level respectively.

While there is no formal definition of what constitutes robustness check of the results, are separate estimations are at least a less formal check. Moving among tables 3 through 5, the majority of the results are consistent both in terms of statistical significance and the magnitude of the effects of titling on property values. As one would expect, the strongest results are for the country as a whole with slighter weaker results for Lima and accounting for the presence of water and electricity connections. As the coefficient estimates do not radically change either across specifications or among different samples, our confidence in the quality of the results, while never perfectly certain, is high.[18]

Ultimately, we are interested in determining an estimate for the amount of property tax revenue lost due to residents living on untitled land. In order to do this calculation we make the simplifying assumptions discussed below.

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[18] We also used a propensity score matching technique to estimate the value of title and found similar results but with slightly larger magnitudes; however, the balancing tests across groups were not all satisfied.

Implications for the Peruvian Property Tax System

Now that we have implicit price of property rights, we estimate the impact to the property tax system. This thought experiment is difficult and requires making limiting assumptions. However, the exercise provides rough orders of magnitude estimates of the costs in revenue squatters impose on the tax system. We acknowledge this is a partial equilibrium analysis and only provides a singular view of the story. As is usually the case, the general equilibrium effects of the experiment are plausibly larger.

First, we assume that all squatters are given property rights, so their values are subject to the estimates from above.[19] We will split this exercise into two parts—country wide and only metropolitan Lima. Now that all of the squatter households are assumed formal, they must register their location and pay property taxes. The size of our sample makes a simulation of each dwelling's property tax bill cumbersome, so we focus our analysis on the average household.

Starting with the country wide scenario, the average rent of a dwelling in our sample without a title is 80 soles per month. Given the estimates of the value of property rights, this rent increases to 85.5 soles per month or 1026 soles per year. The Peruvian Central Bank has estimated the rental value to sales price ratio for formal real estate markets in Peru. The most recent estimation, June 2015, finds the ratio to be 16.4 (BCRP (Peruvian Central Bank) 2015). We acknowledge that the formal market and squatter settlements may not have the same ratio, but we assume the values are comparable and assign the ratio to be 15. With this estimate, the value of an average squatter dwelling in our sample after title is conferred is 15,390 soles.[20]

We know the tax rate for this property valuation is 0.2 percent. Assuming the appraisal accurately values the dwelling, the tax bill is approximately 30 soles. If we assume one quarter of the 30 million Peruvians are squatters then 7.5 million residents live in squatter dwellings. We know that the average household size for our sample is 4.35, so we estimate a total of 1.7 million squatter homes in Peru. The total tax owed by the squatter population is roughly 51 million soles per year. However, some squatters use the property tax system as a way to be in good faith when squatting. From personal discussions with property tax officials, we assume 20 percent of squatters pay property taxes. In total, the property tax revenue lost in Peru from squatting is approximately 40 million soles per year.

Focusing on metropolitan Lima, the average rent for an informal dwelling is about 266 soles. Our analysis implies title would generate an additional 22.3 soles a month or 8.4 percent of rent. Following the same method as above, the value of an average Lima dwelling after titling is 51,901 soles. The tax rate applied is 0.2 percent, so the tax bill is approximately 103 soles. If we assume nine million people live in Lima, and assuming the distribution of squatters is constant throughout Peru then 2.25 million of Lima's residents are assumed to be living in approximately

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[19] We understand the sheer size and political sensitivity of such a titling program, but we assume the cost to be zero since we are estimating the property tax revenue losses of squatting.
[20] This is approximately $5,000 USD at current exchange rates.

500,000 informal dwellings.[21] The total tax owed by is population is 51.5 million soles per year, but as some may use the property tax system to show good faith, this estimate of lost revenue is reduced to approximately 41 million soles per year. As the Lima tax revenue impacts are similar to the country wide predictions, our results suggest the lion's share of revenue gains should accrue to municipalities within metropolitan Lima.

This thought experiment does not include the added benefits of property rights from increased access to formal markets including real estate and financial markets. Likewise, we are not including additional social or economic benefits from property rights including labor market changes or externality effects to surrounding titled properties. We also make no assumption about how the property tax revenue is spent; such as local municipalities installing public infrastructure (water, sewer, power, etc.) and in turn creating an additional increase in the property tax base. These caveats imply that our interpretation of the results as an estimate of the added land value accrued from property rights must admit these qualifications.

Formulating Property Tax Policy in the Presence of Informal Land Use

Property tax policy is a pressing public finance problem in Latin America. It is universally accepted that one of the region's primary constraints on economic growth is relatively poor infrastructure. Much of the problem involves the inability of local governments to provide such basic infrastructure as water and sanitation systems or basic transportation infrastructure. Such infrastructure has to be paid for and the collection of property taxes is essential in such a situation. The problem in Peru is even more acute than the region as a whole. The ratio of property tax collections to GDP is a paltry 0.18. Only two countries in the region have lower ratios. Using Chile as a benchmark, the ratio is nearly one percent of GDP. Not surprisingly, property taxes account for only one percent of total taxes collected in Peru (De Cesare 2012). Using this metric, Peru is in the bottom half of the region with respect to property tax collections. With such a low level of property tax collections, the ability of local governments to provide infrastructure or other social services such as education becomes severely diminished.

These low ratios for Peru have one easily identifiable component. In the metro Lima area, it is estimated that only 60 percent of the property taxes that are owed are actually being paid (De Cesare 2012). Given that Lima accounts for over half of the economy of the country, there would still be a substantial problem even if all property taxes owed in the rest of the country were paid in full. This known problem is greatly compounded by the large informal sector in the property market. Obviously, property taxes cannot be collected from informal properties that have not been registered. In Peru, as elsewhere in the region, this is not a trivial problem.

As outlined above, approximately 25 percent of the population is living in informal housing. This presents a classic catch 22 situation for local governments. They are short of funds for basic urban infrastructure. On the other hand, much of the growth of the urban population is occurring in the informal sector where the collection of property taxes is, to put it mildly, difficult. It is

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[21] Squatters are drawn to employment centers, so the assumption of equal proportions within Peru may be violated. This assumption is likely conservative and may provide a lower bound.

well understood that in the property markets and elsewhere in the economy it would be extremely beneficial for the government to be able to reduce the size of the informal sector. A "rough order of magnitude" estimate of what the existence of the informal property market is costing the government in terms of tax revenue amounts to over 40 million soles on an annual basis. Using any reasonable discount rate, the negative net present value of current policy is quite high.

This is compounded by the distribution of property tax revenue in Peru. Unlike some other countries, municipalities are entitled to the revenue generated by the property tax. Under these circumstances, there is a far greater likelihood that enhancing the revenue derived from property taxes would be spent on local public goods. Further, the official cost of obtaining this revenue is quite low. Under Peruvian law, five percent of property tax revenues are returned to the Federal government as payment for maintaining the property tax register. An additional 0.3 percent also is returned as payment for determining valuations. Essentially, 95 percent of any additional property tax revenue gained from converting informal property to the formal tax system would be garnered by the municipalities for local use. Under the circumstances, a vigorous program to register informal properties would pass virtually any conceivable benefit/cost analysis.

Conclusions

We examine the implications of squatter settlements in Peru on the property tax system. We use annual household survey data to estimate a hedonic regression to uncover the implicit price for property rights and invasion. The model finds a title increases property values by almost seven percent and squatting on the land by invasion reduces values by about six percent controlling for housing characteristics and neighborhood effects. With these values we estimate the revenue loss from squatter settlements to be roughly 40 million soles per year.

This paper shows the severity of the revenue impacts from squatting, but does not fully estimate the social and economic costs derived from squatting. The current underutilization of the property tax system in Latin American is exacerbated by the large squatting population and leads to high demand for public goods without a solid revenue source. The federal governments are left to fill the gap if the services are to be provided. At the same time, land values of local property owners increase with provision but this value is not captured efficiently through the property tax system when informal markets exist. If informal markets are made legitimate, local municipalities' tax bases may match more closely their service demanders.

While this paper does not formally address the social implications of squatting, it does shed some light on the situation in Peru specifically and more generally in Latin America. The literature on the effects of squatting versus the possession of a formal title universally indicates that the provision of titles to squatters produces improvements in welfare. In this vein our paper adds an estimate of a different and more immediate monetary gain to squatters. However, it adds an additional benefit, namely an increase in government revenue. A pressing problem in the region is the implementation of policy that will decrease the level of poverty. In a middle-income country such as Peru this is always difficult due to the size of the needs relative to the resources the government has to deal with them. In this paper, we have shown that increasing the provision

of titles to squatters would in all likelihood increase government revenue while the cost of titles is relatively small as the underlying administration is already established. It is a rare opportunity for a government to be able to improve the welfare to the poor and simultaneously enhance revenues.

References

Alston, Lee J., Gary D. Libecap and Robert Schneider. 1996. "The Determinants and Impact of Property Rights: Land Titles on the Brazilian Frontier" *Journal of Law, Economics and Organization*, 12 (1), pp. 25-61.

Arnott, Richard. 2005. "Neutral Property Taxation", *Journal of Public Economic Theory*, 7 (1), pp. 27-50.

BCRP. 2015. "Indicadores del Mercado Inmobiliario", Notas de Estudios del BCRP # 39, 22 Junio 2015, Retrieved from http://www.bcrp.gob.pe/docs/Publicaciones/Notas-Estudios/2015/nota-de-estudios-39-2015.pdf

Campbell, John Y., Stefano Giglio, and Parag Pathak. 2011. "Forced Sales and House Prices" *American Economic Review*, 101, pp. 2108-2131.

Cockburn, Julio. 2011. "Titulacion de la Propiedad y Mercado de Tierras" *Revista Latinoamericana de Estudios Urbano Regionales*, 31 (111), pp. 47-77.

De Cesare, Claudia. 2012. "Improving the Performance of the Property Tax in Latin America", *Policy Focus Report: Lincoln Institute of Land Policy*.

De Soto, Hernando. 2000. *The Mystery of Capital: Why Capitalism Triumphs in the West and Fails Everywhere Else*. New York: Basic Books.

Dye, Alan. 2006. "The Institutional Framework," pp. 167-208, in Victor Bulmer-Thomas, John Coatsworth, and Roberto Cortes-Conde, eds., *The Cambridge Economic History of Latin America, Vol. II*, New York: Cambridge University Press.

Field, Erica. 2003. "Fertility Responses to Land Titling: The Roles of Ownership Security and the Distribution of Household Assets." *Unpublished manuscript*, retrieved from https://econ.duke.edu/uploads/media_items/field-fertility-05.original.pdf

———. 2005. "Property Rights and Investment in Urban Slums", *Journal of the European Economic Association*, 3 (2-3), pp. 279-290.

———. 2007. "Entitled to Work: Urban Property Rights and Labor Supply in Peru" *The Quarterly Journal of Economics*, 122 (4), pp. 1561-1602.

Field, Erica and Maximo Torero. 2006. "Do Property Titles Increase Credit Access Among the Urban Poor? Evidence from a Nationwide Titling Program" *mimeo*, Harvard University, March 2006.

Galiani, Sebastian and Ernesto Schargrodsky. 2004. "Effects of Titling on Child Health", *Economics and Human Biology*, 2 (3), pp. 353-372.

———. 2010. "Property rights for the Poor: Effects of Land Titling" *Journal of Public Economics*, 94 (9-10), pp. 700-729.

———— . 2011a. "The Dynamics of Land Titling Regularization and Market Development" *United Nations University Working Paper No. 2011/88*.

———— . 2011b. "Land Property Rights and Resource Allocation" *Journal of Law and Economics*, 54 (4), pp. S329-S345.

Geoghegan, Jacqueline, Lori Lynch, and Shawn Bucholtz. 2003. "Capitalization of Open Spaces into Housing Values and the Residential Property Tax Revenue Impacts of Agricultural Easement Programs" *Agricultural and Resource Economics Review*, 32 (1), pp. 33-45.

Jimenez, Emmanuel. 1984. "Tenure Security and Urban Squatting" *Review of Economics and Statistics*, 66 (4), pp. 556-567.

Lanjuow, Jean and Philip Levy. 2002. "Untitled: A Study of Formal and Informal Property Rights in Urban Ecuador" *The Economic Journal*, 122, pp. 986-1019.

Payne, Geoffrey, Alain Durand-Lasserve, and Carole Rakodi. 2009. "The Limits of Land Titling and Home Ownership" *Environment and Urbanization*, 21 (2), pp. 443-462.

Rosen, Sherwin. 1974. "Hedonic Prices and Implicit Markets: Product Differentiation in Pure Competition", *Journal of Political Economy*, 82 (1), pp. 34-55.

United States Agency for International Development. 2010. "Urbanization in Latin America and the Caribbean: Trends and Challenges" *report No. AFP-1-00-04-00002-00*, Retrieved from http://pdf.usaid.gov/pdf_docs/Pnadu384.pdf

World Bank. 2015. *World Development Indicators*. Washington, D.C.: World Bank.

Yinger, John. 2014. "Hedonic Estimates of Neighborhood Ethnic Preferences", *Public Finance Review*, forthcoming.

Zahirovic-Herbert, Velma and Geoffrey K. Turnbull. 2008. "School Quality, House Prices and Liquidity", *Journal of Real Estate Finance and Economics*, 37, pp. 113-130.