Housing Tenure Across Countries:
The Effects of Regulations and Institutions

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Abstract

We analyze city-specific housing tenure choice in some 50 countries around the world. Countries from all regions, and all income levels, are included. Tenure is analyzed using traditional own-rent distinctions, as well as distinctions between private market and social housing. In addition to the usual economic determinants of tenure, such as income, demographic variables, and the relative prices of different tenures, we examine the role played by regulatory environments, institutions, and national culture. The model explores the extent to which the latter variables affect tenure directly, as well as through intervening variables, notably relative prices. Our basic data source for most of the housing variables and some of the collateral economic and demographic data is the Housing and Urban Development Indicators project from the United Nations Centre for Human Settlements (Habitat), and a large number of country correspondents. Collateral data are obtained from a number of other sources, including United Nations and World Bank comparative data.

1. Introduction

Countries around the world, rich, poor, and in transition, exhibit a remarkable range of forms of housing tenure. Furthermore, even controlling roughly for the level of development, and the modes of tenure commonly available, countries exhibit very different proportions of households in each tenure. For the moment, let us limit discussion to rich (OECD) countries. In Australia and in the United States, approximately 70 percent of households own their homes. On the other hand, in Germany and in Switzerland, at comparable levels of development, only about 40 percent of households are homeowners. And the differences extend beyond the commonly used but perhaps oversimplified rent-own dichotomy. For example, in the U.S. and Germany have less than 10 percent of households live in *social housing*, while a number of countries like Finland, the UK, and Austria are around 20 percent and the Netherlands is as high as 35 percent (Ball 2004).

Housing tenure has taken a higher profile recently. For example, the United Nations Millennium Development goals have only one urban development-related goal: "secure housing tenure." Research on the importance of security of tenure has a long history; see for example Jimenez (1982, 1984), but its higher recent profile among development institutions has undoubtedly been partly due to influential polemics by Hernando De Soto (1998, 2000).[1] Another recurrent tenure-related policy issue is the best way to supply housing, especially to low-income households, and in particular the relative roles of public and private sectors, as well as some "third way" of social housing.[2] In many developed countries, increasing the homeownership rate is seen as an important policy goal. Of particular interest is the emerging literature on the relationship between asset ownership, including housing and land, on the one hand and social outcomes and economic development and the other. Such methodologically diverse papers as Green and White (1997), Haurin and Haurin (2002) and Birdsall and Londoño (1997) suggest that the distribution of such assets might be an important determinant of development, and that owning one's home brings broader social benefits. On the other hand, the labor economist Andrew Oswald has received a lot of attention because he found a positive correlation between some

[1] See Angel (2001), Woodruff (2001), Gilbert (2001) and Flood (2002) for measured critiques of de Soto's work.
[2] See the debate in Galster (1997) and Yates and Whitehead (1997), for example, as well as Green and Malpezzi (2003).

European homeownership rates and unemployment rates, and suggested that transactions costs associated with homeownership could impede labor mobility and hence economic performance.[3]

Most of these policy debates are still unsettled. They would all be better informed with a sound understanding of the basic determinants of tenure choice. The existence of tenure discrepancies is widely known, at least in broad form; and people around the world take great interest in the nature of housing tenure. In addition to the large academic literature, literally hundreds of articles about homeownership, rental housing of various forms, and (somewhat less often) squatting or informal housing find their way into the broader press.[4] The details of these patterns is somewhat less well known, and very little is known about their cause, at least in the following sense. While there is a huge literature on tenure choice of individual households *within* selected countries, there is very little literature on determinants of tenure patterns *across* countries.[5] This is so despite the increasing interest in tenure as a policy variable, sometimes controversially so.

It is also broadly known that housing prices vary across countries, again even if one roughly controls for level of development. Most reasonably informed people have a sense that housing costs 'a lot' in Japan, say, and that by international standards housing is 'cheap' in many parts of the United States. In the case of housing prices there is some modest cross-country literature, some of which we describe below. To anticipate, a number of authors have pointed to what we might call institutional or regulatory features of national housing systems that affect these prices, in addition to the "usual suspects" of demographics and income. Most cross country comparisons have focused on asset prices; somewhat less has been done on rents.

Few housing analysts will disagree with the proposition that the relative price of different tenures might well affect the tenure choices of a country's citizens; thus a cross country study of tenure choice needs to examine these relative prices, rather than simply the asset price of housing per se. But few analysts would

[3] See Green and Hendershott (1999, 2002), Coulson and Fisher (2002) and van Leuvensteijn and Koning (2004) for a critique of Oswald's argument, and (mostly) contrary evidence.

[4] To give just a few examples, see *The Economist*, "The Houses that Saved the World," and "Going Through the Roof," both March 30, 2002 (on how housing prices prop up economies); Michael Moss and Andrew Jacobs, "Blue Skies and Green Yards, All Lost to Red Ink," *The New York Times*, April 11, 2004 (on the financial debacle associated with a poorly thought-out private developer's low cost homeownership project in Stroudsburg, Pa.); Michael Raveh, "United Kibbutz Movement Legalizes New Kibbutz Model," Israel Business Arena, December 23, 2003 (on how some traditionally socialist kibbutzim are now moving to homeownership); (add a few from other regions later).

[5] There are several notable exceptions, most of which we discuss below, and one of which has just come to our attention and will be reviewed in the next draft.

disagree either with the proposition that institutions and regulations[6] might affect these tenure decisions. To mention just a few: development regulations, the institutional development of the real estate finance system, how housing is taxed and subsidized, the existence of and nature of rent controls, and of course government decisions to provide housing directly to citizens rather than through private markets are all prime candidates for study.

In the last decade a rapidly growing literature has emphasized the importance of the legal structure for financial and macro economic development (see e.g. La Porta *et al*., 1998, and Claessens and Laeven, 2003, to name two papers). Well-defined property rights that are protected by an efficient judicial system appear to be conducive to growth and development. Such factors should also matter for tenure choice. Well-defined property rights protect against expropriation, and enable using property as collateral. The efficiency of the legal system in dealing with delinquent tenants clearly affects the landlord costs and hence market rents. Equally, the ability of creditors to take possession of collateral without excessive delay affects the supply of credit and hence the cost of homeownership. Recent work by Fisher and Jaffe (2003) and Casas-Arce and Saiz (2005) has started to look at the link between housing and law.

2. Defining and Measuring Housing Tenure

In much of the housing market literature households are classified as either homeowners or renters. As always there is a tradeoff between simplicity and analytical tractability, and realism. In reality there is a broad range of property rights applicable to housing. Households can own or rent structures and/or land. Usage rights can be fee simple, or leased for short or long term. Households may or may not hold title or customary rights over adjacent property and common space; they may rent from relatives or the government as well as from private landlords. The ability of landlords to evict tenants varies, as does the rights of creditors against defaulting property owners. Long-term tenants may be treated differently from recent movers. Rent may be paid in cash or in kind, periodically or in a lump sum, or some combination of the two. Lump sum

[6] When we speak broadly of regulation in this paper, we mean a whole panoply of government interventions, including some that would 'traditionally' be classified as regulations, like rent control; but also including taxes, subsidies, public provision, and the definition and enforcement of property rights. Whether we are using regulation in this broad sense or in the narrower one will be clear from context.

payments may or may not be returned, with or without interest, on leaving the unit. Tenants may or may not receive utilities, maintenance and other services as part of the package. Tenants from family or kinship groups may have different rights than strangers. There are a thousand kinds of informal tenure if there is one.

The above list is confusing but by no means exhaustive. A number of schemes can be suggested to try to categorize tenure forms, or put them in a spectrum. All legal systems, formal or customary, define some system of *property* rights. Anglo-American lawyers refer to a "bundle of sticks," that is, that any property right can be broken down into component rights. Particular tenures in particular places can be described in terms of the property rights they comprise. Table 1 illustrates one framework, based on Malpezzi (1993).[7] This simplified example identifies four basic rights that we associate with ownership: ability to sell, ability to bequeath, ability to sublet and freedom from eviction. Homeowners in most industrialized countries have those rights although they may be severely restricted in practice. Ability to sell has a different meaning in liquid markets, like in the U.S. or Sweden, than in, e.g., Japan where market transactions are much less common. Freedom from eviction is only conditional on not defaulting on your loan payments.

In a standard lease contract on the other hand all those rights associated with ownership would be absent or restricted. In some markets, like in the U.S., lease contracts are short term and landlords are free to evict as the contract expires. In other markets, e.g. Sweden, tenants have a legislated security of tenancy and landlords can only evict as a result of misbehavior. Furthermore tenants may have the right to transfer rental contracts to their children and other relatives under more or less general conditions. In many countries like Korea different types of rental tenure, distinguished by their payment schemes, co-exist side by side. In the most common form, *chonsei* ("key money"), tenants put down a large lump sum deposit, which is refunded at the end of the lease period but without interest.

In many countries “social housing” may naturally be seen as a separate mode of tenure. Developing countries, as well as developed countries, differ widely in the share and nature of publicly provided and assisted rental housing. Of course, virtually all housing of whatever tenure receives some government assistance (and virtually all is taxed in some way as well), so "publicly assisted" is surprisingly arbitrary and difficult to define

[7] Flood (2002) and Payne (2002, 2004) present similar exercises; in particular, Payne has led a research project that aims to collect such data using a common format throughout a number of developing countries.

rigorously. Publicly provided usually means that governments or local authorities own and manage rental units, but even here there are gray areas; some nonprofit housing authorities don't fit unambiguously into either public or private definitions; in socialist countries, where does rental housing provided by state enterprises fit in? And partly because of such definitional problems, a consistent data series for cross-country comparisons is difficult to construct.

Within market or mixed economies, most countries' public rental housing or council housing stock is a small percent of the total (5 percent or less). However, there are significant exceptions in some mixed economics including the Netherlands (9 percent); the U.K. (29 percent); and Hong Kong (40 percent). Many centrally planned economies have much greater shares of their housing stock as public rental; for example China's urban housing stock is well over 80 percent public or enterprise rental, and Moscow's housing, over a decade after Perestroika, remains over 90 percent public.

Even in those countries where public and council housing is not a large share of total housing, the asset value of such housing can be significant, because housing's asset value is large due to its long life, and because a disproportionate number of these units are built on expensive urban land. For example, according to unpublished World Bank estimates some 15,000 public housing units in Ghana have an asset value of about 2 percent of GNP; yet most are barely maintained and the rents collected are so low that the development corporation which owns the housing is technically insolvent. Privatization as a solution to such problems is discussed below; first a discussion of the relative efficiency of the public and private rental markets is in order.

Classifying households as either homeowners or renters, and adding social housing as a third category, there will in practice remain a residual category, including squatters and various informal housing arrangements. Often these two terms are used as loose synonyms, but more specifically squatters are those who reside on (public or private) land whose legal title is held by others; informal housing is a broader concept that comprises housing where the legal status is unclear. Furthermore there are households that don't pay cash rent but have other characteristics similar to renters. Analysis of squatters and other "informal" housing tenures is an extremely important topic, but one we defer to another paper.

Particular problems arise in the interpretation of reported rents and asset prices, when a large social sector exists. Tsenkova and Turner (2004) find a correlation between a low rent in the social sector (possibly even set as

a fraction of the tenants income) and a small share of the social housing sector. Large social (public) rental sectors are often associated with a high, almost market determined rent. They also note that the former planned economies are moving away from a large social or public sector with a low rent to either of these extremes. It is thus not easy to model either rent or share of the sector, as the correlation, in this transitory phase, is not perfect. With this dualistic view of the social sector, the price impact of regulation is probably limited – the sector is either too small or it has a rent structure that is set on market terms. Tsenkova and Turner argue that East European and some of the Asian and African countries may be exceptions to this rule of thumb, and our data are not completely clear on how these sectors are treated.

Despite these necessary qualifications, Figure 1 shows the wide range of home ownership among households in the roughly 250 cities in 65 countries covered by our study. The vertical axis is the percentage of owners in each city, and the horizontal axis is the natural logarithm of estimated per capita income.[8] The median home ownership rate among these cities is about 45 percent. We see the wide range of tenure, from over 90 percent homeowners in Manila and Tirana, to very low home ownership rates in Kumasi, Ulan Bator, and Amsterdam. Despite the emphasis on income in many studies (including ours, see below), some will be surprised to see little discernible simple correlation between the log of average income and homeownership rates. However we will see below that once we control for other variables, and allow for nonlinear tea in the relationship between income and Home-ownership, a relationship emerges.

Figures two and three are similar to figure one, except that we plot the fraction of households that rent in the private market, and the fraction of households living in social housing, respectively. As we would expect, the correlation between ownership in private renting is negative but not perfectly so. For example, Freiberg and Amsterdam are two rich cities with very low Home-ownership rates. But Freiberg contains 90% private renter households, while Amsterdam contains only 30%. Amsterdam, on the other hand, has a 50% incidence of social housing (figure three).

Figure 1 suggests a positive relation between homeownership and income. Consistent with this one would expect a generally increasing trend in homeownership as income rises. Table 2 confirms this belief for a

[8] Sources and details of variable construction are discussed further below.

small sample of countries. Despite the general upward trend in almost all countries with data, Canada, Korea and the United States have experienced (modest) short run dips in rates of homeownership over time.

3. Previous Research on Tenure Choice

The literature on housing tenure is huge, and we do not attempt a comprehensive review. Rather, in this section we summarize very selectively some literature that sets the stage for this study, using our several endogenous variables as the organizing framework.

3.1 Household studies

Most studies are based on micro data and explain differences in the propensity to own across households as a function of income, price and demographic characteristics. Most microeconometric studies of tenure choice have been carried out in developed countries; for early examples see e.g. Li 1977 and Rosen 1979 for the U.S., King (1980) for the U.K. and Brownstone et al. (1985) for Sweden. These studies usually find income and stage of the life cycle are important determinants of tenure choice. They also emphasize the importance of the relative cost of owning versus renting, which is affected by asymmetries in the tax code, especially the deductibility of mortgage interest costs.[9]

Several studies have examined tenure choice in developing countries. A common and unsurprising result for most of these studies is that the propensity to own increases with income. Lim *et al.* (1980) examined tenure choice in South Korea using a carefully drawn survey of Korean households. Limited by the econometrics of the day, they aggregated a number of tenure categories into owning and renting, and estimated an OLS tenure choice model for that simple binary choice. In particular, "renters" included a relatively small percentage of households that paid monthly rent, and a much larger percentage that had renter-like property

[9] In the U.S. the tax code has a strong effect on the relative price of tenure, and it varies with income since the chief tax break, the mortgage interest deduction, increases with income. This is popularly believed to partly explain the strong demand for home ownership for middle income Americans, however Green and Vandell (1999) and Green and Rechovsky (1999) show this is not in fact generally the case. Most households on the cusp of owning or renting will continue to take the standard deduction, hence tenure choice is largely unaffected by the deductibility of mortgage interest and property taxes. Similar tax effects had a major impact on tenure choice in Sweden prior to a tax reform in 1991 that reduced the asymmetries in capital taxation; see Brownstone et al. (1985) for some econometric evidence.

rights, but paid with a large, refundable deposit, *chonsei*, discussed elsewhere in this paper. Income is found to be a significant determinant of home ownership.

Several studies followed Lim *et al*. in examining Korea, often using similar data but tackling econometric issues as technology and computing costs permitted. For example, Kim (1992) examines several tenures separately using a hierarchical logit model to study Korea. In addition to homeownership, Korea has several types of rental tenures, distinguished by their payment schemes. In the most common form, *chonsei* ("key money"), tenants put down a large lump sum deposit as much as 40 percent of the cash value of the unit. At the end of the lease period, the deposit is refunded, but without interest. Other tenants pay periodic rent; and there are mixed forms (deposit and rent, e.g. *wolsei*). Kim finds that both permanent and current income measures, as well as demographic variables, explain tenure choice in Korea. In another Korean study, Zorn (1988) estimates a joint model of tenure choice and mobility, focusing on transactions costs as well as income and life cycle. Iincome is positively associated with owning. Transactions costs generally reduce the probability of moving, whatever the tenure.

Tipple and Willis (1991) examine tenure choice in Kumasi, Ghana using household survey data. They disaggregate tenure into ownership, renting, and "family houses" (roughly similar to renting, but not an arm's length transaction), and identify whether households share services with others or have exclusive use. Using both discriminant and logit models, they find there are more differences between sharing services or not than between owning or renting *per se*. Income, wealth and how long households have resided in the city are the primary determinants of tenure.

Another micro study is Daniere's (1992) examination of tenure choice in Cairo and Manila. She uses household data and logit models to examine owning versus renting (Cairo) renting, squatting, and legal ownership (Manila). Homeownership is strongly associated with income in Cairo, but not in Manila. In the latter city, rather, the probability of ownership hardly budges with income; but the probability of renting falls significantly and that of squatting rises. Interestingly, squatters have more in common with owners than with renters. In a similar vein, Grootaert and Dubois (1988) estimate a probit model of tenure choice in Cote d'Ivoire and find that income and life cycle variables do the bulk of explaining homeownership.

One variable conspicuous by its absence in most of the developing country studies that developed country literature suggests is the relative price of each tenure form. Constructing such a variable is possible but requires some effort (Malpezzi and Mayo, 1987 b). The user cost of a rental unit includes the periodic rent paid, plus any deposits or key money payments, plus payments for housing services not included in the rent (e.g. maintenance expenditures). User cost for owners is even more complicated, since it must account for financing, depreciation, and inflation. Modeling differences across households requires detailed knowledge of marginal tax rates and the composition of taxable income.

A number of papers have presented evidence that in some cities, large fractions of low income households own in the informal sector; as incomes rise they rent in the formal sector; and the richest again become homeowners. Yet such patterns have not been scrutinized or explained carefully. Strassman (1980) suggests that availability of services such as piped water may catalyze investment by some households and make the shift to renting such units attractive relative to current owners of informal units without such amenities. In a very stylized version of such a world we would observe the lowest income households owning very low quality housing, perhaps in the informal sector or with little tenure security; past some threshold, households would begin into a higher quality rental submarket; finally, at higher incomes and (perhaps) overcoming financial constraints, households would be able to purchase such housing.

3.2 Cross-metropolitan studies

Several studies have examined tenure choice across metropolitan areas within a country. Blackley and Follain (1988) and Malpezzi (1996) are representative examples of such studies. Blackley and Follain (1988) examine the proportion of homeowners in U.S. metropolitan areas. Key variables include [more here]. They find [more here].

Malpezzi (1996) develops a model wherein tenure choice, renters, and housing asset prices are determined jointly. The model is estimated using U.S. Census and other data for 60 large MSAs. This study focuses on the efforts of development regulators on prices and tenure, and one key finding is that overly stringent regulations lower the rate of homeownership, primarily through indirect effects of prices. Specifically, past a certain threshold, micro stringent regulation drives up rents and asset prices, but the effect on the latter is

much stronger. Because homeownership rates are increasing in rents, and decreasing as asset prices rise, the net effect is to lower homeownership rates. In one simulation exercise, moving from the first quartile of the regulatory indexes to the third quartile lowers homeownership rates by nine percentage points. In fact, the model described in Malpezzi (1996) is the starting point for our model below.

Several studies examine tenure in cross country contexts. (Discuss Malpezzi and Mayo (1987)). Malpezzi (1993) estimates some very simple regression models and finds homeownership rates to be quadratic in both percent urban population and GNP per capita, but the effect is weak. Angel (2001) uses data from the 1993 round of the World Bank/UN Housing and Urban Development Indicators. He estimates several simple OLS regressions explaining homeownership rates (two alternative models), the percentage of unauthorized housing, and squatter housing, in turn. The first homeownership model includes income, city population growth, household size, construction costs, land costs, the ratio of mortgage loans outstanding to all loans, and the Angel-Mayo enabling index. The enabling index, described in more detail below, is a scalar measure of the housing policy environment. Only the mortgage ratio and the enabling index are significant, by conventional standards; this may be due to (for example) inter-correlations among variables, e.g. between the enabling index and income. Also, Angel did not consider the endogeneity between homeownership rates and the size of mortgage credit markets. In a second model, Angel adds a price/rent ratio (but drops other variables except for income and factor costs). He finds that when price/rent ratios rise, homeownership rates fall, a point which we will emphasize in our own model.

Fisher and Jaffe (2003) examine the determinants of homeownership rates in over 100 countries, as a function of GDP per capita, growth rates of GDP per capita, urbanization (levels and rates of change), government spending, inflation rates, demographic variables and "mandatory finance." The latter is a dummy variable – taken from a World Bank study by Dübel (2000) – indicating countries with mandatory savings-for-house-purchase schemes, like the German Bausparkassen or Singapore's Provident Fund. Fisher and Jaffe estimate a series of OLS models and find that GDP per capita consistently matters, albeit in quadratic form; more urbanized countries have lower homeownership rates; demographics seem to matter; and households in countries with mandatory finance systems are more likely to be homeowners.

In addition to the aforementioned regressions, Fisher and Jaffe also present mean homeownership rates by a series of country categorizations: region, legal origin, climate, income category, political system and linguistic diversity. *t*-tests generally support significant differences between groups, and a separate regression model combining legal origins and several variables from the other regression models performs well. The strongest legal system results are that ceteris paribus German-based legal system countries have lower homeownership rates, compared to English-based; socialist-based systems imply higher homeownership rates.

In many respects the study by Chiuri and Jappelli (2000) bridges the micro and cross-country literatures. Their impressive study uses the Luxembourg Income Study collection of household-level surveys from one to four different survey years from fourteen OECD countries. This yields a panel of some 400,000 observations of households over time and across countries. They focus particularly on two determinants of homeownership: demographics (specifically age of household head), and financial policy. Other determinants – rent policy, say, or interest rates – are assumed to be picked up by country-specific and time fixed effects. Each and every country exhibits a quadratic pattern of age – low rates around age 25, peak homeownership rates in middle age, and declines again in old age. But the patterns differ substantially. Australia, Canada and the UK have especially rapid rises to peaks circa age 40; while the peak in Italy or Spain comes later in life. Furthermore, the decline in old age is modest in Germany, Spain and France, and especially pronounced in Sweden, the Netherlands, and (to some extent) the UK.

Chiuri and Jappelli next examine the effects of the judicial system on down payment requirements (equity requirements) and the ratio of mortgages to GDP. Judicial performance is measured by variables like the duration of foreclosure proceedings, and an assessment of the legal system from a well-known country risk agency. In general they find that more efficient legal systems have a higher fraction of mortgages/GDP, and lower downpayment ratios; systems with more rapid foreclosure have thicker mortgage markets and lower equity requirements. Furthermore when they estimate panel data models they find that the countries with better-developed mortgage markets do indeed tilt first-time homebuying towards younger households.

Gwin and Ong(2004) is the most recent paper that analyzes the determinants of home ownership rates among countries. The basic data used by the paper is identical to ours, i.e. UN Habitat housing indicators

data for 1993 and 1998. They estimate both OLS regressions for 1993 and 1998 samples and the panel data covering the two years. They note that most of the explanatory variables are correlated with each other and that only the relative cost of owning to renting and the interest rate are the two variables that are not significantly related with income or its growth rate. As a result, they drop the 'rule of law' variable that is meant to capture institutional differences.

Their main finding is that there is a significant difference between high income countries and the rest of the sample. Specifically, the higher cost of owning relative to renting as well as higher interest rate lead to lower home ownership rate while higher income growth is associated with higher home ownership rate in high income countries, but none of these variables proved to be significant in the lower income countries. The R squared value was 0.89~0.94 for the high income subsample, but it was 0.08 for the low income subsample. They also find that cultural differences may not be important in explaining variations in home ownership rate across countries. They attribute "ostensibly the higher ownership rates in some countries to government assistance programs, subsidies, subsidies and differences in definitions of formal ownership" (p.18).

3.3 The Impact of Regulations and Institutions

There is a substantial literature on the effects of regulations on housing markets, and a smaller literature on the closely related issue of institutions. Many case studies have been undertaken such as Pollakowski and Wachter (1990), Hannah, Bertaud, Malpezzi and Mayo (1989), Hannah, Kim and Mills (1993) and Muellbauer (1992). However, this paper we are particularly interested in studies that try to measure in some sense regulations and institutions related to housing and real estate markets, especially across markets and across countries. Early studies along these lines in the U.S. include papers that measured the stringency of land use regulation such as Shilling, Srivansan and Guidry (1991), Segal and Srivansan (1985), Hoben and Black (1985), and Rose (1989a,b). Across countries, closer to the intent of this study, an early effort was Malpezzi (1990) although that paper used a measure of general economic policies due to Argawala (1983) that focused on things like exchange rate policies, interest rate policies, labor market policies and the like. A later study by Malpezzi and Ball (1993) measured the stringency of rent control regulations across countries using a straight forward

eight element index. More recent research by Angel and Mayo (1996) and especially Angel (2000) constructed measures of the regulatory environment for housing using data from an earlier round of the indicators research.

Interestingly, the current round of Housing and Urban Development Indicators downplayed though not eliminated questions related to the regulatory environment. This is despite prior research that suggests this environment is an important determinant of market conditions. Malpezzi (1990) found that the house price to income ratio was an increasing function of the Agrawala Index, i.e. countries that had economic policies that were quite divergent from market orientations had much higher housing prices, which Malpezzi and others have argued is a measure of the market's distortion. Malpezzi and Ball (1993) found that the more stringent the rent control regime, the lower the rent to income ratio but the higher the asset price of housing, also consistent with the world in which supply constraints drive up asset prices. This interpretation is strengthened by the fact that Malpezzi and Ball also found evidence that the supply of housing overall is measured by the share of housing investment in GDP declines as rent control stringency increases. Malpezzi and Ball were careful to point out that this might be both a direct effect of the rent control regulations per se, but also it is plausible that countries that have stricter rent control regulations may also have more stringent development regulations in other parts of the market although this hypothesis has not been carefully tested yet.

Other papers such as Renaud (1990) and Buckley (1996) have examined the effects of credit markets. Other studies such as Buckley and Gross have examined the measurement of the state of the legal system and property rights. Of course several of the recent tenure studies we examined above, notably Fisher and Jaffe, and Casas-Arce and Saiz, focus on such variables as well.

4. A Simple Models of Tenure Choice and Housing Prices

As a background to the empirical analysis we will formulate a simple model of the simultaneous determination of tenure and housing prices. The model will be expressed in terms of two modes of tenure, renting and owning, but the generalization to more tenure modes is obvious. We denote asset prices of rental and owner-occupied houses by P_R and P_O, respectively. Corresponding rental costs are given by $R_R = \theta_R \cdot P_R$ and $R_O = \theta_O \cdot P_O$, where θ_R and θ_O can be understood as discount factors that translate asset prices into housing costs, reflecting costs of funds, tax and subsidy rules, and price and interest regulations. For empirical purposes one typically has data on R_R and P_O. Data on P_R are typically unreliable due to scarcity of transactions, and R_O can only be inferred from P_O based on assumptions on interest rates and other parameters.

Households choose tenure based on relative costs and other factors X_T including income, demographics, and regulations. Assuming log-linearity here and throughout we may write the fraction of owners T as

$$\log T = \alpha_R \log \theta_R \cdot P_R - \alpha_O \log \theta_O \cdot P_O + \alpha_X X_T \quad (1)$$

A natural simplification is to let tenure choice depend on the ratio of rental costs, i.e. to assume $\alpha_R = \alpha_O$. Per-capita demand of rental and owner-occupied housing is given by

$$\log Q_O = - \beta_O \log \theta_O P_O + \beta_{XO} X_O$$

$$\log Q_R = - \beta_R \log \theta_R P_R + \beta_{XR} X_R,$$

where X_O and X_R analogously denote all other determinants of demand apart from price.

Equilibrium prices depend on the supply of the two types of housing. In an unregulated long-run equilibrium it is natural to think of owner-occupied and rental housing as very close substitutes in supply, implying that there is only a single asset-price of housing ($P_O = P_R = P$). Total supply is then given by

$$\log Q_S = \gamma_P \log P + \gamma_S X_S,$$

and in equilibrium

$$Q_S = T \cdot Q_O + (1-T) \cdot Q_R.$$

This gives P as a function of the X vectors and the θ parameters. Parameter changes, e.g. a reduction in the deductibility of interest payments for home owners, have a direct effect via conditional demand (the intensive margin) and an indirect effect via tenure choice (the extensive margin), presuming that conditional demand for housing differs between home owners and renters at the extensive margin. In principle the net effect may be ambiguous if the demand difference at the extensive margin is sufficiently big. As an example, an increase in θ_R, e.g. due to reduced interest subsidies for landlords, would decrease conditional demand for rental dwellings, but may increase aggregate demand if those households that switch into owner-occupancy demand a larger quantity of housing than they did as renters. Hence, the net effect on P is ambiguous.

An alternative assumption would be to treat owner-occupied and rental housing as different goods from the production side, e.g. due to regulations or the fact that they are physically different structures, one- vs. multi-dwelling buildings. Supplies are then given by

$\log Q_{SO} = \gamma_{PO}\log P_O + \gamma_{SO}X_{SO}$,

$\log Q_{SR} = \gamma_{PR}\log P_R + \gamma_{SR}X_{SR}$,

and there are two equilibrium equations[10]

$\gamma_{PO}\log P_O + \gamma_{SO}X_{SO} = \alpha_R\log\theta_R \cdot P_R - \alpha_O\log\theta_O \cdot P_O + \alpha_X X_T - \beta_O\log\theta_O P_O + \beta_{XO}X_O$

$\gamma_{PR}\log P_R + \gamma_{SR}X_{SR} = -\alpha_R\log\theta_R \cdot P_R + \alpha_O\log\theta_O \cdot P_O - \alpha_X X_T - \beta_R\log\theta_R P_R + \beta_{XR}X_R$.

or rewriting in terms of R and P_O and introducing simplifying notation

$\varepsilon_O\log P_O = \alpha_R\log R + A_O$

$\varepsilon_R\log R = \alpha_O\log P_O + A_R$,

where ε and A are implicitly defined above. Solving gives

$$\log R = \frac{\alpha_O A_O + \varepsilon_O A_R}{\varepsilon_R\varepsilon_O - \alpha_R\alpha_O} \tag{2}$$

$$\log P_O = \frac{\alpha_R A_R + \varepsilon_R A_O}{\varepsilon_R\varepsilon_O - \alpha_R\alpha_O} \tag{3}$$

Applying these equations to specific variables one can express the impact of, e.g., a change in income as the sum of impacts on tenure choice and on conditional demands for rental and owner-occupied housing:

$$d\log R / d\log y = (\alpha_O\beta_{XOy} + \varepsilon_O\beta_{XRy} - \alpha_{Xy}(\gamma_{PO} + \beta_O))/(\varepsilon_R\varepsilon_O - \alpha_R\alpha_O)$$

This illustrates that the effect on R is ambiguous to the extent that ownership increases with income ($\alpha_x > 0$).

[10] Disregarding constants and making the approximation that $\log(T) = \text{constant} - \log(1-T)$

Data

Our basic data source for most of the housing variables and some of the collateral economic and demographic data is the Housing and Urban Development Indicators project initially begun by Stephen Mayo and associates at the World Bank, notably Shlomo Angel, as well as a number of collaborators from the United Nations Centre for Human Settlements (Habitat), and a large number of country correspondents. The project as a whole is described further in Angel, Mayo and Stephens (1993), Malpezzi and Mayo (1997), Angel and Mayo (1996) and Angel (2000). The Housing and Urban Development Indicators project is an attempt to develop more or less comparable basic indicators on housing, land and real estate and related variables broadly analogist to the comparative data found every year as an annex to the World Banks World Report (see World Bank 2003 a, b).

There are broadly three "generations" of the Indicators data. The first data set was collected in the early 1990's and comprised more or less data from the year 1990 (see Angel and Mayo 1996, and especially Angel 2000 for details). In the 1990s the World Bank largely withdrew from the Urban Indicators exercises, and the second wave of data was collected in 1993 under the aegis of the UNDP (see Flood 1997). The third generation of data was collected in 1998, also by UNDP. The data for 1993 and 1998 data sets can be found at UNDP's "Global Urban Observatory" website, at http://www.unchs.org/programmes/guo

The earlier data can be found in written form in Angel 2000 as well as downloaded from http://www.bus.wisc.edu/realestate. We will use some data from each of the three generations, but will focus primarily on the 1993 data. The three waves of data do not really comprise a very good panel since variable definitions change (notably for tenure) and the set of cities, while growing over time, changes significantly. Also the earliest version of the data was more focused on measuring housing and urban development policy related variables; the latter versions focused more straightforward outcomes data.

Given our focus on a single cross section, we chose the "1993" cross section for our basic sources on tenure and related housing variables, rather than the "1990" or "1998," for several reasons. While none are perfect, we think the 1993 cross section has one of the best sets of tenure variables (including information on social housing). It also has about four times as many cities as the 1990 panel; and it is reasonably close to the data collection period of a number of economic policy and institutional variables. We do use the 1990 panel for

several specific housing policy variables that were created by Angel and Mayo; later panels, unfortunately, do not collect much information of this type.

We also make use of several collateral datasets for both economic conditions and policy and institutional variables that are country, not city, specific. These are specified below, and naturally each country's values are imputed to the cities located in that country.

Tenure Measures

As mentioned earlier, our tenure measures are city-specific and are taken from the 1993 Housing and Urban Development Indicators database. The majority of studies of housing tenure focus on home ownership rates. Our first housing tenure variable, OWNED, follows in this tradition, by measuring the percentage of households owning their homes in each city. We also investigate an alternate variable, PRIVR, the percentage of households who rent their homes in the private market. In the U.S. and other developed countries literature, these two variables are usually considered the obverse of each other. However in many countries there are a range of other tenure forms, such as squatting, and "renting" without the payment of cash grant. In this draft we neglect measures of informal tenure, and focus on the percentage of households living in social housing, SOCI. As discussed elsewhere, all of these definitions must be considered somewhat fuzzy. Different bundles of property rights attach to each form of tenure in different countries.

Prices and Rents

For our measure of price we initially focus on the house price-to-income ratios, and the rent-to-income ratio, from the 1993 Urban Indicators data. Renaud (1990) and Malpezzi (1990, 1999) explain the rationale behind using these ratios in place of price levels per se, but the use of such ratios is especially handy when undertaking cross-country comparisons. In preliminary regressions we discovered that these two price variables were correlated and yielded imprecise estimates. As an alternative, we calculated their ratio, and we interpret this as a gross capitalization rate. We use this cap rate as our measure of relative tenure prices.

Our prior belief is that tenure depends on the relative price of owning and renting, but we also believe that the relative price of owning and reading can be affected by the proportion of households in each tenure.

Therefore we treat our gross cap rate as endogenous, and estimate the models below using an instrumental variable constructed using a set of exogenous variables. Sensitivity tests (not presented here) show that results are not terribly sensitive to whether the original cap rate or the instrumental variables version is used.

Measuring "Institutions" and "Regulation"

One of the focal points of this paper is the construction of indexes that reflect institutional and regulatory regimes in different markets. Examples of the kinds of regulations that are potentially of interest include rent controls, land use and zoning regulations, infrastructure policies, and building and subdivision codes. We have several candidate variables that purport to measure urban development regulation.

One set of variables already mentioned is based on a set of measures from the early housing indicators data collected by Angel and Mayo and their associates. Angel and Mayo (1996) constructed a number of indexes measuring different aspects of the policy environment for housing and real estate. We focus on three aggregate indexes, measuring (1) regulatory stringency for housing development and management, (2) the policy environment for housing and real estate finance, and (3) the state of property rights. Each index is comprised from a set of questions summarized in Angel and Mayo (1996), and normalized so that higher values of the index are "better," in the following sense. Stronger property rights are generally preferred, more developed real estate financial regimes are desirable, and less stringent regulation generally improves the supply responsiveness of the housing market. We note that this is not strictly true in all cases; for In the event, our prior is that the property rights and finance indexes will be most strongly related to tenure; and the regulatory index will affect prices.

There are several sources of data related to economic policies more broadly. One source we will use extensively, especially in this first draft, is the so called Lex Mundi project which collects data from a network of law firms on the nature of property rights and contract enforcement procedures across countries. The best introduction to the data is Djankov, La Porta, Lopez-de-Silanes and Shleifer (2004). Several recent papers such Acemoglu *et al.* have argued that the colonial history of developing and transition countries makes it substantial difference in how property rights and institutions are developed. Using the categorization from the Lex Mundi project, we create dummy variables for countries which are based on Anglo American law, French law,

Scandinavian legal systems, and socialist systems. Generally we will use the largest category, French-based countries, as the base case in our analyses.

The Lex Mundi exercise also collected data on the number of procedures required to foreclose on a property, as well as the time span required. We experimented with both variables, and the results below focus on the number of procedures.

But

It is well known that different countries have different approaches to the proper balance of private markets and public provision of certain goods. Two proxy this phenomenon, we incorporate the percentage of GDP spent by the central government. Another candidate variable is the percentage of government spending devoted to transfer payments. Our prior is that a predisposition to subsidies and transfers will signal a government (or society) that favors social housing over purely private markets. We can think of these two variables as signaling the exogenous size of the social sector, $\underline{Q_S}$, from above.

We have also tried to construct variables based on the supply of mortgage credit. One variable is simply the stock of mortgage credit divided by GDP; another is mortgage commitments averaged over several recent years divided by GDP. Unfortunately this data is not available for a large sample of countries, so we omit it for the time being. Broader coverage can be gleaned for general financial variables. We include one common measure, the stock of M2 to GDP from World Development Indicators.

To the extent households may view purchasing a house as hedge against inflation, we also include a measure of the average inflation rate over the period 1980 to 1998. We construct this average by regressing the log of the CPF against a time trend. We also construct a measure of inflation volatility that is the root mean squared error from these regressions.

Other Variables

Income is measured by metropolitan per capita product (levels and changes). The UNCHS database does not directly provide per capita income or product for each city, but aggregate measures are provided for a number of cities. We put these better gets out of per capita basis, then regress the result on a set of exogenous determinants of income per capita, including demographic variables such as age profiles, city population, population growth, as well as a number of macroeconomic variables and regional dummies. In the event we

were able to explain about 75% of the variation in our original variable, and construct what we feel is a reasonable instrument for city income per capita. In most of the modeling below we take the natural log of this variable, and also add a quadratic term.

As already mentioned, demographic considerations captured by the level of city population and its growth, and the age profile of the national population. Geographic variables are from Gallup and Sachs (2000). In particular, our density measure for each country is based on density calculated using world-wide 5 minute (very roughly 6 miles square) grids. It is the average density each resident observes in the 5 minute grid they live in. (So for example Australia is surprisingly dense by this measure, compared to its simple average density, because almost the entire population lives within a short distance of their coast).

Note that while our basic tenure price variables are city specific, for many variables, especially those related to the aggregate economy and institutional and regulatory features, we match the relevant country data up to our metropolitan level observations.

Dealing with the Endogeneity of Prices and Tenure

Our maintained hypotheses include relationships between house prices and rents, on the one hand, and tenure, on the other. But just as relative tenure prices will (we believe) affect tenure, it is certainly possible that demand for one tenure form relative to another can affect relative prices (rents vs. house prices).

Our strategy is to estimate some simple two-stage least squares models. We impose the following priors. We maintain that the physical geography, and regulatory environment, affect prices. Thus, rent control, whether a country is landlocked, and the average density of the country enter the rent and house price equations, but are omitted from the tenure choice equation. When we discovered that the rent and house price variables yielded imprecise estimates (whether in original form or when instrumented), we constructed the gross cap rate discussed above and constructed an instrument for that ratio. It is the latter variable that we present in our regressions below.

Descriptive Statistics

Table 3 presents summary statistics on key variables. First, note when we combine data from all sources, including three waves of the Indicators project, we have well over 300 cities in over 100 countries. The city is the unit of observation for this study – country level data, notably from the World Bank's World Development Indicators, and the Lex Mundi project, are assigned to each city as appropriate. But despite the large number of putative observations, once we prepare to estimate multivariate models that include data from more than one Urban Indicators wave, the number of usable observations drops sharply. That's especially true when using a variable like percent of housing that's "social," since there are many missing observations even within a wave.

Still, taking the figures in Table 3 at face value, the average homeownership rate is about 45 percent. That's broadly consistent with previous cross-country data such as Malpezzi (1993) or Linn (1980). Average ratios between house prices and incomes are around 6 or 7 (high by U.S. standards, except in larger coastal markets like New York or Los Angeles), and average rent to income ratios are about 0.2. The average inflation rate, 25 percent, is blown up by some extreme observations; the median is 10 percent.

Tables four five and six presents more statistics, in a more detailed breakdown, on a smaller number of key variables. Our three tenure variables are presented, as well as price to income ratios and rent to income ratios, and the ratio of these ratios, the gross capitalization rate. We also present the city's predicted per capita income using the regression approach described above.

We leave detailed study of the tables to the reader but we point out a few interesting facts here. Regionally the percentage of homeowners is actually lower in developed countries than in most of the developing regions. Social housing is higher in developed countries than in developing regions, but in the transition economies of eastern and central Europe and the former Soviet Union, roughly 40% of households still live in social housing as of the time of data collection. On the other hand these transition economies have the lowest rent income ratios and by far the lowest cap rates. Turning to table five we note that countries in the socialist and French legal traditions have the highest rate of Home-ownership followed by Scandinavians. The German legal tradition is one of comparatively low Home-ownership rates. Also notes that the number of observations from "German" and "Scandinavian" countries is small, and in fact once we account for missing variables all of our regression models below rely on cities in either the English, socialist, or French legal traditions.

Model Results

Here we present our first results. We reiterate that these results are especially preliminary. In particular, we have estimated each equation using OLS, despite the potential for endogeneity problems, discussed further in our conclusions. As we are still working on improving the estimation procedures, we ask that these first results be viewed as especially preliminary.

Results from a Simple Model of Price Determination

This paper presents our second round of estimation, but results are still preliminary. In particular we have yet to estimate models for informal are squatter housing, and we wish to test these models using robust estimators. With these caveats, Table 7 presents our models of tenure choice. First we discuss the homeownership equation.

Our expectation is that as rents increase, homeownership rates rise, ceteris paribus; and that as house prices rise, controlling for rents and other determinants, homeownership rates fall. This implies that the correlation between Home-ownership and the cap rate should be positive. In fact in the first column of table seven we find no significant relationship between these two variables, and the insignificant coefficient has the

wrong sign. We also find no significant coefficients for our two income variables, although when an F-test is performed for their joint effect, the probability of observing an F this large if there were no effect is about one in eleven. The inflation rate is a positive determinant of the homeownership rate, consistent with the notion of widespread Home-ownership as a potential inflation hedge. In preliminary analysis we discovered a consistent quadratic relationship between the number of procedures required to enforce a mortgage contract and Home-ownership. Loosely, it appears that if one has too few procedures that may signal a lack of attention to property rights, but if one has too many that may signal a difficult regulatory environment. The degree of financial depth and the economy, as proxied by the ratio between M2 and GDP, is positive but not quite significant. One of our two variables that proxy the degree of central government intervention in the economy is significant, and both are negative. It's hard to know if this represents causality, or if perhaps there is simply an association between a propensity to own property and a tendency for other aspects of the economy to remain marginally private. Interestingly, once other variables are controlled for, the base case French, socialist, and Scandinavian countries have broadly similar Home-ownership rates. At least we cannot differentiate among them on the basis of this data. But countries with English legal systems appear to have higher Home-ownership rates, ceteris paribus.

Next we turn to the equation for private wedding. Here are most basic variables of the cap rates and income are more significant. However the instrumental variable for kappa rate actually has the wrong sign, at least if we examine the relative price of tenure as the presence of a liquidity constraint. It is perhaps less surprising that macro variables such as the inflation rate and M. two GBP, and are contractual variables affect renting less, except that we would expect the percentage of private renters to still somewhat be the obverse of the percentage of homeowners. Our government intervention variables are both significant; broadly countries that spent more of their GDP on central government consumption are more likely to have a private rigors, whereas countries where if higher fractions of that government spending devoted to transfers are less likely to have private letters. Once again, the English legal tradition stands out: households are less likely to be private letters in those countries than in their French socialist or Scandinavian counterparts.

Finally we turn to our simple model for the percentage of social housing. In some respects this model performs best of all, with the highest r-squared and the most significant coefficients. Broadly most variables perform as expected. Higher cap rates lead to lower levels of social housing. Social housing increases in

income, but at a decreasing rate. Countries with deeper financial systems are more likely to have a social housing, ceteris paribus, and countries with broader central government intervention as measured by spending, and specifically higher levels of transfers, are also more likely to have higher rates of social housing. Once these variables are controlled for, it is still perhaps somewhat surprising that in these preliminary regression and the legal tradition doesn't seem to matter.

Conclusion

Our still preliminary results should be viewed with some caution. In addition to examining informal modes of tenure, we will undertake additional regression diagnostics and, if appropriate, robust estimators. While this is to our knowledge the first cross-country study to focus directly on the relationship between institutions, housing prices and tenure choice, all at once, it is broadly consistent with prior cross country studies like Fisher and Jaffe, as well as the U.S. and other literatures that suggest (1) tenure depends on relative prices of renting and owning, and (2) regulation affects rents and house prices.

Clearly much remains to be done along the lines laid out in this paper. Next steps for extending this work include further refinement of the institutional and regulatory measures, including additional work on data reduction issues. Over a longer run, an obvious extension is to collect better data on regulatory practices across cities and over time. Further spatial disaggregation would be desirable, e.g. studying the effect of regulation on central city vs. suburban prices.

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Table 1: Stylized Disaggregation of Bundles of Tenure Rights, Different Tenures and Countries

Property Rights	Homeownership United States	Private Rental United States	Private Rental Egypt	Chonsei Korea
Freedom from Eviction	Yes	Duration of the lease (commonly 1 year)	Indefinite, in practice	Duration of the lease
Able to Sublet	Yes	If landlord approves	Yes, in practice	No
Nominal Housing Costs	Most mortgages roughly fixed, maintenance & taxes increase with inflation	Rise w. inflation, as lease renews (but discounts for long-term tenants)	Yes	Rise with inflation
Real Housing Costs	Fall with inflation	Roughly fixed, in long run	Fall with inflation	Rise with inflation
Ability to Bequeath Unit	Yes	No	Yes, in practice	No
Ability to Sell Unit	Yes	No	No	No
Obtain Capital Gains	Yes	No	Not directly (but landlords sometimes pay tenant to leave)	No
Notable Risks	If prices decline, high leverage can lead to defaults and large losses	Utility costs are often passed through, and energy prices can be volatile	Large up-front "key money" payments	Unexpected inflation during tenure can reduce real value of deposit

Table 3: Summary Statistics on Key Variables

	Mean	Standard Deviation	Number of City Obs.	Raw Data Varies by	Raw Data Source
Homeownership Rate	0.45	0.231	244	City	UNCHS
Percent Private Rental Housing	0.31	0.194	217	City	UNCHS
Percent of Social Housing	0.203	0.234	127	City	UNCHS
Rent/Income	0.199	0.149	206	City	UNCHS
House Price/Income	6.71	5.51	208	City	UNCHS
Gross Capitalization Rate	0.04088	0.0327736	190	City	UNCHS
Per Capita Income (U.S.$)	6,208	16,177	136	City	UNCHS
Metro Population (1000s)	1,670	2,483	280	City	UNCHS
Inflation Rate	0.259	0.376	300	Country	World Bank
M2 / GDP (%)	41.5	28.2	289	Country	World Bank
Percent of Population LE 15	30.9	10.6	326	Country	World Bank
Percent of Population GE 65	7.5	4.9	326	Country	World Bank
English Legal Heritage	0.244		327	Country	Lex Mundi project
Socialist Legal Heritage	0.162		327	Country	Lex Mundi project
Scandanavian Legal Heritage	0.012		327	Country	Lex Mundi project
Property Rights Index	60.5	26.1	164	City --> Country	Angel & Mayo
Real Estate Finance Index	53	25.2	164	City --> Country	Angel & Mayo
Development Regulation Index	36	20.3	164	City --> Country	Angel & Mayo
# of Procedures to Enforce a Contract	23.3	9.8	274	Country	Lex Mundi project
Central Govt Spending on Transfers (% of Spending)	40.3	19.6	235	Country	World Bank
Central Govt Spending/GDP	15.2	5.4	325	Country	World Bank
Avg Density Experienced by Natl Avg Resident	569.4	979.8	311	Country	Gallup & Sachs w. Mellinger

Notes: inflation from regression of log price level against year for each country; volatility is RMSE from same regression.
In regression models, French legal heritage was the omitted category.
There were no countries with German legal heritage left in dataset after other variables constructed.
Angel & Mayo indexes were originally associated with one city in each country. This value was assigned to all cities in that country.

Table 4: Univariate Statistics on Key Variables, By Region

	Percent Homeowners	Percent Private Renters	Percent Social Housing	City Median Rent-to Income Ratio	City Median House Price-to-Income Ratio	Gross Capitalization Rate	City's Predicted Income Per Capita
Developed Countries							
Mean	0.278	0.389	0.222	0.209	4.5	0.049	17,674
Median	0.200	0.380	0.215	0.200	4.6	0.041	18,006
Third Quartile	0.410	0.500	0.240	0.220	4.7	0.058	18,580
First Quartile	0.180	0.200	0.160	0.190	3.8	0.040	17,016
Max	0.720	0.950	0.560	0.340	7.9	0.107	20,930
Min	0.020	0.050	0.000	0.130	1.8	0.027	13,864
N	45	45	30	32	33	32	29
East Asia & Pacific							
Mean	0.607	0.115	0.148	0.203	11.5	0.031	672
Median	0.600	0.130	0.060	0.185	9.9	0.031	606
Third Quartile	0.810	0.180	0.070	0.210	10.4	0.040	863
First Quartile	0.570	0.040	0.050	0.090	5.5	0.024	438
Max	0.960	0.220	0.550	0.550	37.7	0.053	1,393
Min	0.000	0.020	0.010	0.050	4.0	0.002	237
N	13	11	5	18	9	9	18
East/Central Europe & FSU							
Mean	0.495	0.263	0.436	0.054	9.6	0.008	3,410
Median	0.525	0.255	0.400	0.040	7.7	0.004	3,074
Third Quartile	0.715	0.440	0.760	0.070	11.0	0.013	4,885
First Quartile	0.255	0.060	0.120	0.030	5.6	0.003	945
Max	0.970	0.670	0.850	0.120	30.0	0.021	7,467
Min	0.050	0.010	0.030	0.020	3.6	0.001	882
N	40	26	27	30	33	29	33
Latin America/Carribean							
Mean	0.580	0.248	0.019	0.168	3.5	0.055	2,227
Median	0.520	0.230	0.010	0.140	2.6	0.054	1,802
Third Quartile	0.690	0.300	0.030	0.210	3.8	0.075	3,329
First Quartile	0.490	0.130	0.010	0.130	2.4	0.034	1,532
Max	0.950	0.530	0.050	0.520	12.0	0.160	3,599
Min	0.310	0.030	0.000	0.030	1.2	0.012	622
N	41	38	9	37	46	36	35
Middle East/North Africa							
Mean	0.438	0.377	0.087	0.258	9.8	0.036	1,019
Median	0.505	0.350	0.035	0.200	6.5	0.042	748
Third Quartile	0.640	0.540	0.180	0.400	16.0	0.048	848
First Quartile	0.170	0.250	0.010	0.110	3.9	0.018	530
Max	0.790	0.590	0.300	0.690	39.0	0.074	4,082
Min	0.070	0.180	0.000	0.010	2.3	0.001	82
N	18	17	10	18	18	17	18
South Asia							
Mean	0.526	0.209	0.096	0.208	6.7	0.042	521
Median	0.520	0.230	0.040	0.230	7.0	0.045	441
Third Quartile	0.610	0.250	0.100	0.320	8.0	0.060	527
First Quartile	0.390	0.150	0.010	0.050	4.6	0.014	336
Max	0.780	0.540	0.640	0.490	13.3	0.089	1,482
Min	0.320	0.010	0.010	0.010	0.3	0.005	272
N	19	17	19	18	19	17	18
Subsaharan Africa							
Mean	0.407	0.355	0.138	0.257	6.9	0.047	601
Median	0.420	0.340	0.070	0.250	6.1	0.037	386
Third Quartile	0.520	0.470	0.100	0.400	8.8	0.058	660
First Quartile	0.270	0.210	0.030	0.130	3.7	0.027	301
Max	0.920	0.740	0.570	0.580	24.0	0.289	2,366
Min	0.040	0.040	0.000	0.010	1.6	0.004	188
N	65	63	27	59	56	50	59
All Countries							
Mean	0.450	0.310	0.203	0.197	6.7	0.041	3,706
Median	0.450	0.270	0.100	0.170	5.1	0.040	901
Third Quartile	0.610	0.460	0.240	0.260	8.0	0.056	3,329
First Quartile	0.260	0.170	0.030	0.100	3.5	0.019	435
Max	0.970	0.950	0.850	0.690	39.0	0.289	20,930
Min	0.000	0.010	0.000	0.010	0.3	0.001	82
N	241	217	127	212	214	190	210

Table 5: Univariate Statistics on Key Variables, By Lex Mundi Legal Tradition

	Percent Homeowners	Percent Private Renters	Percent Social Housing	City Median Rent-to Income Ratio	City Median House Price-to-Income Ratio	Gross Capitalization Rate	City's Predicted Income Per Capita
English Legal Tradition							
Mean	0.370	0.318	0.127	0.256	6.5	0.043	3,876
Median	0.310	0.250	0.060	0.210	5.1	0.040	517
Third Quartile	0.520	0.500	0.155	0.340	8.0	0.056	2,178
First Quartile	0.200	0.150	0.030	0.180	4.5	0.031	313
Max	0.790	0.760	0.540	0.690	17.8	0.107	19,366
Min	0.040	0.040	0.010	0.010	0.3	0.004	188
N	63	63	40	66	71	64	45
Socialist Legal Tradition							
Mean	0.485	0.276	0.448	0.109	7.7	0.012	2,818
Median	0.520	0.270	0.380	0.065	7.2	0.008	1,482
Third Quartile	0.700	0.445	0.730	0.120	8.9	0.019	4,885
First Quartile	0.270	0.055	0.120	0.030	5.4	0.003	889
Max	0.880	0.670	0.850	0.550	17.0	0.053	7,467
Min	0.050	0.010	0.090	0.020	3.6	0.002	444
N	35	24	21	34	29	27	39
French Legal Tradition							
Mean	0.500	0.273	0.153	0.171	4.2	0.048	3,517
Median	0.500	0.265	0.150	0.150	3.5	0.048	1,408
Third Quartile	0.620	0.345	0.240	0.210	5.2	0.059	3,329
First Quartile	0.430	0.180	0.010	0.120	2.5	0.031	644
Max	0.960	0.660	0.560	0.520	17.4	0.098	19,227
Min	0.020	0.020	0.000	0.010	1.2	0.003	291
N	73	72	25	62	61	54	71
German Legal Tradition							
Mean	0.133	0.701	0.137	0.200	6.5	0.030	18,462
Median	0.140	0.640	0.170	0.200	6.5	0.030	18,580
Third Quartile	0.180	0.840	0.210	0.260	7.9	0.033	18,928
First Quartile	0.110	0.600	0.000	0.140	5.1	0.027	18,137
Max	0.180	0.950	0.280	0.260	7.9	0.033	19,153
Min	0.040	0.600	0.000	0.140	5.1	0.027	17,217
N	7	7	7	2	2	2	7
Scandanavian Legal Tradition							
Mean	0.418	0.233	0.233	0.198	4.2	0.046	18,887
Median	0.420	0.200	0.220	0.220	4.6	0.048	18,206
Third Quartile	0.420	0.265	0.245	0.220	4.6	0.048	19,568
First Quartile	0.415	0.200	0.220	0.175	3.9	0.045	18,206
Max	0.420	0.330	0.270	0.220	4.6	0.048	20,930
Min	0.410	0.200	0.220	0.130	3.1	0.042	18,206
N	4	4	4	4	4	4	4

Table 6: Univariate Statistics on Key Variables, By National Income Per Capita

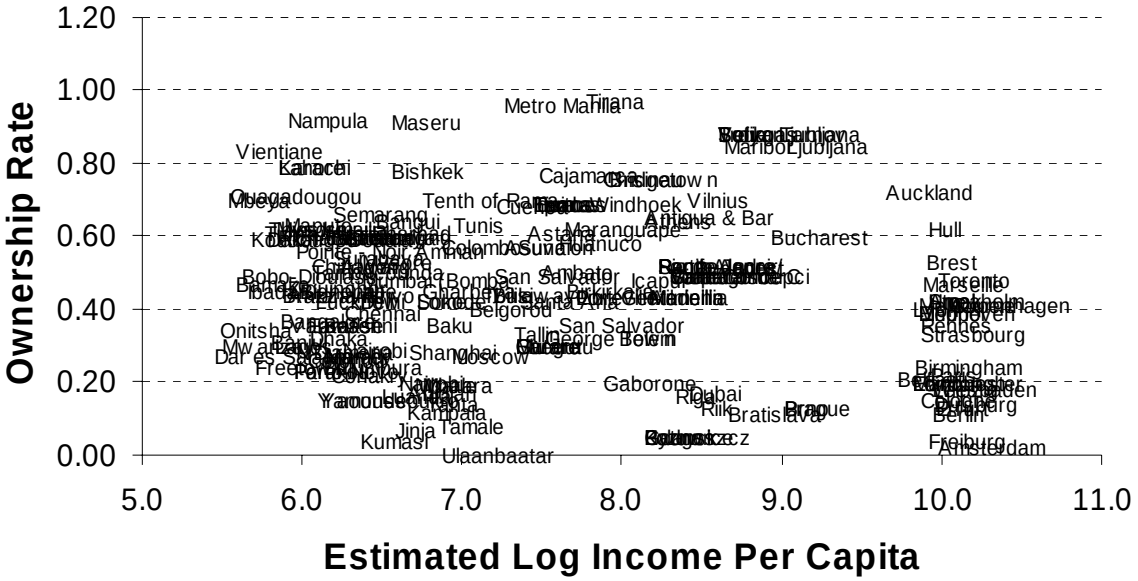
	Percent Homeowners	Percent Private Renters	Percent Social Housing	City Median Rent-to Income Ratio	City Median House Price-to-Income Ratio	Gross Capitalization Rate	City's Predicted Income Per Capita
Low Income (Less than $1,500 per capita)							
Mean	0.492	0.294	0.102	0.228	6.6	0.045	780
Median	0.470	0.260	0.050	0.180	5.6	0.039	438
Third Quartile	0.620	0.435	0.100	0.370	8.6	0.054	763
First Quartile	0.300	0.155	0.010	0.120	3.5	0.024	333
Max	0.970	0.740	0.570	0.690	24.0	0.289	4,885
Min	0.040	0.020	0.000	0.010	0.3	0.002	216
N	93	84	49	99	92	83	95
Middle Income ($1,500 to $15,000)							
Mean	0.484	0.309	0.182	0.154	5.6	0.039	2,028
Median	0.490	0.280	0.060	0.140	3.9	0.039	1,696
Third Quartile	0.620	0.420	0.180	0.210	7.3	0.056	3,185
First Quartile	0.400	0.210	0.020	0.065	3.0	0.011	926
Max	0.770	0.670	0.800	0.520	17.4	0.098	4,397
Min	0.070	0.010	0.000	0.020	2.2	0.002	644
N	67	65	23	52	55	48	56
High Income (Greater than $15,000)							
Mean	0.278	0.389	0.222	0.209	4.5	0.049	17,674
Median	0.200	0.380	0.215	0.200	4.6	0.041	18,006
Third Quartile	0.410	0.500	0.240	0.220	4.7	0.058	18,580
First Quartile	0.180	0.200	0.160	0.190	3.8	0.040	17,016
Max	0.720	0.950	0.560	0.340	7.9	0.107	20,930
Min	0.020	0.050	0.000	0.130	1.8	0.027	13,864
N	45	45	30	32	33	32	29

Table 7: Determinants of Tenure Choice Across Cities

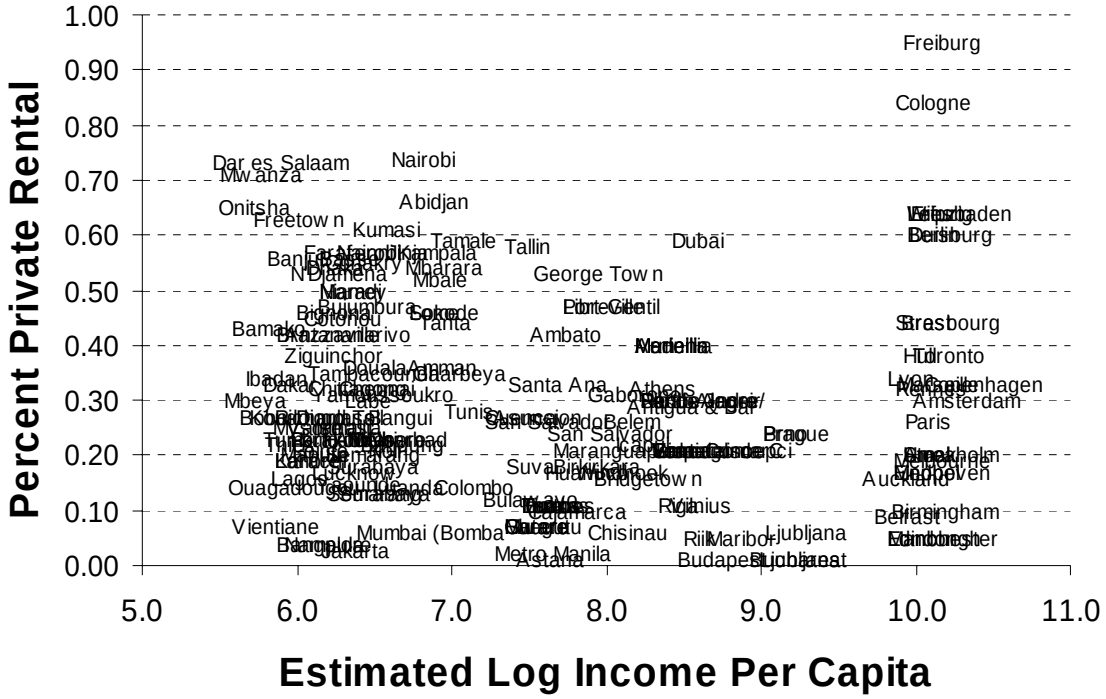
Dependent Variable		Percent Homeowners	Percent Private Renters	Percent Social Housing
Intercept	Coefficient	0.739	**3.297**	**-2.470**
	Standard Error	1.049	**0.685**	**1.468**
	t-Statistic	0.70	**4.81**	**-1.68**
	Prob > |t|	0.483	**0.000**	**0.099**
Cap Rate (IV)	Coefficient	-1.302	**2.358**	**-2.904**
	Standard Error	0.963	**0.691**	**1.212**
	t-Statistic	-1.36	**3.41**	**-2.40**
	Prob > |t|	0.179	**0.001**	**0.021**
	Tolerance	0.516	**0.497**	**0.445**
Log Per Capita Income (IV)	Coefficient	-0.193	**-0.812**	**0.839**
	Standard Error	0.280	**0.184**	**0.362**
	t-Statistic	-0.69	**-4.42**	**2.32**
	Prob > |t|	0.493	**0.000**	**0.025**
	Tolerance	0.004	**0.004**	**0.003**
Log Per Capita Income (IV), Squared	Coefficient	0.017	**0.053**	**-0.059**
	Standard Error	0.019	**0.012**	**0.024**
	t-Statistic	0.90	**4.32**	**-2.48**
	Prob > |t|	0.371	**0.000**	**0.017**
	Tolerance	0.004	**0.004**	**0.003**
Inflation Rate	Coefficient	**0.193**	-0.014	0.224
	Standard Error	**0.055**	0.038	0.149
	t-Statistic	**3.53**	-0.37	1.51
	Prob > |t|	**0.001**	0.712	0.139
	Tolerance	**0.490**	0.441	0.470
# of Procedures to Enforce a Contract	Coefficient	**0.030**	0.001	**-0.062**
	Standard Error	**0.010**	0.007	**0.024**
	t-Statistic	**2.89**	0.11	**-2.59**
	Prob > |t|	**0.005**	0.911	**0.013**
	Tolerance	**0.027**	0.026	**0.009**
# of Procedures to Enforce a Contract, Squared	Coefficient	**-0.00042**	-0.0001	**0.0010**
	Standard Error	**0.00017**	0.0001	**0.0004**
	t-Statistic	**-2.46**	-0.64	**2.51**
	Prob > |t|	**0.016**	0.526	**0.016**
	Tolerance	**0.027**	0.025	**0.010**
M2 / GDP	Coefficient	0.0019	-0.001	**0.008**
	Standard Error	0.0013	0.001	**0.002**
	t-Statistic	1.53	-1.27	**3.69**
	Prob > |t|	0.130	0.208	**0.001**
	Tolerance	0.634	0.648	**0.308**
Avg Central Govt Spending on Transfers (%)	Coefficient	-0.0024	**-0.004**	**0.025**
	Standard Error	0.0018	**0.001**	**0.009**
	t-Statistic	-1.32	**-2.82**	**2.83**
	Prob > |t|	0.191	**0.006**	**0.007**
	Tolerance	0.283	**0.249**	**0.386**
Central Govt Spending as Percent of GDP	Coefficient	**-0.017**	**0.012**	**0.025**
	Standard Error	**0.005**	**0.004**	**0.009**
	t-Statistic	**-3.09**	**3.21**	**2.83**
	Prob > |t|	**0.003**	**0.002**	**0.007**
	Tolerance	**0.549**	**0.546**	**0.386**
English Legal Origin	Coefficient	**0.156**	**-0.200**	-0.075
	Standard Error	**0.057**	**0.037**	0.072
	t-Statistic	**2.77**	**-5.48**	-1.04
	Prob > |t|	**0.007**	**0.000**	0.305
	Tolerance	**0.539**	**0.557**	0.406
Socialist Legal Origin	Coefficient	-0.018	-0.020	-0.032
	Standard Error	0.076	0.072	0.092
	t-Statistic	-0.24	-0.28	-0.34
	Prob > |t|	0.808	0.783	0.733
	Tolerance	0.416	0.453	0.289
Scandanavian Legal Origin	Coefficient	0.127	-0.229	-0.148
	Standard Error	0.219	0.142	0.223
	t-Statistic	0.58	-1.61	-0.66
	Prob > |t|	0.563	0.111	0.510
	Tolerance	0.672	-0.167	0.574
Degrees of Freedom		84	71	45
Adjusted R^2		0.31	0.42	0.65
F-test for Income	Prob > F	**0.089**	0.000	0.013
F-test for Legal Heritage	Prob > F	**0.048**	0.000	0.753

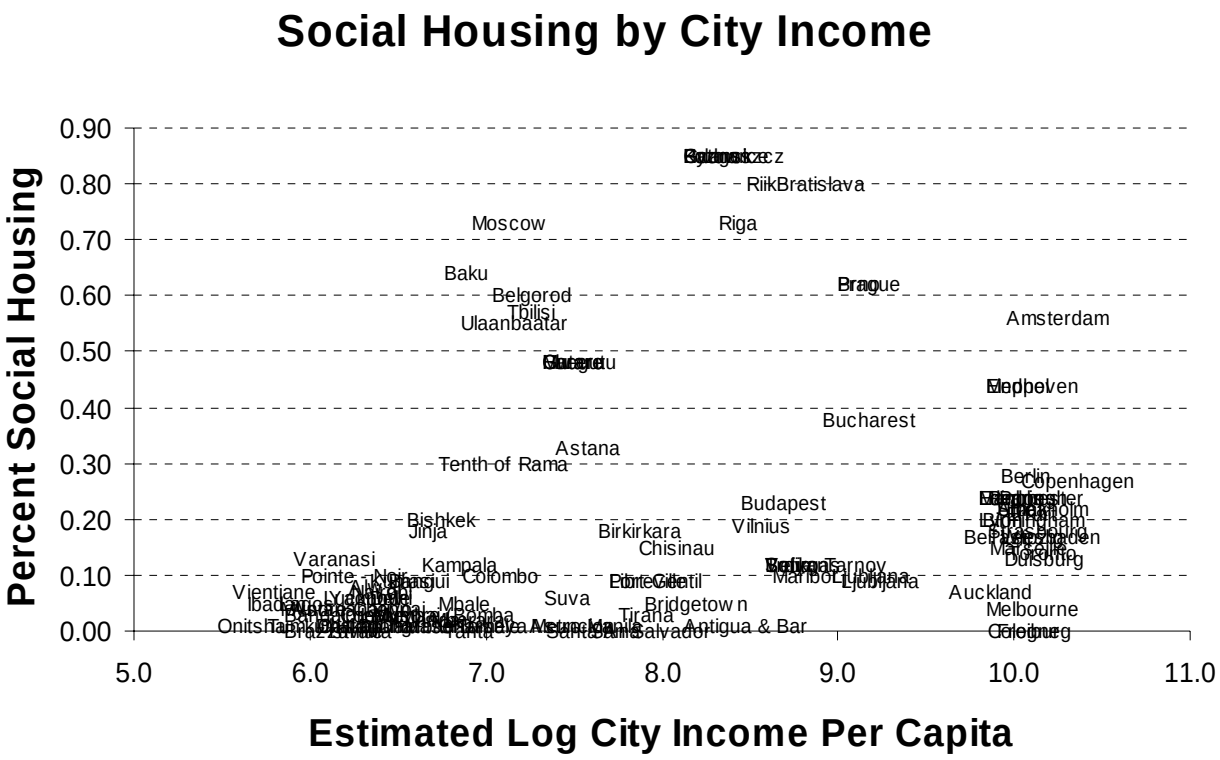
French legal heritage is the omitted category.

Ownership Rate by City Income



Private Rental Rates by City Income




Social Housing by City Income
Percent Social Housing
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
5.0
6.0
7.0
8.0
9.0
10.0
11.0
Estimated Log City Income Per Capita
RikBratislava
Moscow
Riga
Baku
Belgorod
Tbilisi
Ulaanbaatar
Amsterdam
Bucharest
Astana
Tenth of Rama
Berlin
Copenhagen
Budapest
Vilnius
Bishkek
Jinja
Birkirkara
Chisinau
Varanasi
Kampala
Colombo
Tarnov
Vientiane
Suva
Bridgetown
Auckland
Melbourne
Tirana
Antigua & Bar
Salvador