

HOUSING DEMAND, TENURE CHOICE AND HOUSING POLICY IN BRAZIL

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Summary:

This paper analyzes the main determinants of tenure choice in Brazil in formal and informal housing markets. Logit and Multinomial Logit models with several specifications are used to test the household's tenure choice behavior taking demographic, social, economic and locational factors as dependent variables. The main source of information is the 2005 National Household Survey (PNAD) microdata. The probability of ownership is higher among non-afrodescendents, man-headed households and public servants. The poor, the young, recent migrants and single women with young children have higher probabilities of renting or becoming owners in informal settlements. Wealth and life cycle variables such as age, household size and marital status are good predictors for formal ownership. Education enhances the probability of being in the formal housing markets, either as a renter or an owner.

Key Words: Housing Demand, Tenure Choice, Housing Policy, Brazil
Jel Classification: R 15, R21, R31, R38

HOUSING DEMAND, TENURE CHOICE AND HOUSING POLICY IN BRAZIL¹

I. INTRODUCTION

In Brazil, like in other Latin American countries, the governmental housing policies have emphasized the promotion of homeownership in formal housing markets as the best way of satisfying the housing needs of the population, assigning renting an inferior status.

In developed countries several studies boast the positive impacts of homeownership on children, neighborhood conditions and civic participation (Green and White, 1997; DiPasquale and Glaeser, 1999; Green, 2001 and Haurin and Haurin, 2002, among others). There is also a huge body of literature stressing the importance of self-help housing to promote homeownership among the urban poor in Latin American cities, following a tradition launched by John Turner in the 1960's.

Housing is both a consumer and investment good. Besides being a basic human need, housing usually corresponds to the main asset in households' portfolio all over the world. In Brazil housing account for 30% of the total stock of physical capital (IPEADATA, 2000). However, housing tenure conditions vary deeply across countries, irrespective of income patterns, region of the globe and levels of development. In Brazil homeownership ratio is 74, 4% (IBGE, 2000), very close to Argentina (74, 9%), Mexico (75, 3%) and Belgium (74%) and just slightly above the numbers for US (66,2%), but quite behind Spain, where roughly 83% of households are homeowners. On the other hand, in countries with very different stages of economic development such as Germany and Nicaragua homeownership ratios can be quite similar, around 45%, but far behind average homeownership ratios in Latin America countries.

Despite the efforts of housing ministries and national housing banks and other financial institutes to promote homeownership in Brazil and in the rest of the developing world,

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relatively little is known about the households' preferences regarding tenure choice and housing demand in these countries.

Analyzing tenure conditions in developing countries we can find a multiplicity of housing solutions, that include homeownership and renting in formal housing markets, squatting and renting in informal settlements up to the occupancy of rent-free housing, ceded by relatives and employers.

Some studies on housing demand suggest that the poor have a multi-step housing career through different housing sub-markets (street dwellers, tenant and owner in informal markets, tenant and owner in formal markets). The empirical studies show that the tenure choice depends on the household's life cycle, income, wealth, availability of credit, governmental tax policy and inflationary expectations, among others. A more flexible, informal and dispersed labor market will tend to rise the demand for rental housing *vis a vis* homeownership. Several researchers have shown that the low capacity of payment of the poor diminishes their choices in the housing market and restricts their access to formal rental and owner-occupied markets, leading to the increase of informal settlements such as tenements, encroachments, slums and illegal subdivisions.

In this sense, this study tries to elaborate on the following issues: 1) what are the driving forces behind the housing tenure choice of households? 2) What are the tenure options faced by households either in developed or developing countries? ; 3) do poor households have tenure choice or squatting and precarious rental and sharing arrangements in informal settlements are the only options open to them to meet their housing needs? ; 4) what kind of housing policies should be promoted by the government in order to meet housing demand?

Specifically, this paper intends to analyze the main determinants of tenure choice in Brazil in formal and informal housing markets using micro-econometric techniques. The main explanatory variables to modeling the household tenure choice will take into account the demographic, social and economic factors such as household life cycle, income level, wealth and labor market status, among others. The main source of information is the Brazilian Census Bureau (IBGE) 2005 National Household Survey (PNAD) microdata. The article also analyzes the tenure conditions and the various degrees of tenure security of the Brazilian households as well as to what extent the informality in the housing market is

correlated with informality in the labor market, complementing a previous study by Morais, Cruz and Oliveira (2003).

By modeling the tenure choice behavior of the Brazilian households the paper could contribute with several insights over the consumers preferences in the housing market, allowing for a better matching between housing supply and demand, showing the obstacles faced by the poor to access adequate housing, and helping the government in the design of housing policies better adapted to the household demand and the income level, and, therefore more effectively meeting the different housing needs of the Brazilian population.

The paper begins with this introductory section, followed by a survey of the literature on tenure choice both in developed and developing countries. Section III shows a brief retrospect of the tenure conditions and the housing policy in Brazil since the 1940s. . Section IV describes the data and the variables used in the empirical formulation. Section V shows the empirical estimations and the main conclusions derived from the models. Section VI presents the final comments and the policy implications of the study as well as suggestions for future research. Finally, the Appendix presents a theoretical model of housing tenure in formal and informal housing markets, based on an adaptation of Henderson and Ioannides (1983)

II. SURVEY OF THE LITERATURE ON TENURE CHOICE²

There is a vast literature on tenure choice, dealing primarily with the US and other OECD countries. In this section we intend to make only a summary of this literature, with a special focus on housing tenure of vulnerable groups and developing countries.

In developed countries studies housing tenure is usually classified into renting or owning in formal housing markets. Any kind of informality is desconsidered . However, as Malpezzi and Mayo (1987) and Englund et al. (2005) pointed out, this own-rent dichotomy is just a simplification for analytical purposes. In fact, housing tenure can be seen as a continuum of property rights over land and structure, even in developed countries, and

² This section draws on a product prepared by Pianto (2004), our former consultant at IPEA.

actual tenure rights may be influenced by zoning and other urban legislation, rental agreements, length of stay, private and customary laws, among others

One of the earliest works on tenure choice is Kain and Quigley (1972), that measure the effects of spatial segregation and racial discrimination on black and white home ownership differences, using a sample of households in St. Louis, Missouri. Their study shows that blacks pay more than whites for housing of equivalent quality and that blacks, single females, larger families and women-headed households are less likely to own. Their results are reinforced by McDonald (1974) and Roistacher and Goodman (1976), that also find lower homeownership rates among blacks.

Li (1977), using a logit model to explain tenure choice in Boston and Baltimore demonstrate that income, family size, age and race of the household head are the primary determinants of homeownership. Rosen (1979), King (1980), Henderson and Ioannides (1983) and Goodman (1988) stress the importance of the user cost of owning versus renting, the tax laws and portfolio considerations of housing as both an investment and consumption good to explain tenure choice. Blackley and Follain (1983) conclude that the net effect of higher expected inflation is a decrease in the cost of housing, leading to a higher ownership rates and higher investment in housing. Linneman and Wachter (1989) conclude that even in well-developed capital markets, the presence of borrowing constraints adversely affects the homeownership propensities. On the other hand, Deaton (1992), analyzing household savings for least developed countries, and Neri, Carvalho and Nascimento (2000) studying life cycle and households financial motivations in Brazil, state that individuals with liquidity and borrowing constraints can accumulate housing and real estate assets as a buffer-stock against uncertainty. A similar result for U.S. was already shown by Birnbaum and Weston (1974), who found that at the same level of income and wealthy blacks invest more in housing than whites, due to a smaller set of investment opportunities in face of racial discrimination.

Iwarere and Williams (1991), examining data from Washington D.C., show that permanent income, housing prices, wealth, and demographic variables exert the most dominant forces on the housing tenure. Many of the relative cost ideas are refuted by Jones (1994), who finds that socio-demographic variables and wealth are extremely important in

explaining tenure choice decisions. Ionides (1987), using data for 1970-1981, also concludes that wealth and homeownership are positively correlated, with wealth resulting in higher mobility for renters and lower mobility for owners. The negative impacts of housing equity on residential mobility and labor market outcomes are also explored in Henley (1998).

Bourassa (1995) models tenure choice for the metropolitan areas (MAs) of Sydney and Melbourne in Australia, taking permanent and transitory income, demographic characteristics and the relative cost of renting versus owning as explanatory variables. Di Salvo and Ermisch (1997), using panel data, study the effect of variables such as lifetime earnings prospects, family background, a person's own spells of unemployment, the regional unemployment rate, and regional relative house prices on the timing and pattern of first entry into a major tenure (owner-occupied or social housing). They find that being a young parent or the child of parents in social housing increases the chances of being in social housing.

Rothenberg et al. (1992), King (1980) and Ermisch et al. (1996) suggest that tenure choice and housing demand are simultaneously determined. Gibb (2000), claims that tenure choice may also be simultaneously determined by housing location, not just demand, using a nested multinomial logit in which the choice of renting or owning becomes conditional on other choices such as location. However, it is possible that for some low-income people the only choice is renting or sharing and location is therefore limited by tenure, whereas for high-income people the choice of location may be dominant limiting tenure choice. Elder and Zumpano (1991) examine location effects on tenure choice and housing demand in several US metropolitan areas. They find that, for homeowners, housing demand and location are jointly determined, while tenure choice is independent of demand and location. However, this result does not hold for renters, suggesting, again, that they have more limited choices.

Coulson (1999) find that being an immigrant has a substantial negative effect on homeownership but that this effect dissipates over time. Painter, Gabriel and Myers (2001) assess the determinants of housing tenure choice among racial and ethnic groups in Los

Angeles metropolitan area indicating that endowment differences in income, education and immigrant status largely explain the homeownership gap between latinos and whites.

Although in developed economies the available tenures are typically renting or owning, there is a need for further distinction of tenure status in developing countries. In the formal market of developing countries the choice continues to be between owning or renting. However, in these countries, there are several informal tenure arrangements that include: home ownership through squatting or the purchase of illegal subdivisions; renting a bed, room, house or piece of land or share with kin or relatives (Wadhva 1988; Gilbert 1983, DeWandeler et al. 1992, Cocatto 1996).

Throughout the literature, housing sub-markets or tenure options are defined according to various indicators. (Payne, 1988, 1) defines informal settlements as "spontaneous, unplanned or unregulated sub-markets, which commonly attract the general label of self-help housing, slums, or squatters". Lim (1987) uses legality of land occupancy, legality of the physical characteristics and type of occupancy. Stryuk (1990,) considers how the housing was produced, its quality, whether it is rented or owned, and the security of occupancy when defining his housing segments.

The literature stresses that those who live in informal tenures are typically poor and that their tenure choice is frequently reduced to self-help construction or renting in a clandestine subdivision or even rent-free or sharing arrangements (Durand-Lasserve, 1986; Gilbert, 1993; Necochea, 1987; Cocatto, 1996). Coulomb (1988) wonders whether the poor even have a choice or are forced into rental accommodation because there is no other alternative open to them. Edwards (1990) claims that available tenure choice is an increasing function of income and that people with lower incomes have fewer alternatives. However, this author found no direct correlation between tenure choice and social class or income groups because households with the same level of income choose different forms of tenure and *vice versa* (Edwards, 1982). Green (1988, p. 251), states that "although choices can only be made within the constraints which determine what is available, where and at what price, even the most disadvantaged section of the population usually has more than one alternative to choose from". Van Lindert and Van Westen (1991), analysing housing shelter strategies in low income groups in Bamako (Mali) and La Paz (Bolivia) argue that

both the "choice" and "constraint" arguments can apply to different social categories within the same income bracket. In Bamako, some households without financial constraints to secure homeownership chose to continue renting. In La Paz, many of *conventillo* inhabitants prefer to remain in this centrally located rental accommodation than to become owners in the city periphery.

For Cocatto (1996) and Wadhva (1988, 1989) location and affordability are the strongest factors influencing housing preferences. Mehta and Mehta (1989) relate housing preferences to households stage in life cycle. Early on, households base their preferences on their previous housing background and their housing needs. In the second phase, affordability and awareness of housing opportunities play a dominant role. The third and final stage is a process of housing adjustment as one's goals and needs change. This suggests the use of models where age is interacted with the main determinants of tenure choice to adjust for the different stages in life cycle.

Daniere (1992) examines the determinants of tenure choice in Cairo and Manila and extended tenure options to include squatting as a third choice, besides owning and renting. The author indicates that family size, education, income and mobility are powerful forces explaining tenure choice. The findings also suggest that squatters may have more in common with owners than renters. Grootaert and Dubois (1988) used a maximum likelihood probit to analyse tenure choice between owning or renting in Ivory Coast cities, concluding that stage in the life-cycle and mobility are the two prime determinants of tenancy status. Similarly, Arimah (1997), based on a logit model for Ibadan, Nigeria, concludes that income, investment motivation for ownership, number of children, household gender, life cycle-variables, duration of stay in the city and access to land on the basis of ethnic qualification are the main determinants of housing tenure. Huang and Clark (2002), using a multilevel modelling technique, demonstrate that tenure choice in China is affected by socioeconomic characteristics, market mechanisms and institutional factors, with the relationship among the state, work units and households still playing important roles in tenure decisions.

Jacobs and Savedoff (1999) use data from 2 cities in Panama to evaluate the determinants of tenure choice in the context of two models. In the first model households choose between owning or renting, while the second model classifies households as buyers (finish housing), renters or builders (progressive housing). Their results show that life cycle variables influence the decision between owning or renting, whereas choosing between buying a complete housing unit or progressive building it, depends on income and assets levels. Similar conclusions are reached by Koizumi and McCann (2006), also studying housing tenure in Panama. These authors develop a series of log-linear models in which the rent-buy models are extended to include plot purchasing for future building as a third tenure possibility. They conclude that the extended models perform better in identifying which household characteristics are associated with a particular tenure option. Their results suggest that the age of household head and the number of economic dependents are the key factors to explain choice between renting or buying a dwelling. On the other hand, education and income levels explain whether the household purchases a plot to build or a complete dwelling unit.

Most information about informal housing sub-markets comes from case studies. Major cities have been analyzed, such as Ahmedabad (Mehta et al. 1989; Whadva 1989b), Bangkok (Marcussen 1990, Sheng 1992), Bogotá (Edwards 1982), Karachi (Van der Linden et al. 1983), Mexico (Gilbert 1993; Ward 1982), and Nairobi (Amis 1984). Following a legacy left behind by Turner (1968), the literature agrees on the important role played by informal land sub-markets in the supply of ownership alternatives for the poor. However, Miraftab (1997), analysing census data from the MA of Guadalajara, Mexico, observes that the poor cannot be aggregated into a homogeneous group based on income only and that homeownership in informal settlements will not benefit at all, arguing in favor of broadening the scope of housing policies to include renting and sharing as important shelter options for the poor. Coccato (1996), based on research conducted in 3 informal barrios of Resistencia in Argentina, also finds that rentals and sharing increase the number of choices for those who cannot buy, and for those who are in search of job opportunities. Meanwhile, renting also provides a means of income generation, or financing for poor owners. Finally, homeownership may not be a priority for many people, besides reducing mobility. Amis (1984), states that the conventional view that the squatter builds

his own house doesn't hold any longer in Nairobi, where the provision of low-income shelter is supplied by a private rental sector, albeit illegal, operating in "squatting" areas.

Gilbert (1993, 160) writes that Latin American governments "encourage owner-occupation, sacrificing other forms of housing tenure on the altar of the favored option", which limits the shelter opportunities available, causing reduced standards of living for the poor. For this author, to ignore rental housing is simply irresponsible and renting must be recognized as both a respectable and a necessary housing option. Even so, most government policies are still at early stages regarding rental housing in most developing countries (Cocato, 1996). The World Bank (1993, 15) stated that "diversity of the supply is the key for a successful housing sector". Similarly, Hansen et al. (1988,) Gilbert (1989), Van Lindert and Van Westen (1991) and Rakodi (1992,) advocate that housing policies must be aimed at all sub-markets and a wide variety of housing options should be available to every family.

Clearly the determination of tenure choice in developing countries is not a simple problem. While studies on tenure choice in the developed world only deal with formal owning and renting, in the developing world, informal subdivisions, squatting, and rentals of informal properties play a major role in providing housing for the poor. Hence, any study of tenure choice in Brazil must allow for these different categories of tenure as must any future policy considerations which aim to satisfy the housing needs of the Brazilian population.

III. BRIEF RETROPECT OF HOUSING POLICY IN BRAZIL

In Brazil, since colonial times until the 1930's the access to housing by the middle and low income families was made predominantly through the rental markets and housing was mainly private supplied by the upper classes, because there were no official housing financial system (Sampaio, 1994; Bonduki, 1998). As stated by Silveira and Malpezzi (1991, pp. 88) "the private rental sector was crucial in the provision of housing to the fast-growing urban populations of Rio de Janeiro and São Paulo (where rental accounted for about 70 percent of all housing in the 1920s)".

This scenarium started to change when the principle of "self-owned housing" gained momentum after the 1940's, with promulgation of the 1942 Tenants Law and when the official national housing policies started to advocate the benefits of homeownership under President's Getulio Vargas Government (1930-1954). The rent control system established under the 1942 Tenants` Law gave incentives to the construction of housing to sell for owner-occupation, making formal housing less affordable and pushing the poor to informal housing markets. The development of self-owned housing is closely related to the increasing of the construction of high rise buildings in central areas and self-help construction in the periphery. This movement of disincentives to the rental housing private sector together with the massive destruction of low income rental housing in central areas, due to urban renovation projects, under rapid industrialization and explosive urbanization rates led to the emergence of slums and peripheral settlements in the main metropolitan areas of the country (Ribeiro, 1997; Silva e Silva, 1989).

Concerning the provision of Housing Finance Government intervention in the housing market began with the creation of the "Pension and Retirement Funds" (IAPs) or state institutions organized by professional categories after the 1930 revolution. From 1937 to 1945 the IAPS have supplied 124 thousand dwelling units for their partners, with formal employment, encompassing 5% of the total urban population of that period. Later on, a large share of IAPI funds began to be used to financing of public megaprojects such as the construction of the new federal capital in Brasilia.

The "Popular Housing Foundation", created in 1946, was the first governmental institution to promote social housing. However, its performance was quite poor to reduce housing shortage, with the construction of only 19 thousand units between 1946-1964.

The official government policy towards informal settlements at that time was the complete relocation of slum and tenement dwellers to government-built or financed structures such as the *Parques Proletários* (temporary camping) during the 1940s and the 1950s and *Conjuntos Habitacionais* (building blocks of social housing), from 1960s on. From 1962 to 1965 the USAID Alliance for Progress Program lend money for urbanization and slum removal of 42 thousand people out of 27 central slums to 4 newly constructed *Conjuntos Habitacionais*: Vila Aliança (Bangu), Vila Kennedy (Senador Câmara), Vila Esperança (Vigário geral) and Cidade de Deus (Jacarepaguá).

In 1964 the federal government creates the Housing Financial System (SFH) and the National Housing Bank (BNH), under the military regime. BNH was the first effective initiative of the government to promote a national housing policy, with well defined goals and targets, source of funding (FGTS and SPBPE) and specific credit mechanisms (Draibe, 1994).

The creation of BNH in 1964, also had the promotion of "self-owned housing" as one of the main objectives of the national housing policy. The SFH/BNH System divided housing market in 3 income segments: popular (up to 3 minimum wages), affordable (3 to 6 minimum wages) and medium (above 6 minimum wages). Nevertheless, of one the main criticisms we can make to the performance of BNH till its extinction in 1986 is that, despite generating a real estate boom, it has subsidize medium to high income households and was incapable of reaching the low income population, therefore increasing slum formation and horizontal expansion towards the peripheral areas. The State Housing Companies (COHABs) established a supply of housing to the affordable segment (households with income from 3 to 6 minimum wages) based on the purchase of land plots in the periphery, without infrastructure, aiming at reducing the costs, resulting in the supply

of low quality housing in homogenous blocks in segregated neighborhoods, far away from employment centers.

Loans to medium and high income class absorbs the bulk of credit to self-owned house, because less than 20% of the BNH beneficiaries perceived income below 5 minimum wages. BNH has financed 4.8 million dwelling from 1964 to 1986, only 25% of the increment of the housing stock in the period, with the other 75% being produced outside formal housing financial system, through self-help housing in peripheral settlements or slums.

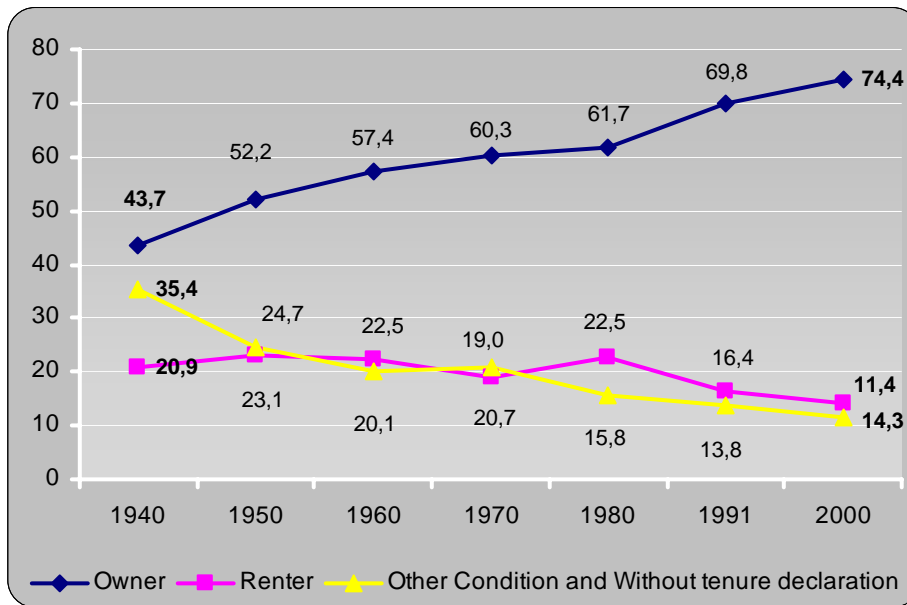
From 1975 to 1979 BNH have promoted "non-conventional" programmes aiming at the low income population serviced land plots, urban infrastructure, core-houses (*casas-embrião*) and acquisition of construction materials (Profilurb, Ficam, João de Barro and Promorar). all with very limited results. By the mid 1970s, with the increasing in unemployment and generalized loan delinquency (thanks to the mismatch between the payment capacity of the borrowers and the increasing in the mortgage downpayments, BNH Systems has become financially insolvent, leading to its extinction in 1986 (Maricato, Bonduki and Tanaka, 2006).

As we have stated before, during 22 years of existence the SFH/BHN System have concentrated loans on the higher income groups, increasing income and wealth concentration, strengthening homeownership and helping to the development a strong real estate sector. With the extinction of BNH part of its attributions has been transfered to CAIXA (operations), part to the Brazilian Central Bank (regulation).

Graphic 1 gives us an idea of the change in tenure conditions occurred over a period of 60 years, when ownership rates increased over 30 percentage points, followed by a decrease in rental housing and other tenure arrangements³.

³ Include rent-free arrangements in dwellings ceded by entrepreneur or kin, dwelling without tenure declaration and tenure conditions other than owner or renter, like invasions (see IBGE definitions at the methodological appendix)

Graphic 1- Brazil- Tenure Condition of private dwellings urban and rural 1940-2000



Source: IBGE- Statistical Yearbooks based on Demographic Census- 1940-2000

More recently we have witnessed the changes in the public policies towards slums: from slum eradication and removals to the newly constructed *Conjuntos Habitacionais* in the periphery to serviced plots, slum upgrading, promotion of collective mutual-help housing (*mutirões*), creation of Zones of Special Interest (ZEIS) and land regularization programmes etc. Important facts for the promotion of social housing in Brazil were the inclusion in the right to adequate housing in the Brazilian Constitution and the promulgation of the Statute of the Cities in 2001, followed by the creation of the Ministry of Cities in 2003.

Housing is one of the priorities of the President's Lula Growth Acceleration Programme (PAC), with the prevision of R\$ 106,3 billion for housing investments for the period 2007-2010. However, even after recent improvements in the urban legislation to promote the social function of the property, the amount of funding for social housing, urban upgrading and land regularization is still quite small comparing to the housing needs of the poor. The amount of money devoted to public sector institutions to invest in social housing in PAC is 14 billion, around 10% of the total prevision of funds for housing. Furthermore, the low

income population has little or no payment and indebtedness capacity, what restricts their access to formal owner-occupied or rental markets and fosters informality. The Federal Government itself has perceived the need to deepen the credit market and take FGTS funds to the low income population, increasing the percentage of total funds devoted to people with monthly income up to 3 minimum wages.

Table 2 below shows the Housing Programmes now available at the federal level. The creation of the Rental Leasing Program (PAR), with a target group of people up to 6 minimum wages, was a tentative to diversify the supply of housing option for the low income population. However, the financial importance of PAR, slum upgrading and regularization and construction materials is almost insignificant when compared to programmes aiming at the financing the purchase of new or old finished housing units for medium to high income households, such as certain actions within the Carta de Crédito Programme .

Table 1- Brazil- Federal Housing Programmes by modality

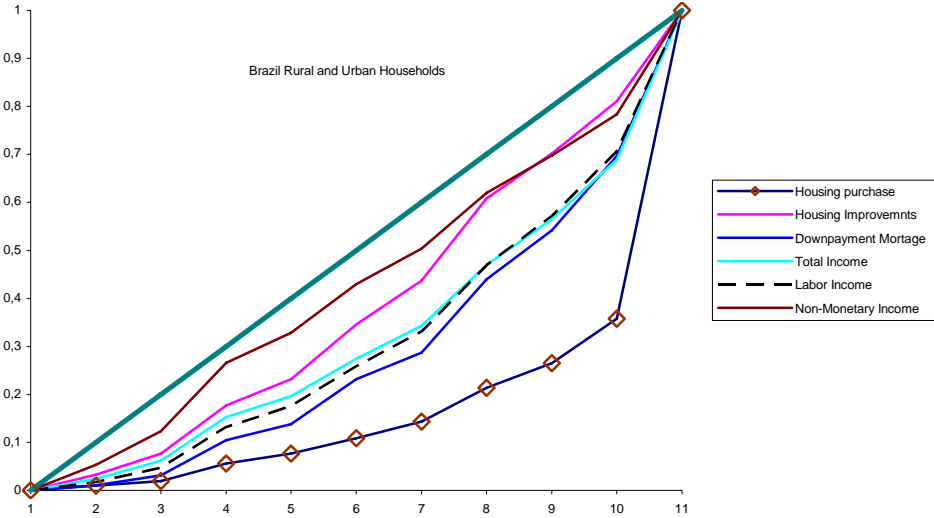
PRODUCTS	PROGRAMMES / ACTIONS	PROPONENTS	SOURCES
Construction of new housing units	Apoio ao Poder Público para construção Habitacional Carta de Crédito Individual Carta de Crédito Associativo Apoio à Produção Pró-Moradia Programa de Arrendamento Residencial (PAR) Programa Crédito Solidário	Public Sector Individuals Individuals Institutions Public Sector Institutions Individuals	OGU FGTS FGTS FGTS FGTS FAR FDS
New housing unit's purchasing	Apoio ao Poder Público para construção Habitacional Carta de Crédito Individual Carta de Crédito Associativo Programa de Arrendamento Residencial (PAR)	Public Sector Individuals Individuals Institutions	OGU FGTS FGTS FAR
Old housing unit's purchasing	Apoio ao Poder Público para construção Habitacional Carta de Crédito Individual	Public Sector Individuals	OGU FGTS
Finishing, extension, recondition or improvement of the housing unit	Apoio à Melhoria das Condições de Habitabilidade de Assentamentos Precários Carta de Crédito Individual Programa Crédito Solidário	Public Sector Individuals Individuals	OGU FGTS FDS
Purchasing of construction's material	Apoio à Melhoria das Condições de Habitabilidade de Assentamentos Precários Carta de Crédito Individual Programa Crédito Solidário	Public Sector Individuals Individuals	OGU FGTS FDS
Purchasing of urbanized plots	Apoio ao Poder Público para construção Habitacional Carta de Crédito Individual	Public Sector Individuals	OGU FGTS
Production of urbanized plots	Apoio ao Poder Público para construção Habitacional Carta de Crédito Associativo	Public Sector Individuals	OGU FGTS
Requalification of urban properties	Apoio ao Poder Público para construção Habitacional Carta de Crédito Associativo Programa de Arrendamento Residencial (PAR)	Public Sector Individuals Institutions	OGU FGTS FAR
Slum Upgrading	Apoio à Melhoria das Condições de Habitabilidade de Assentamentos Precários Habitar Brasil / BID Pró-Moradia	Public Sector Public Sector Public Sector	OGU OGU FGTS
Institutional Development	Habitar Brasil / BID Pró-Moradia	Public Sector Public Sector	OGU FGTS

Source: Ministry of Cities of Brazil (www.cidades.gov.br)

Graphic 2, derived from the IBGE Household Budget Survey (POF) shows the huge income and wealth concentration that prevails in Brazil. As we can see, expenses with finish housing purchases and mortgage downpayments are even more unequally distributed among Brazilian households than labor income. However, POF also points that the expenses with improvement in housing conditions is very well distributed among all income classes. This fact may reflect the effort of the poor populations, that devote their savings to improving their housing conditions. This characteristic of the consumer spending in housing in Brazil shows the opportunity for the implementation of housing microfinance programmes for the progressive reforming, upgrading and expansion of the existing units. Notwithstanding, the high rate of ownership among all income classes in Brazil may reflect this effort of the low income population to improve their housing conditions progressively,

while richer households may prefer to move to new and better housing, instead of reforming or upgrading existing ones. The fact that down payment expenses are more unequal than total income distribution might be a indicator of credit constraint in Brazilian housing markets, showing that the poor households cannot finance their housing equity through the official credit system in the same proportion of their income share.

Graphic 2- Selected Household Expenditures per income bracket (in R\$)



Source: The authors, based on IBGE 2003 National Budget Survey (POF)

IV. THE DATA AND METHODOLOGY

The data used in this paper comes from the Brazilian Census Bureau (IBGE) 2005 National Household Survey (PNAD). PNAD is an annual survey that contains information both on dwellings⁴ and individuals⁵ characteristics of randomly selected households in rural, non-metropolitan urban, and 10 major metropolitan areas (MAs).

To analyze housing tenure choice in Brazil we have selected our sample based on an

⁴ Type of dwelling, construction materials, tenure, rent, access to urban services (water, sewage, garbage), access to durable goods, type of sector and type of area.
⁵ Position in the household, race, gender, migration, education, employment, income, fertility, among others.

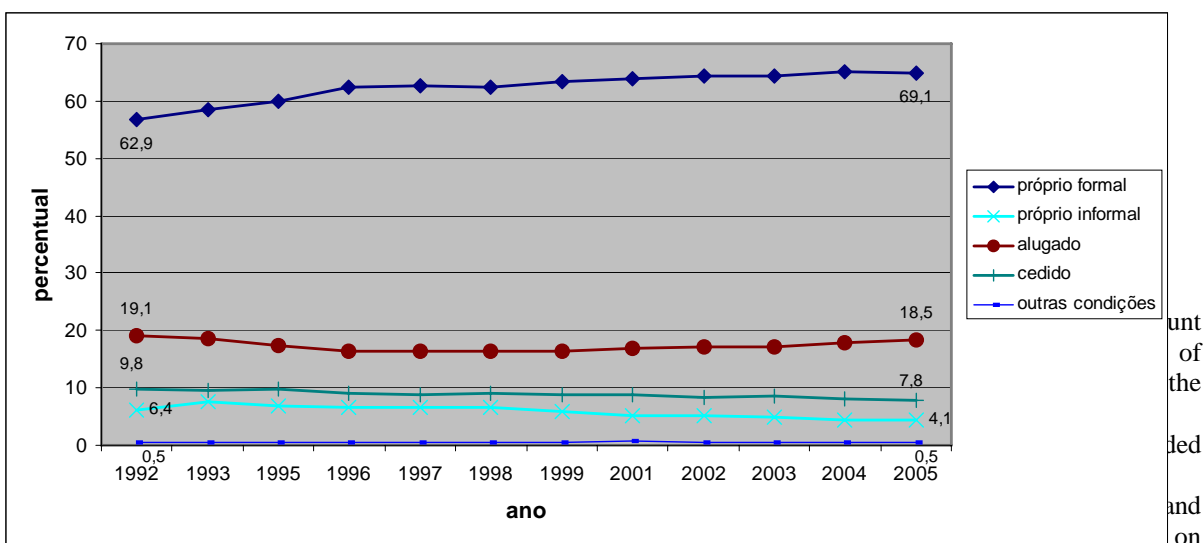
extended concept of urban areas⁶, that includes the 3 types of urban sectors as classified by IBGE (urbanized urban areas, non-urbanized urban areas and isolated urban areas) plus the areas classified as rural of urban extension, that correspond roughly to the urban fringe and are highly interconnected and share several attributes with urbanized areas.

Considering the above concept of urban areas and weighing microdata to be representative of the country as a whole, our sample covers 44,949,283 households.

Conditioned to the availability of the PNAD variables we have used information on the dwelling mode of occupancy⁷, land property rights⁸ and sector type⁹ to define the tenure categories. Informality in the housing markets can be captured either by lack of well-defined property rights (squatters) or by non-compliance with building codes and other urban regulation (slums). The best proxy for slums and other similar informal settlements are the sectors classified by IBGE as substandard areas, that encompass a group of 50 dwelling units or more, undisputed and recently squattered, without authorization, privately or publicly owned, laid out in a scattered and dense manner and lacking essential public infrastructure services, also known regionally as *favelas*, *mocambos* and *alagados*.

The graphic 3 below shows the modes of occupancy in Brazilian cities, considering information on rights over land and construction and mortgage conditions. To elaborate the graphic we did not take into account if housing is located in a slum or not.

Graphic 3- Brazil: tenure conditions of the urban private dwellings



property rights of any kind, not even about rental or other contracts.

⁹ Regular sectors, substandard sectors, indigenous areas and boat areas.

Source: the authors, based on 1999-2005 PNAD microdata

Based on the above variables defined 4 different tenure status were defined: 1) Formal owners: he owns the house, owns the land and the dwelling unit is not located in a substandard area; 2) Formal Renter: Rents or rent-free outside substandard area; 3) Informal Owners: owns the house but not the land or has other tenure condition such as encroachment (squatters), owns in a substandard area (slum dweller) or both and 4) Informal Renter: rents in a substandard area.

Table 1 below shows the absolute frequencies and percentages for housing tenure conditions. Formal owner is the most frequent tenure status (almost 30 million), while informal settlers account for only 7% of our sample. Ceded rent-free and other tenure conditions such as encroachment encompass 8.4% of total cases.

Table 1- Tenure Conditions in Brazilian Urban Areas - 2005

Tenure Condition		Frequency	Percentage	Valid Percentage	Cumulative Percentage
Valid	Formal Owner	2,999,3897	66.7	7.9	7.9
	Formal Renter	8,067,093	17.9	19.6	92.5
	Informal Owner	2,907,590	6.5	7.1	99.5
	Informal Renter	191,112	0.4	0.5	100.0
	Total	41,159,692	91.6	100.0	
Missing	System*	3789591	8.4		
Total		44,949,283	100.0		

Source: The authors relied on 2005 IBGE PNAD microdata,

* it includes rent-free and other tenure conditions

One of the main criticisms one can make to our database is that it underestimates housing informality as compared to many case studies for three main reasons: 1) it only takes into account slums with more than 50 dwelling units; 2) it relies only on self-declaration of the respondents and does not gather information on the existence of land title or other *de facto* evidence of tenure security or any kind of selling or rental contracts; 3) IBGE takes recent upgraded and regularized slums out of the concept of substandard areas, even if local governments keep on considering those areas as slums and housing standards and income levels are far behind the overall neighborhoods.

Based on the literature review, the authors have classified the determinants of tenure choice into four main blocks of variables: 1) Life Cycle and Household Characteristics; 2) Wealth and Permanent Income, 2) Social Vulnerability and Credit Constraint and 4) Location variables.

In the life Cycle and Household Characteristics block the authors have used the following independent variables:

- Age of the Household Head in years
- Household size
- Marital Status

The Wealth and Permanent Income Category include:

- *Per capita* income
- Household income
- Years of schooling of Household Head
- Wealth proxy

Social Vulnerability and Credit Constraints are proxied by:

- Gender of the Household Head: women with children under 14

- Migrant: recent (up to 4 years living in the present municipality), middle (from 4 years up to 9 years) and long-term migrant (more than 9 years)
- Economic dependency: contribution of the household head to total income (head of household income/total household income)
- Labor Market status: formal employee (with access to social security system), employer and public servant vs. informal employees, domestic servants, self-employed and unemployed

The locational variables used are the following:

- Metropolitan areas 10
- Type of municipality: large cities 11 vs small cities
- Macro-Regions: North, Northeast, Southeast, South and Midwest

In PNAD there is no explicit variable for wealth, so the authors have constructed a proxy for household wealth based on housing conditions characteristics and access to durable goods. We have assumed that the absence of proper housing conditions implies a reduction of 1 point in our proxy of wealth for each desirable attribute that is missing. To measure the degree of housing adequacy we relied on the definition of adequate housing that UN-Habitat uses to Monitor Target 11 of the Millenium Development Goals, which must meet the following conditions:

- Safe drinking water (piped water from public network inside the dwelling)
- Proper sewage (public sewage network or septic tank)
- Electricity
- Structural Durability: Permanent Walls (masonry or processed wood) and

¹⁰ Includes the municipalities of Belém, Fortaleza, Recife, Salvador, Belo Horizonte, Rio de Janeiro, São Paulo, Curitiba, Porto Alegre and Brasília (Federal District-DF).

¹¹ Large cities are proxied by what IBGE calls self-representative municipalities (*municípios auto-representativos*), that encompass municipalities that, due to their population or economic importance are always included in PNAD samples.

permanent ceiling (tile, concrete or processed wood)

- sufficient living space (not overcrowded, with less than 3 people per dormitory)

Access to durable goods increases 1 point each for goods like fridge, freezer, television, washing machine, computer or internet and 1.5 in the case of fridge with two doors. Another variable that we have considered in our wealth proxy is number of bathrooms per person as a proxy for size of the housing unit, because rich families usually have more than one bathroom in the dwelling unit. If the household falls in the lowest quartile, we have increased its wealth by 1 point, as the house may be relatively larger and the household relatively wealthier, decreasing 0.5 point per each quartile. So, 2nd quartile gets 0.5 point, the 3rd quartile minus 0.5 and 4th quartile minus 1. This variable varies from from -7 to 11.5 points, with an average was 5.35, very close to the median 5.4 and a standard deviation of 3.13.

Our sample comprises married couples in 63.5% of the cases and 53.8% of the household heads were non-african descendents (white and Asian). Migrants account for 47.9% of the entire sample: 7.2 % with less than 4 years in the municipality, 5.8% with 4 years up to 9 years, and 34.9% living for more than 10 years in the same city. Public servants, a proxy for stable condition in the labor market, account for 5.2% of the total number of household heads.

It should be stressed that this paper presents only of a cross-section analysis of tenure choice. However, it might be very important to include dynamic aspects of housing tenure, like the household's portofolio allocation decision and the user cost of owing vs. renting. For instance, Brazil has experienced periods of extremely high inflation, instability in the labor market, and in such a scenario the purchase of a housing unit might become a hedge against those external shocks. In this sense, housing may be perceived by household seekers as a riskless asset or a less riskier asset than current bank equities, a hypothesis also

raised by Neri, Carvalho and Nascimento (2000).

Table 2 shows some descriptive statistics of the continuous variables used in the regressions. As can be seen, the average age of the household head is 45.8 years, while they have an average of 6.95 years of schooling. Average total household income is R\$ 1.654,00 and average household size is 3.6 members, implying an average *per capita* income of about R\$ 991.16. The variable on economic dependency shows that the income earned by the household head accounts for almost 65% of the household total income.

Table 2- Descriptive Statistic of the Continuous variables used in the Regression

Statistics	Age (Years)	Household Size (person per household)	Economic Dependency (head income/total income)	Schooling (Years)	Household Income (R\$)	Household Per Capita Income (R\$/person)	Wealth
Mean	45.83	3.62	0.65	6.96	1654.07	572.31	5.36
Median	43.75	3.41	0.67	6.86	991.16	300.70	5.40
Standard Deviation	15.90	1.91	0.33	4.60	2431.28	1000.87	3.13

Source: the authors, based on 2005 IBGE PNAD microdata

V. EMPIRICAL MODEL AND RESULTS

In this section we present the main results of the study and the Logit and Multinomial Logit Models with different specifications used to study the determinants of the tenure choice in Brazil, taking demographic, social, economic and locational factors as dependent variables.

The Multinomial Logit Model (MLM) is used to classify discrete or categorical variables with more than 2 states. The MLM is an extension of the Logit Model, and assumes that individuals have the following perceived utility function:

$$u_{i,j} = \beta_{0,j} + \beta_{1j}x_i + \varepsilon_{ij}$$

where i accounts for the individual and j for the category, x_i is the covariate and ε_{ij} is the unobserved error variable.¹²

The individual will choose the category J that gives the highest utility. In other words:

$$u_{i,J} = \text{Max}(u_{i,1}, u_{i,2}, \dots, u_{i,J})$$

The usual assumption is that ε_{ij} has a type I extreme distribution. If this holds it can be shown that the probability of a given category has a Multinomial Logit.

Another assumption in the Standard Multinomial Logit is the so-called independence of irrelevant alternatives (IIA). Formally, one says that IIA holds when the ε_{ij} is independent among categories. Intuitively, if a new alternative is introduced to the individual, the IIA hypothesis says that the individual will not change the odds of the previous category. In other words, it is assumed that the proportionality among category is maintained constant. This assumption can be quite restrictive.

In the present study, we apply the MLM to the case of the housing tenure decisions of Brazilian households. The dependent variable includes the housing tenure both in formal

¹² Of course in this case, it is assumed that there are more than 2 categories, so $j > 2$.

and informal sectors. Informal housing is a widespread phenomena in Brazil and other developing countries. However, there is no consensus on how to define and identify this informal sector. As stated in the previous section we have used information on the dwelling mode of occupancy, on property rights over land and structure and on the neighborhood constructive patterns to define four tenure categories in the complete model: Formal Ownership, Formal Renting, Informal Ownership and Informal Renting.

We begin the analysis by presenting the traditional dichotomic model of housing tenure choice, that is, owner or renter, with no more detailing concerning housing formality or not.

Table 3 below presents the coefficients of the Logit model, where the dependent variable is a dichotomous qualitative dummy, equal to 1 for owners and 0 for renters.

As a minimum value to classify an individual as a homeowner, we have adopted Franses e Paap (2001) suggestion, taking the participation of owners in the sample (70%) as the cut-off value for predictions of that category, instead of the usual 50%. We can see that this model presents a reasonable adjustment, with a correct forecast for 70.6% of the cases: 75.7% for owners and 56.1% for renters.

Table 3- Logit Model for Tenure Choice in Brazil

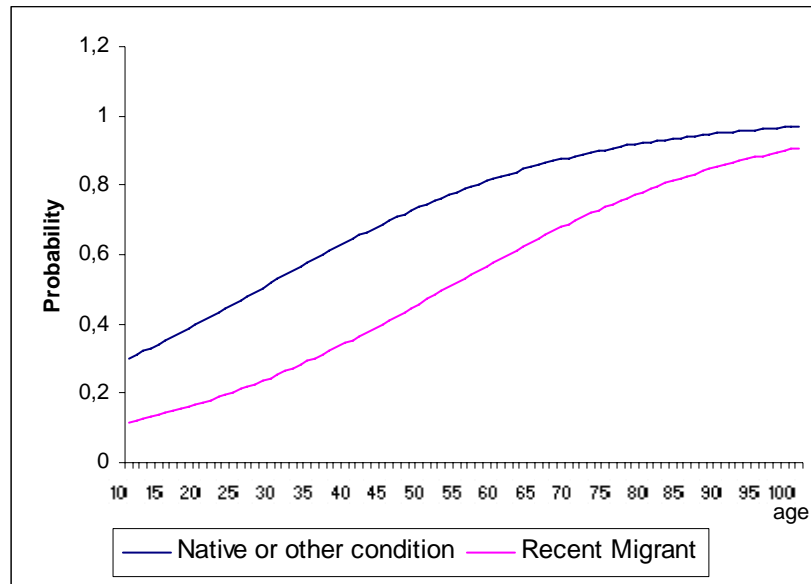
Number of response levels= 2; owner=1; Renter or rent-free=0.

Explanatory Variables	Estimate B	Standard Error	Wald	Df	Sig.	Exp(B)
Step 1 Race Owner	-,048	,001	3566,550	1	,000	,953
Migrant up to 4 years	-1,194	,001	786709,032	1	,000	,303
Migrant_4 to 9 years	-,366	,001	61364,956	1	,000	,693
Migrant 9 years or more	,153	,001	31487,865	1	,000	1,165
Public_servant	,127	,002	5613,953	1	,000	1,135
Formal_worker	-,028	,001	990,790	1	,000	,972
Employer	,035	,002	339,744	1	,000	1,036
Age	,033	,000	1050012,218	1	,000	1,034
Married couples	,252	,001	68109,936	1	,000	1,287
household_size	,185	,000	277257,627	1	,000	1,203
Economic dependency	-,193	,001	19645,605	1	,000	,824
Schooling	-,032	,000	76253,474	1	,000	,969
Wealth	,114	,000	352410,851	1	,000	1,120
Metropolitan Areas	-,074	,001	6637,725	1	,000	,928
Large cities	-,165	,001	27600,961	1	,000	,848
North	,680	,002	146573,796	1	,000	1,974
Midwest	-,122	,001	7792,772	1	,000	,885
Per capita income	,000	,000	238,122	1	,000	1,000
Household income	,000	,000	380,653	1	,000	1,000
Women with children under 14	-,052	,002	697,323	1	,000	,950
Constant	-1,325	,003	245869,466	1	,000	,266

The life cycle variables such as age, marital status and household size show a good adjustment and the expected signs. The age variable presents a positive coefficient, reflecting the effects of life cycle, where an increase in age increases the probability of homeownership. Notice that the longer the time of residence in the municipality the higher the probability of homeownership, with the negative impact of being a migrant dissipation over time

Graphic 4 shows the positive effects of age and negative effects of recent migration (less than 4 years in municipality) over the probability of homeownership.

Graphic 4 – Impacts of Age and Migration on Homeownership

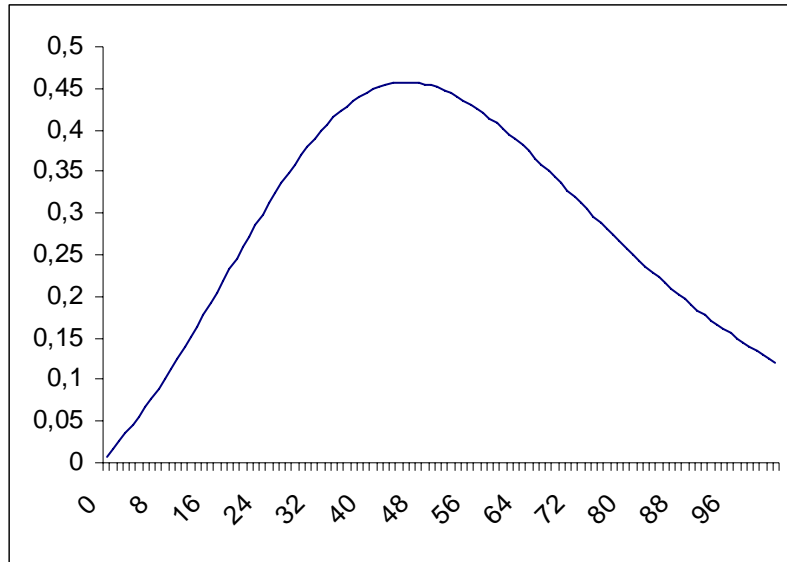


Graphic 5 illustrates the quasi-elasticity of age over the probability of becoming a homeowner. The quasi-elasticity can be calculated as:

$$\frac{\partial \Pr[\text{Ower}|X_i]}{\partial \text{Age}} \text{Age} = \Pr[\text{Ower}|X_i](1 - \Pr[\text{Ower}|X_i])\beta_1 \text{Age}$$

The interpretation of this quasi-elasticity is quite simple. The quasi-elasticity indicates the sensitivity of the probability of homeownership to a percentage increase in the age of the household head, keeping other factors constant. Notice that, this value reaches a maximum around 50 years and from that moment on the impact of age over the probability of homeownership, despite positive, decreases.

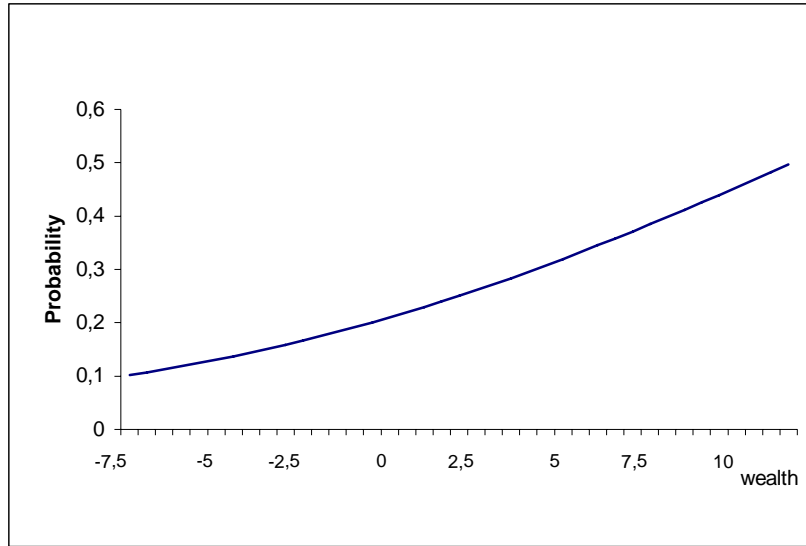
Graphic 5 – Quasi-Elasticity of Age on the Probability of Homeownership



Marital Status and household size positively affect the homeownership probability. Married couples and family size increase by 1,287 and 1,203 the probability of becoming a homeowner. This results shows that point life cycle variables are quite important to explain household's housing tenure choices.

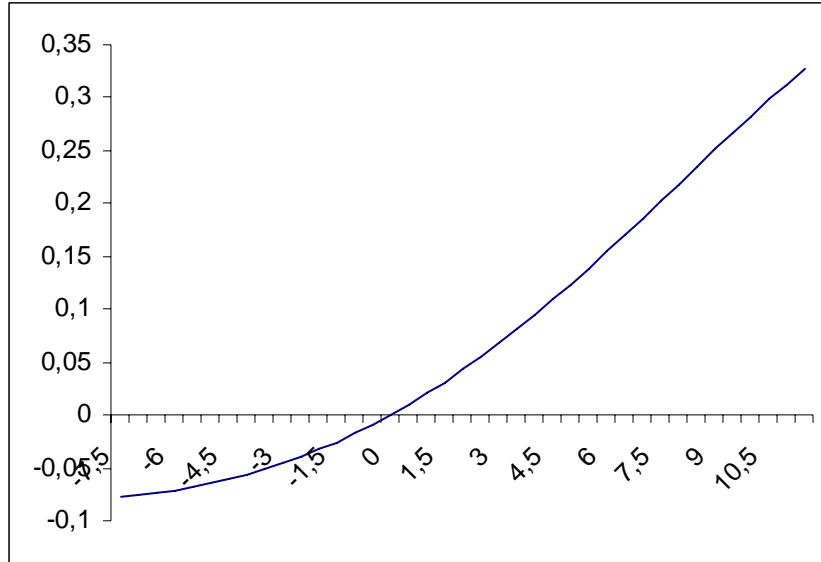
Wealth has a positive impact over homeownership, increasing by 1,12 the probability of becoming a homeowner. Graphic 6 presents the impact of wealth on the probability of homeownership, showing that this probability reaches 50% for the highest wealth levels.

Graphic 6 – Impact of Wealth on homeownership probability



Wealth quasi-elasticity also shows the positive effect of wealth over the probability of becoming a homeowner. Notice that, such an effect is not observed by Henderson & Ioannides (1983), who conclude that wealth is neutral in respect to tenure choice. Fu (1991) shows, however, that this result is due to some inconsistencies in the derivation of the Henderson and Ioannides (1983) theoretical model, and that wealth could have a positive impact over homeownership if the quasi-elasticity of investment motive for housing demand were higher than the quasi-elasticity of consumption motive. The above results demonstrate that in the Brazilian case we can observe such an impact.

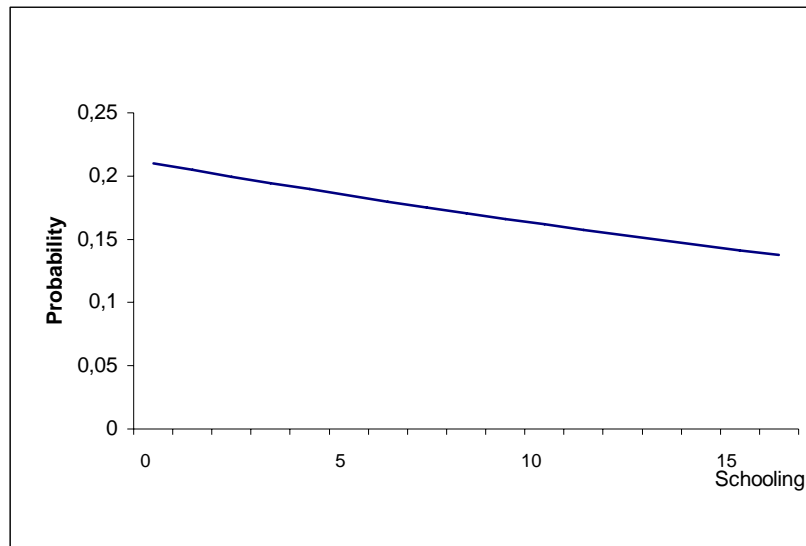
Graphic 7 – Quasi--Elasticity of wealth over homeownership probabiblity



Nevertheless, Current Income, despite having statistical significance, is not as relevant from an economic point of view, as is wealth to explain tenure choice in Brazil. The odds-ratio tell us how much the probability of homeownership increases (decreases) due to variations in independent variables. For household total income and per capita income, the odds-ratio is almost 1, showing that this 2 variables have no relevant impact over the probability of homeownership.

Education, on the other hand, present a negative sign, what is contra-intuitive. *Ceteris Paribus*, the probability of homeownership for heads of households with no schooling is 20.9%, whereas this probability is 14.9% for heads with 15 years of schooling. Here, it can be highlighted the need for a better refining of the concept of homeownership. When we qualify information over housing informality, education has a positive impact over the probability of becoming an owner in formal housing markets.

Graphic 8 -Logit Model: Impact of Education over homeownership



Concerning vulnerability in the labor markets, we can observe that public servants and employers have a positive sign over the probability of becoming a homeowner. Quite surprisingly, for formal employees this effect is negative. Women-headed households with children under 14, will have a negative impact over the probability of homeownership. Another contra-intuitive result is the fact that non-afrodescendents head of households will have a smaller homeownership probability when compared with blacks and mulattos, by a factor of 0.953. Again, this result is due to a non proper discrimination between formal and informal owners, and shows the need for a better distinction between housing sub-markets.

Finally, location variables are significant and present the expected signs: living in metropolitan regions or large cities (self-representative municipalities), decreases the probability of homeownership, probably due to higher land and property prices in larger municipalities. A Regional dummy for North region shows that the probability of homeownership increases in less developed regions. Conversely, in the Midwest, the most dynamic region of the country, homeownership presents a negative sign. This phenomenon can, again, be explained by movements in land and property prices.

In the next two Multinomial Logit Models we try to identify the impacts of housing informality on the tenure choice of Brazilian households. As we have discussed above, this to models help us to clarify some contra-intuitive results over expected signs of the dependent variables like race and education over the probability of homeownership.

In the first Multinomial Logit Model we allow a trichotomous dependent variable, where we make a clear distinction between formal ownership, formal renting and informal settlements (either squatters or slum dwellers). The definition of formal owner and rental markets takes into account property rights over house and land, as well as attributes of the neighborhood (substandard sector or not).

We can notice from the table below that life cycle variables such as age of household head, married couples and household size increase the probability of becoming a homeowner either formal or informal, as compared to rental markets (the omitted category).

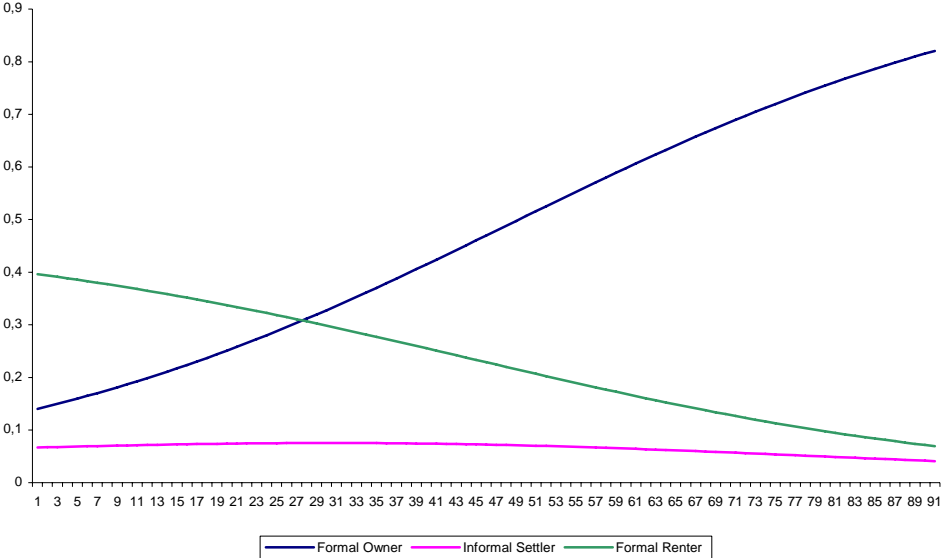
Graphic 9 presents the impact of age in tenure choice decisions in the trichotomous model, showing that an increase in the age of the household head increases the probability of owning and decreases the probability of renting in formal housing markets. However, the impact of this life cycle variable is smaller to explain the probabilities of living in a informal settlement.¹³

It's interesting to see the impact of wealth over homeownership, increasing the probability of owning and renting in formal housing markets, but with a negative correlation with housing informality. This results show that the poor households have fewer opportunities in the housing market and must rely mainly on informal settlements to satisfy their needs, confirming the results well establish in the literature (Gilbert, 1993; Cocatto, 1996; Necochea, 1987, among others). Again, like in the previous model, income variables, albeit

¹³ For further details on the determinants of spatial segregation and the probability of becoming a slum dweller in Brazil see Morais, Cruz and Oliveira (2003).

representative, are not good predictors of tenure choice.

Graphic 9 - Effect of Age of Household over tenure choice in formal and informal housing markets



As is expected, an employment in the public sector increases the probability of becoming a homeowner in formal housing markets and has a negative impact on the probability of becoming a informal dweller. Vulnerability variables such a gender and race present the expected signs: being a afro-descendent and a single mother with young children increases the probability of living in a informal settlements.

For location variables, living in a metropolitan area or in a big city decreases the probability of formal homeownership and increases the probability of becoming an informal dweller, showing that housing informality is a typical effect of the increasing concentration of the population in the major metropolitan areas and other urban agglomerations, corroborating Morais, Cruz and Oliveira (2003) results. The regression also shows that higher educational levels increase the probability of renting in formal housing markets.

Table 4 - Multinomial Logit Model Tenure Choice 1
 Number of response levels=3; formal owner=1, formal renter=2; informal dweller=3

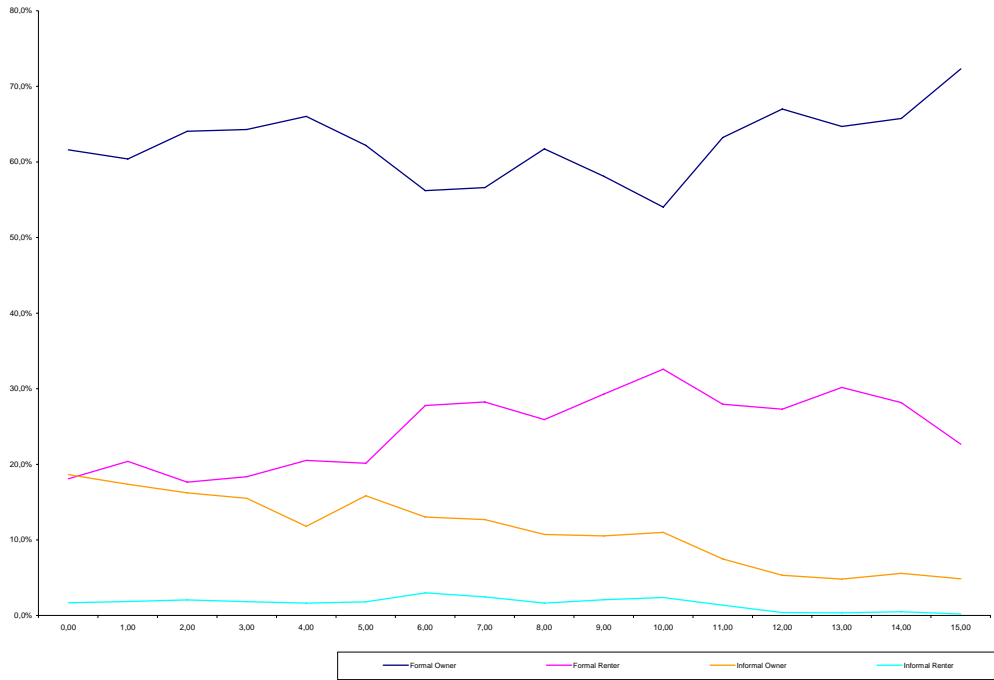
Multinomial Logit tenure 1		Estimate B	Std. Error	Wald	df	Sig.	Exp(B)
1- Formal Owner	Intercept	-1,427	,003	198874,415	1	,000	
	Non afro-descendents	,014	,001	212,798	1	,000	1,014
	Migrant up to 4 years	-1,394	,001	893677,905	1	,000	,248
	Migrant 4 to 9 years	-,477	,002	82757,436	1	,000	,620
	Migrant 9 years or more	,166	,001	26132,041	1	,000	1,180
	Public Servant	,111	,002	3327,792	1	,000	1,117
	Formal Worker	-,027	,001	668,309	1	,000	,973
	Employer	-,093	,002	1997,630	1	,000	,911
	Age of household head	,039	,000	1037578,611	1	,000	1,040
	Married couples	,333	,001	88463,221	1	,000	1,395
	Household size	,178	,000	189263,478	1	,000	1,195
	Economic dependency	-,128	,002	6249,067	1	,000	,880
	Schooling	-,034	,000	68349,850	1	,000	,966
	Wealth	,116	,000	264339,430	1	,000	1,123
	Metropolitan Area	-,186	,001	29476,729	1	,000	,830
	Large Municipalities	-,283	,001	60911,998	1	,000	,753
	North	,885	,002	161080,706	1	,000	2,424
	Midwest	,094	,002	3242,215	1	,000	1,099
	South	,273	,001	43613,771	1	,000	1,314
	<i>Per capita</i> income	,000	,000	489,963	1	,000	1,000
Household ncome	,000	,000	698,426	1	,000	1,000	
Northeast	,338	,001	76354,813	1	,000	1,402	
Women with children under 14	-,062	,002	777,269	1	,000	,939	
3- Informal Dweller	Intercept	-1,923	,005	133085,483	1	,000	
	Non afro-descendents	-,288	,002	34122,506	1	,000	,749
	Migrant up to 4 years	-1,408	,003	199393,089	1	,000	,245
	Migrant 4 to 9 years	-,595	,003	37546,345	1	,000	,552
	Migrant 9 years or more	,040	,002	613,370	1	,000	1,041
	Public Servant	-,118	,004	965,334	1	,000	,888
	Formal Worker	,006	,002	12,055	1	,001	1,006
	Employer	-,342	,004	5824,712	1	,000	,710
	Age of household head	,014	,000	50417,195	1	,000	1,014
	Married couples	,273	,002	22527,695	1	,000	1,313
	Household size	,084	,001	16916,993	1	,000	1,088
	Economic dependency	-,157	,003	3830,120	1	,000	,855
	Schooling	-,079	,000	133532,549	1	,000	,924
	Wealth	-,044	,000	13477,226	1	,000	,957
	Metropolitan Area	1,800	,002	777486,783	1	,000	6,050
	Large Municipalities	,923	,002	164480,356	1	,000	2,517

North	1,108	,003	136085,895	1	,000	3,027
Midwest	-1,001	,004	61898,694	1	,000	,367
South	,236	,002	10798,778	1	,000	1,266
<i>Per capita</i> income	,000	,000	338,244	1	,000	1,000
Household income	,000	,000	2455,421	1	,000	1,000
Northeast	,032	,002	260,341	1	,000	1,032
Women with children under 14	,118	,004	1046,016	1	,000	1,125

Obs. The reference category is: 2 (formal renter)

The results of a more detailed Multinomial Logit model, where we distinguish between 4 categories of tenure choice and qualify informal settlers into informal owners and informal renters are despatched in the table below. We can notice that the main results or the previous Multinomial Logit model were kept, like the high importance of life cycle variables and small impact of current income to explain formal homeownership. An interesting conclusion we can derive from this model is that renters in informal settlements are among the poorest segments of the Brazilian population, even when compared to informal owners. It should be highlighted that non-afrodescendents have higher probability of having access to formal housing market either through ownership or renting. An increased level of education positively affects the probability of renting and owning in formal housing markets, whereas low levels of education foster an entrance of the households into informal housing markets.

Graphic 10- Impact of education on tenure choice



We should highlight that the size of the informal rental market is very small, corresponding to less than 1% of our total sample. In this case, maybe the application of a regression for rare events according to King and Zeng (2001), will increase the explanatory power of our model. However, to analyze the occurrence of rare events is far beyond the scope of this paper.

Table 5 - Multinomial Logit Model Tenure Choice 2

Number of response levels=4; formal owner=1, formal renter=2; informal owner=3; informal renter=4

Multinomial Tenure 2		B	Std. Error	Wald	df	Sig.	Exp(B)
1- Formal Owner	Intercept	1,505	,016	8900,632	1	,000	
	Non afro-descendents	,144	,004	1235,305	1	,000	1,155
	Migrant up to 4 years	-,709	,007	11835,808	1	,000	,492
	Migrant 4 to 9 years	,324	,009	1339,718	1	,000	1,383
	Migrant 9 years or more	,448	,005	8736,345	1	,000	1,566
	Public Servant	,417	,014	914,808	1	,000	1,517
	Formal worker	-,142	,004	1100,387	1	,000	,868
	Employer	,416	,018	547,516	1	,000	1,516
	Age of household head	,052	,000	84126,819	1	,000	1,053
	Married couples	,028	,005	27,555	1	,000	1,028
	Household size	,333	,002	25149,739	1	,000	1,395
	Economic dependency	,018	,007	7,471	1	,006	1,018
	Schooling	,034	,001	3290,057	1	,000	1,034
	Wealth	,290	,001	72927,735	1	,000	1,337
	Metropolitan Area	-3,435	,009	139454,009	1	,000	,032
	Large Municipalities	-2,486	,010	65389,153	1	,000	,083
	North	-,172	,007	644,633	1	,000	,842
	Midwest	1,816	,016	13658,545	1	,000	6,147
	South	1,295	,010	16149,922	1	,000	3,650
	<i>Per capita</i> income	,000	,000	85,042	1	,000	1,000
	Household income	,000	,000	1250,093	1	,000	1,000
Northeast	,437	,005	7709,338	1	,000	1,547	
Women with children under 14	-,402	,008	2424,775	1	,000	,669	
2 - Formal Renter	Intercept	3,332	,016	43404,330	1	,000	

	Non afro-descendents	,145	,004	1233,178	1	,000	1,155
	Migrant up to 4 years	,511	,006	6223,051	1	,000	1,668
	Migrant 4 to 9 years	,714	,009	6474,881	1	,000	2,042
	Migrant 9 years or more	,315	,005	4253,140	1	,000	1,370
	Public Servant	,304	,014	483,184	1	,000	1,355
	Formal worker	-,141	,004	1077,780	1	,000	,868
	Employer	,391	,018	480,510	1	,000	1,478
	Age of household head	,016	,000	8334,092	1	,000	1,017
	Married couples	-,232	,005	1926,072	1	,000	,793
	Household size	,136	,002	4180,424	1	,000	1,146
	Economic dependency	,207	,007	962,299	1	,000	1,230
	Schooling	,062	,001	11237,583	1	,000	1,064
	Wealth	,154	,001	20414,722	1	,000	1,167
	Metropolitan Area	-3,281	,009	126966,085	1	,000	,038
	Large Municipalities	-2,260	,010	53903,521	1	,000	,104
	North	-1,042	,007	23032,978	1	,000	,353
	Midwest	1,727	,016	12330,004	1	,000	5,621
	South	1,018	,010	9960,891	1	,000	2,769
	<i>Per capita</i> income	,000	,000	96,421	1	,000	1,000
	Household income	,000	,000	1201,623	1	,000	1,000
	Northeast	,048	,005	93,504	1	,000	1,050
	Women with children under 14	-,326	,008	1590,367	1	,000	,722
	Intercept	,703	,016	1824,367	1	,000	
3- Informal Owner							
	Non afro-descendents	-,159	,004	1388,468	1	,000	,853
	Migrant up to 4 years	-,848	,007	14001,368	1	,000	,428
	Migrant 4 to 9 years	,248	,009	729,922	1	,000	1,282
	Migrant 9 years or more	,346	,005	4902,084	1	,000	1,413
	Public Servant	,223	,014	248,047	1	,000	1,250
	Formal worker	-,103	,004	534,476	1	,000	,902
	Employer	,192	,018	111,657	1	,000	1,212
	Age of household head	,030	,000	25670,563	1	,000	1,030
	Married couples	-,042	,005	58,795	1	,000	,959
	Household size	,259	,002	14615,976	1	,000	1,296
	Economic dependency	-,017	,007	5,772	1	,016	,984
	Schooling	-,014	,001	512,515	1	,000	,986
	Wealth	,145	,001	17110,301	1	,000	1,156
	Metropolitan Area	-1,563	,009	27922,085	1	,000	,210
	Large Municipalities	-1,371	,010	19102,882	1	,000	,254
	North	,038	,007	29,652	1	,000	1,039
	Midwest	,776	,016	2365,225	1	,000	2,174
	South	1,344	,010	16893,464	1	,000	3,833
	<i>Per capita</i> income	,000	,000	64,625	1	,000	1,000
	Household income	,000	,000	839,450	1	,000	1,000

Northeast	,164	,005	1002,282	1	,000	1,178
Women with children under 14	-,270	,009	972,134	1	,000	,764

Obs. The reference category is: 4 (informal renter)

VI. CONCLUSIONS AND POLICY IMPLICATIONS

This study sought to analyze the tenure choice behavior of Brazilian households, based upon IBGE 2005 PNAD microdata in order to derive some conclusions for policy making.

The main results show that wealth is a good predictor for formal ownership and that current income, albeit statistically significant has very limited impact on tenure choice decisions. Life cycle variables such as age of the household head, marital status and household size increase the probability of formal homeownership. Considering this results, policy makers in Brazil, who have always design housing policy according to current income levels, might create some kind of housing programme or incentive that takes explicitly into account households point in the life cycle, such as incentives to first homeownership or subsidies to rental housing for young people, for instance.

More vulnerable households such as the poor, the afro-descendents or single women with children under 14 years old have a higher probability to be in the informal sector, showing that they have limited tenure choice. The inclusion of information on informality in the analysis improves the quality of the forecasts and changes the sign of the impact of afro-descendents in homeownership.

The effect of education on tenure choice is significant, but the sign of the impact depends on the specification of the dependent variable. Education enhances the probability of being in the formal housing sector, either as a renter or an owner. Recent migration (less than 4 years in the municipality) has a negative impact on homeownership, but this negative impact of migration dissipates over time.

Generally, the forecast performance of the extended Multinomial Logit models, that include informal tenure arrangements in the dependent variable, was superior to the simple Logit

dichotomus owner vs. rent model in identifying the main determinants of tenure choice in Brazil. Even if the models perform quite well to explain tenure behavior in the formal sector, in the informal predictions are quite poor. One possible explanation for this fact can be the existence of local characteristics that might be affecting tenure choice in specific places and that our dummies for fixed effects are not able to account for. In general, if we restrict our sample to metropolitan area the predictive power of the models for the informal sector increases. Also, some corrections to the rare event bias may be performed. (For instance King and Zeng, 2001).

One possible sequence of this study could be try to estimates separate models for each metropolitan area or even estimate tenure choice at intra-city level, taking into account the location as well as tenure choice of households, based on methodologies developed by Gibb (2000) or Elder and Zumpano (1991). The assumption of independence of irrelevant alternatives might be quite restrictive in some cases, so maybe we can perform a formal test or use the Nested Logit Model to avoid this hypothesis (see for instance Franses and Paap, 2000).

Vulnerability and credit constraints variables need further detailing and refining because they show different effects being measured by the same set of variables. An unexpected result is the fact that formal employees present a negative probability of becoming homeowners. Specifically, we need more information on informal property rights and tenure security in order to improve the quality of our forecasts, because informality is not well capture in PNAD. It would be interesting if IBGE could include in PNAD questions about perceived and *de facto* tenure security, such as the existence of legal title or formal purchase and rental contracts In our theoretical model, for instance, one of the key variable to explain tenure choice and housing prices in the informal sector is the probability of loosing the housing equity, and this variable is not explicitly accounted for in the cross-section empirical models.

Another interesting study that can be developed is the dynamic analyses of tenure choice based on the pseudo painnels constructed from the 1992-2005 PNAD series, so that we can take into account the effect of inflation on tenure choice and on the user cost of owing

versus renting. The effects of tenure insecurity over tenancy decisions can also be better captured on a dynamic framework, as perceived tenure security increases over time, if land remains unclaimed for a long time. The impacts of precarious insertion in the labour market over cohabitation and late stayers and the economic obstacles to the formation of new households can also be object of interesting studies in the future.

To conclude, one general recommendation of the paper is that policy makers should not focus exclusively on owner-occupied housing as the best housing solution, but that a wider range of housing options with different modalities, prices, qualities and locations should be available to Brazilian households, from which they can choose the solutions that fits better their housing needs. In this sense, rental housing can offer good housing solutions for young people in search of employment opportunities and newly arrived migrants, with the importance of rental markets to alleviate housing shortage increasing in urban agglomerations and fast growing urban areas.

Furthermore, policy makers should give more attention to variables such as wealth and income distribution, household composition and life cycle variables when designing housing policies and programmes, if they want to promote economic efficient and social inclusion in the Brazilian housing markets.

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APPENDIX

A MODEL OF TENURE CHOICE: THE CASE OF FORMAL AND INFORMAL HOUSING MARKETS

Usually the literature on tenure choice emphasizes the importance of factors like wealth, life-cycle, uncertainty and institutional features of the markets, like taxes.

Henderson and Ioannides (1983) developed a model in which tenure depends on the life cycle, wealth, credit constraint and some institutional variables, like taxes policy. We would like to extend this model to account for a key feature of urban agglomerations in developing countries, the existence of informal settlements. Henderson and Ioannides (1983) consider the dual aspect of housing: the consumption and investment purposes. The model considers a two period agent that maximizes the life-time utility that depends upon the desired stock of housing consumption, the desired stock of housing investment the consumption goods and the savings. Nonetheless, the theoretical literature on the decision of informal settlements is almost silent. One could question which factors that could explain the decision to live in an informal settlements, how the tenure choice is affected by the new option to live in a non-regular housing arrangement.

In this paper, we try to tackle this problem using an OLG model where the agent has initially two options: to rent or to own the house. In the first period, the agent must decide if he wants to buy the house or rent it. As in Henderson and Ioannides (1983), the model assumes that housing is an indivisible good, which has two purposes: consumption and investment. Since it is an indivisible good, one must take into account that if h_I is lower than h_C , the agent can buy h_I units and rent the difference between $h_C - h_I$. Following the argument of H_I the agent will be a tenant if $h_C - h_I > 0$, otherwise the agent will own the house. To model the formal sector, the problem of the consumer, which owns the dwelling, is to maximize a life-time utility defined by:

$$\text{Max}_{S, h_l, h_c, c_1, c_2} L = U_1(c_1, h_c) + \beta U_2(c_2, h_c)$$

Subject to

$$y_1 = c_1 + S + (P - L - R)h_l + Rh_c$$

$$c_2 = y_2 + S(1 + r) + [P(1 + \theta) - L(1 + r) - \delta]h_l$$

$$h_l - h_c \geq 0$$

The household decides in the first period if they buy or rent their home, how much to save(S) and consume (c1). In the second period the agent has an income (y2) plus the return on the assets in the first period (savings and housing), which equals the consumption in the second period (c2). The first order conditions are presented in the appendix.

The first equation shows the usual Euler equation and combining with the second optimality condition, we state the equilibrium in the assets markets:

$$R = \frac{(r - \theta)P + \delta}{1 + r} \quad (1)$$

The interpretation is the usual one: rents must equal interest rates times the price of housing plus the net depreciation. Note that the term θP accounts for the appreciation in the value of the housing, if $\theta > 0$.

As we consider the informal arrangement as an illegal settlement, one way to model the informal market for housing is to include a positive probability to have the house destroyed in the second period, ϕ , if the household lives in an informal settlements. In other words, we suppose that property rights are not completely enforceable by households living in illegal settlements. We suppose that agents interpret this probability as an increase in the depreciation rate. So the problem of the informal owner will be slightly modified, considering this increase in the depreciation rate as ϕ :

$$\text{Max}_{S, h_c, h_f, c_1, c_2} L = U_1(c_1, h_c) + \beta U_2(c_2, h_c)$$

Subjet to

$$y_1 = c_1 + S + (P_{in} - L - R_{in})h_f + R_{in}h_c$$

$$c_2 = y_2 + S(1+r) + [P_{in}(1+\theta) - L(1+r) - \delta - \phi]h_f$$

$$h_f - h_c \geq 0$$

Solving this problem, it is possible again to derive the usual asset equilibrium equation:

$$R_{in} = \frac{(r - \theta)P_{in} + \delta + \phi}{1 + r} \quad (1')$$

Combining the two markets the informal and the formal, it is possible to derive a relationship between rents in the formal and informal sectors, with the acquisition prices in both sectors. 14

Proposition 1: If the price in the formal sector is “actuarial fair”, i.e., equals the price in the informal sector plus the discounted risk to lose the housing unit, rents in both sectors are equal.

Proof: It's trivial to show, from equal (1) and (1'), that $R_{in} = R$ if $P = P_{in} + \frac{\phi}{r - \theta}$.

One corollary of this proposition is: renters in the informal renters are paying relatively more than the formal renters. This might explain the lower proportion of the rent market in informal settlements. These results suppose that arbitrage among renters and owners, and informal and formal market is costless. Assuming that rents can equalize in both sectors, in short, we assume that markets are efficient. Other institutional factors, like transaction cost to move, certainly affect this market efficiency.

Henderson and Ioannides (1983) suppose that the utility function is addictive and separable between consumption good and housing consumption. A comparative static can be used to derive the impact of the wealth and life cycle income on the endogenous variable: housing investment and consumption demand, total savings. In this fist simple model, we assume that savings and housing investment are perfect substitutes, in the next sub-section, this

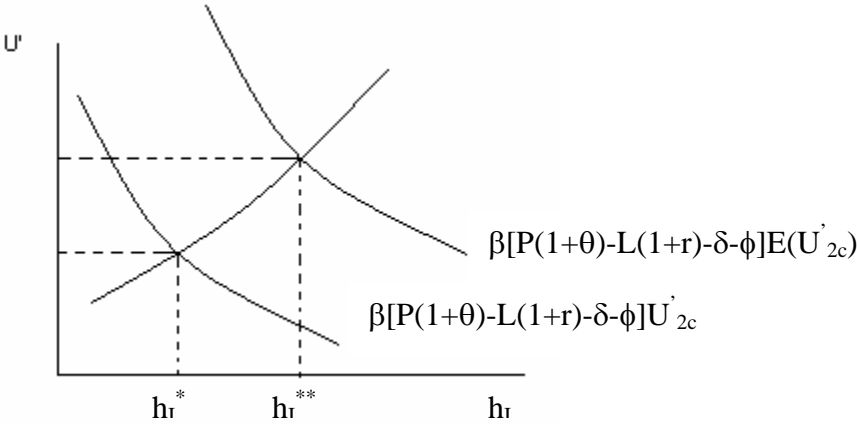
¹⁴ Note that in our model the only cost the household incurs by living in an informal sector is the probability to lose the house, however if one suppose that there is some kind of neighborhood effect,. We abstract from those effects. However, if those effects are present, the differential between the two sectors must be higher.

assumption is relaxed in order to analyze the impact of credit-constrained households, labor market shocks and nominal shocks on monetary savings (S). In contrast with Henderson and Ioannides (1983) we suppose that housing is the riskless asset, so the hypothesis is that households could migrate to housing in order to protect themselves from external shocks. Now, we can suppose that there is an exogenous labor market. In the second period, the household faces a non-insurable shock, ε , as shown in the literature, the presence of such a shock, will make agent to protect their income flow, acquiring real assets. In our case, since the savings and housing are perfect substitutes there will be precautionary savings in order to protect against future shocks.

Therefore to include incomplete labor markets, the model can be rewritten as:

$$\begin{aligned} & \underset{S, h_c, h_r, c_1, c_2}{\text{Max}} \quad L = U_1(c_1, h_c) + \beta E[U_2(c_2, h_c)] \\ & \text{Subjet to} \\ & y_1 = c_1 + S + (P_m - L - R_m)h_r + R_m h_c \\ & c_2 = y_2 + \varepsilon + S(1+r) + [P_m(1+\theta) - L(1+r) - \delta - \phi]h_r \\ & h_r - h_c \geq 0 \end{aligned}$$

where ε represents an iid shock with zero mean and constant variance. The presence of these shocks enhances the demand for assets. This can be seen in the following graph:



The difference between h_r^{**} and h_r^* is the precautionary acquisition of housing due to uncertainty in the labor market. Therefore the presence of a non-insurable shock in the labor market enhances demand for housing investment. It is very easy to show that the precautionary savings are present in this model, this is just an application of Jensen's

inequality. Let \bar{y}_2 be the expected income in the second period, so if the marginal utility is convex, then:

$$E[U'_{2c}(y_2 + \varepsilon + S(1+r) + P(1+\theta) - L(1+r) - \delta)] > U'_{2c}(\bar{y}_2 + \varepsilon + S(1+r) + P(1+\theta) - L(1+r) - \delta)$$

This justifies the shift towards northeast of the marginal utility curve and the extra amount of optimal savings, that is the precautionary behavior.

The main question one can pose is: does precautionary demand for housing increases with wealth?

Proposition 2 If the utility function has decreasing absolute prudence (DAP), that is, $-u'''/u''$ is decreasing then the precautionary demand for housing investment is decreasing with wealth.

Proof: Let λ be the certain equivalent, such that

$$E[U'_{2c}(y_2 + \varepsilon + \lambda + S(1+r) + P(1+\theta) - L(1+r) - \delta)] = U'_{2c}(\bar{y}_2 + \varepsilon + S(1+r) + P(1+\theta) - L(1+r) - \delta)$$

to prove that precautionary savings decreases with wealth one needs to show that $\frac{d\lambda}{dW} < 0$, this can be guaranteed if the utility function is DAP. See Weil (1992).

Therefore, if this results hold, then the less wealthy household will more likely become owners, in face of labor shocks that are not insurable. A higher instability in the labor market would increase the probability to become owner.

The total effect on the consumption goods will depend on the rate of substitution between housing and consumption, however, since savings are increasing, the total consumption will be decreased. Therefore, the probability to be owner enhances, if there is a non-insurable shock in the labor market, because the demand for housing investment will

increase, and the demand for housing consumption will be kept at least at the same previous level.

The same effect of item 3 can be derived to shocks on the nominal or monetary savings, like inflationary impact on nominal savings. Finally, credit-constraint can easily be analyzed in the model, just including another restriction as $S > 0$.

The main conclusions of this model are:

- (1) Properties in the informal market will tend to be cheaper than in the formal sector, if markets are efficient and rents are equal.
- (2) Life-cycle and wealth are important variables in the tenure decision, as shown in the usual in the literature.
- (3) Shocks in the labor market increases the demand for housing investment, therefore the more unstable is the labor market the more likely the vulnerable householder will own his dwelling.
- (4) If the utility function of the household has a decreasing absolute prudence (DAP) then the impact of labor market shocks on the probability to own the house will be higher among less wealthy households.

The same effect of item 3 can be derived to shocks on the nominal or monetary savings, like inflationary impact on nominal savings. Finally, credit-constraint can easily be analyzed in the model, just including another restriction as $S > 0$.