Demographic housing demand: estimates by household sizes

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Housing is a basic necessity of human beings which must provide shelter, allow free access and occupation. Given the complexity of the postulating families and in order to guaranteeing those valuable qualities, habitation, as an asset, is differentiated in size, space localization, quality of the used material, quality of the construction workers' job and finishing criteria among others. For that reason, quantitative studies on housing have been developed in both national and international academic scope. In Brazil and Latin America, for instance, studies for estimating and categorizing the supply by housing demand and deficit have been taking place (ARGENTINA, 1997; GENEVOIS and COAST, 2001 and FJP, 2006). Housing demand projections for the future has only been recently introduced in the Brazilian literature (GIVISIEZ, RIOS-NETO and SAWYER, 2006; GIVISIEZ, RIOS-NETO and OLIVEIRA, 2005), despite being a common subject in international specialized literature (UNITED NATIONS, 1973; SHRYOCK, SIEGEL, and SOCKWELL, 1976; McDONALD, 2007; O'NEILL and LEIWEN, 2007; and YI et alli 2007). As for governmental housing programs, it is imperative to project trends in light of possible household formation, in order to create efficient public housing policies.

A methodology based on age specific headship ratio and its variables has been vastly used in recent years. Since the projection for population growth reflects past and future fertility, mortality and migration patterns, the headship ratio methodology indirectly reflects these three elements of population changes. To cope the application of headship ratio methodology with Brazilian reality, future housing demand projections in several levels of territorial aggregation were carried by means of a research project brought for the National Habitation Office of the Brazilian Ministry of the Cities, coordinated by the Development and Regional Planning Center – CEDEPLAR and University Candido Mendes Institute, in Campos dos Goytacazes – IUCAM Campus (BRAZIL, CEDEPLAR and IUCAM, 2007). The most important innovations included the housing demand projection according to income, education level of household head, household size and housing deficit categories.

This article's objective is to present the housing demand projection distinguished by household size, sex and age. Additionally, there will be discussions on the most pertinent effects in the projection period.

Procedures

The National Household Sample Research – PNAD, from 1992 to 2004, was the source for information. Four household category groups were utilized for the probability model. They were: single household, two inhabitants, three or four inhabitant and five or more inhabitant. In order to comprise the latest changes, the historical changing of the headship function were modeled according to Age-Period-Cohort – APC model. The use of an eminently demographic methodology, when projecting household formation trends, is justified by the assumption that it is a phenomenon related to its individual life cycle. The headship ratio in the age group between x and $x+n$, sex, $({}_nT_x^s)$ is defined by the percentage of household head individuals in every age group. The number of household heads was also controlled by family size categories, which means, $\sum_{r=0}^{n} R_r = {}_nT_x^s$ (fig.1).
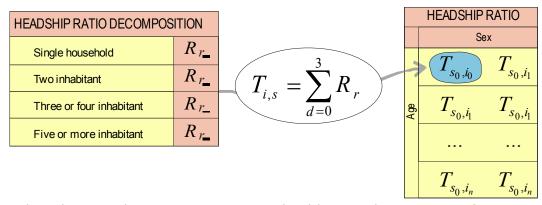
Fig. 1 Three-dimensional matrix: income category headship ratio decomposition reference
Source: IBGE (2007)

Three independent variables are considered in the APC modeling and the regression model is presented as in equation 1. Applying the methodology in two steps permits projecting headship ratio right on the first step, and distribute it in four distinguished household size categories on the second step. The explanatory variables used in the level of education and income models were Age (A), Period (P), Cohort (C) and the household's location (equation 2). The fisrt model was adjusted by a binary logit model, and the second is a multinomial logit model.

$$_nT_x^s = \ln(\mu) = \alpha_r + \theta_r.I + \pi_r.P + \gamma_r.C \qquad \qquad \text{Equation 1}$$

$$\ln\left(\frac{\Pr(R_r)}{\Pr(R_3)}\right) = \alpha_r + \theta_r.I + \pi_r.P + \gamma_r.C + \upsilon_r.UT \qquad \text{Equation 2}$$

Considering

$_nT_x^s$	Headship ratio, by sex and age
$\alpha_r; \theta_r; \pi_r; \gamma_r \text{ e } \upsilon_r$	Estimate indexes
$\Pr(R_r)$	Household R_r category probability

Projection Results

The Brazilian age structure is expected to vary a great deal in the first decades of the twenty first century, since Brazil went through a very fast fertility transition between the 1980s and 2004, when fertility reached the replacement level. Specialized literature relates to a demographic dividend in several realms, associated with a declining dependence rate and an increasing share of the working age population. One can talk of a demographic dividend or window of opportunity in education associated with the declining share of the school aged population. Likewise, one can talk of demographic dividend in terms of the social security system or the savings rate when the share of the working age population increases. The most obvious prediction of housing demand associated with changes in the population age structure after the demographic transition is the increasing housing demand associated with the aging process, observed when the headship rate increases with age.

Figure 2 shows the annual household increase in housing stock between 2003 and 2020 in Brazil. It is clear that the increase in housing stock will decrease until 2014, but from 2015 on that tendency will shift to an increasing pattern until 2020. It is also clear the similarity between the resultant function based on the low and medium fertility estimates. Nevertheless, the Brazilian case shows a different demographic dividend associated with the demographic transition process, a decreasing annual demand for new housing between 2004 and 2015, associated with a substantial declining share of the youth (15-24) and young adult population (25-29) age groups. The annual demand for new housing among the youth declines between 2004 and 2015, while the decline for the young adult population is greater after 2015. Thus, there is a two period demographic dividend.
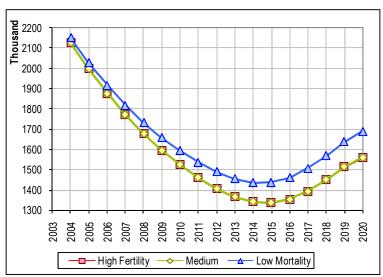
Fig. 2   Annual increase in housing stock, per projection scenario, by period. Brasil, 2003-2020.
Source: PNAD (IBGE, 1982 a 2004). Population Projection (CEDEPLAR, 2007). Headship ratio projection (BRASIL, CEDEPLAR e IUCAM, 2007)

Figure 3 shows that the growth follows the same pattern observed in the four household size categories. This distribution is consistent with the most common family type in Brazil, which are represented by nuclear couple and children households. The most significant change in household size represents one point per cent decrease from five inhabitants or more families. When distinguishing these members by sex, however, the same regularity is not observed anymore.
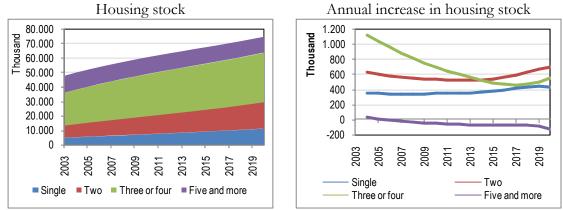

Fig. 3   Household demand projection per period Brasil, 2003 a 2020
Source: PNAD de 1992 a 2004 (IBGE)

One person households, more common among women than men, are also increasing in number of male inhabitants, which has not been observed among the first group. On the other extreme, more than five inhabitant households have been decreasing in numbers throughout the estimated periods, but, in this case, when considering the total, male participation is declining compared to the number of females. Three or four people family numbers are also supposed to decline from 2014 on, at levels below two member family numbers. Moreover, there is a movement towards a negative projection for large household dissolution in the same period. That indicates that the decreasing flow for the total of households until 2014 will be reinforced by the increasing small family household demand. It is no surprise that single household demand projection is positive throughout the same period.

Considering the differential levels, household formation and dissolution flow patterns are different between male and female headship. There is a notorious decrease in the household formation rate when a man is the head. Being a woman the head, however, the decline is noticeable only at the five or more inhabitant household category.
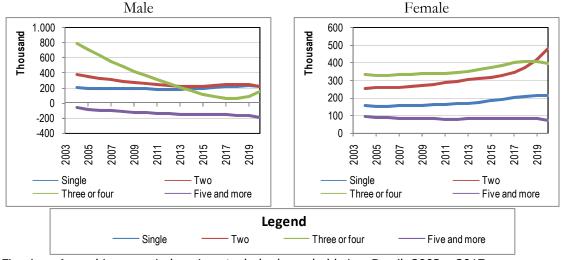

Fig. 4   Annual increase in housing stock, by household size. Brasil, 2003 a 2017
Source: PNAD de 1992 a 2004 (IBGE).

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