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HOUSING, IMPUTED RENT, AND HOUSEHOLDS' WELFARE

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ABSTRACT

Housing is the largest durable good consumed by households. As such, any consumption-based measure of welfare, to be comprehensive, must include the value of the flow of services households derive from their dwellings, the so-called imputed rent. However, estimating imputed rents is a daunting task, which researchers and practitioners tend to overlook. This paper is the first attempt to assess the distributional impact of including housing in the welfare aggregate; the paper tests two estimation methods and analyzes four developing countries. The distributional impact cannot be predicted a priori, and evidence suggests it is context and method specific. Although changes in poverty and inequality are always statistically significant, they are only occasionally larger than one percentage point. By contrast, shared prosperity exhibits sizable changes, which might also determine international re-rankings. Albeit the inclusion of imputed rents reshuffles the set of poor households, observed changes in the socioeconomic profiling of the poor are unlikely to affect pro-poor policy design.

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Housing, Imputed Rent, and Households' Welfare[1]

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1. Introduction

Housing, measured as the welfare value of the flow of services households derive from their dwelling, is one of the most relevant components of households' welfare aggregate, which is used as a basis for distributional analysis (Deaton and Zaidi 2002). Nevertheless, due to data limitations and the difficulty of estimating rental values for non-market tenants and owners, the housing component is often neglected in the construction of welfare aggregates. In fact, although we can reasonably assume that the flow of services enjoyed by living in a dwelling is correctly approximated by the monthly rental payment to landlords among tenants, no such measure is readily available for home-owners. Furthermore, not all tenants pay a market price for the dwellings they live in, as many enjoy subsidized rental arrangements (see, for instance, Lara Ibarra et al 2017), or live for free in a dwelling provided by their employer or by a family member. Therefore, in order to include in a measure of the welfare aggregate the value of the flow of services households derive from the dwellings they live in, one would have first to estimate rental values for home-owners and adjust those for non-market tenants.

As argued by Frick et al. (2010), excluding estimated rental prices from the welfare aggregate used in distributional studies may undermine the validity of comparisons of any distributional outcome, both in time-series within a particular country and in cross-sectional analysis across countries. The need for including the housing component for the purpose of measuring welfare has been stressed by different communities of practitioners. For instance, the US Interagency Technical Working Group on Developing a Supplemental Poverty Measure Census (2010) acknowledges the need to adjust poverty thresholds by housing status. The European Commission financed the project "Accurate Income Measurement for the Assessment of Public Policies" (Sutherland et al., 2009) with the objective, among others, of understanding the distributional impact of the inclusion of rents in income aggregates. Törmälehto and Sauli (2010 and 2013) analyze the implications of including rents in the income aggregate for official poverty and inequality estimates published by Eurostat and conclude that "*the present data quality does not support adding this component to disposable income concept without major improvements in the comparability of the data between countries and within countries across time*" (Törmälehto and Sauli 2013, 39).

By contrast, in order to guarantee meaningful international and inter-temporal comparability of countries' welfare, observed and imputed rental prices are included in National Accounts according to internationally agreed recommendations (SNA 2008). In a sample of OECD countries, for instance, the share of observed and imputed rents in households' total consumption expenditures range from 6.5 percent in Poland to 25 percent in Finland, according to the latest available National Accounts data (OECD 2018). For the same countries, this share may vary sensitively over time, even within a short period. For instance, in Ireland the share almost doubled from 11 percent in 1996 to 20 percent in 2016, in Spain it increased from 10 percent in 1996 to 16 percent in 2016. In some other countries the share decreased: over the period 1996-2016, in Sweden it declined from 25 to 20 percent and in Mexico from 19 to 14 percent. It is clear then that the exclusion of this large component of household consumption from National Accounts would distort country-rankings in terms of Gross Domestic Product (GDP).

The World Bank has recently started collecting information for understanding the key elements of national methodologies used to produce official poverty estimates. Preliminary results shed light on a sample of 69 country-year observations of recent poverty estimates. Only for 28 observations is it possible to understand whether the welfare aggregate included observed and imputed rents (World Bank, 2015). Nonetheless, when housing is included, researchers and practitioners do not usually test how different imputation methods may affect distributional indicators nor justify why a particular method has been chosen. For example, Ceriani, Olivieri and Ranzani (2019) tell a cautionary tale about the accuracy of rents imputed by using the self-

assessment method. Yet, in 15 of the mentioned 28 surveyed cases, poverty estimates include home-owners' self-assessed rental values without any (at least documented) assessment on whether there is a bias or not.

In this paper, we analyze the distributional impact of including the value of the flow of services derived from housing in households' welfare aggregate. Since one of the main results emerging from the previous literature is that the distributional impact may be sensitive to the estimation method (Frick et. al 2010), we implement two approaches in imputing rental values and assess whether and how the method influences our results. Precisely, we investigate the effect of including rent on inequality, poverty (intended both as poverty headcount, depth and severity and in terms of profile of the poor), and shared prosperity, i.e. the annualized growth rate in mean income (or consumption) level of households at the bottom 40 percent of the distribution between two-time periods. To do so, we first provide a theoretical framework to understand the possible distributional outcomes, and then we present results from an empirical application to Albania, Bangladesh, Iraq, and Peru.

While previous studies are conclusive towards a reduction in both inequality and poverty after including rent (for a recent review of the literature, see Balcázar et al. 2017), this paper provides suggestive evidence that the distributional impact is instead context- and method-specific. Results of the empirical analysis indicate that while shared prosperity exhibits sizable changes that might determine international re-rankings, changes in poverty and inequality, albeit statistically significant, are only occasionally larger than 1 percentage point. Nevertheless, including rents in the welfare aggregate is not rank-preserving, and in countries with low headcount rates, any churning around the first decile may imply a change in the profile of the poor. In the examples selected for this study, most of the socio-economic variables characterizing the poor are affected by the inclusion of rents, although changes are rarely substantial. Nevertheless, because housing is an important component of consumption, and it is expected to become even more important as economies grow, then not including imputed rents in the consumption aggregate will result in a noisier welfare indicator, and, in turn, in less precise poverty profiles (Lanjouw and Lanjouw 2001).

The rest of the paper is organized as follows. Section 2 lays out a simple theoretical framework that describes the expected distributional impact of including rental values in the consumption aggregate. Section 3 introduces the data sources used in the analysis and the empirical strategy adopted to impute rental values. Section 4 assesses the distributional impact of imputing rental values on inequality, poverty, and shared prosperity indicators. Finally, Section 5 presents a set of concluding remarks.

2. Theoretical Framework

This section introduces the expected distributional impact of including rental values in the consumption aggregate using a stylized theoretical framework. Given the original distribution of welfare net of rent (which is used as baseline), different assumptions can be made on the corresponding distribution of rental values, where rents include both the level of per-capita market rent for market tenants and imputed rents for home-owners or non-market tenants. We assume three hypothetical scenarios: (i) all individuals pay the same amount of rent; (ii) rent is a fixed proportion of each individual's welfare; (iii) rent is a share, different for each individual, of each individual's net-of-rent welfare. Regardless of the scenario, since rent is a non-negative value for all individuals, the new welfare distribution including rents is shifted to the right with respect to the baseline welfare distribution.

In this paper, the impact of imputing rents on inequality is assessed by looking at changes in the Gini index. Since the Gini index satisfies the property of scale invariance, there would be no change in inequality if rents were a fixed share of each individual's net-of-rent welfare (scenario (ii)). However, the Gini index does not satisfy translation invariance. Therefore, adding a constant value to the baseline distribution (scenario (i)) would imply a change in inequality. In particular, this would imply a reduction in inequality since welfare would

increase proportionally more at the top than at the bottom of the distribution (and the mean of the well-being indicator would increase). Nothing can be stated a priori regarding inequality under scenario (iii). If rent were a growing (decreasing) share of individuals' welfare, inequality would increase (decrease). Yet, if there is no linear relation between the original welfare distribution and rents, the distributional impact of imputed rents cannot be predicted ex-ante.[5] For example, if rents are higher for some specific subset of the population, such as individuals living in urban dwellings, individuals belonging to that subgroup may also present higher rent shares relative other subpopulations. The effect of adding rents on inequality would not be straightforward in this case.

The distributional impact of imputed rents on poverty is assessed analyzing changes in poverty incidence, depth and severity. Recall that poverty measurement involves three steps: defining a welfare indicator (usually consumption or income), setting a poverty line, and finally aggregating all information into a single poverty indicator. Recall, moreover, that the poverty line is usually defined as a function of the welfare indicator itself. This holds true not just in case of a relative poverty line, e.g. 60 percent of median income, but also in case of an absolute poverty line. An absolute poverty line, e.g. based on the cost of basic needs approach, is generally computed in two steps, first by identifying a food poverty line and then by adding to it a non-food poverty line. Seeking simplicity, we can think of the non-food component as determined residually by inflating the food poverty line with the ratio of non-food consumption to food consumption for the reference population.[6] Therefore, if the welfare distribution changes, it should be good practice, whenever possible, to re-estimate the poverty line accordingly. Trivially, if rents are included in the welfare aggregate, but the poverty line is left unchanged, poverty will decrease. When both the poverty line and the original welfare distribution increase as a consequence of including rents in the welfare aggregate, the effect on poverty becomes unpredictable, unless the poverty line is relative, and rents are modeled following scenario (ii). In this case, given that the poverty indices used in this analysis satisfy scale invariance, poverty will not change.

The third indicator of well-being taken into account in this paper is shared prosperity. In 2013, the World Bank adopted two new targets: ending extreme poverty by 2030 and promoting shared prosperity. The emphasis on reducing extreme poverty is in line with the commitment to eliminate extreme poverty enshrined in the first target of the Sustainable Development Goals, which were adopted by the United Nations in 2015 (United Nations 2015). Shared prosperity focuses on the less well-off more broadly. It is defined as the annualized growth rate of the average welfare of the bottom 40 percent of the population between two years y and $y+\tau$, where τ stands for the number of years between two data surveys.

Let us define the average welfare aggregate at time t, for the bottom 40 percent of the population as ${}_t\bar{x}_{B40}$, where $t = y, y+\tau$. Hence, shared prosperity (${}^{y+\tau}_{\ \ y}g_{B40}$) is defined as in equation (1):

$$ {}^{y+\tau}_{\ \ y}g_{B40} = \left[\frac{{}_{y+\tau}\bar{x}_{B40}}{{}_y\bar{x}_{B40}}\right]^{\frac{1}{\tau}} - 1 \quad (1) $$

Monitoring shared prosperity is challenging, as it requires building comparable welfare aggregates over time. For our purposes, the three scenarios we introduced before are here increased to nine, as summarized in Table 1, depending on the prevalent rent-imputation scenario in each one of the observed years.

[5] Blades (2009), for example, shows that the share of housing on total consumption is positively correlated to GDP per-capita. However, there is still no evidence that the share of housing on total consumption is correlated to the distribution of the welfare aggregate in developing countries. More evidence on this is needed, preferably using large samples of countries.

[6] Specifically, the lower level of the total poverty line is defined based on those households whose total consumption is close to the food poverty line. On the other hand, the upper level of the poverty line happens when households whose total *food* consumption is close to the food poverty line (Ravallion 1994). In the following we assume that the reference population for the estimation of the food poverty line does not vary under different definitions of the consumption aggregate, namely, including or not the housing component.

In scenario (i,i), rents added to the original welfare aggregate are a fixed amount in each year (${}_{y}r$ and ${}_{y+\tau}r$). For growth of the bottom 40 percent not to be lower compared with the scenario where rents are not included in the consumption aggregate, the following condition must hold:

$$\frac{{}_{y}r}{{}_{y}\bar{x}_{B40}} \geq \frac{{}_{y+\tau}r}{{}_{y+\tau}\bar{x}_{B40}} \quad (2)$$

In scenario (ii,ii), rents added to the original welfare aggregate are a fixed proportion of the original welfare aggregate for each individual in each year (${}_{y}\lambda$ and ${}_{y+\tau}\lambda$). Therefore, if ${}_{y+\tau}\lambda \geq {}_{y}\lambda$, shared prosperity cannot be lower after rent imputation. The opposite holds if ${}_{y+\tau}\lambda < {}_{y}\lambda$.

In scenarios (i,ii) and (ii,i) rents added to the original welfare aggregate are, for the first year y, a fixed proportion of the original welfare aggregate and a fixed amount for each individual, respectively. The reverse applies for the second year $y + \tau$. For shared prosperity post-rent imputation not to be lower relative to shared prosperity before-rent imputation, the following conditions must be satisfied:

$$\begin{aligned} {}_{y+\tau}\lambda &\geq \frac{{}_{y}r}{{}_{y}\bar{x}_{B40}} \quad \text{for scenario (i,ii)} \\ {}_{y}\lambda &\geq \frac{{}_{y+\tau}r}{{}_{y+\tau}\bar{x}_{B40}} \quad \text{for scenario (ii,i)} \end{aligned} \quad (3)$$

In all scenarios where rents in one (or both) period follow hypothesis (iii), we cannot guess a priori the sign of the change when adding rents to the consumption aggregate because ranking is not preserved in at least one of the two years.

Even if inequality and poverty indices are not affected by rent-imputation, there is still the possibility that changes could happen to the underlying distribution. Unless rent-imputation is rank-preserving, in fact, the same individual might be found in two very different positions before and after the imputation, e.g. above the poverty line, when before imputing rents she was below the poverty line, or at the bottom of the welfare distribution, when before she was at the top of the welfare distribution. Analyzing such changes is important, because they might imply adjustments to redistribution policies. For instance, in anti-poverty strategies, the target population (the set of poor individuals) might change after the inclusion of rental values.

One way to check if adding rent to the welfare aggregate determines churning to the distribution is to build transition matrixes with respect to the baseline scenario with no-rents in the welfare distribution. Each $ij - th$ cell of a $m \times m$ transition matrix represents the probability (or the incidence) to find some individuals belonging the $i - th$ quantile of the original no-rents distribution in the $j - th$ quantile of the distribution including rents. In case no churning occurs, the transition matrix will appear as an identity matrix. Notice that a true non-anonymous analysis would require a transition matrix as large as the population size, although a $n \times n$ matrix would not be tractable or particularly useful. Therefore, a transition matrix typically cluster population into quintiles or deciles. This implies that even in the case the transition matrix is an identity matrix, some reshuffling in the underlying distribution takes place within the subset of population belonging to the same cluster. For instance, some individuals might change position in the distribution, yet they remain within the poorest 10 percent of the population. For the purpose of re-assessing anti-poverty policies, we believe that this level of precision is typically sufficient.

Another important component consists of checking whether rent-imputation changes the characteristics of the poor. Any time transition matrixes show some churning, there is a possibility that the set of poor individuals is composed of individuals with different socio-economic characteristics. This is true even if poverty indices do not change with imputed rental values. For instance, imputed rents among individuals living in urban

settlements might be much higher relative to imputed rents for individuals in rural settlements, pushing all urban dwellers above the poverty line. This, in turn, could suggest a need for a re-allocation of anti-poverty funds from urban to rural areas. Again, assessing the distributional impact of imputed rents on socio-economic characteristics of poor individuals is hard to define a priori, and it remains an empirical question.

3. Data and Approaches to Rent-Imputation

This section describes first the data sources used in the analysis and second introduces the empirical strategy adopted for assessing the distributional impact of imputing rent on inequality, poverty, and shared prosperity. Two different rent-imputation models, namely, a log-linear econometric model and self-assessment method will be used in the empirical analysis.

3.1. Data and the Preliminary Evidence

The analysis makes use of data from nationally representative household budget surveys that are used for the computation of official poverty figures in Albania, Bangladesh, Iraq and Peru. The countries were selected following three criteria: (i) completeness of information, (ii) broadness of regional coverage, (iii) heterogeneity in terms of development stage. The analysis requires detailed information on dwelling characteristics, tenancy status, self-assessed rental price for owners and non-market tenants, and the official methodology followed to compile the consumption aggregate used in the official distributional analysis. Further, the four countries belong to different regions and represent different stages of development, maximizing as much as possible the generalizability of the results.[7]

The analysis for Albania is based on the 2008 and 2012 waves of the Living Standard Measurement Survey (LSMS). The two surveys are representative at urban and rural level as well as at region and prefecture level. Official poverty figures are consumption-based, and the official consumption aggregate does not include rent or imputed rent. It is important to note that we were not able to access to the methodology for determining the official poverty line. Therefore, in the following, Albania does not appear in some parts of the analysis. Data for Bangladesh come from the 2005 and 2009/10 Household Income and Expenditure Survey (HIES). The surveys are representative by divisions at urban/rural/statistical metropolitan area. Official poverty statistics are based on a consumption aggregate that includes imputed rents, although is not clear which imputation method is adopted in the official methodology. The data sets used for Iraq are the 2007 and 2012 rounds of the Iraq Household Socio Economic Survey (IHSES). IHSES is representative by governorate at urban/rural/statistical metropolitan area. The consumption aggregate for official poverty statistics includes rents following the self-assessment approach. Finally, figures for Peru are based on the 2010 and 2013 rounds of the Peruvian Household Survey on Living Conditions and Poverty (*Encuesta Nacional de Hogares sobre Condiciones de Vida y Pobreza* - ENAHO). Official distributional statistics are based on consumption and the official consumption aggregate includes rents following the self-assessment approach with adjustments for non-response.[8]

Typically, the housing section of household budget surveys contains a question about occupancy status of households, allowing selection of different categories, broadly referable to (i) owners (sometimes specifying whether outright or still paying mortgage), (ii) tenants, (iii) tenants living in subsidized dwellings, (iv) individuals living for free in dwellings provided by relatives or employer. These categories sometimes are more finely

[7] The World Bank classifies countries by region (East Asia and Pacific; Europe and Central Asia; Latin America & the Caribbean; Middle East and North Africa; South Asia; Sub-Saharan Africa) and by development stages (low-, lower middle-, upper middle-, high-income). The four countries analyzed in this paper belong to four different regions: Europe and Central Asia (Albania), South Asia (Bangladesh), Middle East and North Africa (Iraq), Latin America and the Caribbean (Peru). And two income levels: Upper-Middle Income (Albania, Iraq; Peru); Lower-Middle Income (Bangladesh).

[8] We do not use officially imputed rents when making our own estimations.

defined. For instance, in the case of Iraq, the questionnaire allows to separate out private/public/governmental sector ownership from occupancy status. Moreover, household surveys may allow for country-specific ownership statuses as in the case of Peru for the category "ownership by invasion." Starting from the occupancy status, as a preliminary step in the analysis, households have been regrouped in two mutually exclusive ownership sets: owners and non-market tenants in one group and market tenants in the second group. The first group includes outright owners, owners paying mortgage, and individuals living for free or paying a subsidized rent; market tenants are defined residually as households paying a rent. The rent paid by market tenants is reported either in monthly or annual values. Table 2 summarizes categories and regrouping specifications for each country and year.

Table 3 summarizes the main differences between tenants and owners with respect to dwellings' and households' characteristics, focusing on the most recent year of analysis. The share of market tenants is typically rather small in all four countries, ranging from 3.6 percent in Albania (2008) to 11.1 in Bangladesh (2010). The large majority of tenants live in urban areas: 82 percent in Albania, about 90 percent in Bangladesh, and virtually all tenants in Iraq and in Peru. In all 4 countries, individuals living in rented dwellings are concentrated in the region of the capital. For instance, one out of three in the region of Tirana (Albania) and two out of three in the region of Dhaka (Bangladesh).

The high prevalence of tenants in largely urbanized areas, and within these areas mainly in the capital region, poses a problem to the rent-imputation exercise as the characteristics of dwellings as well as rental markets in such areas might be very different compared to those in the rest of the country. Hedonic models assume that urban and rural rental markets price houses similarly, although this is well-known to be very unlikely, whereas self-assessment might be less accurate in areas of the country where the rental market is thin (or absent). Further, tenants are more likely to live in households were the household head is younger and also more educated. For example, in the case of Peru, the incidence of individuals living in households where the head has no schooling or incomplete primary education is 18 percentage points lower among tenants than among owners. By contrast, again in Peru, tenants are 19 percentage points more likely to have tertiary education than owners. Similar patterns, even if less accentuated, emerge in the other three countries. Individuals residing in rented dwellings belong to smaller households, although the difference between tenants' and owners' household size is significant only in the two countries with the larger household size on average. In the case of Bangladesh, there is a difference of about 1 member (-0.8 members, from an overall average of 5.3 members) and in the case of Iraq where the gap is of over 2 members (-2.3 members from an overall average household size of 8.9 members). Finally, rented dwellings, although smaller, are on average of better quality than owners': for instance, in Bangladesh, 93 percent of tenants have electricity as opposed to 52 percent of homeowners; in Peru, 94 percent of tenants have a bathroom inside the dwelling as opposed to only 76 percent of homeowners.

3.2. Estimation Approaches to Rent-Imputation

The first step of the exercise requires identifying a vector of rental values for the observed population—object of the distributional analysis. For each household, the rental value to be used in the construction of a welfare aggregate is the actual rent paid by market tenants (r_h^T), and the imputed rental value for home-owners and tenants not paying the market price (r_h^O). Information on rent paid by market tenants is generally available in household budget surveys as the regular payment to landlords for living in the dwelling, although data from other sources might be also used (e.g. administrative registers, listings, mortgage transactions, experts' survey). Imputed rent for home-owners and non-market tenants must instead be estimated.

Several different imputation approaches have been developed, and no one has emerged as superior to others so far (Balcázar et al. 2017). Notwithstanding the lack of consensus about the best method to adopt, two approaches, in addition to excluding the housing component *tout court* from the welfare aggregate, are commonly

used by practitioners in preparing welfare aggregates for distributional analysis: the log-linear hedonic model and the self-assessment method. According to a World Bank survey on the main characteristics of the welfare aggregates used for measuring poverty in 70 developing countries, only 28 cases include housing. Among these 28, 12 use a hedonic model, 11 use self-assessment, and other four adopted a combination of hedonic model and self-assessment (World Bank 2015).[9] While we refer the reader to Balcázar et al. (2017) for an extensive review of the literature on rent imputation for welfare analysis, we briefly discuss in the following the log-linear hedonic model and the self-assessment method.

The log-linear hedonic approach computes the coefficient of a log-linear model on market tenants and use the estimated coefficients to predict rent out of sample, i.e. for home-owners and non-market tenants:

$$\ln r_h^T = \alpha_0 + \sum_{m=1}^{M} X_{hm}\beta_{hm} + \varepsilon_h \quad (1)$$

where r_h^T is household h's rent; X_{hm} is a vector of M different dwelling's characteristics, including location (whether, for example, the dwelling is located in the capital city, in other urban areas, or in rural areas), structural attributes of the dwelling (e.g. the number and characteristics of bedrooms, kitchen, bathrooms), and neighborhood characteristics (e.g. proximity to schools, availability of entertainment, public transportation, parks, crime rate); ε_h is the error term. Estimated parameters $\widehat{\alpha_0}$ and $\widehat{\beta_{hm}}$ explain how level and combination of the different dwelling's features are linked to the rental price paid by market tenants and can be used to estimate the imputed rent for home-owners and non-market tenants:

$$\widehat{\ln r_h^O} = \widehat{\alpha_0} + \sum_{m=1}^{M} X_{hm}\widehat{\beta_{hm}} \quad (2)$$

As underlined by Malpezzi (2002), the semi-logarithmic model has several advantages. First, the coefficients have a straightforward interpretation: they show approximately the percentage change in the imputed rent for a given unit-change in the covariates.[10] It also mitigates the heteroskedasticity problem (Diewert 2003). Second, it allows for flexible specifications of the covariates that can be either continuous or binary. Third, and most importantly, it allows the marginal rental value to be a nonlinear function of size and quality of the dwelling, which is a theoretical requirement of the hedonic model (Rosen 1974; Freeman 1993).

The second imputation approach used in this analysis is self-assessment. The self-assessment method relies on the assumption that owners can provide a good estimate of the market value of their dwellings, perhaps with the help of interviewers, as suggested in Garner and Kogan (2007). This information is frequently found in household budget surveys, where home-owners and tenants enjoying subsidized arrangements are asked to estimate the rental price they would pay to live in the current dwelling (Frick et al. 2010). The question may be asked in two ways that differ in whether the homeowner is asked to play the role of the landlord or the tenant. In the first case, the question would be some variant of "*How much would you receive as a rent if you were to lend your apartment?*" In the second case, the question would read like "*How much would you pay if you were to rent the dwelling you are currently living in?*" The extensive theoretical and experimental literature on the difference between willingness to accept (WTA) and willingness to pay (WTP) for the same good (among others, Hanemann 1991; Fehr et al. 2015; Tunçel and Hammit 2014) argues that measures of WTA usually exceed measures of WTP. This is due to the fact that a person's perceived value of an item is often higher when the person owns the item

[9] According to World Bank (2015), countries using hedonic models to impute rents are the following: Afghanistan (2008); Timor-Leste (2007); Malawi (2004); Sierra Leone (2003); Kenya (2005); Mozambique (2002); Nigeria (2004); Guatemala (2006); Bangladesh (2005); Peru (2010); Tanzania (2007); Zambia (2006). Among countries using self-assessment to impute rents, there are Nepal (2010); Nicaragua (2009); Zimbabwe (2011); Cambodia (2011); Jordan (2010); Belize (2002); Uganda (2005); Indonesia (2010); Panama (2008); Ecuador (2006); West Bank and Gaza (2007). Countries using a combination of hedonic models and self-assessment: Mongolia (2008); Nicaragua (2001); Peru (2013); Zambia (2010).

[10] This is not accurate for dummy variables. In this case, Halvorsen and Palmquist (1980) demonstrate that the percentage change is better approximated by $(100 * \exp(\hat{\beta}_i) - 1)$.

(i.e., the role of the landlord), then when she does not own it (i.e. the role of the tenant). This would suggest that the second version of the question (WTP), may mitigate the possibility of misreporting due to sentimental attachment to the property. In the selected surveys, we observe both types of self-assessed rent questions previously discussed. In particular, in the case of Albania and Peru, the questionnaire uses the first version: (a) "*Assume that you want to rent [out] this dwelling what would be a monthly rent you will be able [to] ask for? If you rented out this dwelling, how much do you think you would make?*", respectively. In the case of Iraq, the instrument uses the second version: (b) "*How much would you pay if you were to rent a dwelling similar to the one you are currently living in?*"[11] For the reason explained above, we expect that the question as it is asked in Iraq is likely to mitigate the possibility of misreporting due to sentimental attachment to the property, while in Albania and Peru self-assessment might be inflated. Table 2 reports questions asked in each country and year.

As noted by Deaton and Zaidi (2002, 37), rental value from self-assessment *must be treated with caution and carefully inspected prior to use*, as home-owners might not have a precise idea of the market value of their dwelling. The scope of this analysis is to illustrate whether and to what extent different methods can lead to different poverty and inequality estimates. Therefore, we do not ascertain the accuracy of self-reported rental values by home-owners and non-market tenants. Ceriani, Olivieri and Ranzani (2019) test the accuracy of home-owners' self-assessed rental value in an application to Peruvian data.

4. Results

In this section, we analyze the distributional impact of including the flow of services from dwellings in the consumption aggregate using data from four developing countries: Albania, Bangladesh, Iraq and Peru. We measure the effect on different outcomes including inequality and poverty indices, profiling of the poor and shared prosperity by comparing consumption aggregates without the housing component with aggregates that include rental values imputed by means of one of the two approaches described above.

This section summarizes the distributional impact of including rents in the consumption aggregates of the selected countries, differentiating between (i) the baseline scenario, with no rent, and two rent-imputation methods: (ii-a) self-assessment and (ii-b) log-linear hedonic model.[12]

We start off by illustrating the relevance of the housing component as a share of the total consumption aggregate on average and along the distribution (by quintile of the original welfare indicator) (Table 4). On average, rents' shares range from a minimum of 4.8 percent of total per capita household welfare (Bangladesh, 2010, self-assessment imputation method) to a maximum of 22.7 percent (Albania 2008, log-linear imputation method). In Albania and Iraq, two upper-middle income countries, housing contributes about 20 percent of total household consumption. Yet, we cannot generalize this result to upper-middle income countries since Peru exhibits a rent share of 14 percent maximum. Rent shares vary according to the rent imputation method. In line with the expectation associated with the type of question used to collect self-assessed rental values, Albania is the only country where on average rental shares based on self-assessment are higher than those obtained with a log-linear model. However, this does not hold all along the distribution: the log-linear approach produces higher rent shares in the bottom three deciles. A similar pattern is recognizable in Bangladesh (2005), although the differences between the two imputation methods are smaller than in the case of Albania. In the case of Peru, under both methods, and in the case of Albania and Bangladesh, under the self-assessment approach, rent shares increase along the distribution. This is in line with findings from Blades (2009), whereby the share of housing in total consumption is positively correlated with GDP per capita. However, in the case

[11] Bangladesh's questionnaire does not specify the type of question asked by the enumerators.

[12] Results of the log-linear hedonic models are reported in the Appendix.

of Albania and Bangladesh, under the log-linear approach, and in Iraq with both methods, rent shares are a decreasing function of households' consumption.

As a reminder to the reader, in the following analysis we report all results using also the official consumption aggregate (denoted in the tables that follow as *original*). The main tables are shown only for the most recent year, with the exception of shared prosperity, where both years are used, and poverty results for Bangladesh, where we show 2005 instead of 2010. This is because the 2005 HIES was used to update the official poverty line, and we were able to get hold and to modify the original code for this year.

4.1. Inequality

The impact of including rent on inequality is assessed by looking at changes in the Gini index. Table 5 shows the Gini index calculated on the consumption aggregate without the rental component (first row) and the difference, in absolute value, between the initial Gini index and the value of the same indicator calculated on consumption aggregates that include imputed rents according to one of the two imputation methods, namely the self-assessment approach and the log-linear model.

Albeit always statistically significant, only in few instances the impact on inequality of including rents in the consumption aggregates is over one percentage point, although the exact magnitude of the changes varies across countries and for the same country across rent-imputation approaches. A notable exception is Iraq 2007 (Table 5, panel a), where we observe an increase of almost 3 percentage points in the case of the log-linear model relative to the case of no rent. In Albania and Peru, the increase in inequality is as large as 2 percentage points when the self-assessment approach is used. This is likely explained by the large variation introduced by self-assessed values of home-owners, who in most cases tend to overestimate the rental market price due to their attachment to the dwelling they own and in some cases they built (see Heston and Nakamura 2009 for the home-owner pride effect, and Ceriani, Olivieri, and Ranzani 2019 for a general discussion on the accuracy of self-assessment and ways to test it).

As for the sign of the impact, in most instances we observe an increase in inequality, in contrast with the rest of the literature where findings seem to build consensus around an equalizing effect of rent imputation (see Balcázar et al. 2017 for a recent review of the literature). Nevertheless, no general conclusion can be drawn: the sign of the impact varies across countries and for the same country across rent-imputation approaches. For instance, the Gini index increases in all countries in the first round of data (Table 5, panel a). In the second waves, instead, the Gini index increases in the case of Albania and Bangladesh using the log-linear approach, while it decreases in the case of Iraq using the log-linear method (Table 5, panel b). These findings seem to corroborate our hypothesis that the sign and magnitude of the rent imputation impact are an empirical question and no a priori theoretical conclusion can be drawn.

4.2. Poverty

The analysis of the impact of rent imputation on poverty is ascertained following two different approaches. First, we show how poverty (as measured by the headcount, poverty gap and squared poverty gap indices) varies when the initial consumption aggregate, which excludes rent, is modified to include imputed rent and the poverty line is left unchanged. Then, we show the impact on poverty indices of including rent both in the construction of the poverty line and in the consumption aggregate.

As expected, poverty decreases if we keep constant the poverty line to the case of no-rent, independently of the rent imputation method. Table 6 shows in fact that the three poverty indices, i.e. incidence, depth and severity of poverty, decrease as a consequence of the shift to the right of the consumption distribution.

Nevertheless, the practice of modifying the consumption aggregate while leaving the poverty line unchanged is inadvisable. For a sound poverty analysis, the poverty line and consumption aggregate should be drawn from the same welfare measure (see, for an extensive discussion on this issue, Lanjouw and Lanjouw 2001). In particular, the poverty line is typically composed of a food and a non-food component. A change in the welfare aggregate measured by adding rent should be accompanied by a similar adjustment of the non-food component of the poverty line.

Therefore, the effects of the different rent imputations on the consumption aggregates were re-assessed by modifying the official poverty line accordingly. As summarized in

Table 7, including rent determines an increase in the poverty lines ranging between 7.5 percent (in Bangladesh for both the self-assessment and log-linear model) to above 20 percent (in Iraq, with the log-linear model). There is no regularity as of which imputation methods determines the largest variations.

When the poverty line is modified consistently with the rent imputation method used in the construction of the consumption aggregate, predicting the sign of changes in poverty becomes challenging from a theoretical perspective. Table 8 illustrates that only in the case of Bangladesh both imputation methods generate an increase in the poverty headcount. In the case of Iraq, the share of poor decreases when the self-assessment approach is applied. In the case of Peru, it decreases with both imputation method. Variations in the depth and severity of poverty do not necessarily follow the same signs of the corresponding poverty headcount variations. For instance, self-assessment in Iraq determines a decrease of poverty headcount, but an increase in the depth of poverty. Regardless of the direction of the variations, the magnitude of the changes has modest economic significance: only in one case (Iraq, self-assessment) poverty headcount changes by more than one percentage point; in all other instances, changes are much smaller. However, such changes, although modest in magnitude, are always statistically significant and can lead to sizeable differences in the profile of the poor if ranking is not preserved, particularly in countries with low poverty headcount rates, as illustrated in section 4.4.

4.3. Shared Prosperity

Table 9 summarizes the impact of the different rent-imputation approaches on shared prosperity, measured by the annualized average growth rate of the consumption level of the bottom 40 percent. To get a coherent measure, the index was built by applying the same rent-imputation method in both years.

Except for Bangladesh, where including rents does not affect shared prosperity, in all other countries the housing component has a sizable and statistically significant effect. In the case of Iraq and Albania, including rents, obtained via the log linear model, reduces shared prosperity. The log-linear model has instead a positive effect on shared prosperity in the case of Peru. However, it is worth noticing that in the case of Albania self-assessment was recorded only for 3 percent of the total non-market-tenants in the 2008 survey. Therefore, the large increase in shared prosperity observed in the analysis (4.7 percent) is due to the missing information in 2008: for 97 percent of the non-market-tenants, a vector of zeros was added in 2008 as self-assessment value.

Our results suggest that, although size and magnitude of the effect of including housing in the consumption aggregate are not predictable and might vary within country according to the imputation method selected, shared prosperity does change as a result and the change can be substantial and might imply churning in country-rankings (see the case of Peru and Iraq), or altering our estimates of a country's performance over time.

4.4. Non-anonymous Distributional Implications

Gini index, poverty indices and shared prosperity all satisfy anonymity: a permutation of the underlying welfare vector does not affect the distribution as long as welfare levels do not change. Nevertheless, rent imputation may determine a proportional shift in the welfare vector with no distributional consequences (e.g. on the Gini index, which is invariant to scale), but at the same time it may imply a churning of individuals along the distribution. In an extreme scenario, it may be possible that after rent is included in the welfare aggregate all individuals below the poverty line become non-poor and the same number of initially nonpoor individuals become poor. In this case, poverty indices may remain the same, leading us to conclude that rent imputation has no effect on poverty, but the characteristics of the poor might change, with important policy implications.

This section concentrates on non-anonymous distributional implications of rent-imputation.[13] First, we check transition matrices to understand whether the rank of individuals changes after rent-imputation. Then, we test whether and how the characteristics of the poor change when both the consumption aggregate and the poverty line are modified to account for imputed rents.

Table 10 shows transition matrices of the two rent-imputation methods with respect to the case of no-rent. To build each matrix, the population in the distributions of consumption with no-rent and the population in the distributions of consumption with imputed rents are first sorted with respect to the per capita consumption levels, and then divided into deciles.[14] We then compare the population in the initial and final distribution by deciles. Each cell of the matrix reports the share of population in each decile of the initial distribution found in the same decile in the final distribution. In case of no re-shuffling, the transition matrix would be a diagonal identity matrix. Table 10 shows that some re-ranking takes place in all countries and across imputation methods, although in most cases individuals move up or down by just one decile. Nevertheless, particularly in countries with low headcount rates, any churning around the first decile may imply a change in the profiling of the poor.

For this reason, we look at the profile of the poor before and after rent imputation. Table 11 summarizes the results and corroborates previous findings: the effect depends on the adopted rent-imputation model, and no regularity can be found across countries. Although most of the socio-economic variables characterizing the poor are affected by the inclusion of rents, the magnitude of these changes is not sufficient, in our view, to justify changes in policies targeting the poor.

5. Final Remarks

Measuring the monetary value of the flow of services that households receive from living in their dwellings poses a challenge to researchers and practitioners. On the one hand, a growing consensus requires that imputed rents should always be included in the welfare aggregate. On the other hand, imputed rents are often neglected, mainly because of inherent technical difficulties in rent imputation as well as due to lack of relevant information in household surveys. Moreover, when imputed rents are indeed included in the welfare aggregate, researchers and practitioners frequently overlook analyzing the distributional impacts of alternative rent-imputation approaches.

This paper is the first attempt to assess the distributional impact of including housing in the welfare aggregate comparing two rent imputation methods in four developing countries at different levels of development. First, the paper introduces a concise theoretical discussion of the expected distributional implications of including rent in the welfare aggregate and concludes that unambiguous predictions of the impact on poverty, inequality, and shared prosperity are possible only under strong assumptions. Second, it provides estimates of the distributional effect of including estimated rental values in the consumption aggregates of four countries.

Results indicate that understanding the distributional impact of including housing in the welfare aggregate is ultimately an empirical question. Including rental values determines statistically significant changes in poverty and inequality indicators, yet such changes are only occasionally larger than one percentage point. Shared prosperity exhibits sizable changes, which might also determine international re-rankings. In countries with low headcount rates, any churning around the first decile may imply a change in the profiling of the poor. Although most socio-economic variables characterizing the poor are affected by the inclusion of rents, changes are rarely substantial. Although any distributional analysis shall include housing in the construction of the welfare

[13] Precisely, we will be discussing quasi-non-anonymous implications since we are not considering changes affecting any particular individual in the distribution, but rather groups of individuals: e.g. individuals belonging to the same decile in the distribution, or individuals belonging to the set of poor individuals.

[14] To keep the analysis tractable, we limit the number of groups to 10. We acknowledge that this analysis is still anonymous, because we do not check the movements of each single individual. To do so, we should create transition matrices of size n, where n is the population size.

aggregate, the choice of the most appropriate imputation method is not trivial, as different approaches generate households' re-ranking along the welfare distribution within country and may potentially imply reshuffling in intertemporal and international comparisons. Therefore, all practitioners in charge of the preparation of welfare aggregates for distributional analysis should add to the list of sensitivity checks a careful examination of the distributional impact of different imputed rent methods, as proposed in this study.

This paper offers three main messages. First, the poverty estimation process must be internally consistent in terms of methodology. Most prominently, poverty lines should always be adapted to the definition of the welfare aggregate. Second, methodological consistency should be maintained over time, by using the same definition of welfare aggregate, including using the same rent-imputation approach. Trends in poverty, inequality and shared-prosperity risk otherwise to be fictitiously driven by differences in the adopted rent-imputation approach. Third, methodological consistency should be sought internationally, after conducting an accurate sensitivity analysis of the distributional impact of different methods on a larger scale. Implementing these three key points calls for a coordination effort of researchers and practitioners involved in all stages of data collection and analysis: from the design of homogeneous questionnaires over time and across countries, to the construction of welfare aggregates allowing for consistent comparisons. In an effort to push forward the research agenda, new data sources may be explored to obtain more reliable and standardized estimates of housing quality and of rental prices. A promising avenue, recently applied in a study for Sub-Saharan Africa, could be the combination of high-resolution satellite photography with household survey data (Tusting et al 2019).

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Table 1: Shared prosperity under different imputed rent scenarios.

		year $t+\tau$		
		A	*B*	*C*
	A	$\left[\frac{{}_{t+\tau}\bar{x}_{B40} + {}_{t+\tau}r}{{}_{t}\bar{x}_{B40} + {}_{t}r}\right]^{\frac{1}{\tau}} - 1$	$\left[\frac{{}_{t+\tau}\bar{x}_{B40}(1 + {}_{t+\tau}\rho)}{{}_{t}\bar{x}_{B40} + {}_{t}r}\right]^{\frac{1}{\tau}} - 1$	$\left[\frac{{}_{t+\tau}\bar{y}^{C}_{B40}}{{}_{t}\bar{x}_{B40} + {}_{t}r}\right]^{\frac{1}{\tau}} - 1$
year t	*B*	$\left[\frac{{}_{t+\tau}\bar{x}_{B40} + {}_{t+\tau}r}{{}_{t}\bar{x}_{B40}(1 + {}_{t}\rho)}\right]^{\frac{1}{\tau}} - 1$	$\left[\frac{{}_{t+\tau}\bar{x}_{B40}(1 + {}_{t+\tau}\rho)}{{}_{t}\bar{x}_{B40}(1 + {}_{t}\rho)}\right]^{\frac{1}{\tau}} - 1$	$\left[\frac{{}_{t+\tau}\bar{y}^{C}_{B40}}{{}_{t}\bar{x}_{B40}(1 + {}_{t}\rho)}\right]^{\frac{1}{\tau}} - 1$
	C	$\left[\frac{{}_{t+\tau}\bar{x}_{B40} + {}_{t+\tau}r}{{}_{t}\bar{y}^{C}_{B40}}\right]^{\frac{1}{\tau}} - 1$	$\left[\frac{{}_{t+\tau}\bar{x}_{B40}(1 + {}_{t+\tau}\rho)}{{}_{t}\bar{y}^{C}_{B40}}\right]^{\frac{1}{\tau}} - 1$	$\left[\frac{{}_{t+\tau}\bar{y}^{C}_{B40}}{{}_{t}\bar{y}^{C}_{B40}}\right]^{\frac{1}{\tau}} - 1$

Note: In scenario A rents are the same level for all individuals in the society; in scenario B rent is a fixed proportion of individual's welfare aggregate; and in scenario C, rent is a different share of individual's welfare aggregate.

Table 2: Datasets and definitions used in the analysis.

	Albania		Bangladesh		Iraq		Peru	
	2008	**2012**	**2005**	**2010**	**2007**	**2012**	**2010**	**2013**
Name of the survey	Living Standard Measurement Survey (LSMS)		Household Income and Expenditure Survey (HIES)		Iraq Household Socio Economic Survey (IHSES)		National Household Survey (ENAHO)	
Sample size (# households)	3,536	6,671	10,080	12,240	17,424	24,821	21,496	30,453
% market tenants	2.34	3.63	9.37	11.07	9.85	9.29	9.92	8.97
Questions used to identify tenure status	What is the ownership of this dwelling?		What is the present occupancy status		A: What is the ownership status of this dwelling?	B: What is the type of occupancy of this dwelling	The dwelling you are living in is: rented?; owned?; etc.	
Possible answers to the question of tenure status	1 - Owner 2- Owner with a mortgage on dwelling 3- Rented from private individuals 4 - Rented from the State 5- Live for free 6 - Other, specify	1 - Owner with legal act, no loan 2 - Owner with legal act (mortgage or loan) 3 - In process of acquiring legal act 4 - Rented from a private individual 5 - Rented from the state 6 - Live for free 7 - Other, specify	1-Owner 2-Renter 3-Squatter 4-Provided free by relatives/employer 5-Government residence 6-Other, specify		1- Household 2- Private Sector 3-Public Sector 4-Government 5-Other	1-Rented 2-Provided by employer 3-Free with arrangement 4-Free without arrangement 5-Random housing 6-Other	1-Rented 2-Owned (totally paid) 3- Owned (invasion) 4-Owend (mortgage) 5-Provided free by employer 6-Provided free by institution 7-Other	
Tenant status: Market tenant	Option 3	Option 4	Option 2		Option 2	Option 1	Option 1	
Tenant status: non-market tenant/owner	Options 1, 2, 4, 5, 6	Options 1, 2, 3, 5, 6, 7	Options 1, 3, 4, 5, 6		Options 1, 3, 4, 5	Options 2, 3, 4, 5, 6	Options 2, 3, 4, 5, 6, 7	
Question used to identify the value of the paid rent	How much is your monthly rent?		Housing related expenses (annual): house rent (rented house)		How much was the last payment that this household made for rent?		How much is your monthly rent?	
Question used to identify the value of self-assessed rent	N.A.	Assume that you want to rent this dwelling what would be a monthly rent you will be able ask for?	Not specified. The survey reports imputed rent for owner-occupied or other in the list of housing related expenses (annual)		If you were to reside in a similar dwelling, what would be the estimated rental monthly value?		If you were to lend this dwelling; how much would you be paid in monthly rent?	
Is rent included in the welfare aggregate for official poverty estimates?	Rent is not included		Rent is included, yet the approach adopted is not clear		Rent is included using self-assessment for home-owners and reported rent paid for tenants		Rent is included using self-assessment for home-owners and reported rent paid for tenants	

Table 3: Dwellings' and household heads' characteristics of tenant households and difference between owners and tenants.

Albania 2012	Overall	Tenants	Tenants-Owners	
Tenant	3.6	100.0		
Urban	54.0	82.3	29.4	**
Region				
Coastal Region	30.8	31.3	0.5	ns
Central Region	41.6	28.9	-13.1	**
Mountain Region	9.2	6.7	-2.6	**
Tirana Region (capital)	18.5	33.1	15.2	**
Male	91.3	89.0	-2.4	ns
Married	90.6	87.1	-3.7	ns
Age group				
[15-24]	0.6	1.4	0.8	ns
[25-34]	5.9	17.7	12.3	**
[35-44]	21.7	25.0	3.4	ns
[45-54]	28.8	25.7	-3.3	ns
[55-64]	22.7	15.8	-7.2	**
[60+]	20.3	14.5	-6.1	***
Education				
None or incomplete primary	3.0	1.3	-1.7	**
Primary	51.2	36.5	-15.3	**
Secondary	34.3	39.3	5.1	ns
Tertiary	11.5	22.9	11.9	**
Employed	63.6	70.2	6.8	ns
Household size	4.6	4.2	-0.4	**
Dwelling characteristics	0.0			
Number of Rooms	3.1	2.5	-0.6	**
Bathroom inside premises	52.3	60.6	8.6	*
Separate Kitchen	56.7	51.9	-5.0	ns

Source: Authors' elaboration on LSMS 2012.
Note: * 10 percent, ** 5 percent, *** 1 percent, ns= statistically non-significant.

Bangladesh 2010	Overall	Tenants	Tenants-Owners	
Tenant	11.1	100.0		
Urban	26.3	83.6	64.5	**
Region				
Barisal	6.3	3.4	-3.2	**
Chittagong	19.1	21.0	2.2	ns
Dhaka	32.8	58.9	29.4	**
Khulna	11.9	8.3	-4.0	**
Rajshahi	12.5	2.5	-11.3	**
Sylhet	11.3	2.2	-10.2	**
Male	89.5	92.2	3.0	**
Married	92.5	94.0	1.6	**
Age group				
[15-24]	1.7	2.3	0.7	*
[25-34]	17.6	24.9	8.2	**
[35-44]	28.4	34.5	6.9	**
[45-54]	25.5	23.4	-2.4	*
[55-64]	15.7	10.9	-5.3	**
[60+]	11.1	3.9	-8.0	**
Education				
None or incomplete primary	58.5	41.6	-19.0	**
Primary	19.4	18.6	-0.9	ns
Secondary	16.2	25.5	10.4	**
Tertiary	5.8	14.3	9.6	**
Employed	92.7	91.1	-1.8	*
Household size	5.3	4.6	-0.8	**
Dwelling characteristics	0.0			
Number of Rooms	2.4	1.9	-0.6	**
Dwelling has electricity	56.4	94.3	42.6	**

Source: Authors' elaboration on HIES 2010.
Note: * 10 percent, ** 5 percent, *** 1 percent, ns= statistically non-significant.

Table 3 (cont.): Dwellings' and household heads' characteristics of tenant households and difference between owners and tenants.

Iraq 2012	Overall	Tenants	Tenants-Owners	
Tenant	5.7	100		
Urban	55.8	90.9	37.2	**
Region				
Kurdistan	21.7	27.6	6.2	**
Bagdad (capital)	7.9	15.7	8.3	**
Rest of Iraq	70.4	56.7	-14.5	**
Male	7.8	6.7	-1.2	*
Married	91.6	92.7	1.2	*
Age group				
[15-24]	1.6	2.9	1.3	**
[25-34]	16.3	25.5	9.8	**
[35-44]	31.6	35.1	3.7	**
[45-54]	21.3	21.2	-0.1	ns
[55-64]	18.8	11	-8.3	**
[60+]	10.4	4.3	-6.5	**
Education				
None or incomplete primary	30.4	25	-5.8	**
Primary	46.1	49.7	3.9	**
Secondary	16.4	16.6	0.2	ns
Tertiary	7	8.6	1.7	**
Employed	63.2	73.9	11.4	**
Household size	8.9	6.7	-2.3	**
Dwelling characteristics	0			
Number of Rooms	2.3	1.8	-0.5	**

Source: Authors' elaboration on IHSES 2012.
Note: * 10 percent, ** 5 percent, *** 1 percent, ns= statistically non-significant.

Peru 2013	Overall	Tenants	Tenants-Owners	
Tenant	9.0	100.0		
Urban	75.6	96.0	22.5	**
Region				
Costa urban	20.5	16.6	-4.3	**
Sierra urban	16.6	20.5	4.3	**
Selva urban	7.2	8.9	1.9	**
Costa rural	2.8	0.4	-2.6	**
Sierra rural	16.8	2.6	-15.6	**
Selva rural	4.9	0.9	-4.4	**
Lima Metropolitana (capital)	31.3	50.0	20.6	**
Male	73.5	72.1	-1.6	***
Married	66.4	63.7	-3.0	**
Age group				
[15-24]	1.7	5.5	4.2	**
[25-34]	10.1	23.7	15.0	**
[35-44]	21.2	27.7	7.2	**
[45-54]	23.9	20.8	-3.3	**
[55-64]	19.9	13.2	-7.4	**
[60+]	23.3	9.0	-15.7	**
Education				
None or incomplete primary	24.2	7.5	-18.4	**
Primary	27.9	19.4	-9.4	**
Secondary	23.4	31.7	9.1	**
Tertiary	24.5	41.4	18.6	**
Employed	83.3	89.0	6.3	**
Household size	3.7	3.4	-0.3	**
Dwelling characteristics				
Number of Rooms	3.5	2.6	-0.9	**
Dwelling has electricity	92.1	99.1	7.6	**
Bathroom inside premises	77.8	94.2	18.0	**

Source: Authors' elaboration on ENAHO 2013.
Note: * 10 percent, ** 5 percent, *** 1 percent, ns= statistically non-significant.

Table 4: Imputed rent as a share of total consumption, overall average and by quintiles of consumption with no rent.

			q1	q2	q3	q4	q5	q6	q7	q8	q9	q10	Average
Albania	2008	Self-Assessment	-	-	-	-	-	-	-	-	-	-	-
		Log Linear	25.63	24.34	24.56	23.51	23.95	21.99	23.27	20.17	21.12	18.26	22.68
	2012	Self-Assessment	18.02	17.87	17.88	18.64	18.14	18.07	20.15	19.94	18.78	19.30	18.68
		Log Linear	22.00	18.57	18.27	17.76	16.65	15.90	15.45	16.00	14.63	13.63	16.89
Bangladesh	2005	Self-Assessment	5.28	4.89	5.10	5.54	5.67	5.80	5.73	6.16	6.24	5.80	5.62
		Log Linear	7.44	5.88	5.40	5.13	5.41	5.55	5.72	5.79	6.48	6.56	5.94
	2010	Self-Assessment	3.86	4.34	4.54	4.72	4.60	4.81	4.55	5.33	5.36	5.55	4.77
		Log Linear	8.44	7.13	7.16	6.66	6.63	6.83	6.41	6.46	6.43	5.94	6.81
Iraq	2007	Self-Assessment	21.71	19.74	19.98	19.21	18.90	18.17	18.44	18.11	18.19	17.51	19.00
		Log Linear	26.09	23.55	22.66	22.66	22.39	21.00	20.96	19.91	20.20	18.45	21.79
	2012	Self-Assessment	15.19	15.32	15.07	14.64	14.15	13.76	13.04	12.17	11.71	10.71	13.58
		Log Linear	22.08	21.46	20.20	19.67	18.61	17.83	17.24	16.47	15.67	13.64	18.29
Peru	2010	Self-Assessment	7.75	7.33	8.12	9.04	9.83	10.29	10.70	11.44	11.64	12.13	9.83
		Log Linear	11.62	9.64	10.85	12.06	12.45	12.30	12.65	13.28	13.21	13.14	12.12
	2013	Self-Assessment	9.05	8.42	9.25	10.05	10.80	11.64	11.78	12.38	13.62	14.50	11.15
		Log Linear	14.10	12.02	12.89	12.98	14.06	14.23	14.66	14.67	15.14	14.99	13.97

Source: Authors' elaboration on LSMS 2008 and 2012 (Albania), HIES 2005 and 2010 (Bangladesh), IHSES 2007 and 2012 (Iraq) and ENAHO 2010 and 2013 (Peru).

Note: Estimates based on the self-assessment approach are not reported for Albania 2008 because most home-owners do not report a self-assessed rental value.

Table 5. Impact of rent imputation on Gini index: differences with respect to the case of no rent.

a. First survey wave

	Albania (2008)		Bangladesh (2005)		Iraq (2007)		Peru (2010)	
No Rent	26.6		30.0		28.6		39.7	
Differences with respect to no rent								
Self-Assessment	0.014	**	0.960	**	0.167	**	1.350	**
Log Linear	1.131	**	0.910	**	2.690	**	0.912	**
Original	0.000	**	1.017	**	0.161	**	1.439	**

Source: Authors' elaboration on LSMS 2008 and 2012 (Albania), HIES 2005 and 2010 (Bangladesh), IHSES 2007 and 2012 (Iraq) and ENAHO 2010 and 2013 (Peru).

Note: * 10 percent, ** 5 percent, *** 1 percent.

b. Second survey wave

	Albania (2012)		Bangladesh (2010)		Iraq (2012)		Peru (2013)	
No Rent	26.9		28.9		30.3		37.9	
Differences with respect to no rent								
Self-Assessment	1.852	**	0.819	**	-0.664	**	1.838	**
Log Linear	-0.643	**	-0.092	**	0.880	**	1.033	**
Original	0.000	ns	0.949	**	-0.645	**	1.922	**

Source: Authors' elaboration on LSMS 2008 and 2012 (Albania), HIES 2005 and 2010 (Bangladesh), IHSES 2007 and 2012 (Iraq) and ENAHO 2010 and 2013 (Peru).

Note: * 10 percent, ** 5 percent, *** 1 percent.

Table 6. Impact of rent imputation on poverty indices with fixed poverty line: differences with respect to the case of no rent.

	Albania (2012)		Bangladesh (2005)		Iraq (2012)		Peru (2013)	
Poverty Headcount								
No Rent	14.3		41.5		24.5		18.8	
Differences with respect to no rent								
Self-Assessment	-6.3	**	-6.1	**	-8.5	**	-3.1	**
Log Linear	-8.2	**	-5.9	**	-10.6	**	-4.2	**
Original	0.0	ns	-7.5	**	-8.5	**	-3.2	**
Poverty Gap								
No Rent	2.9		9.2		5.8		5.5	
Differences with respect to no rent								
Self-Assessment	-1.4	**	-1.6	**	-2.3	**	-1.1	**
Log Linear	-1.8	**	-1.9	**	-2.9	**	-1.5	**
Original	0.0	ns	-2.0	**	-2.3	**	-1.1	**
Squared Poverty Gap								
No Rent	1		2.9		2.0		2.4	
Differences with respect to no rent								
Self-Assessment	-0.5	**	-0.6	**	-0.9	**	-0.5	**
Log Linear	-0.6	**	-0.8	**	-1.1	**	-0.8	**
Original	0.0	ns	-0.8	**	-0.9	**	-0.5	**

Source: Authors' elaboration on LSMS 2012 (Albania), HIES 2005 (Bangladesh), IHSES 2012 (Iraq) and ENAHO 2013 (Peru).
Note: * 10 percent, ** 5 percent, *** 1 percent, ns= statistically non-significant.

Table 7: Monthly per capita poverty lines by definition of the consumption aggregate.

	Bangladesh (2005)	Iraq (2012)	Peru (2013)
No Rent	45.6	176.1	155.9
Self-Assessment	49.0	202.6	168.6
Log Linear	49.0	217.9	175.8
Original	46.5	203.7	158.9

Source: Authors' elaboration on HIES 2005 (Bangladesh), IHSES 2012 (Iraq) and ENAHO 2013 (Peru) and World Bank Development Indicators for the 2011PPP.

Note: Values are expressed in USD 2011PPP.

Table 8. Impact of rent imputation on poverty indices with adjusted poverty line: differences with respect to the case of no rent.

	Bangladesh (2005)		Iraq (2012)		Peru (2013)	
	Poverty Headcount					
No Rent	41.5		24.5		18.8	
Differences with respect to no rent						
Self-Assessment	0.7	**	-1.1	**	-0.4	**
Log Linear	0.8	**	0.3	**	-0.3	**
Original	0.6	**	-1.2	**	1.3	**
	Poverty Gap					
No Rent	9.2		5.8		5.5	
Differences with respect to no rent						
Log Linear	0.3	**	0.2	**	-0.1	**
Self-Assessment	0.6	**	-0.2	**	-0.1	**
Original	0.5	**	-0.3	**	0.5	**
	Squared Poverty Gap					
No Rent	2.9		2.0		2.4	
Differences with respect to no rent						
Log Linear	0.1	**	0.1	**	-0.1	**
Self-Assessment	0.3	**	-0.1	**	-0.1	**
Original	0.2	**	-0.1	**	0.2	**

Source: Authors' elaboration on HIES 2005 (Bangladesh), IHSES 2012 (Iraq) and ENAHO 2013 (Peru).

Note: * 10 percent, ** 5 percent, *** 1 percent, ns= statistically non-significant. Albania is missing because the original codes for the compilation of the poverty line were not made available to the authors.

Table 9. Impact of rent imputation on shared prosperity: differences with respect to the case of no rent.

	Albania		Bangladesh		Iraq		Peru	
No Rent	-1.7		2.1		8.3		8.3	
Differences with respect to no rent								
Self-Assessment	4.7[a]	**	-0.2	ns	-1.1	**	0.4	ns
Log Linear	-1.4	**	0.3	ns	-0.5	*	0.7	***
Original	0.0	ns	-0.3	ns	-1.1	**	0.4	ns

Source: Authors' elaboration on LSMS 2008 and 2012 (Albania), HIES 2005 and 2010 (Bangladesh), IHSES 2007 and 2012 (Iraq) and ENAHO 2010 and 2013 (Peru).

Note: * 10 percent, ** 5 percent, *** 1 percent, ns= statistically non-significant. Bootstrapped standard errors, 1000 replication.

[a] In 2008, first year of analysis, self-assessment is recorded only for 3 percent of non-market tenants. For the other 97 percent, a vector of zeros was added.

Table 10. Impact of rent imputation on individuals' ranking, population shares by consumption deciles.

Albania — No rent

		1	2	3	4	5	6	7	8	9	10
With rent: Self-Assessment	1	76.8	15.0	5.4	1.5	0.0	0.7	0.6	0.0	0.0	0.0
	2	23.0	42.1	19.8	10.7	2.8	1.1	0.3	0.2	0.0	0.0
	3	0.0	36.5	30.1	18.6	9.2	3.5	1.0	1.0	0.2	0.0
	4	0.0	6.6	33.8	26.3	19.4	8.2	4.3	0.8	0.5	0.0
	5	0.0	0.0	10.8	31.1	30.1	16.1	6.7	4.7	0.2	0.4
	6	0.0	0.0	0.0	12.0	28.9	30.9	20.2	5.2	2.0	0.7
	7	0.0	0.0	0.0	0.0	9.6	29.8	30.0	21.4	7.8	1.3
	8	0.0	0.0	0.0	0.0	0.0	9.8	30.3	33.0	22.4	4.7
	9	0.0	0.0	0.0	0.0	0.0	0.0	6.7	32.1	45.4	15.9
	10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.6	21.5	76.9

Albania — No rent

		1	2	3	4	5	6	7	8	9	10
With rent: Log Linear	1	83.4	13.8	1.7	1.1	0.0	0.0	0.0	0.0	0.0	0.0
	2	16.3	61.8	14.2	6.0	1.1	0.3	0.3	0.0	0.0	0.0
	3	0.0	24.5	52.8	16.0	4.9	1.1	0.7	0.0	0.0	0.0
	4	0.0	0.1	30.9	46.9	16.0	4.7	1.4	0.0	0.0	0.0
	5	0.0	0.0	0.5	29.1	48.6	15.8	4.6	1.4	0.0	0.1
	6	0.0	0.0	0.0	0.8	29.7	46.8	18.0	4.0	0.6	0.1
	7	0.0	0.0	0.0	0.0	0.0	31.2	49.1	15.8	3.7	0.2
	8	0.0	0.0	0.0	0.0	0.0	0.0	26.0	53.8	17.8	2.4
	9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	25.0	62.7	12.3
	10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.0	85.0

Bangladesh — No rent

		1	2	3	4	5	6	7	8	9	10
With rent: Self-Assessment	1	92.2	6.9	0.4	0.4	0.1	0.0	0.0	0.0	0.0	0.0
	2	6.8	81.8	10.2	1.0	0.0	0.0	0.0	0.1	0.0	0.0
	3	0.0	11.3	72.1	13.6	2.3	0.5	0.1	0.1	0.0	0.0
	4	0.0	0.0	17.5	64.8	13.0	4.1	0.6	0.1	0.0	0.0
	5	0.0	0.0	0.0	20.3	64.6	12.9	1.8	0.4	0.0	0.0
	6	0.0	0.0	0.0	0.0	20.1	64.9	13.1	1.7	0.3	0.0
	7	0.0	0.0	0.0	0.0	0.0	17.7	69.6	11.4	1.2	0.1
	8	0.0	0.0	0.0	0.0	0.0	0.0	15.0	70.8	13.0	1.2
	9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.6	73.8	10.6
	10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.9	88.1

Bangladesh — No rent

		1	2	3	4	5	6	7	8	9	10
With rent: Log Linear	1	90.7	8.9	0.2	0.3	0.0	0.0	0.0	0.0	0.0	0.0
	2	8.3	79.1	12.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0
	3	0.0	12.1	71.8	14.1	1.7	0.3	0.0	0.0	0.0	0.0
	4	0.0	0.0	16.1	69.0	11.8	2.5	0.5	0.0	0.0	0.0
	5	0.0	0.0	0.0	16.3	70.2	12.0	1.5	0.0	0.0	0.0
	6	0.0	0.0	0.0	0.0	16.3	69.1	13.3	1.2	0.0	0.0
	7	0.0	0.0	0.0	0.0	0.0	16.2	72.7	10.8	0.3	0.0
	8	0.0	0.0	0.0	0.0	0.0	0.0	12.0	77.2	10.7	0.0
	9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.8	81.1	8.1
	10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.2	91.8

Source: Authors' elaboration on LSMS 2012 (Albania), HIES 2005 (Bangladesh), IHSES 2012 (Iraq) and ENAHO 2013 (Peru).

Note: Each row defines a decile of the consumption distribution without rents. Each column defines a decile of the consumption distribution including rent according to the indicated rent-imputation approach.

Table 10. (cont.) Impact of rent imputation on individuals' ranking, population shares by consumption deciles.

	Iraq										Peru									
	No rent										No rent									
With rent: Self-Assessment	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10
1	84.4	13.3	1.8	0.3	0.2	0.0	0.1	0.0	0.0	0.0	92.2	7.0	0.5	0.1	0.2	0.0	0.1	0.0	0.0	0.0
2	15.7	61.7	17.0	4.3	1.0	0.4	0.1	0.0	0.0	0.0	7.8	80.3	10.0	0.9	0.5	0.1	0.2	0.1	0.1	0.0
3	0.0	25.0	50.1	18.1	4.5	1.6	0.5	0.1	0.1	0.0	0.0	12.6	71.0	12.9	2.5	0.3	0.5	0.1	0.1	0.0
4	0.0	0.0	30.5	43.9	18.6	4.9	1.3	0.5	0.3	0.1	0.0	0.0	18.4	64.4	12.3	3.5	0.7	0.5	0.2	0.0
5	0.0	0.0	0.6	32.5	43.0	17.4	4.6	1.4	0.4	0.2	0.0	0.0	0.0	21.9	59.9	13.8	2.8	1.2	0.4	0.1
6	0.0	0.0	0.0	1.0	32.1	44.2	16.9	4.4	1.2	0.2	0.0	0.0	0.0	0.0	24.6	57.4	13.8	3.4	0.5	0.4
7	0.0	0.0	0.0	0.0	0.6	31.5	48.0	16.0	3.6	0.3	0.0	0.0	0.0	0.0	0.0	25.0	56.7	15.2	2.9	0.1
8	0.0	0.0	0.0	0.0	0.0	0.0	28.6	55.1	15.0	1.2	0.0	0.0	0.0	0.0	0.0	0.0	25.2	61.0	12.6	1.2
9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	22.6	67.3	10.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.5	69.7	11.9
10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.1	87.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.6	86.4
With rent: Log Linear	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10
1	76.4	11.9	4.8	2.6	1.8	0.8	0.5	0.4	0.2	0.6	89.7	8.9	0.5	0.3	0.1	0.2	0.1	0.0	0.0	0.0
2	23.6	46.1	13.3	6.4	3.9	2.1	1.8	1.2	0.7	0.8	10.3	74.6	12.4	1.6	0.6	0.0	0.2	0.2	0.1	0.0
3	0.0	39.8	30.2	12.1	7.1	4.5	2.6	1.3	1.6	0.8	0.0	16.5	63.7	15.7	2.1	1.5	0.3	0.2	0.0	0.1
4	0.0	2.1	44.9	24.4	11.4	6.0	4.9	3.0	1.8	1.5	0.0	0.0	23.4	57.6	14.0	3.4	1.2	0.2	0.2	0.0
5	0.0	0.0	6.9	44.5	21.5	11.4	6.8	4.3	2.6	1.9	0.0	0.0	0.0	24.7	55.2	14.7	3.4	1.4	0.4	0.2
6	0.0	0.0	0.0	10.0	43.2	22.5	10.9	7.2	3.8	2.5	0.0	0.0	0.0	0.0	27.8	55.4	12.1	3.5	1.0	0.2
7	0.0	0.0	0.0	0.0	11.0	43.5	24.2	11.6	6.2	3.6	0.0	0.0	0.0	0.0	0.0	24.8	56.4	16.0	2.4	0.3
8	0.0	0.0	0.0	0.0	0.0	9.2	44.6	27.2	12.9	6.0	0.0	0.0	0.0	0.0	0.0	0.0	26.3	59.8	12.5	1.4
9	0.0	0.0	0.0	0.0	0.0	0.0	3.8	43.7	39.9	12.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.7	69.8	11.5
10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	30.3	69.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.7	86.3

Source: Authors' elaboration on LSMS 2012 (Albania), HIES 2005 (Bangladesh), IHSES 2012 (Iraq) and ENAHO 2013 (Peru).

Note: Each row defines a decile of the consumption distribution without rents. Each column defines a decile of the consumption distribution including rent according to the indicated rent-imputation approach.

Table 11: Profiling of the poor based on adjusted poverty lines.

	%	Percentage points difference with respect to No Rent					
	No Rent	Log Linear		Self- Assessment		Original	
Bangladesh							
Urban	23.5	-0.4	**	0.2	**	0.2	**
Tenant	9.3	-0.6	**	-0.5	**	-0.2	**
Male	94.0	0.1	ns	0.1	**	0.3	ns
Age group							
[15-24]	2.3	-0.1	**	-0.2	**	-0.1	**
[25-34]	19.2	-0.1	**	0.2	**	0.0	**
[35-44]	31.7	0.2	**	0.1	**	0.1	**
[45-54]	24.2	0.6	*	0.2	*	-0.1	*
[55-64]	13.0	-0.2	**	-0.1	**	0.1	**
[60+]	9.6	-0.3	**	-0.2	*	0.0	**
Education							
None or incomplete primary	70.8	1.0	**	0.2	**	0.4	**
Primary	4.8	-0.2	**	-0.1	**	-0.2	**
Secondary	16.3	-0.2	*	0.1	*	0.2	**
Tertiary	8.1	-0.6	**	-0.3	**	-0.4	**
Employed	94.8	0.3	**	0.2	**	0.1	**
Iraq							
Urban	46.0	-4.4	ns	-6.4	ns	-6.5	***
Tenant	1.7	2.1	*	1.2	*	1.1	*
Male	7.5	-0.5	**	-0.6	**	-0.6	**
Age group							
[15-24]	1.4	0.1	**	0.0	**	0.0	ns
[25-34]	16.4	-0.5	**	-0.1	**	-0.1	**
[35-44]	33.5	0.5	**	0.5	**	0.5	**
[45-54]	20.9	-0.5	*	-0.3	*	-0.3	*
[55-64]	17.0	0.4	*	0.1	*	0.1	*
[60+]	10.7	0.0	*	-0.3	*	-0.3	**
Education							
None or incomplete primary	37.3	-0.7	**	0.9	**	0.9	**
Primary	49.8	0.5	**	-0.2	**	-0.1	**
Secondary	10.7	0.0	**	-0.7	**	-0.7	**
Tertiary	2.2	0.1	**	0.0	**	0.0	***
Employed	57.6	0.4	**	0.1	ns	0.1	***
Peru							
Urban	49.4	-6.2	***	-6.5	ns	-1.4	ns
Tenant	4.8	-0.1	**	-0.8	**	-0.5	**
Male	77.0	2.1	**	1.0	**	0.9	**
Age group							
[15-24]	1.1	0.1	**	0.0	**	0.1	ns
[25-34]	11.1	1.2	**	0.2	**	0.6	**
[35-44]	23.7	1.2	*	0.7	*	0.7	*
[45-54]	19.5	1.3	**	1.0	**	1.3	**
[55-64]	16.9	-0.6	*	-0.4	*	-0.4	*
[60+]	27.7	-3.2	**	-1.5	**	-2.2	**
Education							
None or incomplete primary	45.8	1.1	**	2.2	**	0.4	**
Primary	32.3	1.1	**	0.8	**	1.5	**
Secondary	16.6	-1.2	*	-1.7	*	-0.9	**
Tertiary	5.3	-1.0	**	-1.4	**	-0.9	**
Employed	85.8	3.0	**	2.4	**	1.7	**

Source: Authors' elaboration on LSMS 2012 (Albania), HIES 2005 (Bangladesh), IHSES 2012 (Iraq) and ENAHO 2013 (Peru).

Note: * 10 percent, ** 5 percent, *** 1 percent, ns= statistically non-significant.

Appendix – Log Linear Hedonic Models

Table A.1 Albania

	2008	2012
Dwelling Type		
Single family house (omitted category)		
Dwelling in building with up to 15 apt.	-0.422	0.0762
	(0.281)	(0.159)
Dwelling in building with more than 15 apt	-0.0229	0.231
	(0.232)	(0.147)
Other	-0.292	
	(0.227)	
Semi-detached house	-	0.104
		(0.193)
Row (or terraced) house	-	-0.337
		(0.295)
Major construction of external walls		
Bricks, stones (omitted catergory)		
Pre-fabricated	0.119	0.370*
	(0.255)	(0.221)
Wood	-	0.253
		(0.393)
Condition of Dwelling Unit		
Very good conditions (omitted category)		
Appropriate for living	-0.390*	-0.210*
	(0.215)	(0.115)
Inappropriate for living	0.0558	-0.684**
	(0.526)	(0.320)
Number of rooms occupied by the family	0.254**	-0.0119
	(0.111)	(0.091)
Dwelling has two or more wc inside	0.4	0.145
	(0.553)	(0.232)
Dwelling has kitchen	-0.166	0.117
	(0.288)	(0.115)
Dwelling has separate bath/shower	-0.234	0.232*
	(0.328)	(0.123)
Dwelling has balcony or terrace	0.361	0.137
	(0.233)	(0.114)
Dwelling has pantry	-0.101	-0.0652
	(0.282)	(0.136)
Dwelling has garage	0.0858	0.384*
	(0.319)	(0.209)
Problems with the dwelling		
Too small	0.0902	0.0697
	(0.198)	(0.116)
Too dark	-0.145	0.400**
	(0.392)	(0.165)
Inadequate heating	-0.221	0.206*
	(0.285)	(0.118)
Leaking roof	1.362***	-0.198
	(0.440)	(0.158)
Damp walls, floor or basement	-0.0763	-0.114
	(0.285)	(0.145)
Windows/Doors in bad condition	-1.111***	-0.166
	(0.305)	(0.116)
Pollution from industry or traffic	0.733***	0.128
	(0.254)	(0.124)
Problem with neighbors	-	0.0552
		(0.187)
Noise from the road	-	-0.15
		(0.139)
Problem of crime in the area	-	-0.107
		(0.331)
Distance from primary school		
Less than 5 (omitted category)		
5--9	-0.284	0.222
	(0.176)	(0.172)
10--14	0.354	0.25
	(0.300)	(0.187)
15--19	-0.129	0.368*
	(0.323)	(0.197)
20 or more	-0.0143	0.17
	(0.413)	(0.193)
Distance from Ambulatory/Doctor		
Less than 5 (omitted category)		
5--9	0.0954	0.113
	(0.263)	(0.155)
10--14	-0.306	0.0427
	(0.339)	(0.151)
15--19	0.309	0.123
	(0.372)	(0.282)
20 or more	0.131	0.324*
	(0.418)	(0.189)
Distance from Bus Station		
Less than 5 (omitted category)		
5--9	-0.466*	-0.157
	(0.27)	(0.10)
10--14	-0.216	-0.321**
	(0.300)	(0.163)
15--19	0.255	-0.22
	(0.339)	(0.153)
20 or more	-0.528	-0.453**
	(0.322)	(0.176)
Location		
Capital (omitted category)		
Other Urban	-0.717***	-0.677***
	(0.179)	(0.133)
Rural	-0.641	-0.725***
	(0.746)	(0.178)
Constant	12.14***	11.49***
	(0.619)	(0.361)
Observations	93	212
R-squared	0.713	0.551

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A.2 Bangladesh

	2005	2010
Number of rooms	0.193***	0.278***
	(0.06)	(0.04)
Room Density	-0.0605	-0.283**
	(0.16)	(0.11)
Dwelling has electricity	0.373**	0.378***
	(0.15)	(0.10)
Type of Toilet		
Sanitary (omitted category)		
Pacca Latrine (water seal)	-0.238**	-0.297**
	(0.10)	(0.14)
Pacca Latrine (Pit)	-0.193**	-0.0996
	(0.08)	(0.11)
Kacha Latrine (Permanent)	-0.259**	-0.0967
	(0.13)	(0.11)
Kacha Latrine (Temp)	-0.474	0.0327
	(0.33)	(0.12)
Open field	-0.198	-1.015***
	(0.27)	(0.21)
Type of walls		
Brick/Cement (omitted category)		
CI Sheet/Wood	-0.569***	-0.287
	(0.11)	(0.19)
Mud Bricks	-0.357**	-0.589***
	(0.15)	(0.16)
Hemp/Hay/Bamboo	-0.501***	-0.410***
	(0.11)	(0.09)
Other	-	-0.433***
	-	(0.14)
Type of roof		
Cement (omitted category)		
CI Sheet/Wood	-0.393***	-0.466***
	(0.10)	(0.10)
Mud Bricks	-1.499***	-0.137
	(0.38)	(0.18)
Hemp/Hay/Bamboo	-0.237	-0.525***
	(0.16)	(0.16)
Other	-0.31	-0.328
	(0.26)	(0.24)
No Separate Dining Room	0.602***	0.359***
	(0.11)	(0.13)
Type of water		
Supply Water (omitted category)		
Tubewell	-0.505***	-0.264***
	(0.09)	(0.10)
Pond/River	-0.744***	-0.396***
	(0.24)	(0.14)
Well	-0.489***	-0.0245
	(0.12)	(0.20)
Waterfall/Spring	-	0.0115
	-	(0.22)
Other	-0.305	-
	(1.05)	-
Region		
Barisal, Rural (omitted category)		
Chittagong, Rural	-1.963***	0.0515
	(0.58)	(0.17)
Dhaka, Rural	-0.0545	0.311
	(0.33)	(0.22)
Khulna, Rural	-0.249	-0.565
	(0.63)	(0.36)
Rajshahi, Rural	-1.786*	0.151
	(1.07)	(0.29)
Rangpur, Rural		0.353**
	0.482	(0.18)
Sylhet, Rural	(0.34)	-0.0214
		(0.30)
Barisal, Urban	-0.0214	0.442**
	(0.30)	(0.20)
Chittagong, Urban	0.443	0.599***
	(0.32)	(0.18)
Dhaka, Urban	0.322	0.705***
	(0.33)	(0.19)
Khulna, Urban	-0.57	0.109
	(0.35)	(0.20)
Rajshahi, Urban	-0.537	0.0489
	(0.35)	(0.18)
Rangpur, Urban	-	0.225
	-	(0.20)
Sylhet, Urban	0.615*	0.161
	(0.33)	(0.33)
Constant	6.569***	6.483***
	(0.41)	(0.21)
Observations	10,080	11,580
R-squared	0.565	0.562

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A. 3 Iraq

	2007	2012
Number of Bedrooms	0.103***	0.129***
	(0.02)	(0.02)
Number of Bathrooms	0.105***	-0.00607
	(0.04)	(0.05)
Number of other rooms	0.134***	-0.189
	(0.04)	(0.18)
Dwelling has dining room	-0.0527	0.0306
	(0.12)	(0.10)
Dwelling has separate kitchen	0.121**	0.0791
	(0.06)	(0.06)
Dwelling has garage	0.108	0.0912*
	(0.07)	(0.05)
Dwelling has garden	0.0306	0.110**
	(0.05)	(0.04)
Quality of walls		
Brick (omitted category)		
Stone/cement	-0.0539	-0.233***
	(0.08)	(0.06)
Clay/bamboo	-0.0647	0.348**
	(0.14)	(0.15)
Other	0.14	-0.00991
	(0.19)	(0.16)
Quality of floors		
Tiles (omitted category)		
Concrete	-0.216***	-0.227***
	(0.04)	(0.05)
Earth	-0.382***	-0.480***
	(0.14)	(0.14)
Other	-0.0939	0.027
	(0.11)	(0.10)
Qualiy of ceiling		
Concrete (omitted category)		
Iron Bars	-0.0712	-0.164***
	(0.06)	(0.05)
Other	-0.478***	-0.360***
	(0.07)	(0.09)
Dwelling is connected to swerage	0.204***	0.0844
	(0.06)	(0.06)
Dwelling is connected to water pipe	0.0801	0.0968
	(0.08)	(0.08)
Type of Dwelling		
House or Flat (omitted category)		
Clay/bamboo house	0.0464	-0.790***
	(0.13)	(0.13)
Other	0.174	-0.0042
	(0.25)	(0.06)
Roads around dwelling in poor conditions	-0.0254	-0.0133
	(0.05)	(0.04)
Settlement Type		
Rural (omitted category)		
Urban	0.340***	0.289***
	(0.06)	(0.06)
Governorate		
Duhok (omitted category)		
Nainawa	-0.692***	-0.660***
	(0.12)	(0.09)
Sulaimaniya	-0.0592	-0.221**
	(0.11)	(0.11)
Kirkuk	-0.338***	-0.172***
	(0.12)	(0.07)
Erbil	-0.00273	0.187***
	(0.09)	(0.07)
Diyala	-0.845***	-0.709***
	(0.12)	(0.09)
Anbar	-0.743***	-0.368***
	(0.11)	(0.08)
Baghdad	-0.841***	-0.175**
	(0.12)	(0.08)
Babylon	-0.736***	-0.448***
	(0.13)	(0.09)
Kerbela	-0.533***	-0.196*
	(0.12)	(0.11)
Wasit	-0.470***	-0.368***
	(0.12)	(0.11)
Salah Al-Deen	-0.672***	-0.364***
	(0.14)	(0.07)
Najaf	-0.460***	-0.384***
	(0.13)	(0.10)
Qadisiya	-0.621***	-0.497***
	(0.12)	(0.10)
Muthanna	-0.753***	-0.699***
	(0.12)	(0.09)
Thi-Qar	-0.618***	-0.316***
	(0.13)	(0.08)
Maysan	-0.609***	-0.169
	(0.12)	(0.11)
Basrah	-0.696***	-0.419**
	(0.11)	(0.20)
Constant	4.634***	5.149***
	(0.16)	(0.15)
Observations	1,657	1,811
R-squared	0.38	0.42

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A.4 Peru

	2010	2013
Number of rooms	0.151***	0.165***
	(0.02)	(0.02)
Room Density	0.0629**	0.0596**
	(0.03)	(0.03)
Dwelling has electicity	0.259**	-0.0185
	(0.12)	(0.17)
Type of toilet		
Connected to public sewerage inside dwelling (omitted category)		
Connected to public sewerage outside the dwelling	-0.228***	-0.181***
	(0.05)	(0.05)
Septic tank	-0.550***	-0.437***
	(0.10)	(0.11)
Latrine	-0.420***	-0.293**
	(0.09)	(0.15)
Blind pit		-0.429**
		(0.19)
River	-0.293*	-0.0427
	(0.16)	(0.21)
No toilet	-0.616***	-0.293***
	(0.11)	(0.11)
Other		-0.323
		(0.20)
Type of walls		
Cement Blocks (omitted category)		
Stones with lime or cement	-0.0619	-0.386
	(0.11)	(0.34)
Adobe	-0.173***	-0.136*
	(0.06)	(0.07)
Tapia	-0.0923	-0.288***
	(0.10)	(0.09)
Cane with mud	-0.0398	-0.469***
	(0.13)	(0.16)
Stones with mud	0.189	0.589**
	(0.20)	(0.25)
Wood	-0.220*	-0.358***
	(0.11)	(0.11)
Mat	1.141***	1.161**
	(0.34)	(0.48)
Other material	-0.344**	-0.0262
	(0.15)	(0.17)
Type of roof		
Armed Cement (omitted category)		
Wood	-0.201**	-0.166
	(0.09)	(0.10)
Roof Tiles	-0.219**	-0.207*
	(0.10)	(0.11)
Calamine plates, cement fiber	-0.201***	-0.237***
	(0.06)	(0.06)
Cane or mat with mud cake	-0.183*	-0.265***
	(0.10)	(0.10)
Mat	-0.745***	-0.849***
	(0.23)	(0.31)
Straw, palm leaves	-0.668***	-0.589***
	(0.22)	(0.16)
Other material	-0.266	-0.151
	(0.16)	(0.40)
Type of flooring		
Parquet (omitted category)		
Asphalt sheets, vinyl or similar	-0.209**	-0.394***
	(0.11)	(0.11)
Tiles, terraces or similar	-0.259***	-0.335***
	(0.09)	(0.09)
Wooden Planks	-0.572***	-0.783***
	(0.11)	(0.12)
Cement	-0.550***	-0.692***
	(0.08)	(0.08)
Dirt	-0.968***	-1.216***
	(0.10)	(0.11)
Other material	-0.455*	-0.380*
	(0.27)	(0.20)
Region		
Costa Urban (omitted category)		
Sierra Urban	-0.105*	-0.109*
	(0.06)	(0.06)
Selva Urban	0.139**	0.0257
	(0.07)	(0.06)
Costa Rural	-0.509***	-0.525
	(0.15)	(0.33)
Sierra Rural	-0.600***	-0.624***
	(0.12)	(0.10)
Selva Urban	-0.427***	-0.517***
	(0.15)	(0.20)
Lima Metropolitana	0.376***	0.327***
	(0.05)	(0.05)
Constant	7.495***	8.112***
	(0.17)	(0.20)
Observations	1,697	2,135
R-squared	0.664	0.606

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

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