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Linking Housing Comparisons Across Countries and Regions

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Background: Direct quantity comparisons were used to link the regions in the 2011 benchmark, not by choice but rather for want of a better data. Direct comparisons are also used by countries when their rental markets are not competitive because too few units on the market, foreigners are too large a part of the market, or subsidized housing is a substantial share of the rental market. This is the practice in many countries in Eastern Europe. In either case a critical input is an estimate of the standard quality of housing in a way that can be compared across units and countries. In May the HTF presented to the TAG modified estimates of housing quality in the regions based on some of the work at the ADB. The report made clear that these modified estimates would have changed the linking factors for housing as used in the 2011 benchmark. The TAG found adjusted factor for electricity quality satisfactory and the substitution of an overall sanitation index as a substitute for the present shares of households with water and toilet worth further exploration. The present note further elaborates the presentation to the TAG in anticipation of obtaining further suggestions from the HTF.

a) The Quantity Approach and User Cost

In those EU, Organisation for Economic Cooperation and Development (OECD), and Commonwealth of Independent States (CIS) countries where rental markets are too thin to produce reliable rental equivalence estimates of owner or tenant rents the practice is to apply user costs to obtain total rents from the income, product and expenditure sides. This concept is what an owner would have to pay to rent their home in terms of depreciation, insurance, taxes, repairs and maintenance, and net surplus. As applied in the EU countries the value of the housing stock, P is multiplied by the components of costs as in (1) below;

$$u_i = P_{it} (r_t + \delta_i) \quad (1)$$

- where, u_{it} is the user costs of house i in period t ,
- P_{it} is the price of home i in period t ,
- r_t is a nominal interest rate often taken as the 30-year mortgage rate;

- δ is the sum of the rates of annual depreciation, maintenance and repair, insurance, and property taxes.¹

In order to obtain the PPP of housing, the total of user costs must be divided by a measure of quality adjusted volume of the housing stock, a direct quantity measure. This means the PPP of housing is indirectly derived, in contrast to the directly measured PPPs in the rental equivalence approach. For most ICP countries the rent expenditures are estimated independently of the volume estimates so there is not necessarily consistency between the indirect and direct volume estimates, a major problem.

Just as most rental surveys have a fairly small list of housing characteristics, the sources for characteristics of the housing stock are often even more limited, whether from the population or housing censuses. This means that the quality-adjusted housing stock captures few dwelling characteristics that differentiate between high and low-income households or countries. The common quality measures were presence or absence of electricity, running water and inside toilet, and for some countries, central heating and air conditioning (not typically available in most non-OECD and CIS countries). The shares of dwellings with each of the above amenities were summed with a weight of one fourth (1/4th) to produce an average quality of the housing stock, then multiplied by the total of dwellings to obtain an estimate of the volume of quality adjusted dwellings. These measures of quality do not adequately differentiate between households or countries at quite different levels of income. That is why the HTF is examining for 2017 of introducing international assessments of the quality of the sanitation and electricity services in place or as a substitute for what has been used in previous ICP rounds. And as will also discussed in this meeting do we need to further examine rough groupings of housing into modern and traditional; or substantial and makeshift; or some other breakdown.

b) Unadjusted Volumes

¹When user costs for rents from the income side are entered on the expenditure side for these countries, the repairs and maintenance costs would be transferred to expenditure headings of materials and labor.

The preferred physical volume measure was area in square meters or next best, number of rooms, but many countries provided only the number of housing units in rural and urban areas, regardless of size. For example, in the 2005 and 2011 ICP comparisons countries often had only rough volume measures, perhaps number of rooms, but often not square meters (m²). This was true even though some of these countries could provide average rents for the ICP stratified characteristics of dwellings by type, size and amenities. In the quantity approach used for linking regions or to make individual country estimates of the quality adjusted volume of housing the usual practice is to multiply the quality index of a country times its unadjusted volume. The only unadjusted volume supplied by most countries was number of housing units. It is proposed in this note to estimate number of rooms for all countries based upon an estimating equation for those countries that have number of rooms; the reason for not adopting square metres is discussed below. The reason for proposing this approach is that there is a systematic relation across countries between their index of per capita GDP and the number of rooms for dwelling, and it is this relationship we propose to exploit.

The empirical estimates below are based upon the 109 ICP 2011 countries that were used in the regional adjusted housing volumes used in linking the regions. (See Konijn, 2017) By adding countries from Eurostat and OECD sources we have augmented the observations on rooms for the OECD countries, which only reported m² for ICP purposes. A total of 85 countries had observations included in equation (2).

$$\ln(R/U) = 1.061 + .000893 Y \quad (2),$$

where U is total number of housing units, R is total number of rooms and Y is the index of GDP per capita from the 2011 ICP. The form of equation (2) is intentionally chosen as to reduce spurious correlation.² Adjusted R² is modest, .181, and the RMSE is larger than one would like. But we believe it is still a viable estimating equation from which to derive approximations of number of rooms for the 24 countries for whom no observation on rooms was available.

² For example we estimated a log and arithmetic form of R on U and Y, where the adjusted R² was .694 and .616 respectively, but the residual error was larger. In fact, the estimate of rooms for the 24 missing observations in Table 1, uses the average of these two equations, not equation (2) above, on the hope that the average will offset other errors. In the log form the Goldberger adjustment was applied.

The position taken here is that if we were to link the countries only by number of housing units we are ignoring substantial information on a superior gross quantity measure, namely number of rooms. The point being made is that using observations on number of rooms for those countries that have them available and adding estimates of number of rooms, albeit with substantial error, for those countries unable to provide a room count will get us closer to the truth than falling back on simply gross numbers of housing units.

What about the preferred ICP measure of housing volume (before quality adjustment), namely square meters? Two factors have led us away from that measure. First only 45 of the 109 countries had data on square meters and these were mainly from the OECD. Secondly, there appeared many observations on m^2 outside the EU that seemed doubtful, including decimal issues for Africa. A general problem is that m^2 per room values showed a large amount of variance displaying little regularity that would provide a basis upon which to estimate m^2 for countries missing values.

c) Effects of Making Room Estimates for all Countries

In this section we illustrate what would have been the effects of using the actual and estimated number of rooms in place of number of housing units in obtaining the linking factors between region. Recall that in the direct quantity approach the real flow of housing of countries has been taken as the product of the volume measure times the quality adjustment. In symbols $HV_A = HQ * HV_U$, where HV_A is a measure of housing volume adjusted for quality factors, HQ is the index of housing quality in a country, and HV_U is a measure of housing volume unadjusted for quality. In the best of all worlds HV_U would be square meters or rooms. For want of country data on these preferred measures resort was made to the measure provided by most countries, number of housing units. Table 1 provides a comparison of the two HV_U measures, number of units as used to link the regions in 2011 and number of rooms.

A reminder that this linking illustration excluded many of the 2011 ICP countries because they were separately linked to the main comparisons like the Pacific islands or they did not have data on units, or they were CIS countries that were separately linked through Russia. The expected effect of using rooms rather than units as the measure of

HV_U is to increase the unadjusted and hence adjusted measures of real housing volume in higher income countries. This for the reason that the living space in a housing unit rises with the income of the household in all housing surveys with which I am familiar.

Table 1: Measures of Unadjusted Housing Volumes in 2011 by ICP Regions (Rooms and Units in thousands)

Region	Countries	Units	Units OECD =100	Rooms	Rooms OECD =100
WA	10	17,207	3.5	56,918	2.8
OECD	41	486,376	100.0	2,094,589	100.0
LA	14	98,641	20.3	246,473	11.7
Asia	15	803,154	165.1	2,021,419	95.9
Africa	28	117,574	24.2	348,793	16.8

In the fourth column we have the an index of the total units in each region relative to the OECD total. The last column provides the same index for rooms. As expected the volume (before adjusting for quality) relative to the OECD of the other regions declines compared to column 4. If we had square meters or rooms for all countries in 2011 we certainly would have used one of those measure, So the argument here is that we would be better off to approximate rooms for those countries for which they are missing, rather than not use the information for those that do. This is particularly true when we would only be using the estimates for regional linking. But even if we are linking individual countries that for some reason could not be compared in its regional comparison, I would argue for approximating the most detailed unadjusted volume measurre that is available.

In conclusion, if the 2017 data provided by the countries are much more detailed than in the 2005 and 2011 ICP rounds, then we will not be as concerned with the issues raised in this note. However, even then, there is a case for carrying out the exercise outlined here in order to compare direct housing adjusted volume estimates with indirect estimates by country as a check on the expenditure estimates. Indirect volume

estimates are based upon housing PPPs estimated from rental surveys, which in turn are based on volume measures of housing that will be bedrooms, all rooms or square meters. To compare the indirect with the direct estimate it would be appropriate that the volume measure used in the direct estimate were the same as used to directly measure the housing PPP.

In the discussion of the housing quality index it was clear that the proposed changes would have substantially altered the 2011 ICP comparisons of real housing volumes across regions and countries. It is also evident that the suggestions in this note would lead to increases in the volumes of housing in the higher income regions and countries. The justification is that the present proposals are simply moving to the measures of unadjusted housing volumes that have been recommended from the beginning of the ICP. The argument for moving in this direction has a strong basis but it needs to be recognized that, if adopted, it will need to be fully explained to users.

Konijn, Paulus (2017) "International Linking of housing in ICP 2011" Housing Task Force meeting, October 27, 2027, World Bank