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Cost-of-Living Differences between Urban and Rural Areas in Indonesia

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This model shows that in a neighborhood on the poverty line, an urban-rural cost-of-living difference of about 10 percent is closer to the truth than the values (as high as 66 percent) used in past work on Indonesia. The relative cost of urban living increases with income.

It is commonly assumed that the cost of living is much higher in cities than in the country because housing rents are higher in urban areas and food staples cost more. This assumption has important implications for sectoral comparisons of welfare levels and distributions.

Ravallion and van de Walle suspected that comparisons of housing rent and food prices overstate the cost-of-living differential. For one thing, the quality of dwelling stock is better on the whole in urban areas, reflecting income differences. For another, the urban consumer is able to stubstitute in favor of other goods and services which do not cost any more in urban areas.

Ravallion and van de Walle present a tractable empirical method for estimating spatial cost-of-living differences that can deal with these problems. Hedonic rent indices are used as the prices for housing in an AIDS demand model, the calibration of which permits one to retrieve the parameters of the consumer's cost-of-utility function. They apply this method to a large set of household data for Java.

They find that the true cost of living in cities is substantially overestimated by conventional methods. This is more pronounced at low incomes, since the marginal cost of utility is larger (relative to expenditures) in urban areas — implying that the relative cost of urban living increases with income.

In a neighborhood on the poverty line, the results suggest (allowing solely for the difference in price vectors) that an urban-rural cost-of-living difference of about 10 percent is closer to the truth than the values (as high as 66 percent) used in past work on Indonesia.

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I. Introduction

The search for consistent welfare measures for comparing households in different circumstances is a long-standing concern.[1] In dualistic developing countries one is particularly interested in comparing welfare levels in the modern (primarily urban) sector with those found in the more traditional (rural) sector; this has important implications for understanding the process of economic development through modern sector enlargement, and the desirability of that process from a social welfare point of view.[2] This paper examines a neglected determinant of relative welfare levels in a dual economy: the cost-of-living.

Housing costs in developing countries often vary enormously between urban and rural sectors. For example, on Indonesia's most populous island, Java, one finds that average dwelling rents in 1981 were six times greater in urban areas than rural areas, and over ten times greater on average in the largest city, Jakarta, than in the island's rural areas. The prices of food-staples tend also to be higher in urban areas; for example, the price of rice in Java is, on average, about 10 percent higher in urban areas.[3]

Many casual observers have been led to argue that the urban cost-of-living is substantially higher, with implications for inter-sectoral welfare comparisons. For example, when the same poverty line in terms of nominal income is applied to both sectors, one often finds much higher poverty levels in rural areas, suggesting that economic policies which do not enrich the traditional agricultural sector (indeed, the policies of many countries have harmed that sector) will have adverse effects on aggregate poverty.[4] It is however, unclear that these conclusions also hold when allowance is made for the (seemingly) higher cost-of-living in the modern urban sector. Empirical research on poverty has sometimes addressed this issue; for example, widely used poverty lines for Indonesia are set at substantially higher levels for households living in urban areas than in rural areas.[5] And the poverty line differentials in past spatial welfare comparisons have often been crucial to sectoral rankings. For example, the 66 percent differential in poverty lines between urban and rural sectors assumed by the Indonesian Central Bureau of Statistics (BPS, 1984) for 1981 is more than sufficient to reverse the poverty ranking of sectors in terms of the headcount index (over that obtained at a zero differential). Similarly, the urban-rural differential in poverty lines assumed in the influential study by Dandekar and Rath (1971) of poverty in India in the 1960s was also sufficient to reverse the sectoral ranking of headcount indices. Clearly the assumptions made about sectoral cost-of-living differentials in past work may have had considerable bearing on the empirical results and their policy implications.[6] The issue merits further investigation.

However there are a number of problems in using observed housing rents and food prices to make spatial cost-of-living comparisons. Two stand out:

i) "Housing" is a highly heterogeneous good and so observed rents can be a poor price index; for example, the considerably higher expenditures on housing in urban areas relative to rural areas typical of developing countries undoubtedly reflect higher consumption levels of certain housing attributes as well as (possible) higher prices for those attributes. Observed housing expenditures thus reflect, at least in part, income differences.

ii) Even if one can devise a satisfactory price index for housing, there may well be significant substitution possibilities with other goods. Although there are a number of empirical problems in identifying price responses, the few studies that have convincingly done so for developing countries suggest that the compensated own-price elasticity of housing demand is far from negligible.[7] Thus, differentials in housing expenditure between urban and rural areas will generally over-estimate the underlying differential in the cost of a given level of utility to consumers. A similar comment can be made about food price comparisons.

The first problem is well-known in applied work, and a solution based on hedonic regressions exists, and has been used widely (particularly following Gillingham, 1975). The second problem is widely appreciated theoretically, and "true cost-of-living" indices for intertemporal welfare comparisons have been estimated (particularly following Muellbauer's, 1974, seminal study for the U.K.). However, this approach has not (to our knowledge) been applied in empirical work on spatial cost-of-living comparisons; the main reason for this is undoubtedly the aforementioned difficulties in identifying price effects, particularly for housing demands.[8]

This paper offers a joint solution to both these problems and uses it to make cost-of-living comparisons between urban and rural areas of Java. To summarize the approach: Hedonic price indices for housing at various locations are first constructed. These are then used in modelling consumers' budget shares devoted to housing and food-staples using household level data. The demand model is then used to retrieve the consumer cost function and so enabling estimation of behavioural cost-of-living indices for urban and rural areas at various income levels.

The following section outlines the theoretical approach. Section III discusses the demand analysis. The data set is Indonesia's 1981 National Socio-Economic Survey (the SUSENAS). Section IV presents the estimated demand parameters, which Section V then uses to construct the spatial cost-of-living indices. Section VI offers some conclusions.

II. The Theory of Spatial Cost-of-Living Comparisons

Spatial cost-of-living indices are viewed here as special cases of the "true cost-of-living indices" proposed by Konus (1939).[9] This section discusses aspects of the theory relevant to our present interest.

The cost (or "expenditure") function for a household with characteristics denoted by the vector z is:

$$c = c(u,p,z) \qquad (1)$$

which is the minimum cost of that household achieving utility u when facing the price vector p. It is intrinsic to our interest in spatial cost-of-living comparisons that different households can face different prices. We shall view the price vector facing the household as a function (though not necessarily continuous) of the household's place of residence, denoted s:

$$p = p(s) \qquad (2)$$

The <u>spatial cost-of-living index</u> for location or sector s is defined as the cost of a given utility level u^r incurred by a reference household with characteristics z^r when facing the prices $p(s)$ which prevail at s, relative to the cost incurred by the same household when facing the prices which prevail at some reference location s^r. Thus the spatial cost-of-living index (COL) is given by:

$$COL = C(u^r, z^r, s^r, s) = \frac{c(u^r, p(s), z^r)}{c(u^r, p(s^r), z^r)} \tag{3}$$

In general, this index will vary according to the values taken by referencing variables (u^r, z^r, s^r) as well as the location being considered (s). For example, only for homothetic preferences will COL be independent of the reference utility level, for only then does $c(u,p,z)$ take the form: $e(p,z)f(u)$. The price index can also be written as a function of the reference income level (y^r) corresponding to the reference utility level on the indirect utility function (v); thus

$$COL = \tilde{C}(y^r, z^r, s^r, s) = c(v(y^r, p(s^r), z^r), p(s), z^r)/y^r \tag{4}$$

The numerator (RHS) is then a "money metric utility" or <u>equivalent income function</u> (King, 1983) for evaluating the welfare of a household facing y^r, $p(s^r)$ and z^r, <u>but</u> using $p(s)$ and z^r as the reference. By inspection of (3) and (4) it can be readily shown that the cost-of-living at place s relative to s^r will increase as reference income (or utility) increases if and only if the marginal cost of utility (expressed as a proportion of expenditure) is greater at s than s^r. This is an empirical question.

It should be remarked that this formulation follows common practice in conventional cost-of-living comparisons of confining attention to market price variability. Here one is measuring the cost of utility under various (location/sector specific) price vectors for <u>given</u> tastes over market goods. However, the latter may also exhibit regional differentiation, such as due to the existence of (non-separable) local public goods, or "social pressures" to conform with local tastes. Thus the cost-of-living index given by (3) or (4) need not measure the cost-of-living at alternative places of residence, after allowing for any shifts in consumer tastes for market goods.

Following from this, it should also be clear that reasonable complete interpersonal welfare comparisons require that even "true" cost-of-living indices must be combined with other information such as on money incomes, household demographic characteristics or other measures of "need", and the availability and cost of local public goods; the existence of local social pressures to conform may also be deemed relevant to such broader welfare comparisons.[10]

In measuring COL one requires an explicit functional form for the consumer's cost function. The form we have chosen to use for this study is the "AIDS" cost function of Deaton and Muellbauer (1980a, b), augmented to include household characteristics, giving the following cost function for household h (h = 1,..,H):[11]

$$\ln c_h = \alpha_o + z_h\pi + \sum_i \alpha_i \ln p_{ih} + \frac{1}{2}\sum_i \sum_j \gamma_{ij} \ln p_{ih} \ln p_{jh} + u \prod_i p_{ih}^{\beta_i} \qquad (5)$$

where α_i, β_i, γ_{ij}, and the vector π are parametric. Linear homogeneity in prices requires that $\Sigma\alpha_i - 1 = \Sigma_i\gamma_{ij} = \Sigma_j\gamma_{ij} = \Sigma\beta_i = 0$. The compensated (Hickisian) demand functions are readily gained from (5) using the fact that the budget share for each good (w_i) is given by the price elasticity of the cost function. The indirect utility function is obtained by inverting (5) at the utility maximum. On substituting this into the compensated demand functions one obtains the following set of uncompensated (Marshallian) demand functions in budget share from:

$$w_{ih} = \alpha_i + \beta_i \ln(y_h/c_h^o) + \sum_j \gamma_{ij} \ln p_{jh} \tag{6}$$

where y_h is expenditure on all goods ("income" for short) and c_h^o is the the minimum cost of zero utility, the log of which is given by (from (5)):

$$\ln c_h^o = \alpha_o + z_h \pi + \sum_i \alpha_i \ln p_{ih} + \frac{1}{2} \sum_i \sum_j \gamma_{ij} \ln p_{ih} \ln p_{jh} \tag{7}$$

Thus c_h^o can be interpreted as the <u>cost-of-subsistence</u> for household h (Deaton and Muellbauer, 1980b). In addition to the additivity constraints mentioned above, the second-order conditions for the consumer's choice problem require that the Slutsky matrix generated by this model is symmetric and negative semi-definite. Following Deaton and Muellbauer (1980b) this requires that $\gamma_{ij} = \gamma_{ji}$ and that all H nxn matrices with elements:

$$k_{ijh} = \gamma_{ij} + \beta_i \beta_j \ln(y_h/c_h^o) - w_{ih} \delta_{ij} + w_{ih} w_{jh} \tag{8}$$

have solely negative eigenvalues (where δ_{ij} is the Kronecker delta).

Under the AIDS model, it is readily verified that the true cost-of-living index (4) takes the following explicit form:

$$\ln COL = \ln c_r^o - \ln y^r + (\ln y^r - \ln c_r^{or}) \prod_i (p_i/p_i^r)^{\beta_i}$$

where $\ln c_r^o$ is given by (7) when evaluated at the price vector p(s) while $\ln c_r^{or}$ is evaluated at $p(s^r)$, and both apply to the reference household (with characteristics z^r), and where p_i is the ith element of p(s), while

p_i^r is the ith element of the vector $p(s^r)$. Note that COL will now be increasing (decreasing) in y^r if $\Pi(p_i/p_i^r)^{\beta_i}$ is greater than (less than) unity.

The task of the empirical work to follow is to estimate the demand functions in the budget share form (6) under the (testable) demand theory restrictions, and use the estimated parameters to retrieve the underlying cost function, so as to estimate the true cost-of-living index (4).

III. Methods of Demand Analysis

The modelling of consumer demand for housing raises two problems: i) housing is a heterogeneous good and so a single scalar measure of the quantity consumed is not readily available, and (thus) ii) observed market "prices" are more properly interpreted as expenditures on a bundle of (potentially) diverse housing attributes.

The approach adopted here for modelling housing demands treats housing as a composite good, the price of which is measured by a location specific hedonic price index.[12] The price index facing each household for its housing is thus the predicted cost for a fixed reference bundle of housing attributes (generally mean points), where the prediction is based on the estimated implicit prices of housing attributes for the district in which that household resides.

An advantage of the 1981 SUSENAS for this purpose is that it included quite detailed questions on dwelling characteristics in both urban and rural areas. For each of the 20 randomly selected districts (Kabupatens and Kota) in our SUSENAS sub-sample, implicit prices are estimated for the following dwelling and location attributes:

i) floor area

ii) land area

iii) number of rooms

iv) dummy variables for windows, private bathroom, laundry, toilet, kitchen and drinking water facilities

v) distances to market, primary school

vi) dummy variable for urban/rural location

vii) dummy variables for type of tenure

Both linear and semi-log specifications were tested and the linear form preferred. For further details see van de Walle (1988b).

One practical problem which arose is that not all potentially relevant housing attributes are observed in positive quantities for all districts. Two hedonic price indices were constructed: the first is only based on attributes which are observed in positive quantities in all districts, the second replaces any unobservable implicit prices by the means of those estimated for the districts for which positive levels of those attributes are observed. However, demand parameters and cost-of-living indices are affected little by the choice between these two methods. Results given here are for the second method of constructing the hedonic price index.

Housing is clearly an important good to include in urban-rural cost-of-living comparisons, since (unlike most other consumer goods) it is not spatially tradeable. Thus the sectoral price differentials can be large. The AIDS housing demand function was initially estimated under the assumption that no other prices vary across the sample. The model then collapses to a single equation for the budget share devoted to housing (dropping subscripts for households):

$$w_1 = \alpha_1 + \beta_1 \ln(y/c^o) + \gamma_{11} \ln p_1 + \nu \qquad (10)$$

where

$$\ln c^o = \alpha_o + \alpha_1 \ln p_1 + \frac{1}{2} \gamma_{11} (\ln p_1)^2 + z\pi \qquad (11)$$

and ν is assumed to be a normally distributed white noise error process. The model can then be consistently estimated by OLS.[13]

Past micro-level housing demand studies have (universally it seems[14]) used such single equations models. However, previous studies of foodgrain demands in this setting by one of the authors suggested that a degree of genuine price variability existed within our sample for food-staples reflecting both spatial price differentials (due to imperfect market integration and transport costs) and seasonality (interviews having been spread over one year) (van de Walle 1988a). A single equations model is still, of course, appropriate if housing is separable from other goods in consumption. But we can see no good reason for believing that this is plausible.

So a second, more general, demand model is estimated which permits cross-price effects between housing and the main food-staple, rice. In this case the model becomes:

$$w_1 = \alpha_1 + \beta_1 \ln(y/c^o) + \gamma_{11} \ln p_1 + \gamma_{12} \ln p_2 + \nu_1 \qquad (12.1)$$

$$w_2 = \alpha_2 + \beta_2 \ln(y/c^o) + \gamma_{12} \ln p_1 + \gamma_{22} \ln p_2 + \nu_2 \qquad (12.2)$$

where the cost-of-subsistence index now takes the form:

$$\ln c^o = \alpha_1 \ln p_1 + \alpha_2 \ln p_2 + \frac{1}{2} [\gamma_{11} (\ln p_1)^2 + 2\gamma_{12} \ln p_1 \ln p_2 + \gamma_{22} (\ln p_2)^2] + z\pi \qquad (13)$$

Under the non-linear restrictions across equations implied by (12) and (13), consistent estimation now requires a non-linear method; an iterative maximum likelihood procedure is used here.[15]

The realism of only allowing these two prices to vary spatially is, of course, questionable. We attempted to include other food-staples in the model besides rice (notably cassava and corn), but found that the relatively high proportion of zero consumptions in the data for these goods created considerable difficulties, both in the attribution of prices and the demand estimation. Household specific prices for other goods (notably non-food-staples) cannot be determined from the SUSENAS, and only piece-meal price data for some cities (and virtually no rural areas) are available from other sources.

In defense of our two-price (three-good) model we note that these two goods do account for a sizeable proportion of total expenditure - a mean of 25 percent in urban areas and 27 percent in rural areas (though the composition is very different; an average of 10 percent of total expenditure is on housing in urban areas, as opposed to 4.7 percent in rural areas). The omitted food-staples account for a small share of expenditures (2.4 percent).

Furthermore, it is far from clear that any omitted price variability has led us to under-estimate the relative cost-of-living in urban areas; while the omitted food items are undoubtedly cheaper in rural areas, many of the omitted non-food goods are likely to be dearer, notably those that are manufactured in, or transported via, urban areas.

The demand models are estimated on a random sample of 4187 households, being all households in the primary data set living in the 20 districts used for constructing the hedonic price index for housing, after excluding all households for which housing expenditures were missing from the data (being 18 percent of the original SUSENAS).[16] All estimated models include household demographic composition variables and dummy variables for season and region (urban/rural; Jakarta/other; East Java/other). The income variable is household consumption expenditure per person (including imputed incomes from own-production). For owner-occupiers the SUSENAS imputes a rental equivalent. Rice prices are the unit values implicit in the expenditures and quantities given in the primary data tapes.[17] For further discussion of these variables and an assessment of the data quality see van de Walle (1988a, b).

Table 1 gives mean prices by sector and other summary data, including the housing quantity indices implicit in the actual expenditures and the hedonic indices. It is of interest to note that the implicit quantity index for housing consumption is generally higher in urban areas, suggesting that the positive effect on housing demand of higher urban incomes has generally outweighed the negative effect of the higher urban housing prices. But notice that this is less pronounced for Jakarta; the considerably higher housing rents in that city have clearly led to lower average consumption levels relative to other urban areas, though still exceeding rural levels.

IV. Estimated Demand Parameters

Table 2 gives the main parameter estimates obtained for both demand models discussed above and their standard errors. (For brevity the parameters on household demographic and other characteristics are omitted but are available on request.)

Table 1. Summary Data

	Expenditure (Rp/mn)	Housing Hedonic index (Rp/mn)	Implicit quantity (rural=100)	Rice Price (Rp/kilo)
Rural areas (N=2580)	1873 (2153)	3448 (2059)	100	217 (31.8)
Urban areas (N=1607)	11353 (19826)	12455 (10576)	168	241 (48.1)
Jakarta only (N=330)	20954 (31506)	30237	128	287 (58.8)

Note: standard deviation in parentheses (one district only in Jakarta sample).

Table 2. AIDS Parameter Estimates

		Estimate	st. error
Housing	α_0	-4556	2265
	α_1	-54.2	19.1
	β_1	.0119	.0018
	γ_{11}	-.695	.144
Housing and rice	α_0	-153.2	2.59
	α_1	-4.21	.170
	α_2	16.1	.501
	β_1	.0264	.0013
	β_2	-.105	.0021
	γ_{11}	-.0638	.0081
	γ_{12}	.324	.0167
	γ_{22}	-1.20	.0523

Note: good 1 = housing, good 2 =rice

The single equation housing demand model is generally consistent with concavity of the cost function (negative compensated own-price effect), though concavity failures do occur at low levels of utility. It is concave in a neighbourhood of the mean points (as can be seen from the negative compensated elasticity in Table 3). Concavity failures occurred in 15 percent of the sample using the single equation model.

The joint housing-rice model performs well from the point of view of demand theory restrictions. Both the symmetry restriction ($\gamma_{12}=\gamma_{21}$) and the concavity condition (negative semi-definite Slutsky matrix) on the joint model performed well. (To test concavity, eigenvalues were calculated at all data points in the sample and both were found to be negative for 84 percent of sample households.) The homotheticity restrictions (β_i=0 for all i) are convincingly rejected, as are the separability restrictions ($\gamma_{12} = \gamma_{22} = 0$) needed to justify a single equation housing demand model when rice prices vary across the sample.

Table 3 gives the implied demand elasticities at mean points. Housing is found to be a luxury good (β_1>0) for both models, while rice is a necessity (β_2<0).[18] Absolute own price elasticities are less than unity for both goods, though far from negligible in magnitude. Cross price effects between rice and housing exist, and indicate that the two goods are (compensated) substitutes, though the cross-price elasticities are fairly small.

V. Spatial Cost-of-Living Indices

The benchmark for all cost-of-living comparisons will be a rural household of average size and composition facing the mean prices of housing and rice for all rural households. Various reference utility levels for

Table 3. Demand Elasticities at Mean Points

	Income	Price (uncompensated) own	Price (uncompensated) cross	Price (compensated) own	Price (compensated) cross
Housing (only)	1.18	-.694	n.a	-.615	n.a.
Housing (joint)	1.39	-.767	-.080	-.673	.191
Rice	.461	-.440	.038	-.335	.075

such a household will be considered, corresponding to various reference income per person. The cost-of-living in urban areas is then calculated at the average urban prices of housing and rice for each rural income level. Thus, for each benchmark rural income, one calculates the corresponding maximum utility level by inverting the rural cost function and then evaluates the urban cost function for that utility level. This is formally identical to calculating the equivalent income at urban prices of each "rural" income level using rural prices as the reference. All calculations will be based on the more general joint housing/rice demand model of the previous section.

Table 4 gives the equivalent incomes and estimated true cost-of-living differentials for various reference incomes in rural areas. The sample mean of rural incomes is about Rp 9,000 per person per month, while the poverty line for Indonesia is typically about Rp 5,000-7,000.

At the mean prices (from Table 1), our estimates of β_1 and β_2 (Table 2) imply that the marginal cost of utility (expressed as a proportion of expenditures) is higher in urban areas than rural areas; specifically, our estimates of $\Pi(p_i/p_i^r)^{\beta_i}$ are 1.0232 for all urban areas and 1.0284 for Jakarta. Thus we find that the urban cost-of-living differential is strictly increasing in reference income or utility, as can be seen from Table 4. This reflects the higher urban housing prices and the empirical result that housing is a luxury good ($\beta_1>0$).[19]

As was clear from Table 1, the differentials in mean housing rents between urban and rural areas moderately over-state the differentials in the hedonic rent indices; while average urban rents are over six times higher than for rural areas (and Jakarta rents are 11 times higher), on

Table 4. True Cost-of-Living Comparisons

	All urban areas		Jakarta only	
Reference rural income (Rp/person/ month)	Equivalent urban income (Rp/person/ month)	Cost-of-living differential (%)	Equivalent urban income (Rp/person/ month)	Cost-of-living differential (%)
3000	3254	8.47	3633	21.1
5000	5488	9.76	6143	22.9
7000	7743	10.6	8682	24.0
9000	10013	11.3	11243	24.9
12000	13441	12.0	15113	25.9
15000	16888	12.6	19011	26.7
20000	22667	13.3	25556	27.8
25000	28481	13.9	32148	28.6
35000	40185	14.8	45438	29.8
50000	57884	15.8	65572	31.1

Note: "Cost-of-living differential" = 100(COL-1).

adjusting for housing quality differences, urban housing costs exceed rural levels by a more modest factor of 3.6 (8.8 for Jakarta).

However, both the comparisons of actual housing expenditures and quality adjusted indices considerably over-state the estimated true COL differential between urban and rural areas, allowing for behavioural demand responses. Using the hedonic price index, the mean difference between urban and rural housing costs is about Rp 9000 per month (Table 1), or about Rp 1800 per person per month at average household size. This represents 20 percent of average rural income per person while the true COL differential at average income is a good deal lower at 11 percent. And this also allows for the slightly higher rice prices found in urban areas. The contrast is even greater for Jakarta: the mean difference in hedonic rents between Jakarta and rural areas represents 60 percent of mean rural income. The COL differential is estimated to be 25 percent.

VI. Conclusions

The existence of substantially higher average housing rents in cities than rural areas of dualistic developing countries, and higher prices for food-staples, have led to suggestions that the urban cost-of-living is a good deal higher. This has important implications for sectoral comparisons of welfare levels and distributions. There are, however, a number of theoretical reasons to suspect that such housing rent and food price comparisons may over-state the true cost-of-living differential. For one thing, the quality of the dwelling stock is often better on average in urban areas, reflecting income differences; for another, there are likely to be substitution possibilities with other goods, so that the increase in (for example) the housing expenditure by a rural household needed to acquire a dwelling of given attributes in urban areas over-compensates for the higher prices of those attributes.

This study has offered and implemented a tractable empirical method for estimating spatial cost-of-living differentials which can deal with these problems. Hedonic rent indices are used as the prices for housing in an AIDS demand model, the calibration of which permits parameters of the consumer's cost-of-utility function to be retrieved. The paper has applied the method to a large household level data set for Java. The results suggest that conventional housing rent and price comparisons do lead to a substantial over-estimation of the true cost-of-living in cities. And this is more pronounced at low incomes, since we find that the marginal cost of utility is larger (relative to expenditures) in urban areas, implying that the relative cost of urban living increases with income. In a neighbourhood of the poverty line, our results suggest that, allowing solely for the difference in price vectors, an urban-rural cost-of-living differential of about 10 percent is closer to the truth than the values (as high as 66 percent) that have been used in past work for Indonesia.

Footnotes

1. For recent discussions of the various approaches see Sen (1979, 1987), Deaton and Muellbauer (1980a, Chapter 7; 1986), Diewart (1980), Osmani (1982), King (1983), and McKenzie and Ulph (1987).

2. See, for example, Fields (1979), Kakwani (1986), and Ravallion and Chao (1987).

3. The above figures are based on our calculations from the primary data tapes of the 1981 household expenditure survey for Java. See Table 1 for details.

4. See, for example, the results of Ravallion and Chao (1987) for various Asian countries.

5. For example, the "Sajogyo poverty line" is set at a rice equivalent which is 50 percent higher in urban areas; see for example, Sajogyo and Wiradi (1985). BPS (1984) assume an even higher differential of 66 percent.

6. Cost-of-living differences need not be the only reason for using different poverty lines; relative deprivation may also be a consideration. But the relevance of the latter to poverty comparisons within Java is questionable. The case for twin urban-rural poverty lines in this setting appears to rest heavily on cost-of-living factors.

7. See the surveys by Mayo (1981) and Malpezzi and Mayo (1987).

8. Price effects on housing demand have been mainly identified by two methods: i) That proposed by Muth (1971) based on (more readily observed) land and other input prices, and subsuming a housing production function into the demand model; for recent examples see

Malpezzi and Mayo (1987), and ii) Those using hedonic price indices as the housing price variables, following Straszheim (1973); for a recent example see Ravallion (1988a).

9. For excellent expositions see Deaton and Muellbauer (1980a, Chapter 7) and Diewert (1980).

10. On the broader welfare issues involved in making "cost-of-living" or "real income" comparisons, see Sen (1979).

11. In theory, household characteristics can be introduced into the AIDS model by allowing any of its underlying parameters to be household specific. The following method is the simplest way of introducing such effects. We experimented with more complicated multiplicative effects in the empirical work but were unable to obtain satisfactory results.

12. It would be theoretically preferable to model the demand for individual housing attributes rather than the composite commodity. However there are so many of the former (13 in our hedonic index) that this was not deemed to be computationally feasible.

13. Although the model is not linear in parameters, all parameters can be uniquely identified from the OLS coefficients (Ravallion, 1989). This ceases to hold with two or more equations.

14. Again see the surveys by Mayo (1981) and Malpezzi and Mayo (1987).

15. Deaton and Muellbauer (1980b) advocate a price index approximation to (13) which makes the model linear in parameters without cross-equation restrictions and so estimable by OLS. However, as Deaton and Muellbauer point out, for satisfactory results this requires that individual prices are reasonably collinear. This is unlikely to hold in a household level cross-section, though it is more plausible in a time series application.

16. We believe that a zero entry for housing expenditure is more properly interpreted as missing data rather than a corner solution of the consumer choice problem; it is now rare for a household to be homeless in Java, and even more unlikely that such a household would get interviewed for the SUSENAS. There are very few zero entries for rice consumption in the data, as it is the main food-staple, and most of those that do occur are also more plausibly missing data than corner solutions (van de Walle, 1988a).
17. The use of unit values in demand modelling can result in a "quality-bias" (Deaton, 1987), though this is unlikely to be a serious problem in this application; see van de Walle (1988a) for further discussion.
18. Our estimated income elasticities for housing are higher than some past estimates for developing countries (see the survey by Malpezzi and Mayo, 1987). However, past estimates for Indonesia have indicated an income elasticity of unity or higher, both from grouped data (Chatterjee, 1979) and on applying the same methods here to a different data set (Ravallion, 1989). Note also that past micro-level housing demand studies have generally been confined to urban samples, where average income elasticities are likely to be lower than in rural areas. Our data set spans both. Our rice demand elasticities accord reasonably well with past estimates; for further discussion see van de Walle (1988b).
19. Noting that, although average urban rice prices are higher than in rural areas, rice is a necessity ($\beta_2<0$). If housing prices were no higher in urban areas, then the urban cost-of-living index would decrease as reference income increases.

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