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COST OF LIVING COMPARISONS FOR JAMAICA

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1. Introduction

During the past decade Jamaica, like many other developing countries, has witnessed high rates of inflation estimated at 15.7 and 14.3 percent in 1975 and 1977, respectively (Statistical Institute of Jamaica, 1984). Households with incomes that have not kept pace with inflation or that consume heavily from items with rapidly increasing prices experience deterioration in the standard of living in these circumstances. For policy purposes, it is important to understand the incidence of inflation impacts especially for low income households (Grootaert and DeTray, 1984; Musgrove, 1985). The cost of living index can be utilized to estimate inflation impacts and to guide policies and programs to alleviate associated economic hardships. For Jamaica, where price increases of staple food were policy related, the comparisons afforded by the estimated cost of living indices have special importance.

This study provides cost of living estimates for Jamaican households from selected socioeconomic groups over time. The approach taken in estimating cost of living utilizes a standard framework (Phlips, 1973; Pollak, 1975; Christensen and Manser, 1975; Braithwait, 1980; Brown and Johnson, 1983). In particular, the Almost Ideal Demand System (AIDS) provides the structure for estimating the cost of living index utilizing Jamaican household expenditure data from 1975 and 1977. Policy implications from the comparisons among household types and over time are important since through taxes, import quotas, food aid and other means, relative prices and cost of living are affected by government programs.

2. The AIDS and the Cost of Living

A cost of living index (CLI) is a measure of the minimum expenditure necessary for a consuming unit to achieve a reference indifference or satisfaction level under different price regimes (Deaton and Muellbauer, 1980a). The cost of living index can be estimated from the neoclassical utility maximization problem but requires reference to a particular utility function. However, with duality theory the preference structure can be represented by a cost function satisfying certain regularity conditions (Deaton and Muellbauer, 1980a, 1980b). The cost function for the Almost Ideal Demand System (AIDS) was selected for the cost of living estimation exercise using Jamaican household data.

The cost function corresponding to the AIDS is given by

$$\log\{c(u, p)\} = (1 - u) \log\{a(P)\} + u \log\{b(P)\} \tag{1}$$

where c is the minimum cost necessary to attain the utility level u and a(P) and b(P) are linear, homogeneous, concave functions of the price vector P (see Deaton and Muellbauer, 1980b). The cost function (1) has an intuitive meaning. At minimum subsistence level (u = 0), total cost depends entirely on log a(P), and as u increases the cost reflects this "subsistence level" and that of obtaining the additional utility determined by b(P).

Deaton and Muellbauer (1980b) have suggested the following flexible functional forms for a(P) and b(P),

$$\log a(P) = \alpha_o + \Sigma \alpha_i \log p_i + \frac{1}{2} \sum_i \sum_j \gamma^*_{ij} \log p_i \log p_j \tag{2}$$

$$\log b(P) = \log a(P) + \beta_o \Pi_i p_i^{\beta_i} \tag{3}$$

where α_o, α_i, β_i and γ^*_{ij} are the structural parameters. The subsistence level function (2) admits substantial flexibility in consumer behavior. Specifically, equation (2) has sufficient second order parameters to allow substitution among all commodities consumed with utility remaining constant. This characterization of preference, albeit limited, is also non-homothetic.

The cost of living index (CLI) associated with (1) is

$$\log \left| \frac{C(u_o, P_t)}{C(u_o, P_o)} \right| \tag{4}$$

where u_o is the reference utility level, P_o and P_t are price vectors for the reference and comparison periods or groups, respectively. The CLI defined by (4) indicates the percentage change in income required to maintain the base standard of living or utility after prices have changed from P_o to P_t.[1] Of course, the advantage of using a reference utility level (or indifference curve) compared to the consumer price index for evaluating living standards is that utility rather than the consumption bundle is constant (see Deaton and Muellbauer, 1980a).

To calculate the CLI, the AIDS is first estimated. Invoking Shephard's lemma, the cost function yields the demand system in share form,

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[1] Brown and Johnson (1983) utilized a similar argument and the Linear Expenditure System to estimate the cost of living of low income households in the U.S.A.

$$w_i = \alpha_i + \sum_j \alpha_{ij} \log p_j + \beta_i (\log Y - \log \{a(P)\}) \tag{5}$$

where Y is the level of income or total expenditure, $\alpha_{ij} = 1/2\ (\gamma^*_{ij} + \gamma^*_{ji})$ and w_i is the ith budget share. Notice that the nonlinear price index enters the share equations. An alternative is to replace this index by Stone index ($\Sigma\ w_k \log p_k$) and estimate (5) as a linear system (Deaton and Muellbauer, 1980b; Ray, 1980; Banskota, Johnson and Stampley, 1986b). In this analysis, the nonlinear price index was directly utilized.

From equation (5) the α's and β's can be estimated. These are also parameters for the AIDS cost function, except for the unobservable utility level u, α_o and β_o. The unobservable utility level for the reference period, denoted with the subscript o, is (Deaton and Muellbauer, 1980a, p. 176)

$$u_o = \log \left|\frac{Y_o}{a(P_o)}\right| \Big/ \log \left|\frac{b(P_o)}{a(P_o)}\right| . \tag{6}$$

The value, α_o, in the cost function can be assigned <u>a priori</u> as the reference period subsistence cost. Then, the cost of living index can be written as,

$$\log \left|\frac{c(u_o, P_t)}{c(u_o, P_o)}\right| = (1 - u_o) \log \frac{a(P_t)}{a(P_o)} + u_o \log \frac{b(P_t)}{b(P_o)} . \tag{7}$$

All the parameters in equation (7) are identified or estimable from the share equation (5). Observe that even if households face the same prices, their costs of living may vary. Deaton and Muellbauer (1980a) argue that richer households have cost of living indices closer to

$b(P_t)/b(P_o)$ whereas poorer households have indices closer to $a(P_t)/a(P_o)$.

3. Data

The data for this study are from two household expenditure surveys conducted by the Statistical Institute of Jamaica (STATIN) in 1975 and 1977. A similar survey was undertaken in 1976 as well but since the latter survey used a different design, being conducted over a prolonged period during the four seasons, it was not employed in analyzing the cost of living. A detailed description of the three surveys and associated data sets is contained in a summary report (Statistical Institute of Jamaica, 1986).[2]

The schedules used in the Jamaican consumer expenditure surveys were of standard form, collecting food expenditures on a weekly basis and reflecting value of food consumed from home production and received as gifts or payments. Expenditures for other items were collected for longer periods, three months for semidurables, one year for durables, etc. As in most consumer expenditure surveys, the data on income obtained in the Jamaican survey proved incomplete and/or unreliable. Thus, the income measure used in the cost of living exercise was per capita total household expenditure (adjusted for consumption from home production and goods received as gifts or payments).

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[2]The sample sizes were 3,495 and 993, respectively, in 1975 and 1977.

Household expenditures were aggregated into three broad categories, namely food, purchased meals or meals away from home, and nonfood. For each household the expenditure group budget shares were calculated as group expenditure divided by total household expenditure. The household size variable used was the number of members, unadjusted for the age and sex composition.

The food group price was calculated as the weighted (by actual expenditure shares) price of all food items purchased by the household. The purchased meals price was simply the price per meal obtained by dividing the total expenditure on meals by the number of meals the members of the household reported having away from home. The nonfood CPI reported by STATIN, adjusted to account for regional variation, was utilized for the nonfood price. The nonfood price information in the surveys were not sufficiently complete to permit a more specialized calculation of this price index.

The cost of living was calculated for different sample partitions. These partitions include low income households ($\leq$ J$5,000) and high income households (J$5,000 >), agricultural and nonagricultural households and finally, Kingston, other towns and rural households. The reference household used for the cost of living calculations and comparisons was: low ($\leq$ J$5,000), agricultural and rural.

4. Estimation

The AIDS model was estimated by normalizing the commodity prices p_i by the household size variable m (Ray, 1980). The resultilng share

equations are,

$$w_i = \alpha_i + \Sigma_j \alpha_{ij} \log p_j + \beta_i \log \frac{y}{a(P)} + \sigma_i \log m \qquad (8)$$

where a(P) refers to the nonlinear price index and $\bar{\sigma}_i$ (= $\Sigma_j \gamma_{ij}$) is a parameter denoting the effect of household size on the budget share other than through per capita real household expenditure (Ray, 1980). Since the budget shares add to unity one share equation can be excluded from estimation. The demand system in (8) was estimated in nonlinear form using seemingly unrelated regression methods to admit possible impacts of contemporaneous correlations in the errors for the households. The estimated parameters are then utilized to estimate costs of living for representative Jamaican households in the different sample partitions.

5. Results

The results of the analysis are summarized in three parts. First, descriptive information is provided on the average or representative households in the selected sample partitions. This is followed by a discussion of the structural parameters and elasticities estimated from the AIDS. Then, the cost of living measures are calculated and evaluated.

Allocation of Household Budgets and Household Size

Average household expenditures for food, nonfood and purchased meals for the selected sample partitions are reported in Table 1. The averages reported are for the 1975 and 1977 data sets combined. Also

reported in Table 1 are the annual household income (total expenditure), household size and the subsample sizes.

Rural households accounted for nearly 55 percent of the combined samples and their mean income was about 56 percent that of Kingston households. Moreover, rural households were larger in average size than either Kingston or other towns households. Agricultural households were on an average larger than nonagricultural households. Low income households were smaller than higher income households.

The expenditure patterns of households shown in Table 1 reveal that those with the lower levels of income spent greater shares of their budgets on food. The higher income households spent greater shares of their budgets on nonfood. Clearly, Engel's law which states that the proportion of income spent on food declines as income increases was observed for Jamaican households (Banskota et al., 1986a, 1986b).

Parameter Estimates and Demand Elasticities

Parameter estimates of the AIDS with the Slutsky restrictions imposed are reported in Table 2. Most of the estimated coefficients reported in Table 2 are statistically significant at least at the 10 percent level. Food is a necessity and the other two commodities, nonfood and purchased meals, are both luxuries. Notice, however, that the purchased meals income coefficient is not statistically significant.

A large number of significant price coefficients suggests a marked responsiveness of consumption patterns for Jamaican households to relative prices. Jamaican households appear to substitute freely

among commodities when relative prices change. Scale coefficients, also presented in Table 2, reveal significant economies of scale in the consumption of food and significant diseconomies of scale in nonfood consumption.

In Table 3 the compensated price, income and scale elasticities are presented for each household type. These elasticities were derived at the sample means for the respective partitions. All own price elasticities are negative as expected. Across the household types, the magnitudes of the estimated elasticities differ modestly indicating the different responses of the households to exogenous changes in prices, income as well as household size. A more detailed discussion and interpretation of these elasticities is provided in connection with the cost of living calculations.

Cost of Living Indices

The cost of living indices for the different types of Jamaican households based on the AIDS model are presented in Table 4. In Table 4, the cost of living index for each type of household is derived relative to the reference household type (see notes for Table 4). Also presented in Table 4 are estimated changes in the cost of living indices, again relative to the reference household type, for food price increases of 10, 20 and 30 percent.

In Kingston the average cost of living was about 13 percent greater than in rural areas. The results in Table 4 also indicate that households in other towns enjoyed a lower cost of living than rural households. The difference in the cost of living between agricultural and nonagricultural households was about the same as

between rural and Kingston households. The high income households (greater than J$5,000) had cost of living of about 66 percent more than the low income households.

In Table 5 the cost of living indices calculated for the representative households with 1975 as the reference year are presented. The cost of living increases between 1975 and 1977 were highest (19.16) for Kingston households. The high income households experienced an increase of similar magnitude.

Food price increases of 10, 20 and 30 percent had differential impacts for the representative households. In Tables 4 and 5, the cost of living indices are calculated with assumed food price increases of 10, 20 and 30 percent. Relative to rural households, Kingston and other town households experience increases in living costs less than proportional to the asumed food price increases. Similar observations can be made comparing the other two sample partitions in Table 4. The conclusions are different when the cost of living indices are calculated for each household type with 1975 as the reference year.

In Kingston a 10 percent increase in food prices above those realized in 1977 increases the cost of living by as much as 26 percent (Table 5). The rates of increase are much lower in other towns and rural areas, but rural households experience a greater increase in their living cost than other town households. However, at higher rates of food price increase, e.g., 30 percent, the impact is greater for rural households. The increase in the cost of living due to 30 percent increase in food prices is about the same between agricultural

and nonagricultural households and slightly lower for the low income households than high income households. Abstracting from the small difference in the cost of living between the latter household types, the changes in the cost of living for households with low incomes due to the food price increase were far greater than the changes for the high income households, with 1975 as the reference year. Clearly high food prices have an antipoor bias.

It is important to qualify the antipoor bias, however. In urban areas poorer households generally purchase most of the food they consume and this antipoor bias will be strongest. Among rural or agricultural households who consume all or part of their produce, food price increase can increase production and income, depending upon whether the foods are domestically produced.[3] However, if imported food prices increase, food producing households may also experience an increase in cost of living, but perhaps not to the extent of the urban poor households, since rural households are more likely to substitute domestic food for imported food. Clearly, the (food) price effect on the standard of living of the poor households can be different among the urban poor and rural or agricultural households (Musgrove, 1985).

Certain interesting implications for the antipoor bias effect of food price increases emerge from a re-examination of the demand elasticities reported earlier. First, consider the own price food demand elasticities. These elasticities are lower for the households

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[3]For Jamaica, this issue is important since a large share of the food supply is imported.

with low incomes (agricultural, low income and rural) than for households with higher incomes. Clearly, with exogenous changes in food prices, higher income households can curtail food consumption by a greater amount than lower income households. In other words, the more elastic the consumption response to the own price of food, the greater is the opportunity to adjust to food price inflation.

Also from Table 3, observe that all households exhibited economies of scale in food consumption, but these scale elasticities are positively related to the values of the own food price elasticities. In other words, high income households also have a greater capacity for reducing food consumption when household size increases. Furthermore, the overall scale elasticities tend to neutralize each other for agricultural households. This is not the case for nonagricultural households. Between low and high income households, the latter have overall scale economies whereas the former have diseconomies of scale. Finally, the overall scale elasticity is higher in Kingston and other towns than rural areas. Thus, households with low incomes find it more difficult to adjust food and living costs due to changes in household size.

6. Conclusions

A number of conclusions are suggested based on the estimated demand system and the cost of living calculations. Relative to agricultural households, nonagricultural households had about 12 percent higher living costs. The cost of living of high income households relative to low income households was nearly 66 percent

greater. Kingston and other town households had cost of living indices of 12.6 and -1.69, respectively, relative to rural households. From 10, 20 and 30 percent food price increases, the relative cost of living indices for the household types were not altered significantly.

Cost of living indices for each type of household were derived for 1977 relative to 1975. The results indicated that Kingston and high income households experienced about a 19 percent increase in their costs of living between 1977 and 1975. The results further indicated that the cost of living varied greatest among the three regions (Kingston, 19 percent, other towns, 9 percent and rural areas 7 percent). For the two income groups, the temporal variation was also significant (high income, 19 percent and low income, 13 percent). The cost of living indices showed the least variation by occupation, with agricultural households (11 percent) and nonagricultural households (13 percent) experiencing almost similar increases.

Food price inflations of 10 percent, 20 percent and 30 percent had different effects in the cost of living indices. The results show a clear antipoor bias in higher rates of food price increase. Reasons for the different responses of cost of living indices to food price increases were also examined. The compensated demand elasticities estimated from the AIDS model for each household type revealed that those with lower incomes (rural, low income and agricultural households) had own price food elasticities that were more inelastic than their counterparts. Lower income households appear to have less flexibility in reducing their food expenditures when prices increase relative to the richer households and this inflexibility may be more

pronounced for urban poor households. Also, the scale elasticities are lower for the poorer households than the richer households, perhaps again signaling inflexibility in reducing living costs.

Table 1

Budget Allocations for Selected Types of Jamaican Households

Household Type	Average Household Size	Average Annual Food Cost (J$)	Average Annual Nonfood Cost (J$)	Average Annual Meals Cost (J$)	Average Annual Income* (J$)	Sample Size	
						Percent of Total	Numbers
Area							
Kingston	3.97	2038	2857	336	5231	31.62	1412
Other Towns	3.95	1751	1849	244	3844	14.06	628
Rural Areas	4.46	1524	1260	133	2916	54.32	2426
Occupation							
Agricultural	4.48	1385	845	86	2315	32.96	1472
Nonagricultural	4.11	1882	2341	275	4498	67.04	2994
Income Group							
Low Income	4.00	1291	829	128	2248	77.56	3464
High Income	5.05	3194	5368	507	9069	22.44	1002

*Total household expenditure was used to proxy household income.

Table 2

Parameter Estimates of the Three Commodity AIDS Model: Jamaica, Pooled 1975 and 1977 Surveys

Expenditure Groups	Parameter*	t-value
Food		
Intercept	0.93	66.48
Price of Food	-0.05	7.27
Price of Nonfood	0.01	1.79
Price of Purchased Meals	0.04	6.11
Income	-0.12	43.50
Household Size	-0.08	20.14
Nonfood		
Intercept	-0.01	0.95
Price of Food	0.01	7.27
Price of Nonfood	0.04	6.19
Price of Purchased Meals	-0.05	4.34
Income	0.12	20.14
Household Size	0.08	21.40
Purchased Meals		
Intercept	0.09	3.12
Price of Food	0.04	6.11
Price of Nonfood	-0.05	4.34
Price of Purchased Meals	0.02	1.20
Income	0.01	1.19
Household Size	0.01	0.48

*Parameter estimates were rounded to two places for presentation.

Table 3

Compensated Price, Expenditure and Scale Elasticities for Selected Types of Jamaican Households: 1975-1977

Household Type	Commodity Group	Price Elasticities			Expenditure Elasticity	Scale Elasticity
		Food	Nonfood	Purchased Meals		
Agricultural	Food	-0.41	0.32	0.09	0.79	-0.13
	Nonfood	0.53	-0.43	-0.10	1.32	0.22
	Purchased Meals	1.48	-0.99	-0.49	1.18	-0.10
Nonagricultural	Food	-0.55	0.42	0.13	0.70	-0.19
	Nonfood	0.33	-0.30	-0.03	1.23	0.16
	Purchased Meals	0.93	-0.28	-0.65	1.11	-0.06
Low Income	Food	-0.43	0.32	0.11	0.78	-0.14
	Nonfood	0.49	-0.45	-0.07	1.32	0.22
	Purchased Meals	1.15	-0.51	-0.63	1.12	-0.06
High Income	Food	-0.58	0.43	0.15	0.65	-0.22
	Nonfood	0.26	-0.23	-0.02	1.20	0.14
	Purchased Meals	0.91	-0.27	-0.63	1.12	-0.06
Kingston	Food	-0.56	0.44	0.13	0.72	-0.20
	Nonfood	0.29	-0.27	-0.02	1.22	0.15
	Purchased Meals	0.88	-0.21	-0.66	1.11	-0.06
Other Towns	Food	-0.52	0.39	0.13	0.73	-0.17
	Nonfood	0.37	-0.33	-0.04	1.24	0.17
	Purchased Meals	0.95	-0.30	-0.66	1.11	-0.06
Rural	Food	-0.47	0.37	0.10	0.76	-0.15
	Nonfood	0.44	-0.37	-0.07	1.27	0.19
	Purchased Meals	1.23	-0.66	-0.57	1.15	-0.08

Table 4

Cost of Living Indices for Selected Types of Jamaican Households

Household Type	Cost of Living Index	Cost of Living Index when Food Prices Increase by[4]		
		10 Percent	20 Percent	30 Percent
Occupation[1]				
Nonagricultural	11.96	12.13	12.29	12.45
Income Group[2]				
High Income	65.86	66.26	66.62	66.96
Area[3]				
Kingston	12.60	12.72	12.82	12.91
Other Towns	-1.69	-1.63	-1.58	-1.54

[1]Reference households are agricultural households.

[2]Reference households are low income (J$5,000 or less) households.

[3]Reference households are rural households.

[4]These increases in food prices are relative to 1977 values.

Table 5

Cost of Living Indices for Selected Types of Jamaican Households: 1975-1977

Household Type	Cost of Living Indices: 1977 Relative to 1975	Cost of Living Indices when Food Prices Increase by[1]		
		10 Percent	20 Percent	30 Percent
Occupation				
Agricultural	11.25	18.59	25.28	31.42
Nonagricultural	13.22	19.97	26.13	31.76
Income Group				
Low Income	13.11	20.17	26.60	32.49
High Income	18.64	25.17	31.22	36.71
Area				
Kingston	19.16	25.77	31.81	37.34
Other Towns	9.32	16.13	22.31	28.00
Rural Areas	7.46	16.14	22.70	44.85

[1]These increases in food prices are relative to 1977 values.

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