Journal of Philippine Development
Number 34, Volume XIX, No. 1, First Semester 1992

EQUIVALENCE SCALE AND POVERTY ASSESSMENT IN A POOR COUNTRY

Arsenio M. Balisacan[*]

INTRODUCTION

Mainly because of lack of data, poverty assessment in poor countries has often been based on available distribution of total household expenditure (or income) (Fields 1989 and World Bank 1990). A household is considered poor, if its total expenditure is less than the poverty line determined for a household of "average" size and composition. This procedure ignores differences in family size and composition as well as scale economies in producing and consuming household goods and services, thereby possibly misrepresenting aggregate poverty. An improved procedure uses per capita measures. However, by ignoring scale economies, the procedure overrepresents large households among the poor. Since many poor countries tend to have disproportionately large households, aggregate poverty may be overblown.

The use of properly constructed household equivalence scales (equivalence scales, for short) is appropriate for aggregate poverty assessment. An equivalence scale indicates at reference prices the cost differential for a household, due to demographic characteristics (e.g., family size, age and sex of family members) and other relevant household attributes (e.g., education, occupation, and region of residence), to reach the welfare level of the reference household. Viewed as a true-cost-of-living index, it represents in one summary measure the changing "needs" of a family as it expands and/or changes attributes. It has thus been a concept central to theoretical and empirical studies concerning poverty, income distribution, tax policy design, and social security payments in a welfare state.

The literature follows two main approaches in construction of equivalence scales. The first uses an expert's opinion on nutritional needs of different age-sex groups to determine them. This approach has, however, not gained wide acceptance since "needs" as a concept is usually regarded as social rather than physiological. Experts hardly agree

---

[*] The author is an Associate Professor of economics at the University of the Philippines, Diliman, Quezon City. He is grateful to Angelita M. Cortez for research assistance.

on what constitutes "correct" needs. Furthermore, needs vary considerably over time and across population groups and regions, depending on environment, work habits, occupation, health and so on. The second approach, as adopted in this paper, uses observed household expenditure patterns. In developed countries with many household expenditure surveys (and hence sufficient price variation in the data), the construction of equivalence scales has often involved the estimation of a complete demand system. In less developed countries, household expenditure surveys are too few and far between such that the construction of equivalence scale may require the estimation of a single equation model.

This paper provides an empirical assessment of overestimation of aggregate poverty in a poor country where household size and composition as well as scale economies in household production and consumption are ignored. The first section discusses two models employed in estimating equivalence scales; the second briefly describes the data and empirical model. The third section presents empirical results and implication of equivalence scales on estimates of aggregate poverty in the Philippines and is followed by a concluding section.

SIMPLE MODELS

One of our main considerations in the construction of equivalence scales is with schemes that are easy to implement and require data widely available in poor countries. These requirements are met by two of the most popular single-equation models — Engel and Rothbarth. The assumptions of these models appear to have found wide favor. We briefly characterize their theoretical underpinnings.

Models of equivalence scales assume the welfare of parents is given by

$$u = u(q,x) \tag{1}$$

where q is a vector of household consumption levels and x is a vector of demographic characteristics. Associated with (1) is an expenditure function which relates the minimum expenditure y necessary to attain a utility level u at prices p and household characteristics x:

$$c(u,p,x) = y \tag{2}$$

Then, if u^r and p^r are some reference utility level and price vector, the equivalence scale for any household h with characteristic x^h is derived as the ratio of its cost function to that of the reference household with characteristic x^r,

$$\varepsilon^h = c(u^r,p^r,x^h)/c(u^r,p^r,x^r) \tag{3}$$

Whether the equivalence scale estimated from observed household behavior corresponds to this definition — or whether the true scale can be recovered at all — has been the subject of recent controversy (Pollak and Wales 1979 and Fisher 1987). Another complication with applying this definition is that, as with true-cost-of-living indices, the scale in general depends on the chosen base level of utility or income, as well as on prices and demographic characteristics.[1] Furthermore, the definition of equivalence scales given in (3) assumes demographic characteristics are not choice variables in their own right, or that changes in demographic characteristics do not affect prices. Modifications to the standard definition have been proposed (Pashardes 1991 and Blundell and Lewbel 1991), but the suggested procedures are often not amenable to available data in poor countries. Besides, in several cases, the issue is an empirical — not theoretical — matter (Gronau 1988: 1191).

Engel Model

The Engel model rests with the premise the share of food in total household expenditures correctly indicates the standard of living of adults. This assumption seems based on the empirical evidence that (i) for households with same demographic characteristics, food share varies inversely with total household income or expenditure and that (ii) for households with same income, food share varies directly with number of children. Denote, following Deaton and Muellbauer (1980: 193-5), the Engel cost function of household h with demographic characteristic xh as

$$c\,(u^h, p^h, x^h) = \mu\,(x^h)\,\Phi\,(u^h, p^h) \tag{4}$$

where $\mu(x^h)$ is the number of adult equivalents of household h and $\Phi(u,p)$ is the per capita cost function, which is that of the reference household (for which $\mu(x^h)=1$). Intuitively, what (4) says is that the cost function of any household h with demographic characteristics x^h is simply the reference household's expenditure function scaled up or down by the number of adult equivalents of the household under consideration.

Expressing (4) in logarithmic form and then differentiating it with respect to the price of food (p_f), we get the Engel food share equation:

$$\begin{aligned} s_f^{\,h} &= \partial lnc\,(u^h, p^h, x^h)\,/\,\partial lnp_f = \partial\,[\,ln\,\mu(x^h) + ln\,\Phi\,(u^h, p^h)]\,/\,\partial lnp_f \\ &= \partial ln\,\Phi\,(u^h, p^h)\,/\,\partial lnp_f = \zeta\,(u^h, p^h). \end{aligned} \tag{5}$$

[1]Lewbel (1991) constructs an equivalence scale independent of a base level of income or utility.

Clearly, assuming prices are constant, food share is directly related with household's utility; hence, it is an indicator of household welfare. In this model, two households are considered equally well-off if they have the same food share irrespective of demographic characteristics and incomes.

Rothbarth Model

The Rothbarth model posits total expenditures on adult goods correctly indicate adult welfare. Suppose we have a two-way grouping of commodities into pure adult goods (A) and other goods (B). The latter group include items consumed by both adults and children, public goods jointly consumed, and goods consumed only by children. Assume the presence of children does not affect the relative prices of A goods. We can then write the Rothbarth cost function for household h as

$$c\,(u^h, p^A, p^B, x^c) = \alpha\,(u^h, p^B, x^c) + \gamma\,(u^h, p^A, p^B) \qquad (6)$$

where p^A and p^B are price vectors for A and B goods, respectively, and x^c vector of demographic characteristics for children. The first term, $\alpha(.)$, is cost of children, and the second, $\gamma(.)$, can be thought of as base or fixed cost.

The total expenditure, y, is, of course, $y^A+y^B = p^AA + p^BB$. Applying Shephard's lemma to (6), the expenditure on adult goods is

$$y^A = \sum_{i \varepsilon A} p_i \partial \gamma\,(u^h, p^A, p^B)\,/\,\partial p_i = \tau\,(u^h, p^A, p^B). \qquad (7)$$

Thus, assuming prices are constant, well-being of household h is directly related with its consumption of adult goods. Equation (7) also implies two households with the same consumption level of adult goods are equally well-off, in spite of demographic characteristics and incomes.

If nonadult goods (B goods) in the Rothbarth model correspond to food in the Engel model, and if foods are necessities, then the Rothbarth equivalence scale is the same as the Engel equivalence scale. In practice, estimates of Rothbarth scales tend to be smaller than those of Engel scales. This inconsistency arises entirely from differences in assumption, not in measurement. Deaton and Muellbauer (1986) demonstrate that while the Engel model tends to overestimate equivalence scales, the Rothbarth model tends to underestimate them. The upward bias in the Engel scale arises because of the likelihood the addition of a child raises the average food share for the household since the child's consumption is mainly food. The rise in the share will, in the Engel model, indicate that the household welfare has declined. A full compensation (*i.e.*, money) intended to keep food share and, hence, household welfare, constant will overstate cost of the child. The equivalence scale is accordingly biased upward.

The downward bias of the Rothbarth scale, on the other hand, arises if presence of children makes goods shared with children more expensive than pure adult goods. In this case, and where adult goods are normal goods, consumption of adult goods will rise. Fully compensating the household to keep adult-good consumption constant (and hence household welfare) to the level prevailing before the arrival of the child will understate cost of the child. The equivalence scale is thus biased downward.

As noted above, the search for the "true" equivalence scale measurable from observed behavior still continues. While alternative models have been proposed, their application has been limited by the available data in poor countries. In these countries, the Engel and Rothbarth models continue to have empirical appeal.

EMPIRICAL SPECIFICATIONS AND DATA

Estimating Equivalence Scales

Consider first estimating Engel equation for food. One equation, frequently fitting the data well, is the Working-Leser form, with food share as a linear function of the logarithm of total outlay (expenditure). A simple extension of this equation incorporating demographic composition and other household attributes is:

$$s_f = \alpha + \beta lny + \sum_i \omega_i n_i + \sum_j \sigma_j D_j + v \qquad (8)$$

where lny is the logarithm of total household expenditure, n_i is demographic composition i, D_j is household attribute j, v is error term, and α, β, ω and σ are parameters. For the demographic composition variables, children are sorted into two age groups, those in the age bracket 0-7 years old (denoted LILCHILD) and those 7-15 years old (denoted BIGCHILD). The chosen reference household for construction of equivalence scales is a childless couple.

The household attributes include a set of dummy variables including region and area (urban or rural) of residence of the household, educational attainment and occupation of household head, and type of household (headed by male whose wife is employed or not, or by female). Strictly speaking, because household attributes may themselves be choice variables over a life cycle, the parameter estimates should be viewed as *conditional* on past decisions concerning accumulation of stocks of human and physical assets. Investigation of the process of accumulation, including migration decisions, is beyond the scope of this paper. Thus, our estimates of equivalence scales have to be interpreted as, following Deaton and Muellbauer (1986), *short-run* indicators of child costs and parental welfare.

Estimation of the Engel equivalence scale requires equating food share of the reference household with that of the household under consideration. Other things being equal, the equivalence scale for a household with children is

$$\varepsilon^h = y^h/y^r = exp\,[-(1/\beta)\sum_i w_i n_i] \tag{9}$$

The procedure for estimating the Rothbarth equivalence scale is similar to the Engel method. Using the same formulation as that in (8), we estimate the Engel share equation for adult goods. We then multiply the estimated equation by the total household expenditure (y) to obtain the total expenditure for adult goods (y^A). We next calculate the reference household's predicted expenditure of adult goods (y^A_0), given this household's total expenditure (y^r) and sample mean characteristics. For some other households, for example, one with two adults and one child, we calculate the total expenditure (y^h) that would generate y^A_0. The cost of the child is then given by y^h-y^r and, as before, the equivalence scale by y^h/y^r.

In this paper, the set of adult goods includes coffee and tea, food eaten outside the home, alcoholic beverages and tobacco, personal care and effects, and recreation.

Aggregate Poverty Measurement

As noted above, our main interest in this paper is to assess numerically the bias in estimated indices of aggregate poverty in a poor country when differences in household composition (and other characteristics) are ignored. The assessment involves, first, identification of the poor and, second, aggregation of data on the poor into an overall measure of poverty. There are unsettled issues in both areas, but these are beyond the scope of this paper.[2] The poor are identified in this paper as those whose expenditures are below the poverty line set at a particular percentage r of the mean adult-equivalent expenditure:

$$z = r\,(1/N)\sum_{i=1}^{N} y_i/\varepsilon_i \tag{10}$$

where ε^i is the total number of adult equivalents for household I and N is the total number of households. In spite of the arbitrary procedure of

[2] For a review of various approaches to distinguish the poor from the non-poor, see Callan and Nolan (1991). On diversity of judgments concerning aggregate measurement of poverty, see Atkinson (1987).

determining the poverty line, its considerable appeal is simplicity and transparency. Its results can be readily understood and serve as a starting point for the analysis of poverty.

For aggregation of the data on the poor, we employ the class of poverty indices proposed by Foster, Greer and Thorbecke (1984), hereinafter referred to as FGT. This is given by

$$P_\theta = \frac{1}{N} \sum_{i=1}^{q} \left(\frac{z - (y_i / \varepsilon_i)}{z} \right)^{\theta} \tag{11}$$

where q is the number of poor households (having consumption no greater than or equal to z), and $\theta \geq 0$ is a measure of poverty aversion. The parameter θ indicates the importance given to the poorest of the poor: the larger θ is, the greater the emphasis given to the poorest households. As the value of θ becomes very large, P_θ approaches a "Rawlsian" measure giving weight only to the poorest among the poor.

Note that the familiar head-count poverty index (H), defined as the proportionate number of the poor, is subsumed in (11), i.e., for $\theta = 0$. Also subsumed in (11), for $\theta = 1$, is the poverty gap index (PG), defined as the arithmetic mean of the income shortfall (expressed in proportion to the poverty line) over all households. As is well known, the drawback of H and PG is they are not sensitive to distribution of living standards among the poor. If income shortfalls are the weights themselves, the resulting FGT measure is distributionally sensitive. For example, for $\theta = 2$, the resulting measure P_2 in (11) is simply the mean of the squared income shortfalls.

The Data

This study used the Philippine Family Income and Expenditure Survey (FIES) conducted in 1985. For equivalence scale estimation, we excluded from the sample single-adult households, couples with children whose ages exceed 15 years, retired couples, and extended families (couples living with parents and/or adult in-laws). The consumption pattern of these households is found consistently different from the rest of the sample. Our sample consists of 5,661 households.

Table 1 gives the definitions and means of the variables used in the regression analysis.

Table 1
DEFINITION OF VARIABLES

Variable	Definition Name	Mean Rural	Mean Urban
Wf	Share of food in total HH expenditure	0.56	0.46
LnX	Logarithm of total HH expenditure	9.49	10.03
LILCHILD	Number of children aged below 7 years old	1.47	1.35
BIGCHILD	Number of children aged 7-14 years old	1.15	1.16
ALLCHILD	Total number of children aged below 15 years old	2.62	2.51
AGE	Age of HH head	44.17	44.91
SQAGE	Square of the age of the HH head	2127.62	2187.02
EDUC1	1 if HH head attended or completed elementary, 0 otherwise	0.48	0.30
EDUC2	1 if HH head attended or completed high school, 0 otherwise	0.20	0.33
EDUC3	1 if HH head attended college, 0 otherwise	0.04	0.13
EDUC4	1 if HH head completed college, 0 otherwise	0.03	0.14
OCC1	1 if the occupation of the HH head is service- or production-related, 0 otherwise	0.12	0.29
OCC2	1 if the occupation of the HH head is transport- or communication-related, 0 otherwise	0.04	0.10
OCC3	1 if the occupation of the HH head is in clerical or sales work,0 otherwise	0.04	0.15
OCC4	1 if the occupation of the HH head is professional or manegerial, 0 otherwise	0.02	0.08
OCC5	1 if the occupation of the HH head is agriculture-related or farming, 0 otherwise	0.64	0.18
HHMWE	1 if the HH head is male and wife is employed, 0 otherwise	0.29	0.35
HHMWNE	1 if the HH head is male and wife is not employed, 0 otherwise	0.69	0.57
REGION1	1 if region is Region 1, 0 otherwise	0.09	0.05
REGION2	1 if region is Region 2, 0 otherwise	0.07	0.03
REGION3	1 if region is Region 3, 0 otherwise	0.09	0.10
REGION4	1 if region is Region 4, 0 otherwise	0.13	0.16
REGION5	1 if region is Region 5, 0 otherwise	0.09	0.04
REGION6	1 if region is Region 6, 0 otherwise	0.10	0.07
REGION7	1 if region is Region 7, 0 otherwise	0.08	0.06
REGION8	1 if region is Region 8, 0 otherwise	0.07	0.04
REGION9	1 if region is Region 9, 0 otherwise	0.07	0.03
REGION10	1 if region is Region 10, 0 otherwise	0.06	0.05
REGION11	1 if region is Region 11, 0 otherwise	0.08	0.08
REGION12	1 if region is Region 12, 0 otherwise	0.07	0.04

Note: HH = household

Table 2
PARAMETER ESTIMATES
OF ENGEL FOOD SHARE EQUATIONS

	Rural			Urban		
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	1.709 (56.63)	1.706 (56.86)	1.599 (40.83)	1.740 (61.62)	1.742 (62.15)	1.643 (42.85)
LnX	-0.127 (-39.22)	-0.127 (-39.31)	-0.120 (-35.19)	-0.133 (-47.27)	-0.134 (-47.60)	-0.129 (-43.05)
LILCHILD	0.021 (14.44)			0.023 (13.31)		
BIGCHILD	0.023 (15.87)			0.021 (13.40)		
ALLCHILD		0.022 (21.77)	0.022 (21.63) + other variables		0.022 (18.48)	0.021 (17.70) + other variables
Adjusted R-square	0.332	0.332	0.355	0.517	0.517	0.538
F Value	559.300	838.700	72.500	815.700	1223.600	99.700

Note: Figures in parentheses are t-ratios.

EMPIRICAL RESULTS

Table 2 summarizes the parameter estimates of the Engel food share equations for urban and rural households. Table 3 presents the Engel share equations for adult goods. F tests indicate regressions for urban households must be estimated separately from those for rural households. All estimated equations also fail the White's χ^2-test for presence of heteroscedasticity. Thus, although the parameter estimates are both unbiased and consistent, they are not efficient and the t-ratios are probably biased. Estimated equations shown in Tables 2 and 3 have been corrected for heteroscedasticity, using the procedure by White (1980).

Coefficients of the demographic composition variables are positive and significant indicating that, as expected, presence of children increases

Table 3
PARAMETER ESTIMATES
OF ENGEL SHARE EQUATIONS FOR ADULT GOODS

	Rural			Urban		
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	0.674 (13.40)	0.079 (13.58)	0.981 (15.02)	0.941 (16.69)	0.953 (17.02)	1.026 (13.39)
LnX	-0.057 (-10.59)	-0.058 (-10.73)	-0.078 (-13.71)	-0.079 (-14.03)	-0.080 (-14.28)	-0.100 (-16.66)
LILCHILD	-0.005 (-2.05)		-0.004 (-1.66)	0.002 (0.61)		0.003 (0.92)
BIGCHILD	-0.008 (-3.56)		-0.006 (-2.81)	-0.006 (-1.98)		-0.005 (-1.57)
ALLCHILD		-0.007 (-4.03)			-0.002 (-1.03)	
			+ other variables			+ other variables
Adjusted R-square	0.047	0.047	0.079	0.085	0.084	0.125
F value	56.700	83.600	12.000	71.400	105.300	13.000

Note: Figures in parentheses are t-ratios.

food share (Table 2). We perform an F test to find out whether coefficients of LILCHILD and BIGCHILD are statistically different from each other. At 5 percent level of significance, the test indicates these coefficients are statistic-ally equal for food share equations, but not equal for adult-good share equations. In equations 2 and 5 of Table 2, we have combined all children into one variable denoted ALLCHILD. This variable, with the logarithm of expenditure, explains 33 percent of the variation in food shares for rural households and 52 percent for urban households. Equations (3) and (6) introduce a vector of other relevant covariates aiming to control for other household attributes affecting consumption patterns, but these variables increase only minimally the explained proportion of the dependent variable's variation. This result is consistent with the frequently noted case that outlay and household size typically provide the bulk of the explained variation in food shares (Deaton *et al.* 1989).

Based on Table 2, cost of a child to a rural childless couple is 20.1 percent. For the urban childless couple, it is 17.7 percent. These estimates are slightly lower than those typically reported for developed countries (Buhmann *et al.* 1988), although somewhat comparable with those reported for some developing countries (Deaton *et al.* 1989). Estimates of cost of a child based on the Rothbarth model are, as expected, less than those based on the Engel procedure. As noted above, the Engel model tends to overstate cost of a child and, hence, the equivalence scale, while the Rothbarth procedure probably understates them. The true cost, as shown by Deaton and Muellbauer (1986), is probably somewhere between the two estimates. Based on Table 3, cost of a child to a rural childless couple is about 8 percent, while for an urban childless couple it is 5 percent. These estimates are extraordinarily low, possibly due to unresponsiveness of some commodities classified as adult goods to changes in income or total expenditure (particularly, alcohol and tobacco).

To illustrate the difference poverty equivalence scales make on aggregate poverty estimates in poor countries, we use equivalence scales implied in food share equations (3) and (6) of Table 2. The chosen alternative poverty lines are 50 percent (lower limit) and 75 percent (upper limit) of the mean adult-equivalent expenditure. Results are shown in Table 4. For comparison, we also estimate aggregate poverty indices based on per capita expenditure and on total household expenditure. The poverty line for the per capita measure is simply a given percentage of the mean per capita household expenditure. On the other hand, the poverty line for the total measure is a given percentage of the mean household expenditure. The aggregate poverty indices for these two measures are shown in Table 4.

Poverty estimates based on total household measures are substantially higher than those based on adult equivalent measures. The overestimation is more serious for poverty indices that take into account the poor's welfare deficits. Using the upper limit poverty line, the total household measure overstates head-count poverty by 15 percent, the poverty gap by 34 percent, and the distributionally sensitive FGT (α=2) poverty index by 56 percent. Use of per capita measures reduces the error on estimates of aggregate poverty, although the error is still relatively large for indices taking into account the poor's poverty deficits. While magnitude of aggregate poverty estimates is sensitive to assumed poverty line, direction of the error is robust with respect to this line.

Table 4
AGGREGATE POVERTY MEASURES[a]
(In percent)

	Poverty Line: 0.50 of Mean Expenditure	Poverty Line: 0.75 of Mean Expenditure
A. *Adult-Equivalent Basis*		
Head-count	21.79	48.03
Poverty gap	5.52	15.28
FGT (a=2)	1.76	6.52
B. *Per-Capita Basis*		
Head-count	24.79	50.03
Poverty gap	6.90	17.28
FGT (a=2)	2.76	7.52
C. *Household Basis*		
Head-count	29.66	55.46
Poverty gap	9.06	20.40
FGT (a=2)	4.03	10.17

[a] Weighted average of rural and urban households.

CONCLUSION

Principally due to dearth of appropriate data, researchers use total household expenditures (or incomes) in assessing aggregate poverty in poor countries. No adjustment is made for differences in household size and composition as well as in scale economies in producing and consuming household goods and services. We have shown this practice tends to exaggerate aggregate poverty in these countries. Normalizing household aggregates by the number of persons in the household reduces—but does not eliminate—the error. However, even in absence of reliable equivalence scales, much improvement in aggregate poverty estimates in poor countries can be obtained if adjustments are made for household size.

These results are quite limited. It would be useful to extend the analysis, e.g., using other classes of aggregate poverty indices (e.g., the familiar Sen index) as well as income distribution indices. An examination of the robustness of equivalence scale estimates in relation to estimating functional forms, choice of reference household, and household survey data may likely yield additional insights for applied welfare analysis.

Appendix Table 1
PARAMETER ESTIMATES
OF ENGEL SHARE EQUATIONS

	Food				Adult Good			
	Rural		Urban		Rural		Urban	
	Coefficient	t-ratio	Coefficient	t-ratio	Coefficient	t-ratios	Coefficient	t-ratios
Constant	1.599	40.83	1.643	42.85	0.981	15.02	1.026	13.39
LnX	-0.120	-35.19	-0.129	-43.05	-0.078	-13.71	-0.100	-16.66
LILCHILD					-0.004	-1.66	0.003	0.92
BIGCHILD					-0.006	-2.81	-0.005	-1.57
ALLCHILD	0.022	21.63	0.021	17.70				
AGE	0.001	1.51	0.001	0.48	-0.003	-2.08	0.006	3.00
SQAGE	-0.000	-1.65	-0.000	-0.18	0.000	2.50	-0.000	-2.51
EDUC1	-0.004	-0.96	0.009	1.24	0.006	0.82	-0.022	-1.47
EDUC2	-0.004	-0.67	0.007	0.98	0.016	1.71	-0.010	-0.69
EDUC3	-0.008	-0.86	-0.001	-0.14	0.017	1.03	0.004	0.25
EDUC4	0.005	0.44	0.008	0.82	0.024	1.23	0.034	1.82
OCC1	-0.009	-0.96	-0.001	-0.10	-0.002	-0.13	0.021	1.60
OCC2	-0.008	-0.71	0.001	0.10	-0.028	-1.42	0.037	2.19
OCC3	-0.009	-0.73	0.009	1.25	0.012	0.61	0.010	0.65
OCC4	-0.027	-1.70	-0.001	-0.08	-0.010	-0.36	0.042	2.15
OCC5	0.000	0.03	0.020	2.67	-0.021	-1.49	0.036	2.34
HHMWE	0.002	0.15	0.009	1.15	-0.033	-1.68	-0.006	-0.37
HHMWNE	0.012	1.05	0.004	0.47	-0.037	-1.87	-0.021	-1.31

Appendix Table 1 *(continued)*

	Food				Adult Good			
	Rural		Urban		Rural		Urban	
	Coefficient	t-ratio	Coefficient	t-ratio	Coefficient	t-ratios	Coefficient	t-ratios
REGION1	0.012	1.11	0.032	3.07	-0.028	-1.52	-0.013	-0.63
REGION2	0.009	1.06	0.023	2.01	-0.021	-1.57	-0.067	-2.85
REGION3	0.014	1.90	0.061	8.42	0.053	4.15	0.028	1.94
REGION4			0.017	2.72			-0.025	-1.97
REGION5	0.003	0.35	0.010	0.97	-0.034	-2.72	-0.050	-2.35
REGION6	-0.000	-0.04	0.020	2.38	-0.016	-1.29	-0.037	-2.18
REGION7	0.036	4.43	0.014	1.45	-0.075	-5.63	-0.091	-4.87
REGION8	0.069	8.54	0.043	3.81	-0.056	-4.15	-0.120	-5.26
REGION9	0.023	2.95	0.037	2.97	-0.034	-2.57	-0.091	-3.6
REGION10	0.039	4.63	0.045	4.49	-0.039	-2.81	-0.084	-4.21
REGION11	0.031	4.00	0.030	3.90	0.002	0.12	-0.047	-3.04
REGION12	0.020	2.54	0.033	3.02	-0.002	-0.17	-0.042	-1.95
Adjusted R-square	0.355		0.538		0.079		0.125	
F Value	72.500		99.700		12.100		13.000	

REFERENCES

Atkinson, Anthony B. "On the Measurement of Poverty." *Econometrica* 55 (1987): 749-764.

Blundell, Richard and Lewbel, Arthur. "The Information Content of Equivalence Scales." *Journal of Econometrics* 50 (1991): 49-68.

Buhmann, Brigitte; Rainwater, Lee; Schmaus, Guenter; and Smeeding, Timothy M. "Equivalence Scales, Well-being, Inequality, and Poverty: Sensitivity Estimates Across Ten Countries Using the Luxembourg Income Study (LIS) Database." *Review of Income and Wealth* 34 (1988): 115-142.

Callan, Tim and Nolan, Brian. "Concepts of Poverty and the Poverty Line." *Journal of Economic Surveys* 5 (1991): 243-261.

Deaton, Angus S; Ruiz-Castillo, Javier; and Thomas, Duncan. "The Influence of Household Composition on Household Expenditure Patterns: Theory and Spanish Evidence." *Journal of Political Economy* 97 (1989): 179-200.

Deaton, Angus and Muellbauer, John. *Economics and Consumer Behavior.* Cambridge: Cambridge University Press, 1980.

___________________. "On Measuring Child Costs: With Applications to Poor Countries." *Journal of Political Economy* 94 (1986): 720-743.

Fields, Gary S. "Poverty, Inequality, and Economic Growth." Mimeo. Cornell University, Ithaca, 1989.

Fisher, Franklin M. "Household Equivalence Scales and Interpersonal Comparisons." *Review of Economic Studies* 54 (1987): 519-524.

Foster, James; Greer, Joel; and Thorbecke, Erik. "A Class of Decomposable Poverty Measures." *Econometrica* 52 (1984): 761-766.

Gronau, Reuben. "Consumption Technology and the Intrafamily Distribution of Resources: Adult Equivalence Scales Reexamined." *Journal of Political Economy* 96 (1988): 1183-1205.

Kuznets, Simon. *Growth, Population, and Income Distribution: Selected Essays.* New York: Norton, 1979.

Lewbel, Arthur. "Cost of Characteristics Indices and Household Equivalence Scales." *European Economic Review* 35 (1991): 1277-1293.

Lipton, Michael. "Labor and Poverty." World Bank Working Paper No. 616. Washington D.C.: World Bank, 1983.

Pashardes, Panos. "Contemporaneous and Intertemporal Child Costs: Equivalent Expenditure vs. Equivalent Income Scales." *Journal of Public Economics* 45 (1991): 191-213.

Pollak, Robert A. and Wales, Terence J. "Welfare Comparisons and Equivalence Scales" *American Economic Review 69* (1979): 216-221.

Tsakloglou, Panos. "Estimation and Comparison of Two Simple Models of Equivalence Scales for the Cost of Children." *Economic Journal* 101 (1991): 343-357.

White, H. "A Heteroscedasticity-Consistent Covariance Matrix Estimator and a Direct Test for Heteroscedasticity." *Econometrica* 48 (1980): 817-838.

World Bank. *World Development Report 1990.* Oxford: Oxford University Press, for the World Bank, 1990.