Household income versus household expenditure: an illustration of the superiority of household expenditure as an estimator of living standards

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Abstract

Using aggregated data on household expenditure and household income from 350 households, regression results from an Engel curve are used to test whether expenditure data can indeed stand as a meaningful proxy for household income. An Engel curve is adopted and an OLS procedure executed to perform this test. Household income and expenditure data are used to test for the appropriateness of income data vis-à-vis expenditure data in estimating and explaining household consumption expenditure behaviour than income data itself when used in Engel curve analysis. Results reveal that estimated household expenditure is larger than estimated income and has less variation around its mean. This is prompted by findings from household level surveys conducted in developing countries, which almost unanimously champion for the use of expenditure as an income proxy in explaining household consumption behaviour. The expenditure data gives a better fit to the Engel relationship judging from the calculated F and coefficient of determination after performing a regression of food expenditure against a set of regressors.

Introduction

There is an almost complete agreement among economists that in the measurement of living standards, particularly in developing country household surveys, estimated household expenditure is a better estimator of living standards than estimated income. The rationale for this grounded on both theoretical and practical points of view. Theoretically, expenditure is a better measure of permanent income in the presence of properly functioning capital markets (Narayan and Pritchett, 1996). Empirically, it is difficult to assign, besides being subject to large seasonal swings (Ainsworth and van der Gaag, 1988; Hentschel and Lanjouw, 1996, Deaton, 1997). Consumption expenditures are often easier to estimate since households probably purchase and consumes a narrow range of goods and services (Henchel and Lanjouw, 1996) and are likely to understate their incomes than overstate their expenditures (Johnson, McKay and Round, 199?, Deaton, 1997). However these are observations that need to be demonstrated to be applicable in the Kenyan context as it appears that expenditure is officially the estimator of choice for academicians, researchers and other interested practitioners. For instance, the last welfare monitoring survey conducted in 1997 by the Central Bureau of Statistics and previous surveys before have used expenditure ostensibly as proxy for income.

Materials and Methods

A statistical test to test the hypothesis that estimated household income does not differ substantially from estimated expenditure was set up from data gathered from 350 households drawn from 4 districts adjacent to the Lake Victoria shores. The households comprising the sample were randomly picked for the purpose of estimating welfare changes occasioned by water hyacinth presence in Lake Victoria. The households were thus divided into two groups, one group of 143 households comprising of those resident close to shores infested by the hyacinth while the other 207 households living close to water hyacinth clear shores. Total household income was estimated from recall over a 12 months were divided into different month period. To prompt recall, questions about income earned over the past 12 months were divided into different income sources ranging from income from agricultural activities, fishing and rental income among others. For activities from which households derive incomes as well as direct consumables such as fishing and agriculture, the portion that was consumed was also considered as income. The residual of household remittances was also added to the household stated income, and the resulting figure taken to be

the amount of income that the particular household had at its disposal over the period. Data relating to household relating to a similar period was collected for respective households. However, household food expenditure including the value for own produced and consumed food was estimated from one week recall period since experimental research conducted in Ghana revealed that reported expenditure fell by 2.9 percent for every day added to the recall period (Scott and Amenuvegbe 1990). Expenditure on other expenditure categories among them, clothing, education, health and energy were estimated over a comparable 12-month period. Weekly food expenditure on the listed food items were then summed and multiplied by 52 to get an annualised total, which was added to the annual total of all other expenditure items. The breakdown of expenditure into a quantity and price component though desired was untenable. Besides, during the study period, prices were assumed constant as is the standard convention with family budget studies.

Results and Discussion

Results were presented on table 1 below shows that estimated household income is less than estimated expenditure and has a higher coefficient of variation. Besides, the mean difference between these two estimates is significantly different from zero meaning there is a saphere! A significant underestimation of income by close to Ksh 18,600 per household per ear. This figure may not indicate the level of savings (or dissavings when negative), as would be the case in this study since savings are negative. Deaton (1997) states that there is a tendency for households to knowingly or unknowingly understate incomes and this is the view adopted to explain the significant difference between reported household expenditure and income. Since household expenditure appears closer to the true value of household permanent income and that the variation around its mean is less than that of an estimated income measure, it therefore aids in better or more accurate estimation of household welfare. In this example, reported income has been underestimated by as much as 20% meaning that in practice, one fifth of incomes may be unobserved if income is chosen as the measure of living standards in place of expenditures. The coefficients of skewness and their associated standard errors lead to the rejection of the hypothesis that income and expenditure are normally distributed. The positive coefficients of kurtosis also lead to the rejection of the hypothesis that the tails of the distribution are not longer than those of a normal distribution.

Table 1: Characteristics of income and expenditure for sample households

Statistic	Expenditure	Income	Residual
Mean	92,879.4	74,224.3	-18,655.1
Standard deviation	77,249.1	66,452.9	72,076.9
Standard error of mean	4,298.3	3,697.5	4,010.5
Coefficient of variation	0.832	0.895	-3.86
Coefficient of kurtosis (s.e.)	4.32 (0.265)	6.543 (0.268)	
Coefficient of skewness (s.e.)	1.988 (0.134)	1.995 (0.134)	

Notes: (s.e) standard error of statistic; Reject normality if ratio of coefficient of kurtosis (skewness) to their respective standard errors is less than –2 or greater than +2.
Source: Authors calculation based on Household Welfare and Water Hyacinth Survey, 2001

Both income and expenditure are significantly positively skewed; exhibiting a long right tailed (nonsymmetrical distribution) frequency distribution. This means that a large proportion of income and a similar proportion of expenditure are controlled by a smaller proportion of households. Figure 1 below, showing separate Lorenz curves, gives a graphical representation of how expenditure and income are distributed among the sample households and this provides a clear pointer to the level or extent of inequality. Gini coefficients of 0.48 in the case of income and 0.41 in the case of expenditure are computed from the data. This result gives one a rough impression of the unequal distribution that characterizes most developing countries, especially in the rural areas. In this figure, it is possible to see that the lowest 20% of households control just about 5% of expenditure while the top 20% control over 40% of expenditures. The same is true for the case of incomes. The poorest half of the households control just slightly less than 20% of income. This shows us why expenditure is not normally distributed but is mostly unevenly distributed with most

households in the lower spectrum of the income/expenditure distribution. (These results are consistent with the finding that most Kenyans especially in rural dwelling households are basically poor. To see this clearly, all households that are considered poor (i.e. those reporting per adult equivalent monthly expenditures less than Ksh 1,452) who make up 52% of the sample control 33% of reported expenditure and 45% of reported incomes in this sample[5].

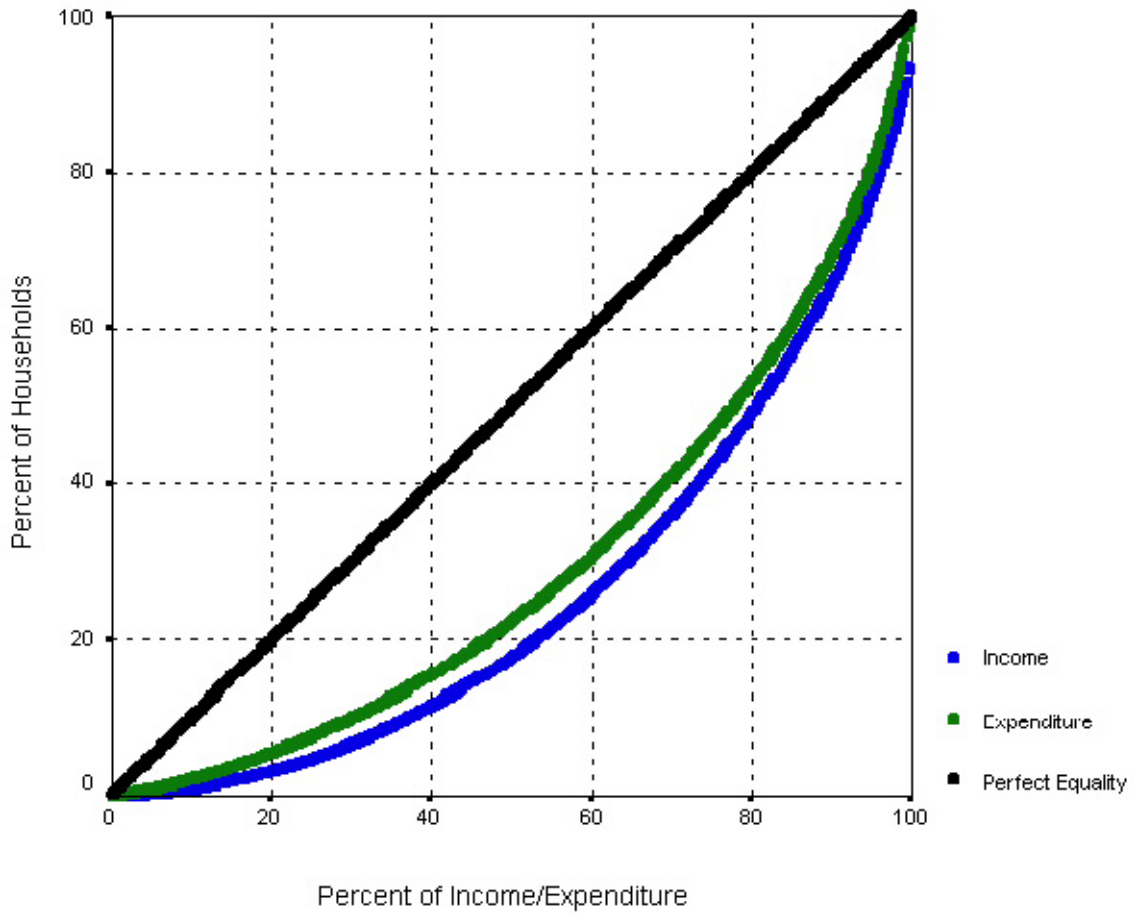

Figure 1: Lorenz curve showing the extent of inequality, Lake Victoria Gulf, Kenya

Ernst Engel came up with the thesis that as income increases *Cateris paribus*, the proportion spent on food decreases. The hypothesis that the living standard can be measured by the food share is based on the analysis of Belgian budgets of working class families collected in 1853 from which Engel found that needs are hierarchically organized with food as the basic need. Based on a conception of the living standard as the level of needs which a family is able to satisfy, and his findings that the budget share of the primary need decreased with total expenditure, he concluded that the food share summarizes in a single quantity the degree to which an individual or a family can satisfy its needs (Folkertsma, 1996). In more technical terms, the law states that the share of food in total expenditure is a decreasing function of the level of prosperity of the household and the law appears to hold almost universally (Madalla and Miller, 1989; Mukras, 1993,Deaton 1997). A generalization of Engel's law states that with increasing prosperity, the budget share of any good initially increases with income and its budget share corresponds with its 'luxury' status. A 'necessity' has a decreasing budget share and its budget or income elasticity is less than one (Lipsey and Christal, 1995). As opposed to household per capita expenditure, the food share may be more encompassing especially when different food items make up the consumption basket of

different households. There is evidence that the income elasticity of food like the budget share is inversely related to income, with an elasticity, which may be as high as 0.8 or 0.9 at very low income levels and close to zero for high incomes (Houthakker, 1987). With this in mind therefore, it is expected that with increasing prosperity, increments in income/expenditure are devoted to non food purchases. However, since this paper is limited to the task of evaluating income and expenditure as regressors in regression analysis featuring Engel curves, the complications of elasticity computation need not be pursued further. If not just by passing, the discussion of the relationship between regressand and other regressors attempted. Our interest is primarily in showing if expenditure data can and should be used in household level studies where household living standards are to be investigated. Data is fitted to an Engel curve of the form:

$$x_f = \alpha + \beta_1 D_1 + \beta_2 D_2 + \beta_3 D_3 + \beta_4 \ln N \ + \beta_5 \ln N_{1-4} + \beta_6 x_{of} + \beta_7 x_t \mid (\mathrm{x_i}) + \varepsilon$$

Where;
is a constant
~ $_{1\text{-}6}$ are coefficients to be estimated
X_f = expenditure on food (Ksh per adult equivalent/month)
X_t = total expenditure (Ksh per adult equivalent/month)
N = household size (persons)
D_1 = water hyacinth present =1, else=0
D_2 = male headed household =1, else=0
D_3 = household defined as poor =1, else=0
X_{of} = own produced food as a percentage of total food consumption (percent)
= stochastic disturbance term

The appropriateness of income in explaining household food consumption behaviour is compared to that of expenditure simply by measure of household welfare i.e. income and expenditure become regressors in separate regressions. In essence, three separate regressions are performed, one restricted and two augmented regressions. The first step involved regressing food expenditures on a restricted model, restricted in the sense that neither income nor expenditure appear as regressors. Two augmented models were then run and observations made on the improvement of the R^2 as well as the computed F statistic. The appropriateness of each of these alternative candidates in Engel curve analysis was then evaluated by examining the extent of improvement on the computed F as well as the coefficient of determination. These results are shown on table 2 below and they indicate that though statistically significant, income does not show a better fit than its proxy, expenditure judging from the computed R^2 and F coefficients. The calculated F and the coefficient of determination all improve on the inclusion of expenditure while in the case of income, the calculated F falls from 63.46 to 57 although the R^2 improves as well. The R^2 improves best in the case of the regression involving expenditure, which is indicative of the superiority of an expenditure measure over an income measure of household consumption potential. This further strengthens the case for the use of expenditure data in place of household income data during household budget analysis. The use of income in this example in the Engel curve would serve to depress the changes occurring in the dependent variable (food expenditure) following a change in the independent variable. For instance, using coefficients from the first augmented model featuring income, following a 10% increase in income, all other factors remaining the same, food expenditure is estimated to increase by merely 0.9% *Ceteris paribus* at mean values for poor households and 0.5% for the non poor. In the second augmented model featuring expenditure, increases of 10% in total expenditure are accompanied by 5% increase in food expenditure in poor households and 4% in non-poor households. The latter figures appear more realistic given the results of past work featuring Engel curves in the country.

The estimated income and expenditure elasticities for these models are 0.07 and 0.36 respectively for poor households and 0.03 and 0.29 for non-poor households respectively. Since these are poor rural households, (recall, Nyanza and Western provinces are also among the most

impoverished regions in the country according to the last welfare monitoring survey) a food elasticity that is close to zero such as 0.07 is not only misleading, but also seemingly unrealistic given the welfare levels that this data relates to. Although the model featuring expenditure involves an intercept, which is less than zero, when applied to the data, the coefficients yield non-negative expenditures. The presence of the less than zero constant may be the biggest handicap for the model but again, one of the least expenditure figure in the data which is Ksh 236.9 evaluates to greater than zero food expenditures for poor households which the regression coefficients show spend less on food in absolute terms than non poor households. However, neither of the Engel curves can guarantee non-negative consumption and allow for prosperity cycles. In addition to those featured here, no Engel curve with these two qualities of non-negativity and flexibility to cycles is available as vet.

It is now evident that from the above analysis, measured expenditure has less variation than income. One thing that is certain is that for both expenditure and income, most households are clustered among lower income/expenditure levels. Expenditure may be less subject to measurement error than income, which may tend to be under reported by respondents. In explaining household consumption patterns, expenditure is a superior measure than income as a regressor in Engel curve analysis. These findings suggest that expenditure should receive more emphasis during the measurement of household living standards, especially in explaining consumption behaviour. Since non of the two augmented models can guarantee non negativity, the expenditure version should be the variable of choice for practitioners.

Table 2: Estimated coefficients for the base and augmented models

	Parameter estimates		
	Restricted model	**Augmented models**	
Constant	2,617.99(17.56)	1,911.42(3.543)	7,054.26(-11.446)
Gender	103.94(1.122)	72.698(0.778)	53.988(0.768)
Poverty	-1,083.7(-13.149)	1,021.02(-11.659)	213.01(2.079)
Share of children below 4 years	276.404(0.921)	258.995(0.867)	362.464(1.593)
Household size	-289.514(-3.985)	-263.821(-3.595)	-172.52(-3.105)
Subsistence orientation	-8.386(-5.117)	-7.868(-4.767)	-8.724(-7.021)
Water hyacinth	-102.47(-1.205)	-79.437(-0.93)	-60.18(-0.933)
Log income	——	89.029(2.046)	—
Log expenditure	——	——	1,216.755(15.964)
Adjusted R^2	0.445	0.45	0.681
F	47.652	41.822	107.48
N	350	350	350

Figures in brackets are t statistics of parameter extimates

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[5] All household members aged 4 years and less are equivalent to 0.24 adults; those aged between 5 and 14 years are equivalent to 0.65 adults while all those above this age are considered adults with an equivalent ratio of 1.