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Welfare Analysis Using Data from the International Comparison Program for Africa

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Abstract

***This paper uses data from the International Comparison Program 2005 to recover income and price elasticity estimates for the African continent using the Extended Linear Expenditure System for 13 broadly defined commodities. The results can be used for aggregate welfare comparison in such global models as GTAP (Global Trade Analysis Project) and exercises to infer welfare impact of relative price shocks at the continental level. In a heuristic way also, it is possible to derive a "utility-consistent" global poverty line from the demand function that could be compared with the popular international poverty lines. Results generally indicate that changes in the price of food items could lead to greater welfare loss compared to changes in the price of energy or other commodities. Income elasticity estimates generally fell within bounds usually found from household surveys. At the continental level, the estimated utility-consistent subsistence expenditure is close to 1.12 dollar a day per person, which is quite close to the 1.08 dollar a day global (international) poverty line used in 2005 to measure absolute poverty*.**

Key words: concentration curves extended linear expenditure systems, International Country Comparison Program.

JEL classifications: D12

1. Introduction

The International Comparison Program (ICP) was introduced in 1968 by the UN Statistical Commission, and housed initially at the University of Pennsylvania, to establish a system of international comparison of national account aggregates free from differences in price levels across countries[1]. The Data collection started in 1970 with 10 countries and this increased to 197 countries in 2005. The number of African countries covered in this survey during this period increased from 1 to 48. Since 1985, the ICP has been managed by the ICP Global Office and is housed at the World Bank[2].

The Purchasing Power Parity (PPP), the key output of the ICP is the most frequently used converter of national income statistics into an internationally comparable units for decades. Most importantly, global poverty measures are based on mean household per capita income or consumption obtained from national surveys expressed in national currencies and then converted into PPPs. The ICP 2005 was conceived mainly to collect price data on more than 1000 commodities across more than 100 countries to provide a basis for international comparison of purchasing power so that global, regional and sub-regional poverty aggregates are measured consistently. The World Bank periodically updated poverty estimates for the developing world by combining basic data from household surveys with PPP[3] that are the basis of regional poverty figures reported globally (Chen and Ravallion,2008, 2007, 2004) .

In a similar vein, empirical work on economic growth routinely uses incomes expressed in PPPs to undertake cross-country comparisons such as the popular Summers-Heston data set (or Penn-Tables as they are popularly called) which in principle provide summary aggregates of national accounts free of differences in price levels across countries.[4]

In this paper, we extend the application of ICP data to global welfare analysis of a "representative household" in the Africa region by looking at changes in demand for broad categories of consumption items in response to changes in prices and income. This is allowed by the fact that the ICP2005 data reports consumption expenditure for 13 broad commodity groupings along with their relative prices for 48 countries covered in the study. Certainly, these expenditure items are in principle comparable and aggregation is allowed by definition keeping in mind the basic assumption used in the collection of the price and expenditure data. Thus, a

[1] Ahmad (2006)
[2] Details on ICP are found at http://web.worldbank.org/WBSITE/EXTERNAL/DATASTATISTICS/ICPEXT/0,,contentMDK:22412218~pagePK:60002244~piPK:62002388~theSitePK:270065,00.html

[3] See http://iresearch.worldbank.org/PovcalNet/povcalSvy.html
[4] See for instance Heston and Summers (1996) and Summers et al (1991, 1988) for detailed discussion of the Summer-Heston data sets. Useful critiques of this data are also found in Knowles (2001), Dowrick (2005) and Dowrick and Quiggin (1997)

comparison of welfare changes following price or income movements can be inferred by looking at the concentration curve for different commodity groupings taking note of the fact that our observational units are countries, not individuals, which limits the conventional interpretations. One possible way of looking at the country level information is to think of policy dialogues focused on regional issues, such as debt relief, development aid, trade liberalization and other issues such as MDGs that require the level of aggregation implied by our data.

Our computations indicate that price shocks that affect for instance food items may have the largest welfare loss at the continental level than say shocks that lead to proportional decline in per capita incomes or increase in transport cost for example through a rise in energy prices. Similar analogy can also be made about the welfare impact of global transfers allowed by proportional price declines through trade liberalization or subsidies (like food aid) or any other mechanism. Similarly, transfers that favor household expenditure on accessing education are superior to any other means of transfer in terms of improving global welfare since nearly households in all countries spent proportionately the same amount on education than on any other commodity. As a natural extension of the analysis based on concentration curves, we specified and estimated the Extended Linear Expenditure System (ELES) using personal savings to identify all the parameters necessary to estimate own and cross price elasticities as well as income elasticities (Lluch, 1975, Howe, 1975), the result of which can be valuable input to global model analysis such as GTAP which uses ELES to model household behavior. Our results from the ELES generally are intuitive and also support the inference we obtained from the concentration curves. Our estimates of income elasticities for such broad consumption categories as food (0.56), water (0.9), clothing (0.69), health (0.74) and education (0.24) suggest these are necessities while for the rest such as alcohol (1.0), recreation (1.3), transport (1.4) and communications (2.2) are luxuries. These elasticity estimates are strikingly similar with those often obtained from large household surveys for individual countries. Since the ELES allows for the estimation of subsistence consumption expenditure, it is interesting to examine whether the "utility-consistent" measures of a poverty line is aligned with the popular one dollar a day international poverty line. We were able to estimate a 1.12 dollar a day subsistence consumption which is very close to the conventional poverty line of 1.08 dollars a day used in 2005. In addition, the marginal utility of income, sometimes known as the inverse Frisch parameter, which measures "level of development", suggest a relatively higher ratio of subsistence component of consumption in total expenditure indicating low level of development of the region.

The rest of the paper is organized as follows. Section 2 outlines the methodology we used to recover price and income responses. Section 3 describes the data and Section 4 provides the results with some discussion. Section 5 concludes the paper.

2. Analytical framework

2.1 Concentration curves

Concentration curves are generalized forms of the popular summary measure known as the Lorenz curve. In many planning exercises, and issues of economic growth, the distribution of expenditure on various goods across a spectrum of household characteristics renders valuable insights to policy options[5]. The concept of concentration curves were early illustrated and rigorously discussed by Roy, et al (1959); and later Kakwani (1980) provided proof of some of the empirical properties, and Yithaki and Slemrod (1991) used them to analyze issues of marginal tax reform in a revenue-neutral setting.

As defined by Yitzhaki and Slemrod (1991: 481), "the concentration curve is a diagram similar to the Lorenz curve. On the horizontal axis, the households are ordered according to their income, while the vertical axis describes the cumulative percentage of the total expenditure on specific commodity that is spent by the families whose incomes are less than or equal to specified income level". This definition of a concentration curve embodies the income effects; and Rao et al (1959) introduced relative concentration curves to normalize the effects of differences in purchasing power so that the effect of differences in preferences for various commodities can be neatly captured. Kakwani (1980)[6] proved important theorems pertaining to concentration curves of which the following may be reproduced for the purpose of this paper:

i. If the income elasticity of commodity i, E_i is greater than the income elasticity of commodity j, then, the concentration curve for i lies above the concentration curve for j;

ii. The concentration curve for commodity i will be above (below) the egalitarian line if, and only if E_i is less (or greater) than zero for all income level greater than zero.

iii. The concentration curve for commodity i lies above (below) the Lorenz curve if, and only if , E_i is less (greater) than unity for all income greater than zero.

[5] see also Haggablade and Younger (2003), and Younger et al, (1999) for the application of concentration curves on African data. Early attempt on Ethiopia using the 1980/81 household income and consumption survey was made by Shimeles (1993)

[6] Kakwani (1980), op cit, pp165-166.

It follows therefore, that if the concentration curve of a commodity lies above the egalitarian, it is an inferior commodity, if the concentration curve lies between the Lorenz curve and the egalitarian line, it is a necessary commodity, and if the concentration curve lies below the Lorenz curve, the commodity is luxury.

Yitzhaki and Slemrod (1991) made an insightful use of concentration curves in the realm of public economics to analyze issues of tax reform. It is rather becoming conventional in the literature to look into the structure of indirect tax systems, and the possibility of reform by maximizing social-welfare function of the community subject to a government revenue constraint[7]. This approach presupposes the knowledge of Indirect Utility Function of the community, and thus the respective demand systems in order to be of any empirical use. When one looks at the severe limitations that developing countries face to meet the data requirements of this approach, then, the search for an alternative method remains a very compelling one. In this respect, the Marginal Conditional Stochastic Dominance Rules (MCSD) developed by Yithaki and Smlerod (1991) using the concept underlying concentration curves can be considered as a significant step to that end.

MCSD is defined as a state where " if the (shifted) [due to tax incidence] concentration curve of one commodity is above the (shifted) concentration curve of another commodity, then, the first commodity dominates in the sense that a small tax decrease in the first commodity accompanied by a taxi increase in the second (with revenue remaining unchanged) increases social welfare functions. In other words, if and only if concentration curves do not intersect will all additive social-welfare functions show that the tax change increases welfare. We refer to these rules as Marginal Conditional Stochastic Dominance Rules"[8]. Normally this proposition would have required the plotting of n(n-1)/2 curves, which for a sufficiently large number of commodities becomes cumbersome. The Gini-coefficient has been used to identify a class of easily computable necessary conditions for welfare dominance via the translation into income elasticities. This condition states that the income elasticity of commodity i should be lower than that of commodity j in order for commodity i to dominate commodity j in the event they are subject to an indirect tax.

We may show the above relations explicitly using the concentration ratio or index concept, which is defined as one half of the area below the 45_0 line minus the concentration curve. That is,

[7]see Atkinson (1970) for the specification of a social-welfare function, Ahmad And Stern (1984), King (1983), Cragg (1991) for empirical application and Deaton (1979, 1981) for the implication of additive preferences to optimal commodity taxes.
[8]Yitzhaki and Smelord (1991), op cit, pp 482

$$c_i = \frac{Cov[X_i, F(y)]}{m_i} \qquad (1)$$

Where, c_i is one-half of the concentration ratio, m_i is the mean expenditure on commodity i, X_i is total expenditure on commodity i, and F (y) is the cumulative distribution of income. Therefore, the area between the concentration curve of commodity i, and the concentration curve of commodity j can be written as:

$$c_i - c_j = [\frac{b_i}{S_i} - \frac{b_j}{S_j}]G_y \qquad (2)$$

Where,

$$b_i = \frac{Cov(X_i, F(y)}{Cov[y, F(y)]}$$

$$S_i = \frac{m_i}{m_y}$$

And m_y stands for mean income or expenditure. Here the revenue implication of the policy reform is assumed to be neutral that is there is no gain or loss to the government. We may interpret b_i/S_i as the weighted average income elasticities of commodity i, the weight being here the Gini-coefficient-implied welfare function, and is a nonparametric estimator of the slope of the regression line of S_i on y.[9] Thus for commodity i to dominate commodity j the weighted income elasticity of commodity i should be larger than for commodity j. The weighting scheme employed here is the Gini-index which also implies a specific form of social-welfare function. In fact, we can further broaden the weighting scheme by using the notion of the extended Gini index which

is given by:

$$G(\alpha) = \alpha \frac{Cov[y, 1 - F(y)]^{\alpha - 1}}{m_y}$$

[9]see Yitzhaki and Slemrod (1991), op cit , pp 487.

where, G (α) is a parameter chosen by the investigator. The Gini is a special case of G (α) where, α is 2. The higher is α the greater is the emphasis on the bottom of the income distribution.

2.2. Demand systems and household welfare

A related approach would be to construct a simple demand system for the commodities of interest to recover income and price elasticities that could be used for a wide range of issues that require discussion of household consumption behaviour. In our case, the utility function that gives rise to the Linear Expenditure System (LES) is of particular attraction. First, we work on a highly aggregated data set which has lost substantial information in the process so that nonlinearity in Engel curves or flexibility in price responses cannot be captured easily from the data. Secondly, the linear expenditure system is popular specification in most global macro and CGE models allowing estimated parameters to have some practical relevance. Third, the full parameters of the LES can be recovered from cross-section data if information on personal savings is available. Finally, interesting welfare measures such as marginal utility of income and direct link with Gini coefficient increase the attractiveness of the LES. The utility function underlying the LES is the Stone-Geary utility function which is specified as follows:

$$U = \sum_{i=1}^{n} \beta_i \ln(x_i - \gamma_i) \qquad (3)$$

where the vectors x and $\boldsymbol{\gamma}$ represent respectively, consumption of the i^{th} commodity and a subsistence component. Maximization of (3) with the usual budget constraint yields the popular LES given by equation (4):

$$e_{iht} = p_{it} x_{ith} = p_{it}\gamma_i + \beta_i (y_{ht} - \sum_{k=1} p_k \gamma_k) \qquad (4)$$

Where p_{it} is price of commodity i prevailing at period t, x_{it} is quantity of i demanded by household in country h at period t, y_{ht} is total income of a representative household in country h at period t and γ_i and β_i are parameters to be estimated, representing respectively the "subsistence" consumption of commodity i, and β_i is the marginal budget share. The structure of the LES is motivated by the assumption that regardless of income levels, each household allocates its income first on the purchase of irreducible quantity of each commodity deemed necessary for subsistence and the remaining is driven by consumption preference. Estimation of (4) is complicated by the non-linear term linking marginal budget share with the "supernumerary" income or consumption expenditure so that a numerical approximation is used in the context of non-linear system of equations.

When data is limited only to a cross-section, then, equation (4) remains unidentified as the number of equations are less than the number of parameters to be estimated (2n-1). It is possible to recover all parameters of the LES by using additional information on income, such as savings under a certain assumption. We note also that by construction and properties of demand function,

the marginal budget shares add-up to unity and the sums of the intercepts of the regression for equation (4) should be zero. With these conditions, then, Lluch (1973) proposed the Extended LES (ELES) where personal savings is included in the consumption basket with the subsistence component set to zero. Summing over the n commodities, we get:

$$E_{ht} = (1-\mu)\sum_{i=1}^{n} p_i\gamma_i + \mu y_{ht} \qquad (5)$$

Where E_{ht} is total consumption expenditure (for the h^{th} household or country in this case) and μ is marginal propensity to consume which is derived from estimates of the individual marginal propensity values($=\sum_{i=1}^{n}\beta_i$) which does not add up to unity because of the (n+1) commodity, which in this case is savings. Combining (4) and (5) and the assumption of marginal budget shares adding up to unity, all the parameters of the linear expenditure system are identified (γ_i, β_i and μ).Noting that the subsistence level of expenditure is invariant across households, the basic estimating equation then can be written as follows:

$$e_{ih} = \alpha_i + \beta_i y_h + \varepsilon_h \qquad (6)$$

Where $\alpha_i = p_i\gamma_i - \beta_i\sum p_i\gamma_i$ and ε_h is stochastic error term. Empirical estimation of equation (6) using cross-section data proceeds with the assumption of contemporaneous error components for the systems of linear equation for each commodity giving rise to Seemingly Unrelated Regression Estimator (SURE). All parameters are identified with personal savings allowed into the consumption bundle where by assumption subsistence consumption of saving is set to zero.

The ELES links income elasticity values with price elasticites through the marginal utility of income so that the full Slutzky matrix is recovered from a cross-section data. We use the following relations to do that:

$$\eta_{i} = {}^{\beta_i}/_{v_i} \qquad (7)$$

$$E_{ij} = \varphi_i\eta_i - \eta_i V_i(1+\varphi\eta_i) \text{ if i=j} \qquad (8)$$

$$= -\eta_i v_j(1+\varphi\eta_j) \text{ if i}\neq\text{j}$$

Where η is income elasticity of demand for commodity i, E_{ij} is the cross-price elasticity and φ is the inverse of the Frisch parameter and is given by $= -\dfrac{y-\sum p_i\gamma_i}{y}$. Often the Frisch parameter is interpreted to indicate the level of development as it measures the proportion of

total consumption expenditure devoted for subsistence. The higher is the value of this parameter, the greater the importance of subsistence expenditure, thus the lower the level of development. Thus the ELES can be used also to estimate the "utility consistent" poverty line using the total subsistence expenditure implied by the demand model for each commodity.

Another interesting feature of the LES is that it establishes a direct link between expenditure shares and Gini coefficients (Kakwani, 1980) to quantify the extent to which the rise in price has impacted on the overall Gini coefficient. From this exercise it would be possible to tell whether the inflationary process is against the poor or it is income neutral or in certain cases biased against the well off households.

Despite the well-known limitations, the LES provides a simple framework to capture the welfare implications of changes in relative prices. For instance, it is possible to establish whether inequality of income rises, falls or remains the same due to only changes in relative prices. To do that we use the result in Kakwani (1980) that links Gini coefficient between two price settings on the assumption that real income among households is held constant:

$$G_t = \frac{\prod_{i=1}\left(\frac{p_i^*}{p_i}\right)^{\beta_i} y_0 G_0}{\left(\sum_{i=1} p_i^* \gamma_i + (y_t - \sum_{i=1} p_i \gamma_i)\prod_{i=1}\left(\frac{p_i^*}{p_i}\right)^{\beta_i}\right)} \qquad (9)$$

Where Gt is Gini coefficient at period t with price vector P*, y_t is mean consumption expenditure at period t and y_0 is mean consumption expenditure in period 0. Using estimated coefficients from (7), it is possible to compute the Gini coefficient at the new set of prices and examine whether or not it leads to a worsening state. The LES is less attractive to investigate price responses though.

3. Data and descriptive statistics

The ICP2005 data used in this study covers 47 African countries (see Table 1 for the list) for which detailed price data, household consumption expenditure for broadly defined categories were collected and estimated. Comparison between per capita consumption computed using PPP and official exchange rate by the African Development Bank – AfDB (2009) indicated significant divergence, particularly for poorer countries. The ICP2005 provided household consumption expenditure on 13 broad categories of consumption goods which we used to construct concentration curves and estimate the parameters of the ELES. These are Food & Non-alcoholic drinks, Alcoholic drink, Clothing, Water and Electricity, Household utensils, Transport Services, Education, Health, Recreation, Communication, Restaurant & miscellaneous expenditure. To identify the parameters of the ELES we also compiled personal savings for 2005 for the countries from ADB Data Platform.

The descriptive statistics indicate that in Africa the average share of household consumption expenditure on Food and Drinks is around 42%. Certainly there are outliers where food consumption is close to or more than total food expenditure due to negative personal saving rates. In general however, the share of food expenditure follows the well documented pattern that it declines with the level of economic development. Relatively well off countries spend a small share of their income on food while poorer countries tend to spend a significant portion of income on food. This is displayed clearly in Figure 1 with the slight hump at the low level of income, but declining smoothly afterwards. Expenditure on Water & Electricity comes next to Food and the shares for other commodity groups are less than 10% in general. Average personal savings hover around 14% of disposable income, which in contrast to other developing regions is still very low. Profile of consumption expenditure varies considerably across countries. Food consumption expenditure varies from the lowest ranges in Zambia and Botswana to Lesotho and Comoros that reported average expenditure shares close to 90% to 100% due to low or negative saving rates. This diversity is evident also for other commodity groupings. Household expenditure shares on education and health are generally driven by policy factors. Places where free primary education or health care services are not introduced generally experience high out of pocket expenditure (such as Lesotho and Sierra Leone).

4. Discussion of results

The concentration curves provide non-parametric comparison of welfare changes induced by policy or price shocks on a wide range of commodities. The Lorenz curve, which is a special case of concentration curve can be used as a reference to compare for instance proportional tax or (direct budget support in the case of external transfers) to finance certain publicly provided commodities such as education, health, water & electricity or subsidies of food items, etc. For

African countries, the Lorenz curve is distinguishingly skewed reflecting the large variation in income levels across the continent. The implied Gini coefficient is around 45% which is close to what is often reported for Africa. Thus there is a large cross-country inequality perhaps more than some other developing regions. In Figure 2 we compare two of the recently headline catching shocks experienced by households in Africa: food and energy price crisis. One could pose the policy problem for instance as follows. In light of higher food and energy prices, would it make sense to subsidize food and energy items financed say through proportional income tax or borrowing externally (at may be concessional rates). Figure 1 indicates that subsidizing food is clearly welfare improving at the continental level while focusing on energy prices may not. In fact, on the aggregate, subsidizing activities related to transport will worsen welfare[10].

What about transferring resources to finance social sectors such as education and health? It is evident from Figure 3 that spending on education leads to superior welfare improvement in comparison to any other commodity, including food items. But, in general, any international transfers spent on food, education or health is much better than say transfers that improve household income. This is the intuition of most donors.

Extending the discussion in the context of full demand system provides some valuable parameters that are often used to calibrate global models. Based on the discussion in section 2, Table 3 reports parameter estimates of the Extended Linear Expenditure System where personal savings is used to identify all the parameters. The results generally indicate a well behaving linear relationship between demand and personal income. Our estimation method also adjusts for possible contemporaneous correlation across equations and the explanatory power of the linear Engel curve is also reasonably high. Generally, the marginal budget share for some commodities is lower than the average share so that demand is income inelastic. These are Food, Clothing, Water and Electricity, Health and Education. It is interesting to note that household per capita expenditure on education is uniformly distributed in all countries across Africa and the average budget share is also among the lowest. One is tempted to relate this feature to efforts by governments to publicly provide education services. The other interesting dimension is also the fact that average school attainment rate vary considerably despite proportional effort by households in poor and rich countries to invest on education. Luxury goods are the usual suspects: Alcohol, communication, recreation, transport, restaurant related expenses, etc. Quite strikingly the elasticity values reported for these broadly aggregated commodities are more or less consistent with what one often finds from large household surveys of individual countries.

The price responses indicate (Table 5) quite a dampened feature largely because of the level of aggregation (substitution possibilities across broad commodities tends to be low) as well as the structure of the ELES which is biased towards income elasticity. Another explanation is also the high value of the Frisch parameter (or marginal utility of income) which links price elasticity

[10] It is very important to keep in mind that the global comparisons may or may not be consistent with the country level situations. The continental comparison is justified on the grounds of cross-country comparisons.

with the income elasticity. Not surprisingly, most commodities are price inelastic as reported in Table (5). The main factor driving the own price elasticity in this set up is the marginal budget share (the higher the household spends on particular commodity for a one dollar increase in income, the larger the response to own price shocks, vice versa) and the share of subsistence consumption in total consumption or the Frisch Parameter. The role of savings to identify all the parameters of the ELES is crucial. Moreover, the implied marginal budget share is also interesting. A one dollar increase in per capita income could lead to a saving of 36 cents on the average implying that savings is an income elastic "commodity" in Africa.

Finally, our estimate of total consumption expenditure needed for subsistence is close to 407 in PPP which is about 1.12 dollar a day, close to the 1.08 dollar a day conventionally used at a global level. To a certain degree, this finding gives credence to the global poverty line which has been under a lot of scrutiny lately Deaton & Dupriez (2010).

5. Conclusions

This paper attempted to utilize the data generated by the ICP-Africa 2005 on 48 African countries to extract some welfare comparisons across a broadly defined group of commodities. No doubt that such level of aggregation may be considered a bit stretching the underlying concept of choice theory which essentially is built on a number of restrictive assumptions. However, the whole idea of building the ICP-Africa 2005 data is to be able to compare standard of living across countries in a consistent framework. In that sense, then, aggregating per capita consumption expenditure and some of its extensions such as poverty, inequality or any other measure of welfare is allowed.

The 13 commodities covered in the ICP2005 survey are also comprehensive allowing for some interesting inferences that may help policy dialogues. For instance, should food be subsidized at the expense of say fuel, or should direct income transfers (such as budget support) promote household welfare instead of some targeted expenditure say on health, education and other necessities such as food. In dealing with these issues, certainly household level data at a country level would be more sensible because of the realism in policy actions. In a context where cross-country policy coordination is hardly observed our comparison may sound "theoretical". However there are instances where well known global models require such inputs for their calibration. One of the most frequently used global model is Global Trade Analysis Project which focuses on cross-regional policy simulations such as trade liberalization. One of the components modeled is household behavior where actually the Extended Linear Expenditure System is specified to capture price and income responses. Our computations help identify these parameters for such exercises easily. Often, available country information is imputed for the whole region to run the models. Thus, our results may fill these gaps.

The other interesting dimension of this global demand analysis is that the estimated parameters strikingly are close to what one would obtain from household surveys in these settings. There is nothing strange or out of the ordinary in our estimates of income and price elasticity values. Finally, even our poverty line estimate from "subsistence" expenditure implied by the model is very close to the international poverty line which was computed using a completely different approach.

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Table 1: African countries covered under ICP2005

Country	Per capita consumption expenditure in PPP
Angola	310.1237
Benin	485.8138
Botswana	1334.234
Burkina Faso	376.5132
Cameroon	672.3389
Cape Verde	1153.902
Central African Republic	309.1735
Chad	363.1584
Comoros	414.3654
Congo	364.2758
Congo, Democratic Republic	68.19534
Côte d'Ivoire	525.9131
Djibouti	519.0859
Egypt	1653.074
Equatorial Guinea	1309.882
Ethiopia	216.5842
Gabon	1253.719
Gambia	190.3816
Ghana	436.3439
Guinea	291.603
Guinea-Bissau	196.8927
Kenya	553.1107
Lesotho	774.3787
Liberia	117.9258
Madagascar	342.5094
Malawi	235.8604
Mali	337.821

Mauritania	518.0571
Mauritius	3383.374
Morocco	1125.192
Mozambique	265.0105
Namibia	1257.736
Niger	215.5689
Nigeria	561.6708
Rwanda	270.6373
Sao Tome and Principe	658.5045
Senegal	610.9812
Sierra Leone	317.7314
South Africa	2607.232
Sudan	857.7122
Swaziland	1412.419
Tanzania	370.8047
Togo	414.1749
Tunisia	2066.349
Uganda	332.0936
Zambia	356.9883
Zimbabwe	179.5134
Mean	699.5871

Source: ADB, ICP project

Table 2: Summary Statistics

Average expenditure ratios	Obs	Mean	Std. Dev.	Min	Max
Food expenditure	47	0.417	0.172	0.124	1.005
Saving ratio	47	0.138	0.202	-0.512	0.649
Water	47	0.111	0.039	0.035	0.253
Transport services	47	0.072	0.042	0.012	0.190
Clothing	47	0.059	0.040	0.012	0.254
Household utensils	47	0.050	0.021	0.004	0.131
Miscellaneous goods	47	0.041	0.024	0.000	0.118
Health	47	0.040	0.038	0.004	0.197
Alcohol & tobacco	47	0.036	0.035	0.001	0.196
Education	42	0.031	0.038	0.002	0.200
Recreation	47	0.027	0.021	0.004	0.114
Restaurant	47	0.023	0.027	0.000	0.145
Communication	47	0.016	0.016	0.001	0.070

Source: author's computation using AfDB Data Platform and ICP 2005

Table 3: Seemingly Unrelated Regression Estimate for the ELES Parameters: Dependent Variable is Disposable Income

Broad consumption categories	Coefficient	SD	Z-value
Food and Non-alcohol	0.2354997	0.0149967	15.7
Constant	94.46787	18.56974	5.09
Alcohol	0.0359582	0.0044822	8.02
Constant	-1.329985	5.550114	-0.24
Clothing	0.0411219	0.0032226	12.76
Constant	7.096983	3.990449	1.78
Water and electricity	0.1084259	0.006779	15.99
Constant	-5.494426	8.39417	-0.65
Household utensils	0.0504609	0.0032221	15.66
Constant	-0.508313	3.989752	-0.13
Health	0.0295296	0.0049542	5.96
Constant	6.657909	6.13454	1.09
Transport	0.101146	0.0080871	12.51

Constant	-13.8858	10.01395	-1.39
Communications	0.034621	0.0032386	10.69
Constant	-10.35782	4.010236	-2.58
Recreation	0.0349589	0.0028717	12.17
Constant	-7.204188	3.555852	-2.03
Education	0.0072792	0.0029862	2.44
Constant	10.93661	3.697714	2.96
Restaurant	0.0399303	0.0084184	4.74
Constant	-8.301922	10.42416	-0.8
Miscellaneous goods	0.048131	0.0039291	12.25
Constant	-3.145296	4.865252	-0.65

Breusch-Pagan test of independence: chi2(66) = 224.531, Pr = 0.0000

Source: author's computations using ICP data

Table 4: Subsistence Consumption and Income Elasticity of Demand for Broad Commodities

Commodity groupings	Subsistence consumption	Marginal budget share	Average budget share	Income elasticity
Food & Non-alchold drink	190.45	0.24	0.42	0.56
Alchol & tobacco	14.66	0.04	0.04	1.01
Clothing	23.86	0.04	0.06	0.69
Water & electricity	44.19	0.11	0.11	0.98
Furniture (nondurable)	20.57	0.05	0.05	1.01
Health	12.04	0.03	0.04	0.74
Transport	41.22	0.10	0.07	1.41
Communications	3.75	0.03	0.02	2.23
Recreation	7.04	0.03	0.03	1.31
Education	27.21	0.01	0.03	0.24
Restauant	2.97	0.04	0.02	1.76
Miscellaneous goods	19.62	0.05	0.04	1.19
Total substistence expenditure	407.57			

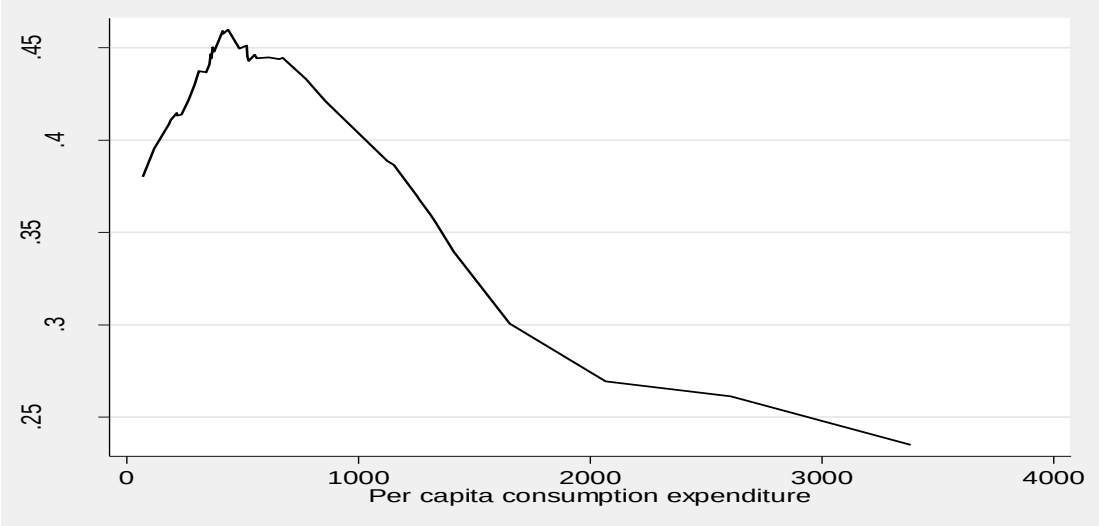
Source: author's computations using ICP data

Table 5: Cross and Own Price Elasticity Values from the ELES

	Food & Non-alchold drink	Alchol & tobacco	Clothing	Water	Furniture (nondurable)	Health	Transport	Communications	Recreation	Education	Restauant	Miscellaneous goods
Food & Non-alchold drink	-0.486	-0.125	-0.138	-0.122	-0.118	-0.094	-0.141	-0.049	-0.073	-0.190	-0.029	-0.128
Alchol & tobacco	-0.177	-0.489	-0.021	-0.019	-0.018	-0.014	-0.022	-0.007	-0.011	-0.029	-0.004	-0.020
Clothing	-0.121	-0.013	-0.437	-0.041	-0.019	-0.014	-0.025	0.001	-0.010	-0.004	-0.005	-0.015
Water & electricity	-0.171	-0.019	-0.028	-0.538	-0.027	-0.019	-0.035	0.001	-0.014	-0.006	-0.008	-0.022
Furniture (nondurable)	-0.176	-0.019	-0.028	-0.060	-0.523	-0.020	-0.036	0.001	-0.014	-0.007	-0.008	-0.022
Health	-0.129	-0.014	-0.021	-0.044	-0.020	-0.614	-0.026	0.001	-0.010	-0.005	-0.006	-0.016
Transport	-0.247	-0.027	-0.040	-0.084	-0.038	-0.028	-0.461	0.001	-0.020	-0.009	-0.011	-0.031
Communications	-0.389	-0.043	-0.063	-0.133	-0.061	-0.044	-0.079	-0.800	-0.031	-0.014	-0.017	-0.049
Recreation	-0.229	-0.025	-0.037	-0.078	-0.036	-0.026	-0.047	0.001	-0.700	-0.009	-0.010	-0.029
Education	-0.042	-0.005	-0.007	-0.014	-0.006	-0.005	-0.008	0.000	-0.003	-0.197	-0.002	-0.005
Restauant	-0.306	-0.034	-0.049	-0.105	-0.048	-0.034	-0.063	0.001	-0.025	-0.011	-0.878	-0.039
Miscellaneous goods	-0.207	-0.023	-0.033	-0.071	-0.032	-0.023	-0.042	0.001	-0.017	-0.008	-0.009	-0.48175

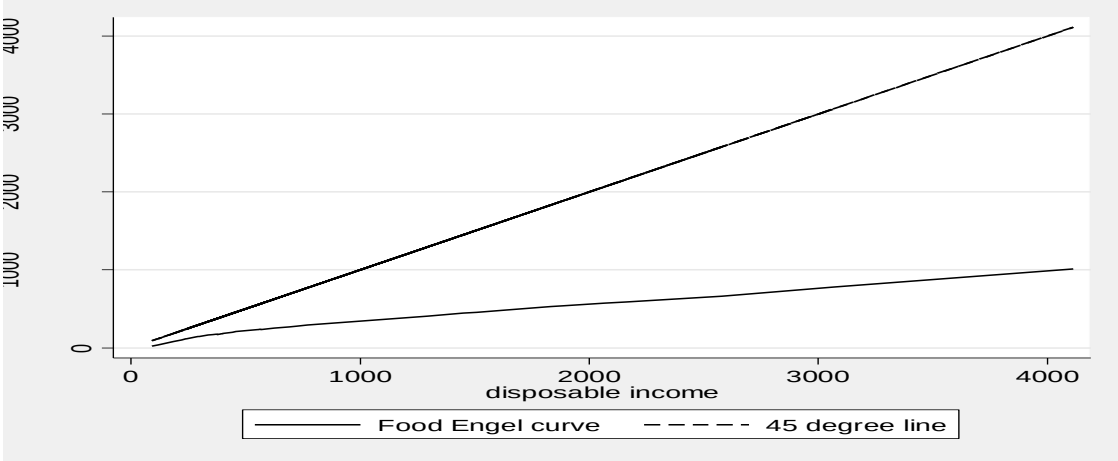
Source: author's computations

Figure 1: Share of Food in Total Consumption Expenditure in Africa: 2005



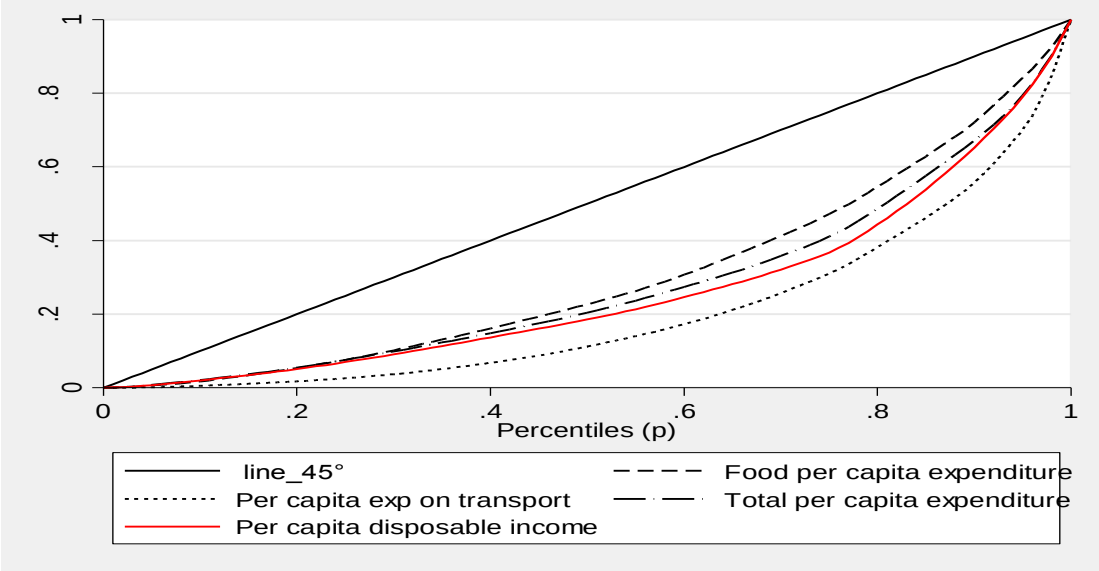
Source: author's computations based on ICP data

Figure 2: Engel Function for Food Expenditure



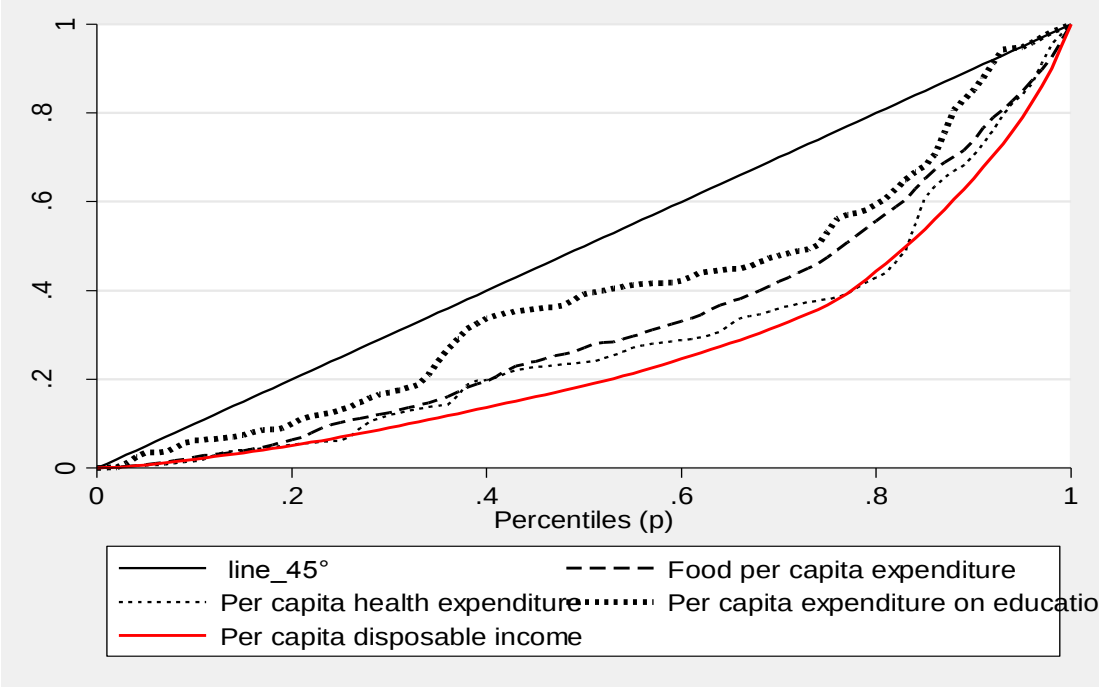
Source: author's computations based on ICP data

Figure 3: Concentration Curve for Selected Commodities in Africa using Data from ICP 2005



Source: author's computations based on ICP data

Figure 4: Concentration curve for selected commodities in Africa using data from ICP 2005



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