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Some Issues in Using Unit Values as Prices in the Estimation of Own-Price Elasticities: Evidence from Urban Ethiopia

by

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Abstract
Accurate price and quantity data are fundamental in order to estimate price elasticities, construct cost of living indices, standard of living measures and poverty indices. In the absence of prices, unit values are often used as substitutes. This is a common practice in LDCs, where the shortage of price data is acute. Based on the Ethiopian urban household survey of 1994 and using Deaton's (1988) cluster-based methodology, we illustrate the bias caused by the presence of measurement error and quality effects in unit values on the estimated own-price elasticities for 13 food commodities. Results are also found to be sensitive to the methodology adopted and the size of clusters. Therefore, we need to be cautious when interpreting price elasticities generated using unit values. In addition, the estimated elasticities can inform subsidy and tax reforms in Ethiopia because such estimates are the basis to examine who benefits and who loses from price changes and especially from food subsidies which are often implemented to protect the poor.

Outline
1. Introduction
2 Methodology
3. Data
4. Results
5. Conclusion

I. INTRODUCTION

It is widely recognised that accurate price information is required for the analysis of household welfare issues. Price data are essential to construct cost of living indices, standard of living measures, to derive poverty lines and to investigate behavioural responses such as own-price elasticities of demand. However, in many developing countries, especially in Africa, information on prices has often not been gathered in conjunction with household surveys. Often household budget surveys collect information on expenditure and on quantities of purchases by households. The division of expenditure on a given item by quantity bought gives the unit value of the item which is often taken as a proxy for price.

This paper extends previous work by investigating pertinent technical issues that relate to the estimation of price elasticities using household data from LDCs (Deaton 1987, 1988, 1990 and 1997). In agreement with the existing literature, we argue that unit values are contaminated with measurement error and quality effects. Aggregating various goods into a commodity, differences in the welfare of households and price changes are the major factors for the presence of quality effects in unit values. Measurement error exists in units values because households report expenditure and quantity data with error. We explore how much difference the correction for measurement error and quality effects makes to estimated elasticities. The fundamental assumption of Deaton’s methodology is the absence of price variation within geographical clusters. We ask whether this assumption is plausible in urban areas. We believe that the validity of this assumption is heavily dependent on the way clusters are defined. We are interested in answering: Which cluster size is appropriate? Are the results sensitive to differences in the definition of geographical clusters? We also investigate the sensitivity of the results to changes in the estimation method. This study is the first examination of these issues in the context of Ethiopia.

The study estimates own price elasticities for 13 groups of food commodities using the 1994 Ethiopian Urban Household Survey. The statistical significance of differences between estimates and techniques is established by appropriate tests. The paper is organised as follows. Section 2 sets out the methodology. Section 3 describes the data followed by the discussion of results in section 4. Then the paper concludes.

II. METHODOLOGY

Unit value variation arises not just from variation of prices across households but also from measurement error in reported expenditure and quantity and from quality effects. By quality effects are meant the differences in quality of purchased goods implicit in unit values. Expenditure on a given commodity is simply the product of the price of the commodity and quantity of the commodity. Note that the commodity can be a composite good such as fruit. In the absence of actual prices, expenditure is the product of unit value and quantity (Deaton, 1997). As unit values vary partly due to genuine price variation and partly due to quality variation in purchases, the expenditure identity can be expressed as the product of price, a quality index and quantity. A standard method for examining the presence of quality effects in unit values is to run OLS regressions of the logarithm of unit values on the logarithm of total expenditure (a household welfare measure), household demographics and other household characteristics. The slope coefficient on the log of total expenditure variable is referred to as the quality elasticity (Prais and Houthakker, 1955). A significant coefficient suggests the absence of a one-to-one correspondence between unit values and prices. In this case, unit values can not be used as prices without appropriate corrections.

Quality choice may be influenced by prices as consumers respond to price changes by altering both quantity and quality. Therefore, insofar as unit values reflect quality as well as genuine price variation, they are elements of consumer choice in the same way as quantities. Consequently, the regression of quantity on unit value is a regression of one choice variable on another and runs all the usual risks of possible lack of identification, simultaneity bias and interpretational ambiguity (Deaton, 1988). In addition, there is a wider issue of measurement error. If unit values are derived from reported expenditures and quantities, measurement error in both or either of them will be transmitted to measurement error in the unit value, which can induce a spurious negative correlation between quantities and unit values. The measurement error problem here arises from reporting error as we believe that households do wrongly report either the amount of money they spent while buying a given commodity or when recalling the quantity of the commodity purchased.

However, quality can be modelled as the choice of commodities within a group facing similar prices. A weakly separable structure is proposed by Deaton (1988) to relate the effects of price on quality to the effects of total expenditure on quality. Take meat as an example. The basic assumption is that meat forms a separable branch of preferences. Therefore, the demand for individual varieties of meat depends on the total meat budget and on the prices of the individual meats. In consequence, changes in the level of market prices of all meats together affect the demands for individual meats in exactly the same way as do changes in the total budget devoted to meat. But the quality of meat depends on the composition of demand within the meat group. In consequence, if we know how the quality of meat changes with changes in total expenditure, we can predict the effects of changes in absolute prices on the unit value.

The basic model estimated by Deaton (1988) is one in which market prices are treated as unobservable variables. Since household surveys typically collect data on clusters of households that live together in the same village, he assumed that there is no genuine variation in market prices within each cluster. This is especially so if the households are surveyed at the same time. The assumption concerning clusters is the key to identification. Note that a 'cluster' is defined as a geographical area which can be a city or part of a city.

For each household *i* in cluster c, therefore, assume that there are data on purchases of a range of goods, with both expenditure and quantity data provided. We have the following one-good one-price model which is similar to the system model postulated by Deaton;

$$\ln q_{Gic} = \alpha_G^0 + \beta_G^0 \ln x_{ic} + \gamma_G^0 z_{ic} + \theta_{gi} \ln p_{gic} + (f_{GC} + u_{Gic}^0) \qquad (1)$$

$$\ln V_{Gic} = \alpha_G^1 + \beta_G^1 \ln x_{ic} + \gamma_G^1 z_{ic} + \phi_{gi} \ln p_{gic} + u_{Gic}^1 \qquad (2)$$

where

$\ln q_{Gic}$ = log of quantity of good G demanded by household i in cluster c;

$\ln V_{Gic}$ = log of unit value of good G for household i in cluster c;

$\ln x_{ic}$ = total expenditure of household i in cluster c;

z_{ic} = vector of demographic and other characteristics of household i in cluster c;

p_{gic} = the unobserved prices of the good faced by household i in cluster c;

f_{GC} = a cluster specific fixed effect for good G;

a, b, g, q and j = parameters to be estimated; and

u^0_{Gic} and u^1_{Gic} are the error terms of the quantity and the unit value equations respectively.

Equation (1) is a standard double-logarithmic demand function, in which the logarithm of the quantity demanded is linked to total expenditure per capita, a vector of demographic and other household characteristics, and to the (unobserved) prices of the good. The error term in the quantity equation has two components. f_{GC} is a cluster specific fixed effect, to be interpreted as the cluster-specific residual in the demand function for good G. It can represent unobservable taste variation from cluster to cluster. Deaton treated f_{GC} as a fixed effect but no difficulties arise if it is thought of as being random. Therefore, f_{GC} can be allowed to be correlated with the observable explanatory variables; but we must assume that it is uncorrelated with the unobservable price p_{gic}. The household specific error component u^0_{Gic} has an expectation of zero within the cluster and is assumed to be uncorrelated with all other regressors, including the fixed effects. Its existence indicates the usual inexactness of econometric models as well as the presence of measurement error in quantities.

The unit value equation (2), shows that price is allowed to affect quality choice. Note that there are no fixed effects in this equation because these effects would preclude any inference about price from unit values, and the model would not be identified. The presence of unobservable fixed effects does not allow for a direct link between unobservable prices and unit values. As in the quantity equation, there is an idiosyncratic error, u^1_{Gic}, reflecting, among other things, measurement error. Both u^0_{Gic} and u^1_{Gic} have cluster components and are allowed to be correlated. Since the logarithm of unit value is the difference between the logarithm of expenditure and the logarithm of quantity, measurement error in the latter must be correlated with error in the former.

Under these assumptions, within-cluster estimators of the unit value and quantity equations can identify quality effects without contamination by the (unobservable) variation in market price. These within estimators can also be used to compute the extent of the measurement error, since only the spurious variances and co-variances will exist within clusters. We know that there is measurement error both in the quantity and unit value equations. Both the variance in the logarithm of unit values and the covariance between the logarithms of quantity and unit values have to be corrected using the error variance and the error covariance estimated using equations (3) and (4) below.

There are two estimation stages. At the first stage, cluster means are subtracted from all variables and we estimate the equations by within-cluster OLS. Removing cluster means removes the prices and fixed effects and allows consistent estimation of the relevant regressors in both equations.

Removing cluster means from (1) and (2) gives;

$$(\ln q_{Gic} - \ln \bar{q}_{GC}) = \beta_G^0 (\ln x_{ic} - \ln \bar{x}_{GC}) + \gamma_G^0 (z_{ic} - \bar{z}_{GC}) + (u_{Gic}^0 - \bar{u}_{GC}^0) \qquad (3)$$

$$(\ln V_{Gic} - \ln \bar{v}_{GC}) = \beta_G^1 (\ln x_{ic} - \ln \bar{x}_{GC}) + \gamma_G^1 (z_{ic} - \bar{z}_{GC}) + (u_{Gic}^1 - \bar{u}_{GC}^1) \qquad (4)$$

Because unit values will vary not only with the choice of quality, but also with actual market prices, (4) should include price as a regressor. This is impossible if price data is not available. Quantity is also affected by price; therefore, equation (3) should have price in it as a regressor. However, it is possible to estimate the non-price parameters of equations (3) and (4) consistently if we are prepared to make the assumption that market prices do not vary within each cluster over the relevant reporting period. Note also that the equations could have been extended to include prices simply by adding dummy variables for each cluster. However, by the Frisch-Waugh (1933) theorem, the regression of deviations from cluster means gives identical parameter estimates to those that would have been obtained from the regression containing the cluster dummies.

‘Corrected’ quantity and unit values can then be defined using the parameter estimates from the first stage. The estimates of the b ‘s and g ’s from the within estimators are the final estimates of these parameters. Write these as $\tilde{b}_G^0$, $\tilde{g}_G^0$,, $\tilde{g}_G^0$, (i.e. parameter estimates of the quantity equation) and $\tilde{b}_G^1$, $\tilde{g}_G^1$ (i.e. parameter estimates of the unit value equation). Then, define the 'corrected' quantities and unit values by;

$$\tilde{y}_{GC} = n_c^{-1} \sum (\ln q_{Gic} - \tilde{b}_G^0 \ln x_{ic} - \tilde{g}_G^0 z_{ic}) \tag{5}$$

$$\tilde{w}_{GC} = n_c^{-1} \sum (\ln V_{Gic} - \tilde{b}_G^1 \ln x_{ic} - \tilde{g}_G^1 z_{ic}) \tag{6}$$

where n_c = number of households per cluster.

In equation (5) and (6), cluster averages of the 'corrected' quantities and unit values are calculated. At the second stage, between-cluster variation of quantities and unit values are used to estimate the price elasticities. The immediate issue in estimating elasticities is how to identify the coefficients on the price terms of equations (1) and (2) with correction for measurement error and quality effects. Since we know nothing about prices, there is no way of pinning down either q_{gi} or j_{gi}. However, the residuals from the first stage regressions can be used to estimate the variance and co-variance of the residuals in the quantity and unit value equations. The variance and covariance of the residuals are the building blocks of the measurement error correction on the elasticity estimates.

2.1. Measurement error correction

Let $\tilde{s}_{11}$ and $\tilde{s}_{22}$ be the residual variances of the quantity equation and the unit value equation respectively. Further, suppose $\tilde{s}_{12}$ is the covariance between them. Now define an error-in variables estimator (see Deaton, 1988);

$$f = q_{gi} / j_{gi} = \frac{Cov(W_{GC,} y_{GC}) - s_{12} / n_c}{Var(W_{GC}) - s_{22} / n_c} \tag{7}$$

By replacing theoretical magnitudes in equation (7) by their first stage estimates, we can obtain a consistent estimate of the ratio q_{gi} / j_{gi}. Hence,

$$\hat{\phi} = \frac{Cov(\tilde{W}_{GC}, \tilde{y}_{GC}) - \tilde{\sigma}_{12} / n_c}{Var(\tilde{W}_{GC}) - \tilde{\sigma}_{22} / n_c} \qquad (8)$$

where n_c = is the number of households per cluster.

To understand the intuition behind this estimator, note that, if there were no ‘corrections’ to the numerator and denominator in (8), it would be the ratio of a covariance to a variance, which is the usual OLS estimator. The correction terms, $\tilde{\sigma}_{12} / n_c$ and $\tilde{\sigma}_{22} / n_c$ are designed to correct for the part of the between-cluster variances and co-variances that comes from measurement and econometric error in the underlying first-stage equations.

2.2. Correction for quality effects

Quality is defined as the value of a commodity at fixed reference prices relative to its physical volume and is a function of the consumption of the commodity. A change towards relatively expensive goods will increase the quality of the group as a whole. Provided the marginal rates of substitution between different goods in the group are independent of quantities consumed outside the group, we can write the subgroup demands as a function of total group expenditure and within-group prices. Separability implies that quality changes in response to price is determined by the price, income, and quality elasticities of the commodity group (Deaton, 1988). When prices rise holding relative prices constant, there is a reduction in demand for the group as a whole. When less is bought, there is a quality effect whose magnitude depends on the elasticity of quality with respect to expenditure on the group. As a result, there will be no quality changes if either the price elasticity or the quality elasticity is zero. The separability assumption provides the basis for quantifying and correcting the bias that would arise from quality effects.

We can now go back to the second stage of estimation and see how we arrive at estimates of price elasticities, θ_{gi}. Following the above arguments, the ratio $\phi = \theta_{gi} / \psi_{gi}$, can be rewritten as

$$\phi = \theta_{gi} / \psi_{gi} = \varepsilon_p / (1 + \beta^1_G \varepsilon_p / \varepsilon_x) \qquad (9)$$

where e_p = price elasticity of demand

β_G^1 = quality elasticity

e_x = quantity elasticity

By rearranging equation (9), we get

$$e_p = f \ / (1 - f \ \beta_G^1 / \ e_x) \tag{10}$$

Since we know the estimate of f which is $\hat{f}$ from equation (8), β_G^1 and e_x from the first stage regressions, we can estimate the price elasticity e_p purged of the effects of quality (see Deaton 1997 for more details).

III. DATA

The analysis in this paper is based on the Ethiopian Urban Households Survey (EUHS) which was collected by the Department of Economics of Addis Ababa University (Ethiopia) in collaboration with the Department of Economics of the University of Göteborg (Sweden) in 1994. The total sample size of 1500 households was distributed over the selected seven urban centres of Ethiopia in proportion to their populations. The analysis in this study is based on 13 commodity groups. These commodity groups are aggregates over different qualities or varieties. Annex A and B provide more information on the data and the definition of variables used in this paper.

The quantity data is composed of the quantity of purchases made in metric and non-metric units. To standardise the quantities recorded in non-metric units, we have computed the average cost of a given commodity measured in non-metric unit for a given geographical cluster and the average cost of the same commodity measured in metric units in the same cluster. To obtain a relative quantity conversion factor, the former is divided by the latter. Then the resulting ratio is used to convert quantities measured in non-metric unit into kilograms. This procedure is similar to the one employed by

Lambert and Magnac (1997).[1] The relative conversion factors are defined for each non-metric unit separately.

Our households are classified into clusters (i.e. geographical areas of various sizes). The data at our disposal are not collected on cluster-basis but we can easily use the information within the survey to define clusters of different sizes. In this study we have defined three types of clusters based on the existing administrative structure in Ethiopia. The country is divided into different administrative regions and cities are the capitals of each of the regions. We have data on seven of the cities which form the largest possible clusters. A city is divided into different 'Weredas' (42 in number) and Weredas are split further into 'Kebeles' (212 in number). 'Kebeles' are the lowest administrative units in Ethiopia. In addition to considering one 'Kebele' as a cluster, we also defined a Wereda (a collection of Kebeles) and a city (a collection of Weredas) as a cluster in order to examine the behaviour of estimated coefficients at various levels of aggregation of the geographical areas over which prices are assumed to be uniform.

IV. RESULTS

Tables 1, 2 and 3 below give price elasticity estimates[2] generated using the previous section's methodology for different geographical cluster sizes i.e. Table 1 for Kebele (the smallest cluster size); Table 2 for Wereda and Table 3 for city (the largest cluster size). The 2nd columns of each table give the elasticities estimated from between cluster variation but without correction for measurement error and quality effects using equations (5) and (6). The 3rd columns give elasticities with measurement error correction according to equation (8) and the 4th columns give elasticities with measurement error and quality effects correction based on equation (10).

4.1. Does correction for measurement error and quality effects make a difference?

Table 1 gives the estimates when Kebeles (the smallest geographical units) are defined as clusters. We can see that there are differences between the OLS estimates and the

1 In further work, Disney, McKay, and myself have derived conversion factors econometrically allowing for quality effects and measurement error and examine the impact of such an exercise in the estimation of price elasticities and poverty analysis in Ethiopia.

2 Regression results from for all stages of estimation can be obtained from the author.

estimates obtained after the measurement error and quality effects correction. This is true for the majority of the commodities. The presence of measurement error and quality effects in unit values seems to bias uncorrected estimates downwards. However, we can not generalise that uncorrected elasticities are biased downwards or upwards.

Table 1: Own-price Elasticities (Cluster = Kebele)

Commodity (Number of Clusters)	OLS Estimate	Estimates corrected for Measurement Error Only	Estimates corrected for Measurement Error and Quality Effects
Teff (202)	-1.11 (0.26)***	-2.18 (0.42)***	-1.77 (0.40)***
Wheat (187)	-0.15 (0.25)	-3.1 (0.89)***	-2.54 (0.71)***
Cereals (180)	0.46 (0.18)***	0.1 0(0.24)	0.10(0.24)
Pulses (199)	0.23 (0.10)**	0.34 (0.24)*	0.36 (0.13)***
Shiro (191)	-0.78 (0.14)***	-3.7 (1.47)***	-2.75 (1.08)***
Fruits and Vegetables (201)	1.27 (0.06)***	-0.22 (0.02)***	-0.20 (0.02)***
Meat (168)	-0.49 (0.14)***	-1.32 (0.29)***	-1.21 (0.28)***
Milk & Butter(181)	-0.29 (0.09)***	-2.3 (0.57)***	-1.33 (0.35)***
Oil (201)	-0.84 (0.09)***	-1.14 (0.17)***	-1.04 (0.12)***
Spices (124)	-0.05 (0.09)	0.17 (0.16)	0.18 (0.16)
Coffee (203)	-0.31 (0.11)***	-0.87 (0.14)***	-0.69 (0.13)***
Sugar (198)	-0.43 (0.13)***	-0.66 (0.93)	-0.65 (0.94)
Tella (83)	-0.53 (0.19)***	1.06 (0.46)**	-2.94 (1.12)***

N.B. Standard errors are reported in parentheses in columns 2, 3 and 4. The standard errors in columns 3 and 4 are computed using the Delta Method. The number of clusters is given in parentheses next to the commodities in the first column. Coefficients with *** are significant at 1%; with ** at 5% and with * at 10% levels.

Table 2 gives estimates for a cluster of a bigger size, Wereda. Again, for most of the commodities, the results show that overlooking the corrections for measurement error and quality effects led to a downward bias in the OLS estimates.

Table 2: Own-price Elasticities (Cluster = Wereda)

Commodity (Number of Clusters)	OLS Estimate	Estimates corrected for Measurement Error Only	Estimates corrected for Measurement Error and Quality Effects
Teff (42)	-1.86 (0.44)***	-2.22 (0.54)***	-1.74 (0.52)***
Wheat (42)	-1.91 (0.53)***	-2.7 (0.87)***	-1.98 (0.61)***
Cereals (42)	0.58 (0.28)**	0.67 (0.10)***	0.81 (0.10)***
Pulses (42)	0.18 (0.33)	0.177 (0.46)	0.183 (0.47)
Shiro (42)	-0.88 (0.24)***	-1.11 (0.30)***	-1.01 (0.29)***
Fruits and Vegetables (42)	-0.46 (0.17)***	-1.6 (0.82)**	-0.89 (0.52)**
Meat (42)	-0.26 (0.27)	-0.37 (0.12)***	-0.38 (0.08)***
Milk & Butter (42)	-0.40 (0.18)**	-0.52 (0.30)**	-0.50 (0.30)**
Oil (42)	-1.01 (0.30)***	-1.67 (0.53)***	-1.45 (0.50)***
Spices (41)	0.13 (0.14)	0.95 (1.45)	1.61 (2.2136)
Coffee (42)	-0.22 (0.22)	-0.27 (0.25)	-0.25 (0.25)
Sugar (42)	-0.10 (0.21)	-0.18 (0.34)	-0.18 (0.34)
Tella (39)	-0.24 (0.23)	1.52 (1.34)	2.76 (2.24)

N.B. Standard errors are reported in parentheses in columns 2, 3 and 4. The standard errors in columns 3 and 4 are computed using the Delta Method. The number of clusters is given in parentheses next to the commodities in the first column. Coefficients with *** are significant at 1%; with ** at 5% and with * at 10% levels.

Table 3 gives the results when all households in a given city are considered as belonging to a single geographical cluster. One notable fact here is that the estimates after measurement error correction are not dramatically different from the OLS estimates as opposed to the results reported in tables 1 and 2. These two estimates seem to converge to each other as the cluster size increases. This should not be taken to infer that measurement error will be eliminated as the cluster size increases. The bias still exists. Moreover, when the estimates that also allow for quality effects correction are compared with the OLS estimates, a different result emerges. Except for pulses the OLS estimates and the estimates in the last column show sizeable and significant differences. As the size of the cluster increases, the results imply that quality effects bias the OLS estimates more than the measurement error problem.

Table 3: Own-price Elasticities (Cluster = City)

Commodity (Number of clusters)	OLS Estimates	Estimates corrected for Measurement Error only	Estimates corrected for Measurement Error and Quality Effects
Teff (7)	-2.89(0.69)***	0.01(1.23)	-2.89 (1.13)***
Wheat (7)	-3.95 (1.70)***	-3.79 (1.53)***	-0.51 (1.55)
Cereals (7)	-0.35 (0.10)***	-0.38 (0.13)***	-0.17 (0.09)**
Pulses (7)	0.99 (0.73)*	0.98 (0.37)***	1.2 (0.35)***
Shiro (7)	-0.81 (0.53)*	-0.85 (0.48)**	-0.80 (0.49)*
Fruits and Vegetables (7)	-0.80 (0.17)***	-0.93 (0.94)	-0.66 (0.40)**
Meat (7)	-026 (0.95)	-0.28 (0.07)***	-0.30 (0.05)***
Milk & Butter(7)	0.03 (0.12)	0.36 (0.29)	0.36 (0.29)
Oil (7)	-0.81 (0.20)***	-0.80 (0.52)*	-0.75 (0.50)*
Spices (7)	0.09 (0.28)	0.10 (0.17)	0.1 (0.17)
Coffee (7)	-0.33 (0.47)	-0.35 (0.14)***	-0.33 (0.14)***
Sugar (7)	-0.14 (0.48)	-0.19 (0.05)***	-0.19 (0.05)***
Tella (7)	-0.52 (0.89)	-1.07 (0.69)*	-0.7 (0.61)

N.B. Standard errors are reported in parentheses in columns 2, 3 and 4. The standard errors in columns 3 and 4 are computed using the Delta Method. The number of clusters is given in parentheses next to the commodities in the first column. Coefficients with *** are significant at 1%; with ** at 5% and with * at 10% levels.

To establish whether the measurement error and quality effects correction bring statistically significant differences between the coefficients, we test hypotheses about the equality of the estimates with and without the corrections for each of cluster types. In other words, the first set of tests are conducted for the equality of estimates across columns in each of the tables [see tables under Annex C].

The tests suggest significant differences between estimates with and without correction in a statistical sense for the majority of the commodities. These results reinforce the conclusions of other similar studies undertaken on data sets from Côte D'Ivoire and Indonesia (Deaton 1987, 1988, 1990). Our analysis highlights the need to make corrections both for measurement error and quality effects on unit values in the Ethiopian context. Otherwise, one has to be cautious when interpreting elasticities estimated using unit values.

The innovative aspect of this paper is to investigate the sensitivity of the results to cluster definition and methodology. This is to establish how the results can be contingent upon the size of the cluster we define and the choice of methodology. This is the task we take up in the final few paragraphs of the paper.

4.2. Are the results sensitive to the estimation method used?

Table 4 below reports the elasticities which are obtained simply by regressing log of quantity purchased on log of unit values and other household socio-economic variables (i.e. without cluster separation). We call them crude elasticities as unit values entered the model as prices without any correction. In all cases, the change in method results in significant changes in the parameters estimated. In most cases, the elasticities reported as crude estimates are much lower than those estimates obtained in tables 1, 2 and 3 and fewer of them are significant. In the case of pulses, the sign of the elasticity has changed following a change in method but it is not significant. Moreover, some of the coefficients are not meaningful or far too small to be plausible given the potential substitutability between different types of grains.

Table 4: Crude Elasticity Estimates

Commodity	Estimates
Teff (1237)	-0.06 (0.1202)
Wheat (695)	-0.13 (0.1417)
Cereals (688)	0.01 (0.1082)
Pulses (1090)	-0.007 (0.1018)
Shiro (858)	-0.76 (0.0505)***
Fruits and Vegetables (1298)	-0.28 (0.0437)***
Meat (491)	-0.64 (0.1361)***
Milk and Butter (576)	-0.38 (0.0689)***
Oil (1326)	-0.1961 (0.0861)**
Spices (324)	0.44 (0.0362)***
Coffee (1234)	-0.56 (0.0591)***
Sugar (950)	-0.54 (0.0555)***
Tella (134)	-0.54 (0.2483)**

N.B. The figures in parentheses in the first column represent the number of observations. The standard errors are also indicated in parentheses in the second column. Coefficients with *** are significant at 1% and with ** at 5% levels.

4.3. Are the results sensitive to the definition of clusters?

In the various applications by Deaton (1987, 1988, 1990); the influence of varying the size of the clusters on the elasticity estimates has not been examined. This study has tested the robustness of the results by looking how sensitive the results could be by changing the size of the clusters.

As shown in the tables above, the results indeed are sensitive to the size of the clusters. Comparing the OLS estimates, seven of the commodity groups have shown an increase in the magnitude of their estimates as we move from Kebele to Wereda. Do the elasticities of these same commodities show an increase as we move from Wereda to city? Except for teff and wheat, this does not appear to be the case. Therefore, there is not a clear trend in the OLS estimates (lack of robustness) as cluster size increases. The volatility of estimates from one cluster size to another cluster size is an enduring fact. This is also true if one looks at the coefficients obtained after measurement error and quality effects correction as cluster size varies.

In general tests across clusters, i.e. between tables, are conducted commodity by commodity to examine the equality of the various estimates as the definition of the clusters change [see the tables under annex D]. The various tests show that estimates do vary significantly in a statistical sense as cluster sizes change for most of the commodity groups.

The fundamental assumption of Deaton’s methodology is the absence of price variation within clusters. This is a plausible assumption if one works with data from rural clusters. In rural areas, there is often one market per cluster or even for many clusters. But in urban areas, it is more likely for households in cluster A to make purchases in cluster B or C or D since there are many markets (big and/or small). Transportation difficulties are not as severe in urban areas as they are in rural areas.

If one is working on urban data sets, how can one retain Deaton's assumption of constant prices? We believe that one possible solution to this question revolves around the way clusters are defined. It is argued here that defining clusters that are bigger in size makes the assumption more acceptable in the context of urban data sets. This is because the larger the cluster the more likely for the household to visit a market or markets within that cluster and it is more probable for prices to be similar. However if the cluster is too large, the within and between-cluster identification of quality effects becomes less well determined as household make purchases in different markets within the large cluster and face different prices. Thus, concerning cluster size, there is a trade-off between the plausibility of the 'separate market' or uniform price assumption and the precision of the estimates. This section has illustrated this trade-off. We argue here that a cluster should not be too large (like city in our case) or too small (e.g. Kebele). This is because in the former case it is unrealistic to suppose that all households in a city buy their goods from a single market and in the latter case we suffer from small sample size which makes the measurement error problem severe.

Overall, the discussions we have had in sub-sections 4.1, 4.2 and 4.3 above indicate that results are sensitive both to changes in the definition of clusters and methodology.

V. CONCLUSION

This paper has applied the Deaton methodology to Ethiopian data and confirmed the usefulness of cluster analysis to identify quality effects and measurement errors in unit values. Its novelty is to show the sensitivity of own-price elasticity estimates to changes in the definition of clusters and in the estimation method. Own-price elasticities have been estimated for 13 food items (groups). A careful investigation of the method might lead one to question the validity of the assumption if sampled households are drawn from urban areas. This is because of the possibility of having a number of markets within an urban cluster as opposed to a single one in a rural cluster. Our results justify the cluster-based analysis simply because price elasticities derived from estimates which ignore quality variations and measurement error are much less plausible (table 4). Nevertheless, there is clearly a trade-off concerning cluster size. Our own view is that the intermediate specification ('Wereda') gives reasonable results.

We have also seen ‘crude’ elasticities which are obtained by estimating standard double-log demand functions. Results were also found to be sensitive to changes in method. We argue that the cluster-based estimation as detailed in section 2 is a more careful way of addressing the issue we raised in relation to unit values.

Therefore, one should note that there is a certain degree of caution that the analyst should exercise when it comes to a decision about the size of clusters and the methodology to employ. This is because we observe a lack of robustness in the estimates as we vary the size of the geographical clusters as well as the method adopted. It seems that we need to be very careful when we interpret results that involve unit values. It may be misleading to stick to one definition of cluster as well as to a given methodology. The analyst should define a cluster that he/she thinks is a reasonable size in an urban context. The researcher also needs to make the best possible effort to get unit values that are free from any of the biases we discussed in the body of the paper. We know that quality effects and measurement error biases are not negligible and need to be addressed if one has to use the results with a reasonable degree of confidence. This is more true if we bases policy on results that involve unit values. The estimated elasticities can inform subsidy and tax reforms in Ethiopia because such estimates are the basis to examine who benefits and who loses from price changes and especially from food subsidies which are often implemented to protect the poor.

Finally, often quantity recorded in non-metric units are ignored by analysts. We believe that there is an improvement in this paper over existing practices with regard to the treatment of quantities reported in non-metric units. Even if they are not ideal, we have used relative conversion factors. A more careful and appropriate procedure in treating the quantity data recorded in non-metric units while estimating own price elasticities is our future research agenda.

REFERENCES

Deaton, A. (1987) "Estimation of Own- and Cross-Price Elasticities from Household Survey Data", *Journal of Econometrics,* vol. 36, pp. 7-30.

__________ (1988) "Quality, Quantity and Spatial Variation of Prices", *The American Economic Review*, vol. 78, no. 3, pp. 418- 430.

____________ (1990) "Price Elasticities from Survey Data: Extensions and Indonesian Results", *Journal of Econometrics,* vol. 44, pp. 281-309.

____________ (1997) *The Analysis of Household Surveys: a Microeconometric Approach to Development Policy.* Washington D.C. and Baltimore: The World Bank and John Hopkins University press.

Frisch, Ragnar and Frederick V. Waugh (1933) Partial Time Regressions as Compared with Individual Trends. *Econometrica*, vol. 1, pp. 387 – 401.

Lambert, S. and T. Magnac (1997) "Implicit Prices and Recursivity of Agricultural Households' Decisions", INRA and CREST, mimeo.

Prais, Sigbert J., and Hendrik S. Houthakker (1955) *The Analysis of Family Budgets,* Cambridge University Press.

Annex A: Data

A sample of 1500 households were selected from seven major urban centres of the country. This sample is intended to be representative of the main socio-economic characteristics of the country's urban population. To select the urban centres, all towns with populations of 100,000 and above were listed, and consideration was given to their relative representativeness in terms of populations and cultural diversity, major economic activity of the towns and their catchment areas, and their administrative importance. On the basis of these criteria: Mekele and Dessie in the north, Bahir Dar in the north west, Addis Ababa in the centre, Dire Dawa in the east, Awassa in the South and Jimma in the south west were selected. Mekele and Dessie were selected to represent areas often affected by drought and the socio-economic groups in the north. Bahir Dar was included as a representative town of the main cereal producing areas of the country. Addis Ababa is by far the largest city and the capital, and represents the diversity of the country's population. Dire Dawa is mainly a trading centre, while Awassa is the administrative centre of the south, and was chosen to represent the large Enset culture (one of the food cultures in Ethiopia). Finally, Jimma was selected to represent the urban characteristics of the main coffee growing regions of the country.

The 13 commodity groups used in this paper are teff, wheat, cereals (barley, sorghum, maize), pulses (lentils, split lentils, chick peas, cow peas, split cow peas), shiro (beans or peas powder used to make stew to accompany the pancake made from the staple cereal – Teff), fruits and vegetables (orange, banana, potato, tomato, carrot, onion, garlic, ginger); meat (beef and mutton), spices, milk and butter, oil, coffee, sugar and tella (local alcoholic drink).

Annex B: Variable Definition for the First Stage Regression

Variable Name	**Description**
DEVQ	The difference between quantity purchased by each household and the cluster mean quantity
DEVV	The difference between unit value of kg reported by each household and the cluster mean unit value
DEVPCEXP	The difference between the per capita food expenditure of each household and the cluster mean per capita expenditure
DEVSIZE	The difference between the number of members of each household and the cluster average household size
DEVLT6K	The difference of the ratio of kids less than 6 years of age in each household and the cluster average ratio of the same group
DEVM615	The difference of the ratio of boys between the age of 6 and 15 in each household and the cluster average ratio of the same group
DEVF615	The difference of the ratio of girls between the age of 6 and 15 in each household and the cluster average ratio of the same group
DEVK615	The difference of the ratio of kids between the age of 6 and 15 in each household and the cluster average ratio of the same group
DEVM1555	The difference of the ratio of males between the age of 15 and 55 in each household and the cluster average ratio of the same group
DEVF1555	The difference of the ratio of females between the age of 15 and 55 in each household and the cluster average ratio of the same group
DEVA1555	The difference of the ratio of adults between the age of 15 and 55 in each household and the cluster average ratio of the same group
DEVMGE55	The difference of the ratio of males over the age of 55 and the cluster average ratio of the same group
DEVFGE55	The difference of the ratio of females over the age of 55 and the cluster average ratio of the same group
DEVAGE55	The difference of the ratio of adults over the age of 55 and the cluster average ratio of the same group
DEVMALE	The difference between the dummy for male heads of each household and the cluster mean dummy for male heads
DEVEMPL	The difference between the dummy for the employment status of the head of each household and the cluster mean of the same dummy.
DEVSCH1	The difference between the dummy for any level of education status of the head of each household and the cluster mean of the same dummy
DEVSCH2	The difference between the dummy for a primary level of education status of the head of each household and the cluster mean of the same dummy
DEVSCH3	The difference between the dummy for a secondary or higher level of education status of the head of each household and the cluster mean of the same dummy

Annex C: Summary of statistical tests for each of the clusters

The results relate to whether the column estimates are significantly different from each other in the statistical sense.

Table C.1: Summary of statistical tests for Kebele

Commodity	Column 2 Vs Column 3	Significance level	Column 2 Vs Column 4	Significance level	Column 3 Vs Column 4	Significance level
Teff	Yes	1%	Yes	5%	No	-
Wheat	Yes	1%	Yes	1%	No	-
Cereals	Yes	5%	Yes	5%	No	-
Pulses	No	-	No	-	No	-
Shiro	Yes	1%	Yes	1%	No	-
Fruits & vegetables.	Yes	1%	Yes	1%	No	-
Meat	Yes	1%	Yes	1%	No	-
Milk & Butter	Yes	1%	Yes	1%	Yes	5%
Oil	Yes	1%	Yes	5%	No	-
Spices	Yes	5%	Yes	5%	No	-
Coffee	Yes	1%	Yes	1%	Yes	10%
Sugar	Yes	1%	Yes	1%	No	-
Tella	No	-	Yes	1%	Yes	1%

Table C.2: Summary of statistical tests for Wereda

Commodity	Column 2 Vs Column 3	Significance level	Column 2 Vs Column 4	Significance level	Column 3 Vs Column 4	Significance level
Teff	No	-	No	-	No	-
Wheat	Yes	10%	No	-	No	-
Cereals	No	-	No	-	Yes	10%
Pulses	No	-	No	-	No	-
Shiro	No	-	No	-	No	-
Fruits & vegetables	Yes	1%	Yes	1%	No	-
Meat	No	-	No	-	No	-
Milk & Butter	No	-	No	-	No	-
Oil	Yes	5%	Yes	10%	No	-
Spices	Yes	1%	Yes	1%	No	-
Coffee	No	-	No	-	No	-
Sugar	No	-	No	-	No	-
Tella	Yes	1%	Yes	1%	No	-

Table C.3: Summary of statistical tests for City

Commodity	Column 2 Vs Column 3	Significance level	Column 2 Vs Column4	Significance level	Column 3 Vs Column 4	Significance level
Teff	Yes	1%	No	-	Yes	5%
Wheat	No	-	Yes	5%	Yes	5%
Cereals	No	-	Yes	10%	Yes	10%
Pulses	No	-	No	-	No	-
Shiro	No	-	No	-	No	-
Fruits & Vegetables	No	-	No	-	No	-
Meat	No	-	No	-	No	-
Milk & Butter	Yes	5%	Yes	5%	No	-
Oil	No	-	No	-	No	-
Spices	No	-	No	-	No	-
Coffee	No	-	No	-	No	-
Sugar	No	-	No	-	No	-
Tella	No	-	No	-	Yes	10%

Annex D: Summary of statistical tests across clusters

Table D.1:- Equality of OLS Estimates Across Clusters

Commodity	OLS Estimates [KebeleVs Wereda]	Significance level	OLS Estimates [Kebele Vs City]	Significance level	OLS Estimates [Wereda Vs City]	Significance level
Teff	Yes	1%	Yes	1%	Yes	5%
Wheat	Yes	1%	Yes	1%	Yes	1%
Cereals	No	-	Yes	1%	No	-
Pulses	No	-	Yes	1%	Yes	1%
Shiro	No	-	No	-	No	-
Fruits & Vegetables.	Yes	1%	Yes	1%	Yes	5%
Meat	Yes	1%	Yes	5%	No	-
Milk & Butter	Yes	1%	Yes	1%	Yes	1%
Oil	Yes	1%	No	-	No	-
Spices	Yes	1%	Yes	10%	No	-
Coffee	No	-	No	-	No	-
Sugar	Yes	1%	Yes	5%	No	-
Tella	Yes	10%	No	-	No	

Table D.2: Equality of the estimates after correcting only for measurement error across clusters.

Commodity	Estimates corrected only for Measurement error [kebele Vs wereda]	Signifi-cance level	Estimates corrected only for Measurement error [kebele Vs city]	Signifi-cance level	Estimates corrected only for Measurement error [wereda Vs city]	Signifi-cance level
Teff	No	-	Yes	1%	Yes	1%
Wheat	No	-	No	-	No	-
Cereals	Yes	1%	Yes	5%	Yes	1%
Pulses	No	-	Yes	1%	Yes	5%
Shiro	Yes	5%	Yes	5%	No	-
Fruits & Vegetables	Yes	1%	Yes	1%	No	-
Meat	Yes	1%	Yes	1%	No	-
Milk & Butter	Yes	1%	Yes	1%	Yes	1%
Oil	Yes	1%	Yes	5%	Yes	10%
Spices	Yes	1%	No	-	No	-
Coffee	Yes	1%	Yes	1%	No	-
Sugar	No	-	No	-	No	-
Tella	No	-	No	-	No	-

Table D.3: Equality of the estimates after correcting for measurement error and quality effects across clusters.

Commodity	Estimates corrected for Measurement error and quality effects [kebele Vs Wereda]	Signifi-cance level	Estimates corrected for Measurement error and quality effects [kebele Vs city]	Signifi-cance level	Estimates corrected for Measurement error and quality effects [wereda Vs city]	Signifi-cance level
Teff	No	-	Yes	1%	Yes	5%
Wheat	No	-	Yes	1%	Yes	1%
Cereals	Yes	1%	No	-	Yes	1%
Pulses	Yes	10%	Yes	1%	Yes	5%
Shiro	Yes	10%	Yes	5%	No	-
Fruits & Vegetables.	Yes	1%	Yes	1%	No	-
Meat	Yes	1%	Yes	1%	No	-
Milk &Butter	Yes	1%	Yes	1%	Yes	1%
Oil	Yes	1%	Yes	1%	Yes	10%
Spices	Yes	1%	No	-	No	-
Coffee	Yes	1%	Yes	1%	No	-
Sugar	No	-	No	-	No	-
Tella	Yes	1%	Yes	5%	Yes	10%

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Research Fellows (Internal)

Simon Appleton – poverty, education, households
Adam Blake CGE models of low-income countries
Mike Bleaney - growth, international macroeconomics
Indraneel Dasgupta – development theory
Norman Gemmell – growth and public sector issues
Ken Ingersent - agricultural trade
Tim Lloyd agricultural commodity markets
Paula Lorgelly – health, gender and growth
Andrew McKay - poverty, peasant households, agriculture
Chris Milner - trade and development
Wyn Morgan - futures markets, commodity markets
Christophe Muller – poverty, household panel econometrics
Tony Rayner - agricultural policy and trade

Research Fellows (External)

V.N. Balasubramanyam (*University of Lancaster*) – foreign direct investment and multinationals
David Fielding *(Leicester University)* - investment, monetary and fiscal policy
Göte Hansson (*Lund University*) – trade, Ethiopian development
Robert Lensink *(University of Groningen)* – aid, investment, macroeconomics
Scott McDonald *(Sheffield University)* – CGE modelling, agriculture
Mark McGillivray *(RMIT University)* - aid allocation, human development
Jay Menon *(ADB, Manila)* - trade and exchange rates
Doug Nelson *(Tulane University)* - political economy of trade
Shelton Nicholls *(University of West Indies)* – trade, integration
David Sapsford (*University of Lancaster*) - commodity prices
Eric Strobl *(University College Dublin)* – labour markets
Finn Tarp *(University of Copenhagen)* – aid, CGE modelling
Howard White *(IDS)* - aid, poverty