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HOUSEHOLDS' DEMAND IN ALBANIA: MEASURING THE EFFECTS OF INCOME AND PRICE SHOCKS TO CONSUMER DEMAND USING MICRO DATA

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Note: The views expressed in this paper are those of the author and do not reflect the views of the Bank of Albania.

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ABSTRACT

This paper applies a Quadratic Almost Ideal Demand System in Albanian pooled cross-sections data of almost 9000 households for the period 2005-2012. We bring together a comprehensive demand system composed of eight commodity groups matching the Institute of Statistics' ECOICOP good classification: food, alcohol and tobacco, clothing, utilities, household goods, transportation, entertainment and other goods to obtain income compensated, uncompensated and cross-price price elasticities for each of these commodities. The results suggest that food, utilities and personal care are necessities while all other expenditure groups are considered luxuries by Albanian households. On the other hand, price elasticity estimates suggest that expenditures for food, utilities, alcohol and tobacco are inelastic while households easily substitute their expenditures between entertainment, transport and household items if one of the prices increase. We use our estimates to argue about the impact of regulated price changes on consumer demand and discuss the further potential use of our results.

Keywords: Household Demand, Income Elasticity, Price Elasticity, Regulated Prices

1. INTRODUCTION

Both common sense and economic analysis suggest that changes in income and prices can normally be expected to alter the ways in which consumers spend their money. But by how much? How will the consumers react to an increase in food prices? How will the consumers spend the additional money if their income rises?

Elasticities are a useful concept to describe these relationships. Estimation of demand systems allows economists to compute demand elasticities for composite or individual commodities. Measuring the elasticities and being able to shape the demand curves and the Engel's curves help to understand and predict the behaviour of consumption if the economic conditions of households change.

At the macro level, the consumption patterns and the trends have been discussed extensively during the recent years in Albania. On the other hand, it is well-known that utility-based consumer demand equation derived at the micro level do not hold at the macro level, except when imposing highly restrictive assumptions (Stocker, 1984, 1986, 1993). In particular, price and expenditure elasticities are subject to "aggregation bias". That is to say, elasticities calculated at mean income using macro data are in general, different from corresponding elasticities calculated using micro data (Denton, Mountain, 2004).

Analysis based on individual data may contribute to improved understanding of consumer behaviour, greater precision of estimated parameters, and better forecasting and simulation outcomes. So far, consumers demand in Albania at the micro level has not received sufficient attention in research. Dushku and Çami (2017) have measured the marginal propensity to consume out of income and real wealth using micro data, yet their paper does not explore the relationship between consumption and prices and on the other hand does not analyse the relationship between consumption and income for disaggregated budget components.

Moreover, the role of regulated prices in every economy is crucial. Adjustments in regulated prices do not appear every year, but if they do appear they can be of significant size, with crucial implications for overall inflation. On the other hand, the absence of an increase in the regulated prices can have a negative impact in inflation as well. Thus, understanding the impact of regulated prices on consumer demand is important for both, forecasting and for policy decisions.

In Albania, regulated prices have always been an important contributor and driver of inflation. Until 2009, regulated prices were one of the main contributors in inflation (Bank of Albania, 2006, 2007, 2008, 2009). In 2009, the low level of annual and base inflation - respectively 2.2 and 1.3% in average terms for the year - reflected the base effect from the comparison with the high level of prices of the previous year and the reduction on a broad basis of internal inflationary pressures in the context of the economic

downturn and the lack of growth in administered prices (Bank of Albania, 2010). Starting from 2011, the contribution remained low at 0.1pp of total inflation accompanying a low level of annual and base inflation as well (Bank of Albania, 2011, 2012, 2013).

Therefore, the aim of this study is to build and estimate a household demand system which must incorporate an investigation into the effects of changes in income and prices, taking into account household heterogeneity related to demographics and composition while being consistent with demand theory. The main focus of our analysis is to provide estimates of both own- and cross-price and income elasticities, which can be used among other things when analysing the impact of exogenous price changes, especially regulated prices on consumer demand.

The chosen model to be estimated is the Quadratic Almost Ideal Demand System developed by Banks et al. (1997), a new cutting-edge model in deriving uncompromised demand and non-linear Engel curves. This model has shown to be consistent with the observed expenditure patterns of individual consumers in a long time series of expenditure surveys and is also able to provide a detailed welfare analysis of shifts in relative and exogenous prices (Banks et al. 1997).

The estimation of the QUAIDS begins with building a system of equations to be estimated from cross-section data on the purchases of many households. The functions of the system developed here are applied to the data obtained from the Living Standards Measure Survey (LSMS) conducted by the National Statistics Institution of Albania (Instat). The wide variety of households in the LSMS sample allows cross-section data to provide a rich diversity of income, expenses, and demographic attributes of households. Our final sample equals 8714 households.

Our results on income elasticities suggest for food, utilities and personal care are the necessities. All other expenditure groups are considered luxuries by Albanian households. Moreover, price elasticity estimates suggest that expenditures for food, utilities and alcohol and tobacco are inelastic, as theory would suggest, because

these commodities have few to no substitutes. The expenditures for "luxury" goods and services[1], particularly those for entertainment, household items and transportation behave as substitutes to each-other with estimated cross-price elasticities higher than two. This implies that if the price of one of these commodities increases, the households easily allocate their budget to the other two commodities. The elasticities also suggest that there exists a substitution effect between food and utilities with the other commodities but this effect is very small meaning that this effect although present is very weak.

On the other hand, QUIADS estimates enable us to predict how consumption patterns will shift if income or prices change through simulating and forecasting the composition of future purchase patterns. In this paper we have simulated a 10% increase in total household expenditures and a 30% increase in energy prices and predicted how the budget shares are going to change. A 10% increase simulation in total expenditures is going to decrease the share of food and utilities and increase the share of the other luxury goods especially transport and entertainment. On the other hand, if we simulate a 30% price increase in energy prices (exogenous), keeping everything else constant, the combination of low budget elasticity and low own-price elasticity suggests that households need energy whatever the level of their income, and do not reflect price developments significantly: the effects of a change in regulated energy prices on other commodities are estimated to be very limited.

The paper is structured as follows: in Section 2 we present a background on demand modelling and some empirical suggestions. In Section 3 we present the theoretical QUIADS model, assumptions and estimation. In Section 4 and 5 we present the data and results and finally in Section 6 the conclusions.

[1] Here we define as luxury all expenditures with an income demand elasticity larger than 1.

2. THEORETICAL AND EMPIRICAL BACKGROUND

2.1 BACKGROUND ON DEMAND MODELING

Estimation of systems of demand functions was at the forefront of applied economic research for the majority of the 20th century. Research was centred on discovering the laws governing consumer preferences and the operations of markets (Brown and Deaton, 1972). Attention was also given to the measurement of elasticities and to the problem of specifying flexible and easily testable functional forms consistent with utility theory. For the past 50 years this literature has grown considerably, and at this point in time it is therefore hard to provide a complete historical survey of applications of demand theory. Attention will for that reason be restricted to a few notable contributions.

The origins of quantitative studies on consumption patterns of households goes back to the publication of a quantitative study done by Ernst Engel (1821-1896) in the year 1857 (Houthakker, 1957: 532-551). Since this first empirical evidence was introduced, the research literature has explored various demand model in the attempt to estimate unbiased Engel's curves/framework. The first empirical examination of a system of demand equations is due to Leser (1941), who estimated income and price elasticities for six consumption categories based on U.S. data. More than a decade later, Stone (1954) was the first to estimate the linear expenditure system (LES) proposed by Klein and Rubin (1947-1948), which quickly became the benchmark model for empirical demand analysis. Ever since, there has been a continuous flow of research examining alternative and more flexible demand system specifications.

In 1965, Henri Theil proposed what has come to be known as the Rotterdam model, which approaches demand analysis in a probabilistic manner (Theil, 1965). The model is linear in parameters and allows theoretical constraints derived from utility theory to be easily imposed and tested. A decade later, Christensen, Jorgenson

and Lau (1975) established one of the two current standards for applied demand analysis, the transcendental logarithmic (translog) demand system.

Next, the most used model until the 90s-00s was developed by Deaton and Muellbauer (1980), based on a log-linear demand system called the Almost Ideal Demand System or AIDS. Its title stems from the six properties associated with the system, which together make it almost ideal for applied work: (i) it gives an arbitrary first-order approximation to any demand system, (ii) it satisfies the axioms of choice exactly (cf. e.g. Deaton and Muellbauer (1980b, ch. 2.1)), (iii) it aggregates perfectly over consumers, (iv) it has a functional form which is consistent with household budget data, (v) it is simple to estimate (provided the linear approximation is adopted), and (vi) it can be used to test the theoretical restrictions of homogeneity and Slutsky symmetry by means of linear restrictions on the parameters.

Unfortunately, the AIDS has bias in the estimation of the Engel curves due to its inflexible built in shape that would not allow for a "hump" shape for certain budget shares. Because of these reasons, Banks et al. (1997) introduced the Quadratic Almost Ideal Demand System (QUAIDS) by adding a quadratic term of log income (expenditure) to the classic AIDS model and showed that no additional degree of dependence on log income is needed. This preserves the flexibility of the empirical Engel curve findings while permitting consistency with utility theory and is shown to provide a practical specification for demands across many commodities, allowing flexible relative price effects.

2.2 EMPIRICAL LITERATURE

So far, as mentioned, there is no estimate of demand elasticities using Albanian data, but elseways, there are a vast majority of papers and also theoretical literature worldwide that have calculated income and price elasticities for a wide variety of expenditure groups which can serve as benchmarks to our estimations. In fact, the theoretical and empirical literature both suggest and converge to similar estimates for these elasticities.

Engel, up front suggested for a food income elasticity of 0.878 (Engel, 1857). Furthermore, according to Engels's law, poorer households devote a higher share of income to food than richer households. It could be understood as the proportion of income spent on food declines as income increases, implying that "food is a necessity whose consumption rises less rapid than does income". Deaton and Muellbauer applying their AIDS model suggested for a food income elasticity of 0.21 and also for a clothing income elasticity of 2, drink and tobacco income elasticity of 1.22 and transport income elasticity of 1.23. Banks et al. (QUAIDS model) found a food income elasticity of 0.57 and also that it's Engel curve has "inverted U shaped" properties. On the other hand, clothing (1.14) and alcohol (1.27) are found to be luxuries.

In the article of Houthakker (1957) one can find estimated elasticities for 30 plus countries, including different regions and periods, on food, clothing, housing and miscellaneous goods. Income elasticity of food falls within the range of 0.4-0.6 for richer countries and of 0.7-0.9 for poorer countries (Houthakker, 1957). This is also a good representation of the Engel's law mentioned above for food consumption. Furthermore, clothing is considered a luxury only in poor to middle income countries (Houthakker, 1957). The main reason for these estimates is that consumers in rich countries devote less than 20 percent of their budget to food, while this rises to more than 50 percent in the poorest countries (Clements et al. 2004).

In regard to the price elasticity of demand, theory suggests that goods that have few to no substitutes display high inelasticity to price changes. Classic examples to this are bread, tobacco, electricity, fuel, gas etc. The opposite is true for goods that have many substitutes. (Frank, 2008). Deaton and Muellbauer (AIDS) have found a food price elasticity of 0.57. Banks et al. (QUAIDS model) have found a food price elasticity of 0.78 and fuel of 0.47 which are both inelastic whereas demand for clothing (1.04) and alcohol (1.53) is found to be elastic.

An overview study by Lewbel (1997) provides estimates of own-price elasticities for food and clothing coming from influential studies

conducted between 1954 to 1997 and applying different types of models (LES, AIDS, Translog QES, and QUAIDS). In the case of food, the estimated own-price elasticities range from -0.40 to -0.96. In the case of clothing, the elasticities range between -0.48 and -1.38. Another overview study by Blundell (1988) provides estimates for budget and price elasticities for different types of households. The average estimated budget elasticities are about 0.6, 0.3, 1.3, and 1.2 for food, fuel, clothing, and transportation, respectively. Concerning uncompensated price elasticities, Blundell (1988) estimated -0.45, -0.74,-0.84, and -0.7 on average for the same set of commodities. Again, our estimates tend to be in line with these results.

The QUAIDS itself has been applied extensively since it was first introduced in 1997 and has turned itself into a classic model that academia and central banks are using today for estimating demand systems. All these new articles find similar estimates to what theory and earlier studies have suggested. Blow, Lechene and Levell (2015) find an income elasticity for entertainment higher than two whereas expenditures for food, utilities and fuel are inelastic. A similar paper of the Czech National Bank (Dybczak et al. 2010) ran the same model and found out that food, utilities and personal care are necessities with estimated elasticities of 0.894, 0.582 and 0.869. Furthermore expenditure on energy and transportation and communication resulted to be the most affected by changes in their own prices. On the other hand, they have extended the use the QUAIDS to analyse and explain other issues related to consumer demand. Dybczak et al. (2010) have used the QUAIDS estimates to simulate the reaction of the budget shares toward a 30% in regulated prices and found out that the decisions on consumption are strongly impacted by electricity, gas and health care prices increase. Rondinelli (2015) estimated the elasticities before and after the crises of 2008 and found out that the proportion of total expenditure geared toward the satisfaction of basic and difficult to compress needs is higher the lower is disposable income.

3. QUADRATIC ALMOST IDEAL DEMAND SYSTEM

3.1 QUAIDS AND ELASTICITIES

The QUAIDS, developed by Banks et al. (1997), is an extension of the classical AIDS model of Deaton & Muellbauer (1980) allowing for a quadratic behaviour of household expenditures towards income. The authors derive a class of demand systems of rank 3 that have log income as the leading term in an expenditure share model and an additional higher order income term. Banks et al. (1997) argue that a quadratic logarithmic term is sufficient to explain the behaviour towards consumption while assuring consistency with utility theory and allowing flexible relative price effects for demand across many commodities.

Under QUAIDS, the i-th budget share (w_i) equation for household h is given by:

$$w_{ih} = \alpha_i + \sum_{j=1}^{n} \gamma_{ij} lnp_j + \beta_i ln\left\{\frac{x_h}{a(p)}\right\} + \frac{\mu_i}{b(p)}\left[ln\left\{\frac{x_h}{c(p)}\right\}\right]^2 \qquad (1)$$

where $\mathbf{i=1,\ldots, n}$ indicates good i and $w_{ih}= p_{ih} q_{ih})/x_h$

You may find the derivation in Section A1 in the Appendix.

The restrictions that are required to make the model consistent with the theory of demand are the adding-up restrictions, the homogeneity restriction and the symmetry restriction. "k" can be interpreted as a sophisticated measure of household size, which in principle could take account of age composition and other household characteristics and which is used to deflate the budget x, m to bring it into "a needs corrected per capita levels".

The adding-up restrictions ensure that the sum of budget shares equals one. They are defined as following:

$$\sum_{i=1}^{n} \alpha_i = 1 \qquad \sum_{i=1}^{n} \gamma_{ij} = 0 \qquad \forall j$$

$$\sum_{i-1}^{n} \beta_i = 0 \qquad \sum_{i} \mu_i = 0 \qquad (2)$$

The homogeneity restriction implies that the budget share function should be homogeneous of degree zero in $\mathbf{p}$ and $\mathbf{x}$ or:

$$\sum_{j} \gamma_{ij} = 0 \qquad \forall i \qquad (3)$$

And finally the symmetry restriction:

$$\gamma_{ij} = \gamma_{ji} \qquad (4)$$

The adding-up restriction can be implied while solving the system by estimating **n-1** equations and calculate the remaining coefficients of the n-th equation using the condition. The homogeneity restriction can be tested for each equation separately or it can be imposed by the use of relative prices and the symmetry can be tested through a x^2 test.

The negativity condition cannot be insured by any restriction on the parameters alone but the resulting Slutsky matrix can be tested for negative semi-definiteness. On the other hand, if some goods happen to be Giffen or the externalities of the model are important, we would not expect the negativity restriction to be fulfilled.

As the coefficients generated by the model are difficult to interpret, we are going to report the income and price elasticities. The QUAIDS helps calculate the price elasticity of demand. A measure of the responsiveness of purchase decisions to small changes in price. We will also yield the income elasticity of demand, a measure of the responsiveness of purchase decisions to small changes in income. Finally, even though of little interest, we will be able to calculate the cross-price elasticities, which is a measure of responsiveness of the quantity demanded of one good to small changes in the price of

another good. Cross-price elasticity is the criterion by which pairs of goods are classified as being either substitutes or complements. If the elasticity is positive, than the goods are substitutes and if the elasticities are negative, the goods are complements [Frank, (2008)].

We are going to calculate two types of price elasticities: compensated and uncompensated. The Uncompensated (Marshall-ian) demand curve deals with how demand changes when price changes, keeping income and utility constant. The Compensated (Hicks-ian) demand curve deals with how demand changes when price changes, holding utility constant (Frank, 2008).

The derivation of the QUAIDS income, compensated and uncompensated price elasticities can be also found in section A1 in the Appendix.

3.2 FURTHER MODEL ASSUMPTIONS

Apart from the restrictions showed above, there are several conditions that need to hold for the model to be consistent.

One of the most important requirements is that each household (consumer) is faced with fixed prices i.e not dependant on the total of demanded quantity.

Second we have to assume weak separability:

(1) Between goods included and excluded from the model (ex. work and leisure),
(2) Weak separability of preferences between goods in any two periods. This assumption is supported by the two-stage decision making process and the life-cycle theory where households first distribute consumption over time (savings) and then allocates the remaining income in given periods between goods and services (what it may be called multi-stage budgeting).
(3) Weak separability between durables and non-durables. Durable goods are considered savings or investment and therefore are not concerned in the second stage of decision making process and the life-cycle theory. In our model we exclude any known durable goods and consider only the non-durable and semi-durable goods.

In this paper we discuss and assume that the decision making process on the side of demand is not done by individuals but rather by the household as a whole. We consider the household to be the best option of a unit for demand analysis.

4. DATA

4.1 THE LIVING STANDARD MEASUREMENT SURVEY

A significant share of demand analysis literature uses cross-sectional data from micro-level household surveys to estimate demand systems including QUAIDS. To estimate the model we use a pool of repeated cross-sections from the Living Standards Measure Study (LSMS) of 2005, 2008 and 2012.

The LSMS is a survey conducted by the National Statistics Office (INSTAT), with a frequency of 4 years, conducted for the first time in 2002. The survey contains a wide range of information on several living aspects of Albania and gathers information at the individual and household level. Thus, it contains information on comprehensive and detailed lists of consumption items and household characteristics including the head's background. The sample is representative at national level as well as at the regional and urban/rural level.

Using established Instat guidelines from the official basket of the inflation and CPI estimation methodology (Instat uses the COICOP classification), we consider the following eight groups of commodities: food, alcohol and tobacco, clothing, utilities, household goods, transportation, entertainment and other goods (here: personal care). For more details on how the goods and services are grouped please refer to Table A1 in the Appendix.

We have excluded the groups of "education expenses" and "hotels and restaurants expenses". The first, due to the fact that education expenses require more specific modeling and the later due to the fact this information is not available in the survey. On the other hand, we argue and assume that the exclusion of these

budget shares do not impact significantly our system estimates as they constitute only a small percentage share to total consumption [for more see aggregate consumption data provided by the institute of statistics]. Furthermore, we have excluded all durable goods, due to the model assumption of weak separability between durables and non-durables.

Data on food expenditure are collected by means of a 14-day diary which provides information on food eaten inside and outside home, non-purchased goods and goods that were bought prior to the reference period. Data on utilities are reported for 1 month and include: electricity, water, gas, fuel, telephone (both landline and mobile) and rent. Other goods and services are reported on a 1, 6 and 12 month basis.

We assume that consumption in a month is a good representation of consumption for the following 11 months. Thus, we have multiplied by 26, 12 and 2 respectively the 14-day, 1 month and 6 month data in order to work on annual data[2].

As per the household annual income variable we use the total monthly self-reported income of the household multiplied by 12. We acknowledge that this variable includes some limitations due to the predisposition of households to under-report this information especially in the upper part of the income distribution (Moore et al. 2000).

In order to insure comparability, all monetary variables have been adjusted for prices and household size and also weighted for cost of living differences between regions.

Furthermore, the household characteristics that have been included in the QUAIDS estimation are: head education as a control for permanent income, dummy for the residence size as a control for housing wealth, head of the house age as a control for consumption smoothing, dummy on urban/rural area, head sex, marital status, number of children living in the household, all to control of preferences based on the lifestyle and subjective poverty as a control for perceptions. Based on the theoretical and empirical

[2] We are using annual price data.

literature, these are all factors that significantly contribute in consumption decisions of households and therefore in the individual demand for goods and services.

We also tested what is considered two crisis dummy variables, one for 2008 and one for 2012 were in the case of Albania it was observed a decrease in aggregate consumption. According to descriptive statistics and also from running the model twice including these dummies one at a time, the consumption patterns do not seem to change dramatically and significantly during these years. Therefore we decided that there is no reason for the inclusion of a crisis dummy in our model.

In table A.2 in the Appendix are presented all the main and control variables used in the estimation with their description.

In order to avoid the biased outcomes of our estimates, some adjustments of the data used had to be performed in order to pre-maintain a healthy degree of homogeneity (König, Dovalova, 2016).

First, the households that have not reported on their income and expenditure were excluded and all missing values were dropped in order to obtain a balanced pool.

Second, we want to track the expenditure activity of only the households with a possible or potentially economically active head excluding households whose members have retired. For this purpose we have omitted observations for the households the heads of which are younger than 25 and older than 62 years.

Third, due to the existence of extreme values (outliers) in the net expenditure observations we have decided to exclude households with the net total expenditure lower than the 5th and higher than the 95th percentile. Also, we have dropped all observations below the first and above the last percentile in each commodity group in order to avoid bias arising from the presence of outliers in price indexes.

Our final sample consists of 8714 households over 3 annual price points.

Below we present the descriptive statistics of our pooled sample. For a detailed table for each year please refer to Section A2 in the Appendix.

Table 4.1 Descriptive Statistics (All obs.)

	Mean	St. Dev	Min	Max
Food Share	0.606	0.125	0.157	0.937
Alcohol and Tobacco Share	0.036	0.05	0	0.346
Clothing Share	0.055	0.044	0.001	0.396
Utilities Share	0.172	0.074	0.022	0.527
Household Items Share	0.054	0.038	0.002	0.372
Transportation Share	0.031	0.055	0	0.491
Entertainment Share	0.005	0.012	0	0.147
Other Goods Share	0.037	0.028	0	0.263
Total Expenditure	432923	130695	214843	815577
Urban Dummy			0	1
Square meters dummy			0	1
Head of the household Age	44.5	8.167	25	62
Head Education			0	1
Subjective Poverty	4.74	1.79	1	10
Head Sex			0	1
Marital Status			0	1
Number of children	2.051	1.18	0	6

*the budget shares and total expenditure are expressed in per capita
Source: Author's calculations

4.2 PRICE DATA

A common limitation with cross-sectional data is the lack of price information, an important variable in estimating demand systems. Lewbel (1989) developed an approach for the construction of household level commodity price indices (Stone-Lewbel prices) using only budget shares and CPIs of the goods comprising the commodity groups. He treats prices just as costs of living of a certain household.

The use of SL prices in demand estimations in comparison to using only CPI data is more precise and economically plausible [Hoderlein and Mihaleva (2008)] as it does account for spatial and household variability [Slesnick (2005)].

The prices used to calculate the SL prices are the CPI prices calculated by Instat for the corresponding periods. The CPI contains prices of around 150 categories according to the ECOICOP classifications. The time period for which the CPI is measured ranges from a month to a year. We use only the annual average prices reported which seem to complement our annual data better (we are not sure of the month the data on consumption is reported) but also have be proven to produce more significant estimates [Castellon et al. (2012)].

The prices are first computed for each commodity as weighted average of prices from the CPI with weights being the expenditures. The aggregated prices are then computed for each bundle with weights being expenditures of all the households. Finally, in the estimation the aggregate prices are used as they reflect the market effects on the demands rather than a shift in taste.

5. ESTIMATION

5.1 METHOD

We estimate the equation:

$$w_{ih} = \alpha_i z_i + \sum_{j=1}^{n} \gamma_{ij} lnp_j + \beta_i z_i ln\left\{\frac{x_h}{a(p)}\right\} + \frac{\mu_i z_i}{b(p)}\left[ln\left\{\frac{x_h}{c(p)}\right\}\right]^2 + \varepsilon_i \qquad (5)$$

Where $\mathbf{z}_i$ is the coefficient estimated of other household characteristics. Notice in (1) that demographics and other household characteristics could be allowed to enter all terms as in (5).

We use Lecocq and Jean-Marc (2015) approach to estimating QUIADS. This method is used to estimate the AIDS and QUAIDS using Blundell and Robin's (1999) iterated linear least-squares (ILLS) estimator. Although nonlinear, almost-ideal (AI) demand models,

as most popular parametric demand systems, share a common property: they are conditionally linear. That is, they are linear in all the parameters conditional on a set of functions of explanatory variables and parameters. Browning and Meghir (1991) exploited this conditional linearity to construct a simple ILLS estimator for the AI demand model, and Blundell and Robin (1999) generalized it and derived the conditions for its consistency and asymptotic normality. Blundell and Robin (1999) also showed how to account for the endogeneity of total expenditure by using the instrumental-variable (IV) and augmented regression techniques of Hausman (1978) and Holly and Sargan (1982).

The first stage of the QUAIDS involves estimating a first-step budgeting equation, where consumers make a choice about how much of total expenditure will be devoted to food, conditional on the consumption of non-food goods and services, and household's demographic and socio-economic characteristics.

We estimate **n-1** equations and use the formulas of the adding-up restriction to calculate the coefficients of the n-th (8-th) equation. We impose the restrictions of homogeneity restriction of the model using relative prices when solving and finally test for the symmetry restriction on the estimated coefficients.

The standard errors are bootstrapped with no limitation on iterations.

As a final step we calculate the income and price elasticities based on the coefficients estimated as explained in section 3.2.

5.2 RESULTS

Table 5.1.1 below presents the QUAIDS income demand elasticities and in tables 5.1.2 and 5.1.3 the uncompensated (Marshall) and compensated (Hicks) demand price elasticities. The model estimates can be found in Table A2 in the Appendix. Furthermore, in the same table are presented the results of the χ^2 test on the symmetry requirement. The p-value of the χ^2 test equals

0.2016, not rejecting the hypothesis that symmetry is present. As we have intentionally imposed the model the other two assumptions, we can say that our model is consistent with demand theory and we can move on with the elasticity interpretation.

First and foremost, as mentioned, the QUAIDS allows for the possibility to incorporate a quadratic term of income to test for the non-linearity of the behaviour of expenditures. In our case, we cannot find a significant quadratic behaviour of demand and this is true for all budget shares including food expenditures (This means that applying an AIDS model instead of a QUAIDS model would yield the same elasticity estimates).

Table 5.1.1: Income Elasticities

Commodity	Expenditure Elasticity
1. Food and non-alcoholic beverages	**0.89**
2. Alcoholic beverages and tobacco	1.10
3. Clothing	1.17
4. Utilities	**0.83**
5. House Items	1.18
6. Transportation	1.10
7. Entertainment	1.91
9. Other items	**0.98**

Source: Author's calculations

Moving on to table 5.1.1 according to the estimations, (1) food and non-alcoholic beverages (2) utilities and (3) other items (here: personal care) can be considered necessities for households (elasticity <"1"). All other budget components have an elasticity higher than "1" suggesting that all of these goods are considered luxuries. The higher the elasticity, the more the commodity is a luxury purchase for the mean household. Furthermore, all actions that would increase the cost of purchasing the luxury goods would increase the inequality in the population [Ray and Vatan (2013)]. The opposite would decrease inequality and increase the welfare of the low-middle income household as it will be able to afford with more ease a more expensive and diversified bundle.

As regarding the own-price elasticities of demand, they are located in the diagonal line in bold of tables 5.1.2 and 5.1.3 and the cross-price elasticities in the rest of the table. As mentioned before, the Uncompensated (Marshallian) demand curve (5.1.2) deals with how demand changes when price changes, holding money income constant. The Compensated (Hicksian) demand curve (5.1.3) deals with how demand changes when price changes, holding "real income" or utility constant. And finally, the Slutsky equation says that the total (Marshallian) price effect is equal to the sum of the substitution effect (i.e., Hicksian price effect) plus an income effect.

The Marshall and Hicks elasticities of demand estimated using our data are negative meaning that an increase in the price of the good will decrease the quantity purchased of that good. This means that all our commodities display properties of "normal goods". In fact we do not expected any of these commodities to act like Giffen goods even though some of the items that compose the observed budget share definitely are Giffen. These elasticities are also larger than the cross-prices elasticities as one would theoretically expect as demand for one good is expected to be more sensitive towards the changes in price of that good rather than towards changes in prices of its complements or substitutes (Frank, 2008). Elastic goods and services generally have plenty of substitutes. As an elastic service/good's price increases, the quantity demanded of that good can drop fast. Inelastic goods have fewer substitutes and price change doesn't affect quantity demanded as much. Furthermore, the elasticities display different but very similar values were the Hicks elasticities are slightly lower than Marshall's elasticities due to the income compensation. As a conclusion, we can say that the elasticities generated using our data are consistent with utility and demand theory explanations.

As concerning the elasticities themselves, the own-price estimates indicate for the demand for food, alcohol, tobacco and utilities are inelastic as theory would argue as these goods have few to no substitutes. The own-price elasticity for alcohol and tobacco is slightly larger at 0.7-0.75 but this is possibly due to the "alcohol" component which has a few substitutes in comparison to tobacco which has no substitutes.

On the other hand, the demand for the other commodities but especially for, transport and entertainment is highly elastic suggesting that the households easily move away from the consumption of these goods if their price increases and vice-versa. This goes hand in hand with the estimated income elasticities of demand. As suggested from the compensated price elasticities the income impact is not as significant as in the case of the inelastic goods.

Table 5.1.2: Marshall (uncompensated) price elasticities

Commodity	1	2	3	4	5	6	7	8
1. Food and.	**-0.237**	0.140	0.077	0.043	0.097	0.102	0.091	0.199
2. Alcoholic bev.	0.123	**-0.754**	0.382	0.047	0.370	0.492	0.536	0.513
3.Clothing	0.023	0.337	**-2.482**	0.045	1.759	0.174	2.201	1.186
4. Utilities	0.099	0.085	0.045	**-0.161**	0.064	0.074	0.069	0.069
5. House Items	0.102	0.321	1.185	0.145	**-2.552**	1.222	2.246	1.23
6. Transportation	0.196	0.587	0.958	0.103	1.421	**-3.676**	2.458	0.438
7. Entertainment	0.107	0.866	2.217	0.155	2.685	2.803	**-4.161**	0.988
8. Other items	0.111	0.529	1.306	0.122	1.363	0.387	0.451	**-1.388**

Source: Author's calculations

Table 5.1.3: Hicks (compensated) price elasticities

Commodity	1	2	3	4	5	6	7	8
1. Food and.	**-0.231**	0.138	0.074	0.042	0.094	0.100	0.091	0.197
2. Alcoholic bev.	0.123	**-0.702**	0.385	0.045	0.373	0.492	0.536	0.513
3.Clothing	0.023	0.338	**-2.222**	0.045	1.754	0.173	2.203	1.186
4. Utilities	0.097	0.084	0.041	**-0.151**	0.061	0.073	0.068	0.067
5. House Items	0.101	0.327	1.188	0.145	**-2.449**	1.222	2.247	1.231
6. Transportation	0.195	0.587	0.958	0.103	1.421	**-3.645**	2.458	0.439
7. Entertainment	0.107	0.866	2.217	0.155	2.685	2.803	**-3.393**	0.952
8. Other items	0.111	0.532	1.306	0.122	1.365	0.39	0.471	**-1.385**

Source: Author's calculations

Finally, in economics, the cross elasticity of demand or cross-price elasticity of demand measures the responsiveness of the quantity demanded for a good to a change in the price of another good, ceteris paribus. If the elasticity is positive, than the goods are substitutes and if the elasticities are negative, the goods are complements. Moreover, the higher the elasticity the stronger the relationship between the goods.

The cross-price elasticities estimated using our data suggest that expenditures for luxury goods and especially those for entertainment, household and transportation behave as substitutes to each-other with an elasticity higher than 2. This suggests that if the price of one luxury item increases, the households are going to substitute it with another luxury item very easily. The cross- price elasticity of these commodities with food and utilities is positive, meaning that if the price of food increases the consumption of the "luxury items" is going to increase but the elasticity is very small meaning that the substitution effect is in fact modest and not pronounced.

5.1.1 THE IMPACT OF REGULATED PRICES ON THE BUDGET COMPOSITION

In Albania, regulated prices, in particular energy prices, have always been an important contributor and driver of inflation.

During 2005-2008 Albania faced an energy crises related to scarcity in production and consumption of electricity. This was accompanied by high prices of alternative sources like fuel and its by-products. Therefore electricity had to be imported in 2007, but on the other hand, the prices did not increase until 2008 by 0.8% following the imports. The rise in the price of energy, added to the impact of domestic inflationary pressures on consumer price developments especially on the non-tradable sector of goods and services at 3.7%. The size and simultaneous occurrence of these shocks were reflected in high inflation rates during the first half of the year (Bank of Albania, 2007, 2008).

In 2009, the low level of annual and base inflation - respectively 2.2 and 1.3% in average terms for the year - reflected the base effect from the comparison with the high level of prices of the previous year and the broad-based reduction of domestic inflationary pressures in the context of economic slowdown and lack of growth in administered prices. The prices of "administered prized goods" showed an unusual behaviour during 2009. For the first time in the last ten years, the annual inflation of this category was negative (on average -2.2%) until September (Bank of Albania, 2009).

In the first half of 2011, it was reflected as the end of the electricity price increase effect in January 2010 and of some other commodities (water, medical services, etc.) The category "Regulated Price Goods" contributed only 0.1 percentage points to total inflation. The contribution of this category, which in the past gave a strong positive contribution to inflation, was minimized throughout 2012 due to the non-changing electricity tariffs of about two years. Other regulated prices, in general, continue to make a low contribution to the value of annual inflation (Bank of Albania, 2011, 2012). These effects are still present to this day (Bank of Albania, 2013, 2014, 2015, 2016, 2017).

In regard to our model, having estimated the parameters of the quadratic demand system and the income and price elasticities, we can quantify the expected effects of changes in commodity prices and in the level of consumption expenditure on the budget shares of, expenditure on, and demand for specific commodity groups. The model estimates are applied to scrutinize the effect of adjustments in regulated prices on consumer demand for eight commodity groups. As regulated prices are set by the regulatory authority and these prices are not further adjusted by market forces, i.e., regulatory prices are exogenous, it is appropriate to use the QUAIDS model to simulate their impact on consumer demand.

For the purpose of this exercise, we have decided to simulate a 10% increase in total expenditures (assuming that income has increased) and a 30% increase in regulated energy prices, as apparently it has had the most impact in inflation and base inflation in the case of Albania. This exercise can be easily conducted even for other regulated prices but also for other non-regulated prices that the researcher is interested in.

To solve this exercise first, we quantify the share of the regulated energy prices in the specific commodity bundle (in this case utility). Second, we quantify how a 30% change in this price translates into the price of a specific commodity bundle. Third, applying the estimated elasticities we quantify the impact on consumption shares, before and after the change was introduced. For more information on the procedure, please refer to the paper of Dybczak et al. (2010).

In the table 5.1.1.1 below we have presented the results of both our simulations in column "3" and "4" and the average budget composition of our pooled cross-section for comparison in column "1".

Table 5.1.1.1 Simulation by 10% increase of total expenditures and 30% increase in energy prices

	Avg. 2005-2012	10% increase in total expenses	30% increase in energy prices
1.Food	0.607	0.602	0.608
2.Alcohol and Tobacco	0.037	0.038	0.037
3.Clothing	0.054	0.056	0.053
4.Utilities	0.172	0.170	0.172
5.Household Items	0.054	0.055	0.054
6.Transportation	0.031	0.035	0.031
7.Entertainment	0.005	0.007	0.007
8.Other	0.037	0.037	0.037

Source: Author's calculations

If we simulate a 10% increase in total expenditures (indirectly assuming that income has increased), keeping everything else constant, the consumption share of food and utilities is going to decrease and substituted by an increase in the consumption share of particularly entertainment, transport and the other "luxury" items. The opposite would happen of course in the case of a decline in expenditures: an increase in the share of food and utility consumption is going to be present which on the other hand is going to decrease the budget share of the other goods.

Next, we simulate a 30% increase in energy prices holding everything else constant. Energy is an important commodity group that matters for policy makers as we mentioned. The estimated budget elasticity is the lowest among all eight budget elasticities, as demonstrated in Table 5.1.1. This indicates that households need roughly the same amount of energy, independent of their income level. At the same time, the compensated own-price elasticity is low. The uncompensated price elasticity as well indicating a price inelastic commodity. Consequently, as the price of energy increases, the quantity of the energy bundle demanded falls to a very small

extent. The combination of low budget elasticity and low own-price elasticity suggests that households need energy whatever the level of their income, and do not reflect price developments significantly. As presented in the table above, the effects of a change in regulated energy prices on other commodities are estimated to be very limited according to the cross-price elasticities.

6. CONCLUSIONS

This paper applies a Quadratic Almost Ideal Demand System in Albanian microdata of 8714 households for the period 2005-2012. We built a comprehensive system composed of eight commodity groups matching the Institute of Statistics' good classification: food, alcohol and tobacco, clothing, utilities, household goods, transportation, entertainment, and other goods to obtain income and compensated/uncompensated price elasticities for each of these commodities.

The results suggest for food utilities and personal items are necessities with an elasticity of 0.89 and 0.93 and 0.98 towards income. All other expenditure groups are considered luxuries by Albanian households especially entertainment which has an income elasticity close to 2.

Observing the own (compensated and uncompensated) and cross-price elasticities calculated for our commodity groups, the expenditures on food, utilities, alcohol and tobacco are inelastic as these commodities have little to no direct substitutes and the household substitute easily between the "luxury" items, especially between entertainment, transportation and household items.

Furthermore, we have placed special attention to the impact of regulated prices on consumer's choice. In the case of Albania, regulated prices, in particular energy prices, have always been an important contributor and driver of inflation and base inflation. As regulated prices are set by the regulatory authority and these prices are not further adjusted by market forces, i.e., regulatory

prices are exogenous, it is appropriate to use the QUAIDS model to simulate their impact on consumer demand. For the purpose of this exercise, we have decided to simulate a 10% increase in total expenditures (assuming that income has increased) and a 30% increase in regulated energy prices. This exercise can be easily conducted even for other regulated prices but also for other non-regulated prices that the researcher is interested in.

If we simulate a 10% increase in total expenses (meaning income has increased), holding everything else constant, the consumption share of food and utilities in the future is going to decrease and substituted by an increase in the consumption share of entertainment, transport and the other "luxury" items. If we simulate a 30% increase in energy prices, the combination of low budget elasticity and low own-price elasticity suggests that households need energy regardless the level of their income, and do not reflect price developments significantly: the effects of a change in regulated energy prices on other commodities are estimated to be very limited.

Despite not being the purpose of this paper, it is worth mentioning for future research, that the QUAIDS can be modified and modelled in certain ways to be useful in short term projections where we assume prices to be sticky on the supply side: a change in the VAT rate or excise duties, change of price regulations. The results are important in analysing the impact of exogenous price changes on consumers' behaviour and comparing the effects of adjustments in individual regulated prices on aggregate demand. Furthermore it can be modelled in order to analyse some ceteris paribus changes in household and income redistributions as for example the aging of the population. Finally the QUAIDS allows for modelling interest rate elasticities of savings as well.

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8. APPENDIX

A.1 THE QUAIDS DERIVATION

The QUIADS is derived from the following indirect utility function:

$$\ln u(x,p) = \{[\frac{\ln m - \ln a(p)}{b(p)}]^{-1} + \mu(p)\}^{-1} \quad (A1)$$

Where $[\ln m\text{-}\ln a(p)]/b(p)]$ is the indirect utility functions of the PIGLOG demand system developed by Muellbauer (1975, 1976) and μ is an extra term which is a differentiable, homogeneous function of degree zero of prices $\mathbf{p}$. The AIDS model has an indirect utility function given by equation (3) but with μ term equal to zero.

ln $\mathbf{a(p)}$ has the translog form of:

$$\ln a(p) = \alpha_0 + \sum_{i=1}^{n} \alpha_i \ln p_i + \frac{1}{2}\sum_{i=1}^{n}\sum_{j=1}^{n} \gamma_{ij} \ln p_i \ln p_j \quad (A3)$$

And $\mathbf{b(p)}$ is the simple Cobb-Douglas price aggregator defined by the formula:

$$b(p) = \prod_{i=1}^{n} p_i^{\beta_i} \quad (A4)$$

The term $\mu(\mathbf{p})$ is the one which allows for the transformation to a rank 3 demands system that is as similar a possible to the AIDS but allowing for a quadratic shaped Engel curve. $\mu(\mathbf{p})$ is defined as follows:

$$\mu(p) = \sum_{i} \mu_i ln p_i \quad (A5)$$

The terms $\alpha_i, \beta_i, \gamma_i, \mu_i$ are the structural coefficients to be estimated.

Applying Roy's identity in the indirect utility function (1) we get the budget share w of commodity i as described by the formula:

$$w_i = \frac{\partial \ln a(p)}{\partial \ln p_i} + \frac{\partial \ln b(p)}{\partial \ln p_i}(\ln m) + \frac{\partial \mu(p)}{\partial \ln p_i}\frac{(\ln m)^2}{b(p)} \quad (A6)$$

Notice that if $\mu(p)$ is equal to zero than (5) reduces to an AIDS budget share model.

Solving we arrive at the formula:

$$w_{ih} = \alpha_i + \sum_{j=1}^{n} \gamma_{ij} ln p_j + \beta_i ln\left\{\frac{x_h}{a(p)}\right\} + \frac{\mu_i}{b(p)}\left[ln\left\{\frac{x_h}{c(p)}\right\}\right]^2 \qquad (A7)$$

where $i=1,\ldots,n$ indicates good i and $w_{ih}=(p_{ih}\, q_{ih})/x_h$.

Remember that everything hold if and only if assumptions (2), (3) and (4) hold.

To calculate the elasticities, we differentiate equation (A9) with respect to ln m and ln pj respectively and we obtain:

$$\theta_i = \frac{\partial w_i}{\partial \ln m} = \beta_i + \frac{2\mu_i}{b(p)} * \ln\left[\frac{m}{a(p)}\right] \qquad (A8)$$

$$\theta_{ij} = \frac{\partial w_i}{\partial \ln p_j} = \gamma_{ij} - \mu_i(\alpha_j + \sum_k \gamma_{jk} \ln P_k - \frac{\mu_i \beta_j}{b(p)} * \ln[\frac{m}{a(p)}]^2 \qquad (A9)$$

The income elasticities are given by $e_i = \frac{\theta_i}{w_i} + 1$ and with a negative μ and positive β will be seen to be greater than unity at low levels of expenditure, and eventually less than unit as the total expenditure increases and the term μ becomes more important. Therefore, these commodities have the characteristics of being luxuries at low levels of expenditures and necessities at high level of expenditures.

The uncompensated price elasticities (Marshall Price Elasticity) are calculated using the formula $e_{ij}^u = \frac{\theta_{ij}}{w_i} - \delta_{ij}$ where δ_{ij} is the Kronecker delta.

The Slutsky equation $e_{ij}^c = e_{ij}^w + e_i w_j$ is used to calculate the compensated price elasticities e_{ij}^c (Hicks Price Elasticity) and assess the symmetry conditions by examining the matrix with the elements $w_i[e_{ij}^c]$ which should be symmetric and negative semidefinite. The Slutsky equation says that the total (Marshallian) price effect is equal

to the sum of the substitution effect (i.e., Hicks-ian price effect) plus an income effect. What this does is eliminate the income effect from Hicks-ian demand, it isolates the substitution effect. This is because in a Hicks-ian demand function the consumer is assumed to receive precisely enough (minimised) income to achieve a fixed level of utility.

A.2 VARIABLE INFORMATION

Table A1: Classification of individual consumption according to purpose (COICOP)-extract

COICOP: breakdown of individual consumption
Expenditure of households
By division and group
01 food and non-alcoholic beverages
01.1 food
01.2 non-alcoholic beverages
02 alcoholic beverages and tobacco
02.1 alcoholic beverages
02.2 tobacco
03 clothing and footwear
03.1 clothing
03.2 footwear
04 housing, water, electricity, gas and other fuels
04.1 actual rentals for housing
04.2 imputed rentals for housing
04.3 maintenance and repair of the dwelling
04.4 water supply and miscellaneous services relating to the dwelling
04.5 electricity, gas and other fuels
05 furnishings, household equipment and routine household maintenance
05.1 furniture and furnishings, carpets and other floor coverings
05.2 household textiles
05.3 household appliances
05.4 glassware, tableware and household utensils
05.5 tools and equipment for house and garden
05.6 goods and services for routine household maintenance
06 health

06.1 medical products, appliances and equipment
06.2 outpatient services
06.3 hospital services
07 transport
07.1 purchase of vehicles
07.2 operation of personal transport equipment
07.3 transport services
08 communication
08.1 postal services
08.2 telephone and telefax equipment
08.3 telephone and telefax services
09 recreation and culture
09.1 audio-visual, photographic and information processing equipment
09.2 other major durables for recreation and culture
09.3 other recreational items and equipment, gardens and pets
09.4 recreational and cultural services
09.5 newspapers, books and stationery
09.6 package holidays
10 education
10.1 pre-primary and primary education
10.2 secondary education
10.3 post-secondary non-tertiary education
10.4 tertiary education
10.5 education not definable by level
11 restaurants and hotels
11.1 catering services
11.2 accommodation services
12 miscellaneous goods and services
12.1 personal care
12.2 prostitution
12.3 personal effects n.e.c.
12.4 social protection
12.5 insurance
12.6 financial services n.e.c.
12.7 other services n.e.c.

Table A2. Expenditure descriptive statistics by year

	Mean	St. Dev	Min	Max
2005				
Food Share	0.602	0.120	0.205	0.925
Alcohol and Tobacco Share	0.042	0.052	0	0.336
Clothing Share	0.055	0.046	0.001	0.349
Utilities Share	0.189	0.066	0.022	0.472
Household Items Share	0.05	0.036	0.002	0.362
Transportation Share	0.029	0.053	0	0.490
Entertainment Share	0.004	0.011	0	0.115
Other Goods Share	0.035	0.025	0	0.173
Total Expenditure	433293	128001	215297	813488
2008				
Food Share	0.601	0.121	0.227	0.925
Alcohol and Tobacco Share	0.041	0.049	0	0.272
Clothing Share	0.047	0.035	0.001	0.278
Utilities Share	0.188	0.083	0.0255	0.527
Household Items Share	0.055	0.039	0.002	0.372
Transportation Share	0.029	0.052	0	0.375
Entertainment Share	0.005	0.012	0	0.112
Other Goods Share	0.035	0.025	0	0.263
Total Expenditure	433564	128342	216843	815577
2012				
Food Share	0.599	0.129	0.157	0.925
Alcohol and Tobacco Share	0.029	0.047	0	0.346
Clothing Share	0.056	0.046	0.001	0.396
Utilities Share	0.186	0.069	0.031	0.511
Household Items Share	0.056	0.039	0.002	0.343
Transportation Share	0.034	0.058	0	0.429
Entertainment Share	0.005	0.014	0	0.147
Other Goods Share	0.035	0.031	0	0.197
Total Expenditure	438809	126161	217528	815583

Source: Author's calculations

Table A.2: Description of variables

Variable	Description
"Food" Share	The ratio of the total expenditure on food to the total (annual) expenditure of the household
"Alcohol and Cigarettes" Share	The ratio of the total expenditure on alcohol and cigarettes to the total (annual) expenditure of the household
"Clothing" Share	The ratio of the total expenditure on clothing to the total (annual) expenditure of the household
"Utilities" Share	The ratio of the total expenditure on utilities to the total (annual) expenditure of the household
"Household Goods" Share	The ratio of the total expenditure on household goods to the total (annual) expenditure of the household
"Transportation" Share	The ratio of the total expenditure on transportation to the total (annual) expenditure of the household
"Entertainment" Share	The ratio of the total expenditure on entertainment to the total (annual) expenditure of the household
"Other Goods" Share	The ratio of the total expenditure on other goods to the total (annual) expenditure of the household
Ln Food Price	The natural logarithm of food price
Ln Alcohol and Tobacco Price	The natural logarithm of alcohol and cigarettes price
Ln Clothing Price	The natural logarithm of clothing price
Ln Utilities Price Ln Housing Price	The natural logarithm of utilities price The natural logarithm of housing price
Ln Transportation Price Ln Entertainment Price	The natural logarithm of transportation price The natural logarithm of entertainment price
Ln Other Goods Price	The natural logarithm of other goods price
Ln of total HH expenditures Ln of total HH expenditures square	The natural logarithm of total (annual) expenditure of the household The natural logarithm of total (annual) expenditure of the household squared
Urban Square meters dummy	=1 if the HH lives in an urban area, =0 otherwise =1 if the residence > 130 m2, =0 otherwise
Log of Head Age	The logarithm of head age
Log of Head Age Squared	The logarithm of head age squared
Head Education dummy	=1 if the head has a university degree or higher,=0 otherwise
Subjective Poverty	Factorial, reported on a scale from 1 to 10, where 1 denoted very poor and 10 denotes very rich
Head of household Sex	=1 if head is male,=0 otherwise
Marital Status	=1 if head is married,=0 otherwise
Number of Children	Number of children living in the HH

A.3 QUAIDS ESTIMATES

Table A2: QUAIDS estimated coefficients

	1. Food an…	2. Alcohol…	3.Clothing	4. Utilities	5.House It…	6. Transpo…	7. Entertai…	8. Other it…
Constant	0.339*** (0.055)	-0.016*** (0.002)	-0.041** (0.018)	0.082** (0.019)	-0.259*** (0.012)	-0.346*** (0.017)	-0.317*** (0.012)	-0.003** (0.001)
PRICES								
lnp1	-0.449*** (0.004)							
lnp2	0.084*** (0.001)	-0.0112*** (0.005)						
lnp3	0.045*** (0.001)	0.0145*** (0.002)	-0.0672*** (0.002)					
lnp4	0.087*** (0.001)	0.0172*** (0.002)	0.082*** (0.001)	-0.0797*** (0.003)				
lnp5	0.057*** (0.001)	0.0178*** (0.002)	0.097*** (0.002)	0.0106*** (0.001)	-0.0797*** (0.001)			
lnp6	0.061*** (0.001)	0.0186*** (0.003)	0.0100*** (0.002)	0.0126*** (0.002)	0.0123*** (0.001)	-0.0082*** (0.003)		
lnp7	0.055*** (0.001)	0.0202*** (0.002)	0.0111*** (0.002)	0.0119*** (0.002)	0.0135*** (0.001)	0.0142*** (0.001)	-0.0088*** (0.002)	
Lnp8	0.059*** (0.001)	0.0194*** (0.002)	0.0107*** (0.002)	0.0117*** (0.001)	0.0128*** (0.001)	0.0136*** (0.001)	0.0152*** (0.002)	-0.0086*** (0.002)
INCOME								
lnm	-0.038*** (0.011)	0.002 (0.004)	0.015** (0.003)	-0.008* (0.004)	0.006** (0.002)	0.001 (0.004)	0.007** (0.003)	0.006** (0.002)
lnm2	0.004*** (0.001)	0.007 (0.000)	0.004*** (0.001)	-0.003** (0.000)	0.004*** (0.000)	0.001 (0.000)	0.005** (0.000)	0.004*** (0.000)
DEMOGRAPHICS	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	8714							
Average R2	0.87							
Alpha 0=	14.5							

Symmetry Test	Chi2(21) = 29.54	Prob > chi2 = 0.2016

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