Household Consumption Pattern: Empirical Evidence from Nigerian Survey

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Submitted to the
Institute of Graduate Studies and Research
in partial fulfillment of the requirements for the Degree of

Master of Science
in
Economics

Eastern Mediterranean University
June 2013
Gazimagusa, North Cyprus

Approval of the Institute of Graduate Studies and Research

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ABSTRACT

This research paper examines the household consumption pattern: empirical evidence from the Nigerian living standard survey using general household survey conducted by the National Bureau of Statistics. We attempted to identify these determinants within the framework of an economic model, using two separate data – post-planting and post-harvest data sets generated from surveys in 2012 employing the robust Quantile Regression technique. Our analysis and finding provides evidence that heteroskedasticity is a natural phenomenon in the household consumption pattern since the families in the survey are from diverse backgrounds. We represented income with a proxy variable; total expenditure alongside with the second explanatory variable; household size and both play significant roles in the household consumption pattern.

Recommendations to improve and build upon existing agricultural techniques and styles were made. This is inspired by the important role that agricultural sector plays in any economy, which determines to a large extent, the flexibility of that economic system to meet future requirements of being productive, efficient and competitive. It is hoped that policy suggestions there in will help make the Nigerian agricultural sector highly improved to provide for the needs of its citizens and also to face challenges amidst global competition.

Keywords: Household, Quantile Regression, Nigerian Living Standard Survey

ÖZ

Bu çalışmada dünya bankası tarafından yürütülen yaşam standartları anket verileri kullanılarak Nijeryalı kırsal kesim hanehalklarının çeşitli tüketim harcama kategorilerini etkileyen faktörlerin etkisi ampirik olarak incelenmektedir. Hanehalklarının harcama kalıpları, gelir ve tasarruf davranışlarını içeren sorulardan elde edilen sonuçlar ekim ve hasat dönemleri sonrası olarak iki ayrı aşamada değerlendirilmiştir. 2012 yılında tamamlanan anket verileri kullanılarak oluşturulan modelin tahmin aşamasında veri heterojenliği olgusuda dikkate alınarak dilim regresyon yöntemi kullanılmıştır. Gıda, ulaşım, giyim,sağlık gibi çeşitli harcama kategorileri sırasıyla bağımlı değişken, toplam geliri temsilen toplam harcamalar ve hanehalkı büyüklüğü de bağımsız değişkenlerdir.

Bazı harcama kategorilerinde hem dönemlere hem de harcamalar arası farklılıklar gözlenmektedir. Elde edilen sonuçlara göre ülkenin tarımsal yapısıyla ilgili bazı öneriler ortaya konmaktadır. Tarım sektörünün ülkenin gelecekteki gereksinimlerini de karşılayabilecek ölçüde, üretken, verimli ve rekabetçi olması ve ekonomik sistem içinde bu şekilde yerini alması önemlidir. Çalışma sonucunda belirlenen tarım politikası önerileriyle Nijerya tarım sektörünün vatandaşların ihtiyaçlarını sağlamak için yapılandırılması ve küresel rekabet sorunlarıyla başa çıkabilmesi umulmaktadır.

Anahtar kelimeler: Hanehalkları, Dilim Regresyon, Nijerya Yaşam Standardı Anketi

To my Parents

Kolajo & Grace Gbolahan

And

Friends

ACKNOWLEDGMENTS

I give all honor and adoration to my Lord and Savior Jesus Christ; the author and finisher of our faith; the source of all knowledge and wisdom for giving me the privilege and fortitude to embark and successfully complete this work.

My immense gratitude goes to my special supervisor Assoc. Prof. Dr. Cem Payaslioğlu for his patience, support and unwavering assistance which led to the successful completion of this thesis.

Finally I wish to also appreciate the valuable inputs of my friends in multifold towards making this work a success and my educational tug in general. God bless you all.

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Chapter 1

INTRODUCTION

Nigeria, known for her black populace is situated in West Africa and shares territory with Chad and Cameroon to the east, to its northern hemisphere is Niger. The population of Nigeria is above 158 million people and it used to be an old colony of the Great Britain. Nigeria has a vast reserve of natural resources totaling up to more than 89 in number and all these natural resources have played a positive role in her economic development and growth.

Before the 1970's, the Nigerian economy used to thrive majorly on its agricultural produce. Agriculture is not currently generating foreign exchange revenue for the nation, but it still employs the largest percentage of labor. In reference to World Bank (1975) the agriculture sector of Nigeria was listed as one of the major exporter of cash crops.

The category of farming mainly practiced in Nigeria is usually subsistence farming which does not require the use of heavy machineries. Small as these farms are, their aggregate produce covers for over 80% of the total food production and on average about thirty three percent of the land mass is being cultivated. Nigeria has different weather seasons which allows for growing almost all the crops that can be grown in the world tropical hemisphere. The government provides incentives and finances to promote large scale agriculture, although this type of farming category is uncommon in Nigeria. In as much as the weather condition remains favorable, there is still a stall in productivity which is due to low soil fertility in some regions and low technical knowhow in terms of cultivation.

Progressively, since agriculture is responsible for the highest employment of the total labor force, it therefore implies that majority of households earns their living through agriculture which in turn is the source of income, upon which each household expenditure is based in accordance with individual household's budget. Changes in household expenditure during the periods of volatile farm incomes (post planting and post-harvest periods) affects the household consumption patterns because of the changes in budget.

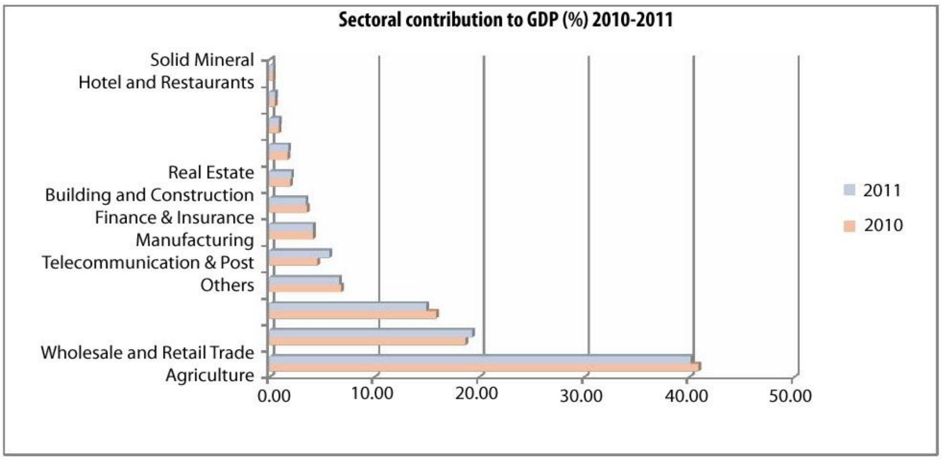

Figure 1: Sectoral Contributions to GDP (2010 – 2011)

The figure gives the percentage alms to GDP in years 2010 and 2011. As of 2011, agriculture contributes the highest share of GDP to the economy with 40.24%, seconded by the wholesale and retail trade 19.38%. Following in line is the oil and gas sector contributing 14.71%. Putting the percentages from the three sectors together, they contributed all together 70% share of GDP to the nation's economy in

2011. Their share of crude oil and agriculture contributed to the GDP in 2011 compared to the 2010 dropped by 1.17 and 0.63 respectively.

1.1Nigerian Economy

The Nigerian economy has suffered many economic imbalances and political unrests since independence in 1960. Even with its vast natural recourses, the level of agriculture's contribution to the Nigeria's economy has suffered a decline. Agricultural produce which used to account for 65-70 percent of total exports as of 1960s, reduced to 40 percent in the 1970s. This huge decline came as a result of increase in crude oil revenue.

Nigeria, lost its title as the food basket because of the negligence of its agricultural sector and now ranks as one of the largest food importing nation, and this again is as a result of oil and gas sector taking over the major export revenue thereby making the government shift attention away from the agricultural sector.

The advent of crude oil has infected Nigeria with a sickness called "Dutch Disease" which is a case of huge monetary inflow from the sale of major natural resources, which in this case is oil; this in turn overshadows many other sectors of the economy and causing major economic imbalances which ranges from crime to unemployment to inflation and trade deficit.

Total dependence on a primary product such as sole exporting of crude oil poses a huge problem, and in order for the economy to reach its full potential, the nation need to embark upon a diversification process in order to develop other primary products and regenerate products like agriculture which despite not being the main foreign exchange generator still plays a vital role in the economic growth share of GDP.

1.2 Agricultural sector in the Nigeria Economy

A self-sustaining agricultural sector will provide means for any nation to meet the need of its growing population, and also provide raw materials for its industries. For any country, the agricultural sector does have a way of multiplying effect on the social, economic development and industry due to its multidimensional nature. In economic history, agricultural rotation has proven to be a fundamental pre-condition for economic development [(Eitcher and Witt, 1964; Oluwasanmi, 1966; Jones and Woolf, 1969)]. Interestingly, the Nigerian economy in its first 10 years of independence can clearly be presented as an agricultural economy because agriculture played a pivotal role in the total economic growth [(Ogen, 2003)]. In regards to the GDP contribution, agriculture emerged as the highest contributor. In this same time period, Nigeria came on top as the world's second largest exporter of cash crops like cocoa, palm kernel as well as palm oil.

The Nigerian government, have noticed that the total reliance on oil as the sole source of foreign revenue has degraded the economy of the nation, thereby realizing that the neglect of the agricultural sector need to be revisited and directly involve itself in the sector and commercialize the agricultural production from the subsistence level it used to be. As a result of this, numerous large scale projects have been put in place to foster the agricultural production. [(Fasipe, 1990)].In spite of this major effort by the government, Nigeria became the major importer of different agricultural produce. To again battle the persistent problem of degradation of agricultural sector, the government in years between 1995 and 1998 started a reformation program to facilitate lending policies of the Agricultural Credit Guarantee Scheme (ACGS) which makes it easier for farmers to have access to credit facilities. The government also established the Calabar Export Processing Zone (EPZ) and started the Egugu, Kaduna, Jos and Lagos EPZs. These zones have their separate area of specialization of crops and food production. With these in place, the National Rolling Plan for 1996-1998 forecasted that in the year 2000, Nigeria should have been able to feed its own citizens, have an advanced capacity process which will provide raw materials for both local industries and also at export level, in order to be able to once again increase the sectorial contribution of agriculture to the GDP [(Lawal, 1997)]. The endemic corruption level in the country has greatly hindered the success of these beautiful objectives due to lack of commitment on the side of the officials. To be able to come out of this pit, the Nigerian policy makers need be greatly concerned about the economists who delegate roles to agriculture in economic development and who are of the opinion that industrialization is synonymous with economic development [(Ogen, 2002; Ogundipe, 1998)].

In years to come, the welfare of the rural populace in Nigeria will depend on agriculture. The rural economy is significantly dependent on agriculture for its survival; it generates more than thirty percent of GDP, and stands as the highest employer of labor in the rural community.

The agricultural sector remains the undisputable largest contributor, to the Nigerian economy, providing more than thirty eight percent of the non-oil foreign revenue earnings, providing jobs for over seventy percent of the active labor force in the country.

The General Household Survey (GHS-Panel) fielded by the National Bureau of Statistics in 2010-2011, the survey is the first of its kind, carried out to gather panel data on households, their characteristics, welfare and their agricultural activities. The survey is the result of a partnership established with the Federal Ministry of Agriculture and Rural Development (FMA&RD), the National Food Reserve Agency (NFRA), the Bill and Melinda Gates Foundation (BMGF) and the World Bank (WB). Under this partnership, a pattern to gather agricultural and household data in a pattern that gives room for the examination of agriculture's role in household welfare in due process was formulated. The GHS-Panel, given the high dependence of the household on agricultural activities in the country provides vital information on the household like human capital, economic activities and access to services and resources. The ability to follow same households overtime makes the GHS-Panel a new and powerful tool for studying and understanding the role of agriculture in household welfare over time as it allows analyses to be made of how households add to their human and physical capital, how education affects earnings and the role of government policies and programs on poverty, inter alia. The GHS-Panel turned out to be the first panel survey carried out by the NBS.

The GHS survey is a cross-sectional survey of 22,000 households performed yearly across the nation. Carried out in partnership, a full revision of the questionnaire was carried out and, simultaneously, a sub-sample of the GHS now gives the panel survey. The panel component (GHS-Panel) applies to 5,000 household of the GHS gathering more extra data on multiple agriculture events and household consumption. The GHS-Panel, with its main aim being to better the data from the agricultural sector and create a linkage between this sector and other aspect of household characteristic behaviors, concentrated deeply on the Harmonized National Living Standards Survey (HNLSS-a multi-topic household survey) and the Agricultural Sample Survey (NASS= the key agricultural survey) to invent a new survey instrument to give more emphasis on the role of agriculture in households' economic welfare that can be followed over time. The first session of the revised GHS and GHS-Panel was conducted into visits to the Panel Households (Post-planting visit in August-October 2010 and post-harvest visit in February-April 2011) and one visit to the full cross-section (in parallel with the post-harvest visit to the panel). The GHS-Panel will be conducted once in every two years while the GHS-Cross section will be conducted once every year.

The survey examined a large portion of socio-economic topics gathered through three different questionnaires allocated to the household and the community. These are the;

GHS-Panel Agriculture Questionnaire, administered to the entire household engaged in agriculture activities such as crop farming, livestock rearing and other agricultural and related activities which solicits information on land ownership and use; farm labor; inputs use; GPS land area measurement and coordinates of household plots; agriculture capital; irrigation; crop harvest and utilization; animal holdings and costs: and household fishing activities. To allow for elaborate information breakdown for individual crops, some information was gathered at the crop level.

GHS-Panel Household Questionnaire, administered to the entire household in the sample and it in the end provides information on demographics; education; health (including anthropometric measurement for children immunization); labor and time use; food and non-food expenditure; household nonfarm income-generating activities; food security and shocks; safety nets; housing conditions; assets; information and communication technology; and other sources of household income. Household location were arranged geographically so as to be able to later link the GHS-Panel data to other available geographic data sets.

GHS-Panel Community Questionnaire, allocated to the community to gather information on the socio-economic indicators of the enumeration areas where the sample households resides. It provides information on access to infrastructure; community organizations; resource management; changes in the community; key events; community needs; actions and achievements; and local retail price information.

1.3Aim of the study

Since agriculture remains the highest employer of labor, highest GDP contributor and the major means of livelihood to the people of Nigeria, the objective of my thesis is to investigate empirically the relevance of Engel’s law in Nigeria household consumption pattern, their characteristics, income and expenditure by employing the post-planting and post-harvest data sets of the Nigeria General Household Survey – Panel data (GHS-panel) provided by the National Bureau of statistics (NBS).

During the post planting and post-harvest periods, income level changes. Shortly after planting, the household income is expected to deplete as a result of farming expenses, and right after harvest, household income changes as well, where income is expected to increase due to proceeds from sale of farm produce. These two periods have different effects on household budgets and thus causing families to change their expenditure approach because in one, income falls and in the other income falls.

The work of Ernest Engel in 1857, the relationship between a household's expenditure on a particular good and total household expenditure can be considered as a beginning stage for the analysis of household budgets. Ernst Engel showed it distinctly that all form of household expenditures depends on income, but that each type of expenditure depends on income in its own distinct way. The functional reliance of expenditure on income is traditionally studied by the analysis of Engel curves.

Typically, Engel curves evaluated across different household samples portrays that budget shares change with income, which means that considering series of expenditures, the levels grow non-proportionally with income. For example, the total budget allocated on food tends to decrease with income. This is a very robust empirical regularity, found in numerous samples of families, and classically referred to as Engel law. Other types of expenditure follow different patterns, although in a less robust manner. For example, when considering leisure, it is often the case to observe that shares of budget spent on this kind of goods or services increases with income. The different reactions to income changes, exhibited through different types of expenditures, suggest the existence of different motives energizing consumption decisions.

Furthermore, he suggested that when studying household consumption, it is necessary to distinguish and classify expenditure categories according to the wants they serve [(see Chai and Moneta, 2010)]. He identified particular categories of wants 'nourishment', 'clothing', 'housing', 'recreation', 'safety', and several others. To each category of expenditure it should be assigned a homogeneous set of wants. In this framework, the shape of Engel curve for food (that is Engel law) can be explained by asserting that nourishment is one of the basic household needs and that the goods which are necessary for their satisfaction have, in case of deprivation, higher utility than that of any other commodities.

Yet, once want for nourishment is satiated, the marginal utility of successive increments of the same goods falls [(see Pasinetty, 1981; Witt, 2001)]. Thus, each family seeks to reach a particular level of expenses on food (under the constraint of its budget), but once its members are nourished enough, other types of expenditures will be considered, should there be enough budget left. This would explain why poor families spend, on average, a higher share of their budget on food than rich families. Other assumptions on the relationship between single wants and utility and on the existence of a hierarchy of wants may further clarify the structure of Engel curves for higher goods and services, including luxuries [(see Pasinetti, 1981; Foellmi and Zweimuller, 2008)].

Chapter 2

LITERATURE REVIEW

2.1 Summary

There are quite a number of theoretical and empirical literatures prior to this day that discusses the quantile regression.

According to Cameron and Trivedi, in their work, ‘’they performed conditional quantile estimates and compared it with the usual mean estimation using OLS regression. The application involves Engel curve estimation for household annual medical expenditure. Most especially they considered the regression relationship between the log of medical expenditure and the log of total household expenditure. Their regression yielded an estimate of the (constant) elasticity of medical expenditure with respect to total expenditure. Their data were from the World Bank's 1997 Vietnam Living Standard Survey and the sample consists of 5,006 households that have positive level of medical expenditures, after dropping 16.6 percent of the sample that has zero expenditure to permit taking the natural logarithm. For simplicity they dropped observations with zero expenditure. In the presence of many household characteristic variables, for lesser complexity, they considered one regressor, the log of total household expenditure, to serve as proxy for household income.

In their estimation results, the linear least-squares regression yields an elasticity estimate of 0.57. They continue to state that, the 0.57 estimate would usually be interpreted to mean that medicines are a ‘’necessity’’ and hence their demand is income elastic. They again said that, this estimate was not very surprising, but before accepting it at face value, they sent further to acknowledge that there maybe be a considerable level of heterogeneity in the elasticity across different income gaps.

Deaton (1997) provides a nice prelude to Quantile Regression for demand analysis. In a study of Engel curves for food expenditure in Pakistan, "he discovers that even though they median Engel elasticity of 0.906 is similar to the ordinary least squares estimate of 0.909, the coefficient at the tenth quantile was 0.879 and the estimate at the 90th percentile is 0.946, indicating a pattern of heteroskedasticity."

Blumberg and Moulton (1995) in their work studied demand for alcohol employing survey data from the National Health Interview Study and discovered sizable heterogeneity in the price of income elasticities over the full range of the conditional distribution.

Inequality and mobility of earnings presents itself as a natural field of applications for quantile regression.

Conley and Galenson (1998) in their work explored wealth accumulation in several U.S cities in the mid-nineteenth century.

Gosling, Machin and Meghir (2000) studied the income and wealth distribution in the United Kingdom.

Trede (1998) and Morillo (2000) compared earnings mobility in the United States and Germany.

In empirical finance, advancing literature has shown and proven the application of quantile regression methods. One aspect of this literature is the blistering expanding literature on value at risk: this relationship is developed in Taylor (1999), Chernozhukov and Umantsev (2001) and Engel and Manganelli (1999).

Bassett and Chen (2001) studied quantile regression index models to characterize mutual fund investment styles.

Chapter 3

DATA AND METHODOLOGY

3.1 Introduction

To facilitate the critical study of the household consumption patterns in Nigeria, this research work will seek to discretely and effectively study different expenditure categories for two distinct farming periods.

The variables of interest include the log of total expenditure which servers as proxy for income expenditure, log of total food expenditure, log of health expenditure, log of clothing expenditure, log of transportation expenditure and the household size of the families. These variables are collected from the two planting seasons, namely the post planting and the post-harvest seasons.

3.2 Methodology

This thesis engages the quantile regression procedure which was developed by Koenker and Basset (1978) which offers a strong alternative to the method of ordinary least squares (OLS) especially when the errors are not normally distributed.

3.2.1 Quantile Regression Process

Quantile regression is a method that should be used effectively by economists doing research, especially by those using micro level data. Statistical distributions of such data usually have unequal variation due to complex interactions between factors affecting micro-units' (individual, establishment, firm etc) consumption and/or production decisions. Unequal variation implies that there is more than a single slope (rate of change) describing the relation between a response variable and predictor variables. Quantile regression estimates multiple rates of change (slopes) from minimum to maximum response, providing more complete picture of the relationship between variables missed by other regression methods. Quantile regression methods have usefulness that goes beyond giving much detailed characterization of the data. Median regression is more robust to outliers than least-square regression.

Additionally, quantile regression estimators appear to be steady under weaker stochastic assumptions than possible with least-square estimations. Leading examples are the maximum score estimator of Manski (1975) for binary outcome models and the censored least absolute deviations estimators of Powell (1984) for censored models.

3.2.2 Engel Curves

An Engel curve illustrates the fluctuation in pattern of a typical consumer's expenditure with respect to changes in income or total expenditure. Engel curve does not only depend on consumer characteristics, it can also depend on variables as well. A good's Engel curve has two functions, to determine its income elasticity, and also to tell whether the good is inferior, normal or luxury good.

An Engel curve is the function which explains how a consumer's expenditure on a set of goods or services is associated to the consumer's total recourses at a constant price, so $q_i = g_i (y,z)$, where q_i is the quantity consumed of good i, y is income, wealth, or total expenditures on goods and services, and z is a vector of other characteristics of the consumer, such as age and household consumption. Engel curves are frequently expressed in the budget share form $w_i = h_i$ [log(y), z] where $w_i$is the fraction of y that is spent on buying good i. The goods are typically aggregate commodities such as total food, clothing, transportation or health expenses, consumed over some weeks or months, rather than discrete purchases.

3.2.3 Quantile Engel Curves

Koenker and Hallock present a classical empirical application in economics, Engel's (1857) analysis of the relationship between household food expenditure and household income. Using data taken from 235 European working-class households, they plotted Engel's data with seven estimated quantile regression lines corresponding to the quantiles {0.05, 0.1, 0.25, 0.5, 0.75, 0.9, and 0.95} superimposed along with least-squares line. Their plot clearly revealed the possibility of the dispersion of food expenditure to rise in sequence with an increase in household income. The space between lines of the quantile regression shows that the conditional distribution of the food expenditure is skewed to the left: the smaller the spacing of the upper quantiles showing high density and a short upper tail and the wider spacing of the lower quantiles indicating a low density and longer lower tail.

Their finding point to an important discrepancy between the conditional median and mean fits which according to Koenker and Hallock "is partially explained by the asymmetry of the conditional density and partially by the strong effect exerted on the least squares fit by the two unusual points with high income and low food expenditures".

In this section I perform conditional quantile estimation and compare it with the usual conditional mean estimation using OLS regression. The application involves Engel curve estimation for household annual health, transportation, and food and clothing expenditure categories. More especially, I consider the regression relationship between the log of all the expenditure categories, that is, health, transportation, food and clothing and the log of household total expenditure. These regressions yield estimates of the (constant) elasticities of health, food, clothing and transportation expenditures with respect to total expenditure.

The data are from National Bureau of Statistic's 2012 Nigerian Living Standards Survey. The sample consists of 22,000 households that have positive level of health, transportation, food and clothing expenditures respectively after dropping samples that have zero expenditure to permit taking natural logarithm. The GHS survey is a cross-sectional survey of 22,000 households conducted yearly across the country.

The panel component (GHS-Panel) applies to 5,000 households of the GHS collecting additional data on multiple agricultural activities and household consumption. Values that turn out to be zero may well be handled employing the censored quantile regression methods of Powell (1986). Although several household characteristic variables are available, for simplicity I only consider one regressor, the log of total household expenditure to serve as a proxy for household income and household size serves as my second explanatory variable.

3.2.4 The Quantile Regression Estimation

In this thesis we used a linear quantile regression method as earlier stated above, developed by Konker and Bassett (1978). QR is the suitable means for handling extreme values or outliers. Furthermore, it shows the differences in the relationships between explained and the explanatory variables at diverse points of the conditional distribution of the endogenous variable.

While the estimator for ordinary least squares are found by minimizing the sum of squared residuals, the quantile regression estimator on the other hand is the vector β that minimizes:

$$\min_{\beta}\left[\sum_{i*}\theta\left|y_i - x'_i\beta\right| + \sum_{i**}(1-\theta)\left|y_i - x_i'\beta\right|\right] \quad (1)$$

where $i^* = i \mid y_i \geq x_i'\beta$ and $i^* = i \mid y_i < x_i'\beta$

Usually, the equation objective function (1) denotes an unequal linear loss function. For example for the median τ = 0.5, this becomes the total loss function determining the median regression. But if we decide to vary all τ parameters in the interval of between 0 and 1 creates all the various regression quantiles, detecting the conditional distribution of detecting the conditional distribution of y given χ .

Chapter 4

ANALYSIS OF EMPIRICAL RESULTS

4.1 Introduction

This chapter is started by the defining, analyzing, followed by the statement of our primary expectations in accordance with the signs of the variables used in this thesis. Out of the many variables that could be used to further this analysis, I distinguished and embraced the variables listed amongst many other important variables, as the most important variables that best describes Household Consumption patterns in Nigeria.

4.2 Definition of the Variables

The variables used are, total expenditure, which serves as proxy for income, health expenditure, transportation expenditure, clothing expenditure and household size. In order to avoid scaling problem, all these variables are converted into logarithmic form except the household size that remains in the linear form. Therefore, majority of the estimation results measures elasticities because of the double logarithmic form of the variables after resolving the scaling problem.

4.2.1 Results of Quantile Regression

The quality and trustworthiness of our estimation indispensably depends on the specification of the model. The Quantile Regression model estimates functional forms between variables most specifically for the various probability parts of a distribution. We start this quarter by presenting the estimated results of QR generated by Stata-11. To be able to benefit from distinguishable evaluation of results, it makes more meaningful sense to encapsulate the results using tables. To be able to clearly examine the Household Consumption Pattern, using the same variables (regressors) we run the regressions for two faming periods, Post-Planting and Post-Harvest periods, starting with the Post-Planting results.

4.2.2 Food Expenditure Post Planting Data

Table 1: Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
ltotfood	4934	12.21954	.8288102	7.387974	14.35292
ltotexp	4991	12.57963	.9017519	5.899898	15.52999
hhsize	4991	5.520337	3.091902	1	31

Both the mean and standard deviation values of dependent variable and total expenditures variables are very close after removing 57 missing values and leaving 4934 usable observations for food expenditure. The household size varies between minimum of 1 and maximum of 31.

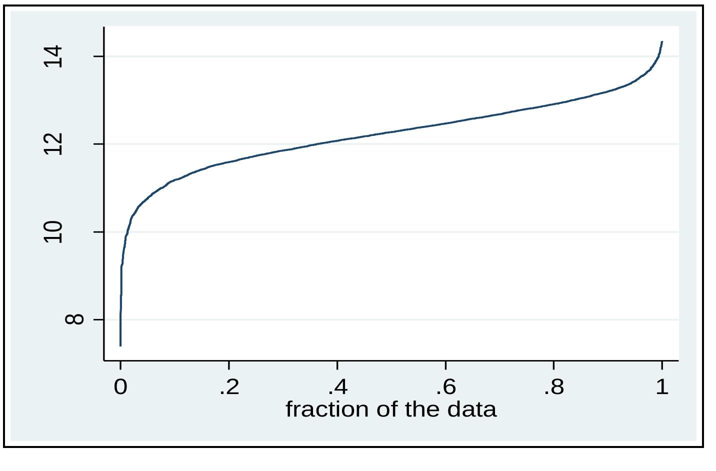

Figure 2: Quantiles of the Dependent Variable Graph

I have approximately, $q_{0.1}$=11, $q_{0.25}$=11.5, $q_{0.5}$=12.25, $q_{0.75}$=13, and $q_{0.90}$=13.25 the distribution appears to be reasonably symmetric for at least 0.05<q<0.95.

Table 2: Median Regression Estimate

```
Median regression                                    Number of obs =      4934
  Raw sum of deviations 3172.117 (about 12.275166)
  Min sum of deviations 1120.908                     Pseudo R2     =    0.6466
```

ltotfood	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ltotexp	.8756415	.0050919	171.97	0.000	.8656591	.8856239
hhsize	.0187458	.0014043	13.35	0.000	.0159927	.0214989
_cons	1.159611	.0616768	18.80	0.000	1.038697	1.280525

The median regression is estimated using the simplex algorithm with iterations rather than using gradient based optimization methods since my quantile function is not differentiable. All regressors are highly statistically significant with the expected signs.

For the median (0.50 quantile) the estimated coefficient 0.875 is the elasticity. The interpretation of the household size can be made more meaningful by transforming it into level form.

Table 3: OLS versus Quantile Estimates

Variable	OLS	QR_25	QR_50	QR_75	BSQR_50
ltotexp	0.844	0.817	0.876	0.937	0.876
	0.006	0.010	0.005	0.004	0.006
hhsize	0.024	0.027	0.019	0.008	0.019
	0.002	0.003	0.001	0.001	0.001
_cons	1.444	1.652	1.160	0.597	1.160
	0.077	0.118	0.062	0.044	0.065

According to the above table, the coefficients vary across quantiles. The leftmost column provides least square estimates, followed by estimates for q=0.25-0.75. The median estimates with bootstrap errors are given in the rightmost column with 400 bootstrap replications. The standard errors are in the second row and highly significant for all variables. The median and the highest quantile estimates are well above the least squares estimates for log of total expenditure regressor. As for the highly significant household size, its impact is much greater at the lower conditional quantile of the food expenditure, thereby suggesting that the sensitivity of food expenditure to changes in household size is rather tied up with lower levels of food expenditures. Since we can naturally associate the lower level of food expenditures with poverty, the size of the family matters a lot for this group.

Table 4: Test Results for Heteroskedasticity

```
. * Test for heteroskedasticity in linear model using estat hettest
. quietly regress ltotfood ltotexp hhsize

. estat hettest ltotexp hhsize , iid

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: ltotexp hhsize

         chi2(2)      =    35.25
         Prob > chi2  =   0.0000
```

In spite of the logarithmic transformation of the dependent variable and the total expenditure regressor the Breusch-Pagan/cook-Weisberg test soundly rejects the null hypothesis of homoskedasticity. The interpretation is easy, since families used in the survey come very diverse areas with plausibly different customs and habits; therefore, heteroskedasticy in the residuals is a natural consequence.

Table 5: Simultaneous Quantile Regression

```
Simultaneous quantile regression                    Number of obs =      4934
  bootstrap(400) SEs                                .25 Pseudo R2 =    0.5866
                                                    .50 Pseudo R2 =    0.6466
                                                    .75 Pseudo R2 =    0.6970
```

ltotfood	Coef.	Bootstrap Std. Err.	t	P>|t|	[95% Conf.	Interval]
q25						
ltotexp	.8168068	.0096515	84.63	0.000	.7978856	.835728
hhsize	.0268675	.0025386	10.58	0.000	.0218907	.0318443
_cons	1.651609	.1094243	15.09	0.000	1.437088	1.866129
q50						
ltotexp	.8756415	.0058377	150.00	0.000	.864197	.8870861
hhsize	.0187458	.0015729	11.92	0.000	.0156622	.0218294
_cons	1.159611	.0659989	17.57	0.000	1.030224	1.288998
q75						
ltotexp	.9367654	.0047456	197.40	0.000	.9274619	.9460689
hhsize	.0078282	.001255	6.24	0.000	.0053678	.0102885
_cons	.5971157	.0532646	11.21	0.000	.4926933	.7015381

From the table above, it is clear that the log of the total expenditure regressor and the household size regressor are both highly statistically significant across all the quantiles. The effect of the household size regressor is smallest at the highest quantile which implies that the household size effect drops across the quantile increases.

Table 6: Test Results of Coefficient Equality across Quantiles

```
. * Test of coefficient equality across QR with different q
. test [q25=q50=q75]: ltotexp

 ( 1)  [q25]ltotexp - [q50]ltotexp = 0
 ( 2)  [q25]ltotexp - [q75]ltotexp = 0

       F(  2,  4931) =  120.00
            Prob > F =    0.0000

. test [q25=q50=q75]: hhsize

 ( 1)  [q25]hhsize - [q50]hhsize = 0
 ( 2)  [q25]hhsize - [q75]hhsize = 0

       F(  2,  4931) =   44.72
            Prob > F =    0.0000
```

According to the table above ‘coefficient equality’, since the log of total expenditure and household size seem to differ across quantiles, therefore a formal test of equality will be needed. The F test for the null of coefficient equality across both total expenditure and household size is strongly rejected at 1% level.

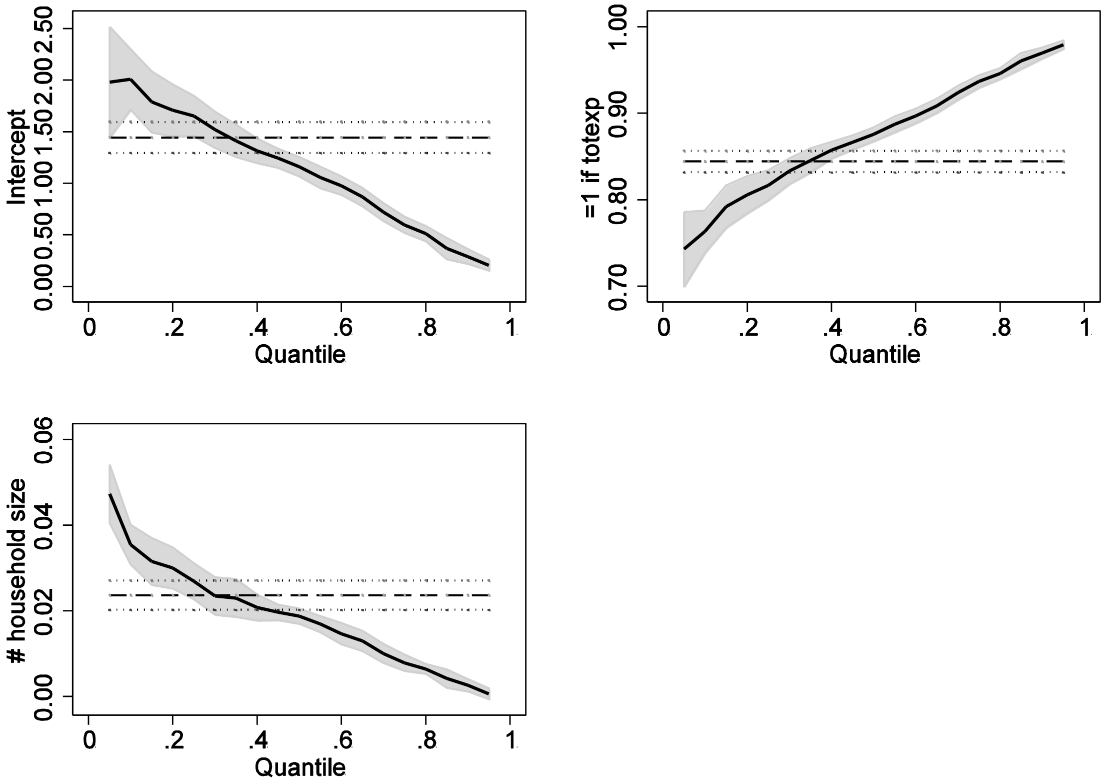

Figure 3: Quantile Regression Graphs

The dashed horizontal lines are OLS (least-squares) point estimates and dotted lines are confidence intervals which, for obvious reasons do not change with quantiles. The upper right plot shows that coefficients on total expenditures are positive and starts at a value around 0.74. The largest effect shows up at the highest quantiles so food expenditure elasticity with respect to total expenditure hovers above 0.95. The lower plot, on the other hand indicates that at the higher quantiles the effect of household size on food expenditures gets closer to almost zero. Since the dependent variable is in log, coefficient of household size can be interpreted as semi elasticity. Note that confidence intervals narrow down at extreme upper quantiles.

4.2.3 Health Expenditure Post Planting Data

Table 7: Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
lhealth	2341	8.379773	1.328353	2.995732	13.71015
ltotexp	4991	12.57963	.9017519	5.899898	15.52999
hhsize	4991	5.520337	3.091902	1	31

There is an obvious gap between the mean of dependent variable and total expenditures, but a close margin between their standard deviation. Upon removing 2,650 missing variables, leaving 2341 usable observations for health expenditures, the household size varies between minimum of 1 and maximum of 31.

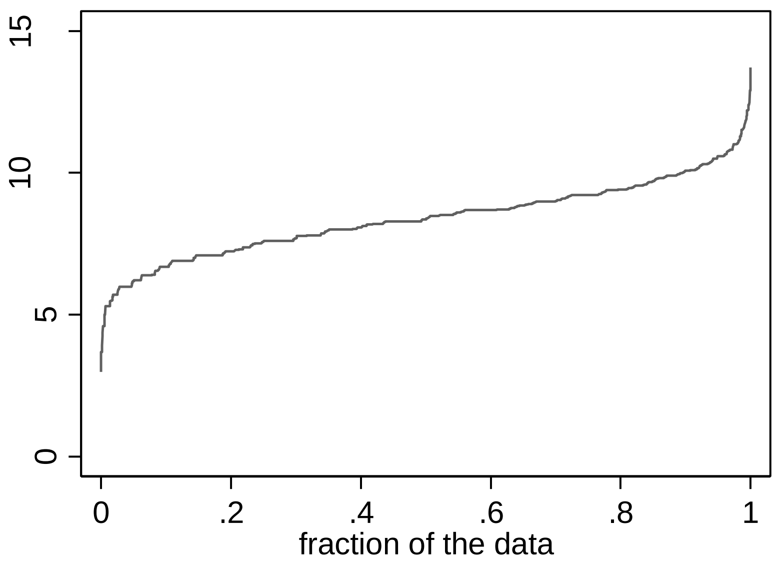

Figure 4: Quantiles of the Dependent Variable Graph

In the figure above, I have approximately, $q_{0.1}$=7, $q_{0.25}$=7.8, $q_{0.50}$=8.5, $q_{0.75}$=9.0, $q_{0.90}$=12. The distributions appears to be seasonably symmetric for at least 0.01<q<0.50.

Table 8: Median Regression Estimates

```
Median regression                                   Number of obs =      2341
  Raw sum of deviations 2438.278 (about 8.3566332)
  Min sum of deviations 2296.266                    Pseudo R2     =    0.0582
```

lhealth	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ltotexp	.4924863	.0338754	14.54	0.000	.4260573	.5589152
hhsize	.0027797	.0091981	0.30	0.763	-.0152575	.0208169
_cons	2.085062	.4185327	4.98	0.000	1.264328	2.905796

The table above reports the median regression results for the health expenditure. The iterations simplex iterations since the standard gradient are not applicable. The regressor total expenditure demonstrates a highly significance level as opposed to the hhsize regressor which is not statistically significant in this expenditure category.

Table 9: OLS versus Quantile Estimates

Variable	OLS	QR_25	QR_50	QR_75	BSQR_50
ltotexp	0.524	0.539	0.492	0.487	0.492
	0.033	0.037	0.034	0.052	0.031
hhsize	-0.004	0.006	0.003	-0.004	0.003
	0.009	0.011	0.009	0.014	0.008
_cons	1.694	0.656	2.085	2.973	2.085
	0.410	0.457	0.419	0.645	0.384

With respect to the table above, there is a variation among the coefficients. The first column from the left hand side provides least squares estimates, followed by quantile estimates for q=25-0.75. The median estimates together with bootstrap error are given in the last column to the right with 400 bootstrap applications. The standard error are in the second column and significant. The median and the highest quantile are below the least squares estimates for the log of total expenditure regressor. In the case of household size regressor, even though the least squares and the highest quantile for the household size carries a counter intuitive sign, these figures are insignificant, it therefore reduced the effect of household size to minimal. A low level of health expenditure indicates unavailability or lack of funds, therefore the size of the family is important for this group.

Table 10: Test Results for Heteroskedasticity

```
.
. * Test for heteroskedasticity in linear model using estat hettest
. quietly regress lhealth ltotexp hhsize

. estat hettest ltotexp hhsize , iid

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: ltotexp hhsize

         chi2(2)      =     0.48
         Prob > chi2  =   0.7863
```

Despite the transformation of dependent variable and the total expenditure regressor into the logarithmic form, the Breusch-Pagan / Cook-Weisberg test fails to reject the null hypothesis of homoskedasticity. This interprets that despite diversity in the family used for the survey, they all have a high similarity when it comes to health expenditure.

Table 11: Simultaneous Quantile Regression

```
Simultaneous quantile regression                  Number of obs =      2341
  bootstrap(400) SEs                              .25 Pseudo R2 =    0.0571
                                                  .50 Pseudo R2 =    0.0582
                                                  .75 Pseudo R2 =    0.0504
```

lhealth	Coef.	Bootstrap Std. Err.	t	P>|t|	[95% Conf.	Interval]
q25						
ltotexp	.5388098	.0400583	13.45	0.000	.4602562	.6173633
hhsize	.0062576	.0135114	0.46	0.643	-.0202381	.0327532
_cons	.6561371	.4977548	1.32	0.188	-.3199496	1.632224
q50						
ltotexp	.4924863	.0318827	15.45	0.000	.429965	.5550076
hhsize	.0027797	.0079044	0.35	0.725	-.0127207	.0182801
_cons	2.085062	.3861213	5.40	0.000	1.327886	2.842238
q75						
ltotexp	.4870593	.0473418	10.29	0.000	.3942231	.5798956
hhsize	-.0037512	.0117801	-0.32	0.750	-.0268518	.0193494
_cons	2.972798	.5899575	5.04	0.000	1.815903	4.129692

From the table above, out of the two regressors, only the log of total expenditure remains highly statistically significant across the quantiles. The household size is statisticially insignificant all through the quantiles, even with its counter intuitive signs in the 75th quantile.

Table 12: Test Results of Coefficient Equality across Quantiles

```
.
. * Test of coefficient equality across QR with different q
. test [q25=q50=q75]: ltotexp

 ( 1)  [q25]ltotexp - [q50]ltotexp = 0
 ( 2)  [q25]ltotexp - [q75]ltotexp = 0

       F(  2,  2338) =    0.78
            Prob > F =    0.4583

. test [q25=q50=q75]: hhsize

 ( 1)  [q25]hhsize - [q50]hhsize = 0
 ( 2)  [q25]hhsize - [q75]hhsize = 0

       F(  2,  2338) =    0.28
            Prob > F =    0.7532
```

From the table above, it is clear that the log of total expenditure and the household size regressor seem to change across quantiles, therefore a formal test of equality has to follow. Since the F test for the null of household size is statistically insignificant at 1% level because of the high P-value, I therefore failed to reject the null hypothesis for both regressors.

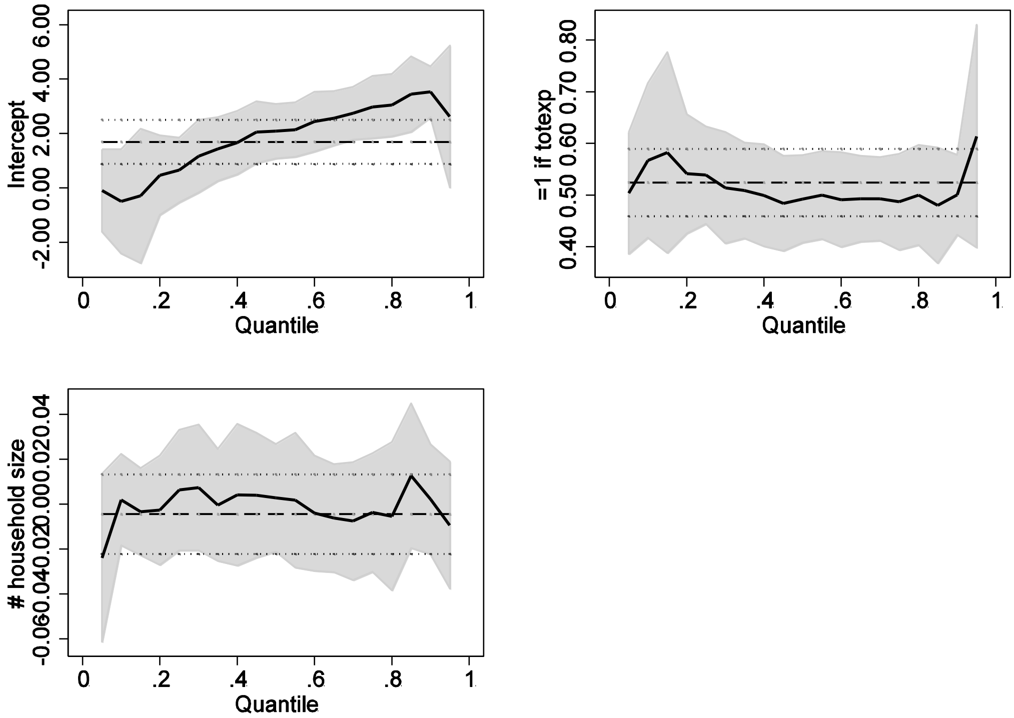

Figure 5: Quantile Regression Graphs

The upper right hand plot shows that coefficients on the total expenditure are positive and start at a value of approximately 0.51. Although the highest effect is experienced at the highest quantile, there is a significant decline in the effect between 0.2-0.7 quantiles. The lower plot, interprets the effect of household size on health expenditure and this plot shows that the effect is falling and rising across quantiles with the highest at approximately 0.85^{th}quantile.

4.2.4 Clothing Expenditure Post Planting Data

Table 13: Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
lclothing	3865	9.284369	1.117128	4.382027	13.93169
ltotexp	4991	12.57963	.9017519	5.899898	15.52999
hhsize	4991	5.520337	3.091902	1	31

Both the mean and the standard deviation values of dependent variable and total expenditure are quite close. Removing 1126 missing values leaves me with 3865 usable observations for the clothing expenditure and the household size varies between minimum of 1 and maximum of31.

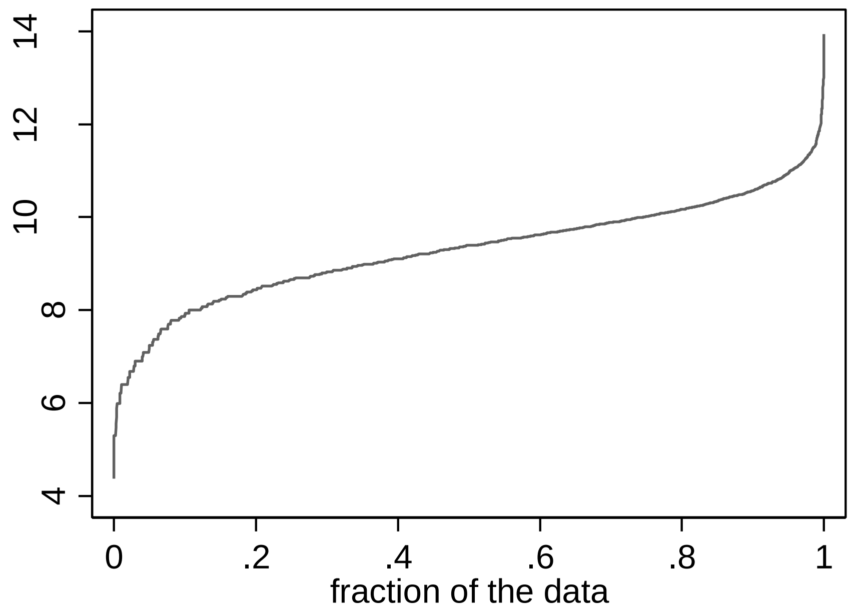

Figure 6: Quantiles of the Dependent Variable Graph

I have approximately, $q_{0.1}$= 8.0, $q_{0.25}$=8.7, $q_{0.5}$=9.3, $q_{0.75}$=9.9, $q_{0.90}$=10.4 and the distribution appears to be reasonably symmetric for 0.25<q<0.90.

Table 14: Median Regression Estimates

```
Median regression                                    Number of obs =      3865
  Raw sum of deviations 3318.643 (about 9.392662)
  Min sum of deviations 2814.653                     Pseudo R2     =    0.1519
```

lclothing	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ltotexp	.5619116	.0211877	26.52	0.000	.5203715	.6034518
hhsize	.0600051	.0056793	10.57	0.000	.0488703	.0711398
_cons	1.914204	.261408	7.32	0.000	1.401693	2.426715

The table above gives the median regression for the clothing expenditure. All regressors are highly statistically significant with the expected signs. The estimated coefficient 0.561 measures the elasticity.

Table 15: OLS versus Quantile Estimates

Variable	OLS	QR_25	QR_50	QR_75	BSQR_50
ltotexp	0.575	0.551	0.562	0.547	0.562
	0.020	0.028	0.021	0.019	0.023
hhsize	0.048	0.047	0.060	0.062	0.060
	0.005	0.008	0.006	0.005	0.005
_cons	1.697	1.498	1.914	2.599	1.914
	0.245	0.342	0.261	0.229	0.285

According to the table above, there is a noticeable variation across the quantiles. The first column on the left gives the least square estimates, followed by estimates for the quantiles. The median estimates with bootstrap errors are given in the rightmost column with 400 bootstrap replications. The standard errors are in the second row and are statistically significant for all variables. The least square estimate is well above all the three sets of the quantiles for the log of total expenditure regressor. In the case of the household size which is equally significant across the quantiles, its impact is noticed to increase from the lower quantile to the highest and thus suggests that the sensitivity of clothing expenditure to changes in household size is rather tied up with higher levels of clothing expenditures.

Table 16: Test Results for Heteroskedasticity

```
.
. * Test for heteroskedasticity in linear model using estat hettest
. quietly regress lclothing ltotexp hhsize

. estat hettest ltotexp hhsize , iid

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: ltotexp hhsize

         chi2(2)      =     6.61
         Prob > chi2  =   0.0366
```

Despite the logarithmic transformation of the dependent variable and the total expenditure regressors which normally is a way to correct for heteroskedasticity, the Breusch-Pagan / Cook-Weisberg test soundly rejects the null hypothesis of homoskedasticity. And the interpretation is that because the families used for the survey are from diverse parts of the country, exhibiting different customs and habits, therefore, heteroskedasticity in the residual is a natural consequence.

Table 17: Simultaneous Quantile Regression

```
Simultaneous quantile regression                    Number of obs =      3865
  bootstrap(400) SEs                                .25 Pseudo R2 =    0.1107
                                                    .50 Pseudo R2 =    0.1519
                                                    .75 Pseudo R2 =    0.1747
```

lclothing	Coef.	Bootstrap Std. Err.	t	P>|t|	[95% Conf.	Interval]
q25						
ltotexp	.5512077	.0326863	16.86	0.000	.4871236	.6152918
hhsize	.0465854	.0109258	4.26	0.000	.0251645	.0680062
_cons	1.498076	.3962518	3.78	0.000	.7211929	2.274958
q50						
ltotexp	.5619116	.025618	21.93	0.000	.5116855	.6121378
hhsize	.0600051	.0054789	10.95	0.000	.0492633	.0707469
_cons	1.914204	.3162962	6.05	0.000	1.29408	2.534327
q75						
ltotexp	.5470544	.0178492	30.65	0.000	.5120596	.5820492
hhsize	.0624096	.0051539	12.11	0.000	.0523049	.0725143
_cons	2.5994	.2187088	11.89	0.000	2.170605	3.028196

The table above shows that both explanatory variables are statistically significant across all quantiles, and the coefficients differs across the quantiles. The response of the clothing expenditure to the changes in household size tends to increase from lowest to the highest quantiles.

Table 18: Test Results of Coefficient Equality across Quantiles

```
. * Test of coefficient equality across QR with different q
. test [q25=q50=q75]: ltotexp

 ( 1)  [q25]ltotexp - [q50]ltotexp = 0
 ( 2)  [q25]ltotexp - [q75]ltotexp = 0

       F(  2,  3862) =    0.32
            Prob > F =    0.7271

. test [q25=q50=q75]: hhsize

 ( 1)  [q25]hhsize - [q50]hhsize = 0
 ( 2)  [q25]hhsize - [q75]hhsize = 0

       F(  2,  3862) =    1.23
            Prob > F =    0.2911
```

Since the log of total expenditure and household size differ across quantiles, therefore a formal test of coefficient equality was conducted and I failed to reject the null hypothesis for the F test at 1% level.

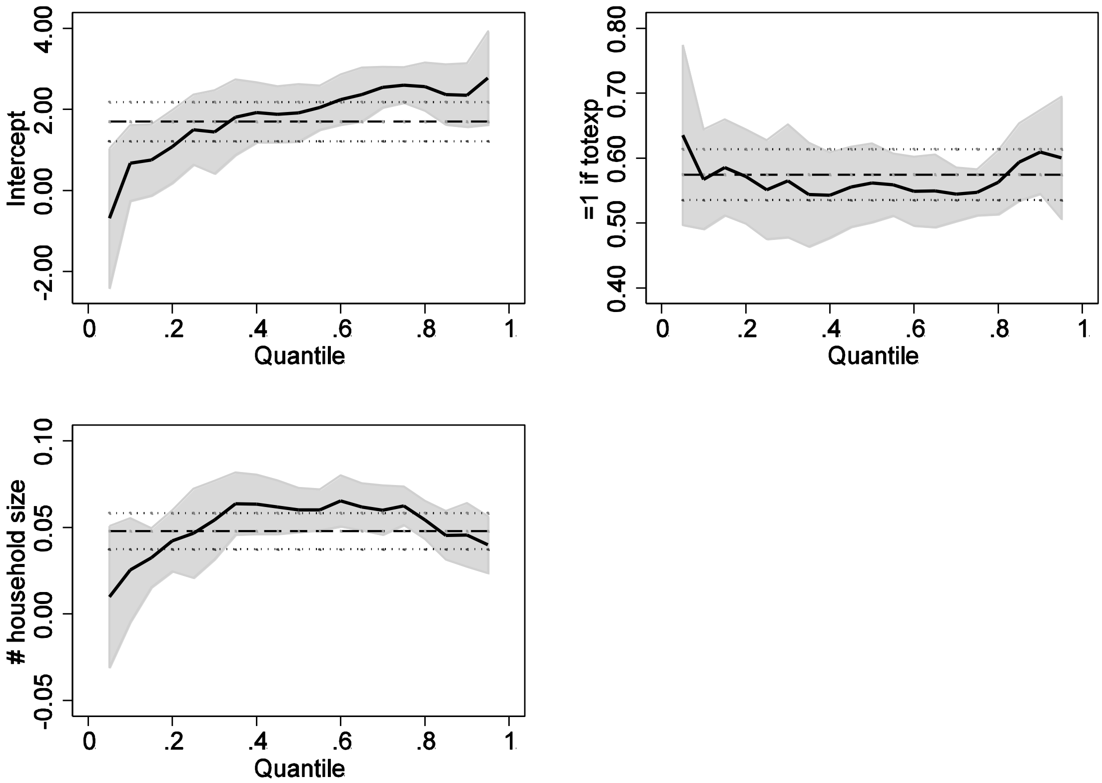

Figure 7: Quantile Regression Graphs

The upper right plot shows that coefficients on clothing expenditures are positive and start at a value of approximately 0.65. The largest effect comes up at the least quantile, so clothing expenditure elasticity with respect to total expenditure hovers above 0.65. The lower plot indicates that the household size effect on clothing expenditure increases up until the 0.4thquantile, followed by decline and increase in the pattern of the graph and it stops at the highest quantile with a positive value of 0.05. Since the dependent variable is in log, the coefficient of household size can be interpreted as semi elasticity. Also note that confidence intervals narrow down at extreme quantiles.

4.2.5 Transportation Expenditure Post Planting

Table 19: Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
ltransp	2327	10.16982	1.168149	5.899898	14.43128
ltotexp	4991	12.57963	.9017519	5.899898	15.52999
hhsize	4991	5.520337	3.091902	1	31

There exist a close gap between the mean and standard deviation of both dependent variable and total expenditure variable. Laying down 2664 missing values left me with 2327 usable observations for the transportation expenditure. The household size still varies between the minimum of 1 and maximum of 31.

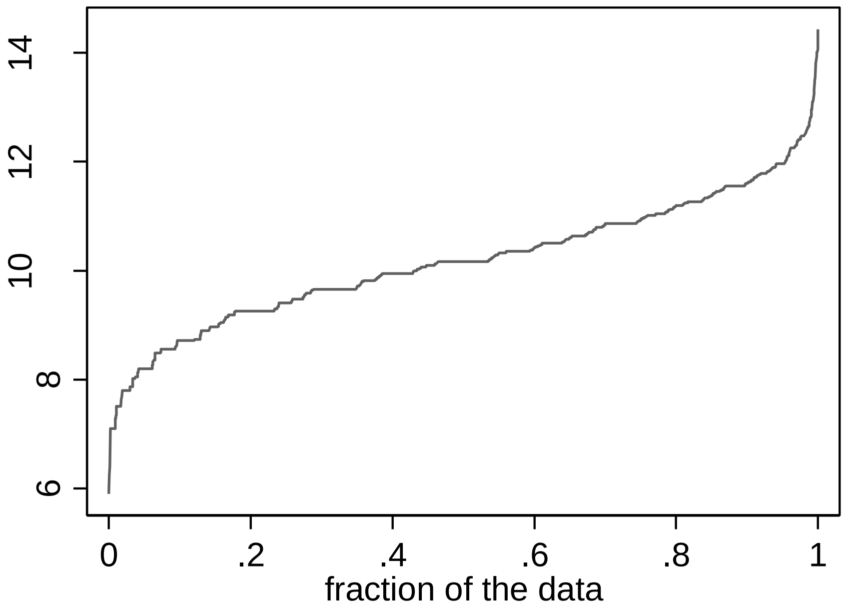

Figure 8: Quantiles of the Dependent Variable Graph

Approximately, I have $q_{0.1}$= 8.5, $q_{0.25}$= 9.3, $q_{0.50}$= 10.2, $q_{0.75}$= 11.2, $q_{0.90}$ = 11.8 and the distribution appears to be reasonably symmetric for at least 0.75<q<0.9

Table 20: Median Regression Estimate

```
Median regression                                    Number of obs =      2327
  Raw sum of deviations 2120.699 (about 10.168595)
  Min sum of deviations 1746.678                     Pseudo R2     =    0.1764
```

ltransp	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ltotexp	.9307482	.030684	30.33	0.000	.8705773	.9909191
hhsize	-.0582282	.0075867	-7.68	0.000	-.0731055	-.0433508
_cons	-1.477165	.384492	-3.84	0.000	-2.231148	-.7231814

The table above, reports median regression results. The iterations are simplex iterations since the standard gradient-methods are not applicable. All regressors are highly significant, although the household size carries a negative sign, but still significant.

Table 21: OLS versus Quantile Estimates

Variable	OLS	QR_25	QR_50	QR_75	BSQR_50
ltotexp	0.938	0.905	0.931	0.940	0.931
	0.028	0.044	0.031	0.038	0.039
hhsize	-0.061	-0.081	-0.058	-0.045	-0.058
	0.007	0.011	0.008	0.009	0.010
_cons	-1.615	-1.660	-1.477	-1.064	-1.477
	0.347	0.554	0.384	0.471	0.481

According to the table above, the coefficient vary across quantiles. The first column to the left presents the least square estimates followed by the quantile estimates and the median estimates with bootstrapping. The standard errors are significant for all the variables. The log of total expenditure regressor is higher than the least square estimates in the highest quantile and statistically significant across the quantiles. As for the household size, it carries a counter intuitive sign, but the regressor is significant still, it therefore means that as household size increases, the transportation expenditure decreases.

Table 22: Test Results for Heteroskedasticity

```
.
. * Test for heteroskedasticity in linear model using estat hettest
. quietly regress ltransp ltotexp hhsize

. estat hettest ltotexp hhsize , iid

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: ltotexp hhsize

         chi2(2)      =    19.69
         Prob > chi2  =   0.0001
```

Even with the logarithmic transformation of the dependent variable (transport expenditure) and the total expenditures regressor, the Breusch-Pagan / Cook – Weisberg test soundly rejects the null hypothesis of homeskedasticity. And the interpretation is simply that, hetereskedasticity in the residual is bound to be present since the families in the survey are from diverse areas with different customs and habits.

Table 23: Simultaneous Quantile Regression

```
Simultaneous quantile regression                     Number of obs =      2327
  bootstrap(400) SEs                                 .25 Pseudo R2 =    0.1556
                                                     .50 Pseudo R2 =    0.1764
                                                     .75 Pseudo R2 =    0.2187
```

ltransp	Coef.	Bootstrap Std. Err.	t	P>|t|	[95% Conf.	Interval]
q25						
ltotexp	.9052185	.0503659	17.97	0.000	.8064517	1.003985
hhsize	-.0812806	.0143899	-5.65	0.000	-.1094991	-.0530622
_cons	-1.660491	.6233025	-2.66	0.008	-2.882778	-.4382037
q50						
ltotexp	.9307482	.0407264	22.85	0.000	.8508844	1.010612
hhsize	-.0582282	.009996	-5.83	0.000	-.0778301	-.0386263
_cons	-1.477165	.5023563	-2.94	0.003	-2.462278	-.4920512
q75						
ltotexp	.939936	.0336295	27.95	0.000	.8739891	1.005883
hhsize	-.0454845	.0083757	-5.43	0.000	-.0619092	-.0290598
_cons	-1.064153	.4190704	-2.54	0.011	-1.885944	-.2423617

The above table shows that the log of total expenditure is statistically significant as well as the household size regressor, despite that it carries a counter intuitive sign.

Table 24: Test Results of Coefficient Equality across Quantiles

```
.
. * Test of coefficient equality across QR with different q
. test [q25=q50=q75]: ltotexp

 ( 1)  [q25]ltotexp - [q50]ltotexp = 0
 ( 2)  [q25]ltotexp - [q75]ltotexp = 0

       F(  2,  2324) =    0.28
            Prob > F =    0.7526

. test [q25=q50=q75]: hhsize

 ( 1)  [q25]hhsize - [q50]hhsize = 0
 ( 2)  [q25]hhsize - [q75]hhsize = 0

       F(  2,  2324) =    3.17
            Prob > F =    0.0424
```

As seen from the table above, the log of total expenditure and household size differ across the quantiles, thus, a formal test of equality is conducted and i failed to reject the null hypothesis for the F test at 1% level in the case of total expenditure variable and strongly reject the null hypothesis at 1% level for the household size variable. The effect of the household size regressor is dropping as the quantiles increases

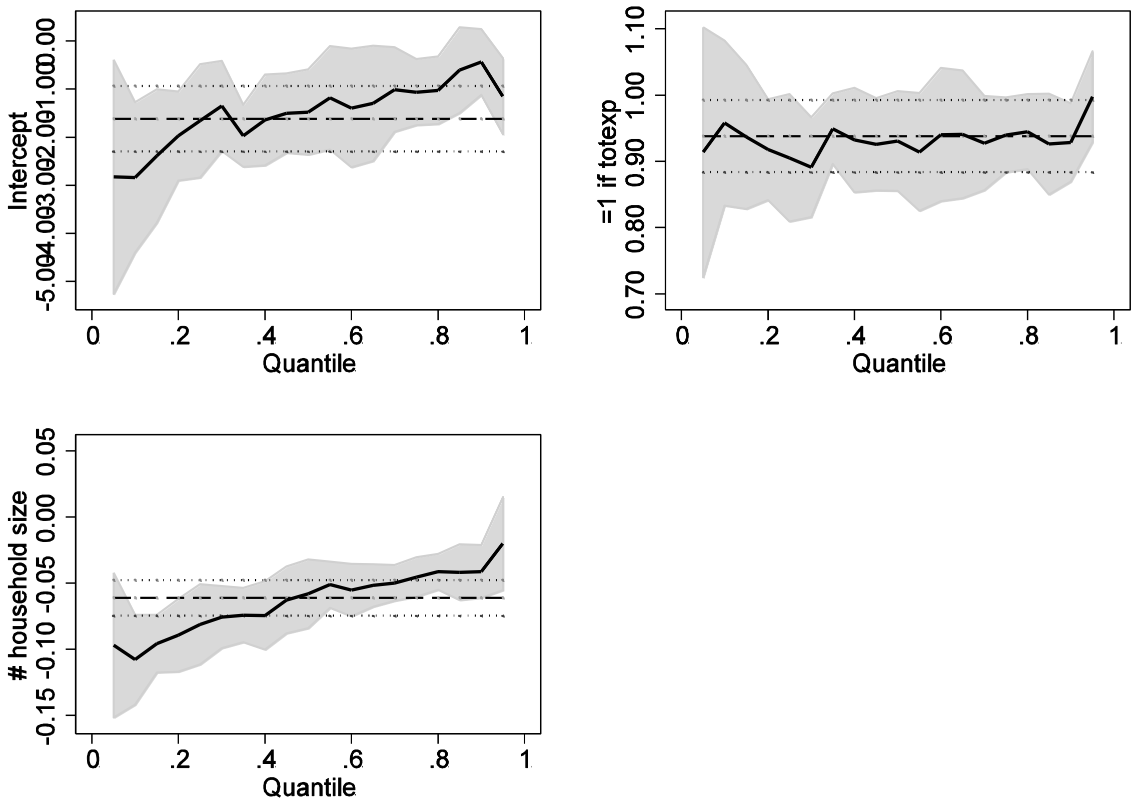

Figure 9: Quantile Regression Graphs

The upper right plot shows that the coefficients of transportation expenditure are positive and starts at an approximate value of 0.91. There is a significant drop at 3^{rd}quantile. The lower plot on the other hand indicates that at the higher quantiles, the effect of the household size on transportation expenditure gets larger.

4.2.6 Food Expenditure Post Harvest

Table 25: Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
ltotfood	4839	12.35183	.6931979	5.476868	14.71549
ltotexp	4845	12.71506	.7200109	8.153692	15.39354
hhsize	4845	5.775851	3.161056	1	31

The mean and standard deviation values of the log of total expenditure and the dependent variable are quite close. Just s missing values are avaialble and dropped leaving 4839 usable observations for the food expenditure. The household size remains between the minimum of 1 and maximum of 31.

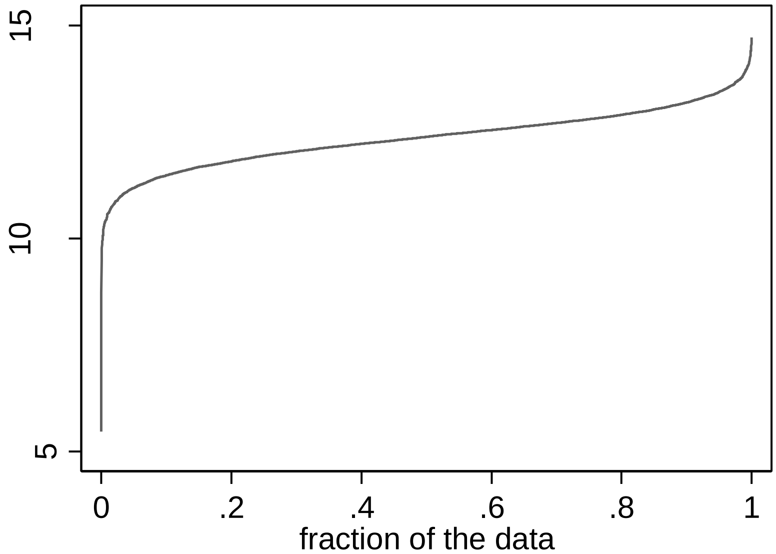

Figure 10: Quantile Regression of the Dependent Variable

Approximately, I have $q_{0.1}$ =11, $q_{0.25}$ =12, $q_{0.5}$ =13, $q_{0.75}$ =13.5, $q_{0.90}$ =13.8. The distribution appears to be symmetric for $0.5<q<0.90$

Table 26: Median Regression Estimate

```
Median regression                                   Number of obs =      4839
  Raw sum of deviations 2588.696 (about 12.383892)
  Min sum of deviations 1018.759                    Pseudo R2     =    0.6065
```

ltotfood	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ltotexp	.8782404	.0063859	137.53	0.000	.865721	.8907598
hhsize	.0089827	.0014412	6.23	0.000	.0061573	.0118081
_cons	1.199977	.0788298	15.22	0.000	1.045435	1.354519

In the table above, all regressors are highly significant with the expected sign. For the median (0.50 quantile) the estimate coefficients 0.878 is the elasticity. And the iterations are simplex iterations since the standard gradient methods are not applicable.

Table 27: OLS versus Quantile Estimates

Variable	OLS	QR_25	QR_50	QR_75	BSQR_50
ltotexp	0.848	0.809	0.878	0.933	0.878
	0.007	0.010	0.006	0.004	0.006
hhsize	0.011	0.018	0.009	0.005	0.009
	0.002	0.002	0.001	0.001	0.001
_cons	1.504	1.843	1.200	0.665	1.200
	0.084	0.126	0.079	0.055	0.067

The first column to the left represents the least square estimates, followed by the quantile estimates and lastly the median estimates with bootstrap regressor given in their rightmost quantile with 400 bootstrap applications. The standard errors are in the second row and highly significant for all variables. The median and the highest regressors are well above the least square estimates for the log of total expenditure regressor. And for the household size which is equally highly significant, its impact is much stronger at the lower conditional quantile of the food expenditure thereby suggesting that the sensitivity of food expenditure to changes in the household size is rather tied up with lower levels of food expenditures. And since it is easy to naturally associate low level of food expenditure with poverty, the size of the family matters a lot for this group.

Table 28: Test Results for Heteroskedasticity

```
.
. * Test for heteroskedasticity in linear model using estat hettest
. quietly regress ltotfood ltotexp hhsize

. estat hettest ltotexp hhsize , iid

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: ltotexp hhsize

         chi2(2)      =    22.88
         Prob > chi2  =   0.0000
```

In spite of the logarithmic transformation of the total food expenditure and the total expenditure variables regressors, the Breusch -Pagan / cook-Weisberg test soundly rejects the null hypothesis of the homoskedasticity. This is as a result of the diversity in the background of the families used in the survey. Therefore heteroskedasticity is present.

Table 29: Simultaneous Quantile Regression

```
Simultaneous quantile regression                    Number of obs =      4839
  bootstrap(400) SEs                                .25 Pseudo R2 =    0.5496
                                                    .50 Pseudo R2 =    0.6065
                                                    .75 Pseudo R2 =    0.6677
```

ltotfood	Coef.	Bootstrap Std. Err.	t	P>|t|	[95% Conf.	Interval]
q25						
ltotexp	.8085649	.0093448	86.53	0.000	.790245	.8268849
hhsize	.017586	.0020157	8.72	0.000	.0136343	.0215377
_cons	1.843177	.1129411	16.32	0.000	1.621761	2.064593
q50						
ltotexp	.8782404	.0061046	143.87	0.000	.8662726	.8902082
hhsize	.0089827	.001543	5.82	0.000	.0059578	.0120077
_cons	1.199977	.0715141	16.78	0.000	1.059777	1.340177
q75						
ltotexp	.9334896	.0044999	207.45	0.000	.9246678	.9423114
hhsize	.0045611	.0011715	3.89	0.000	.0022644	.0068578
_cons	.6645917	.0545445	12.18	0.000	.5576597	.7715238

The table above shows clearly that the log of the total expenditure regressor and the household size regressor are both highly statistically significant across all the quantiles. The effect of the household size regressor is smallest at the highest quantile which implies that the household size effect drops across the quantile increases. And the response of the food expenditure to changes in the household size seems to decrease at higher conditional quantiles.

Table29: Test Results of Coefficient Equality across Quantiles

```
. * Test of coefficient equality across QR with different q
. test [q25=q50=q75]: ltotexp

 ( 1)  [q25]ltotexp - [q50]ltotexp = 0
 ( 2)  [q25]ltotexp - [q75]ltotexp = 0

       F(  2,  4836) =  109.09
            Prob > F =    0.0000

. test [q25=q50=q75]: hhsize

 ( 1)  [q25]hhsize - [q50]hhsize = 0
 ( 2)  [q25]hhsize - [q75]hhsize = 0

       F(  2,  4836) =   22.70
            Prob > F =    0.0000
```

There is a clear difference between the log of total expenditures and household size variables across the quantiles, this therefore prompted a coefficient equality test. The F test for the null of coefficient equality across both total expenditures and household size is strongly rejected at 1% level.

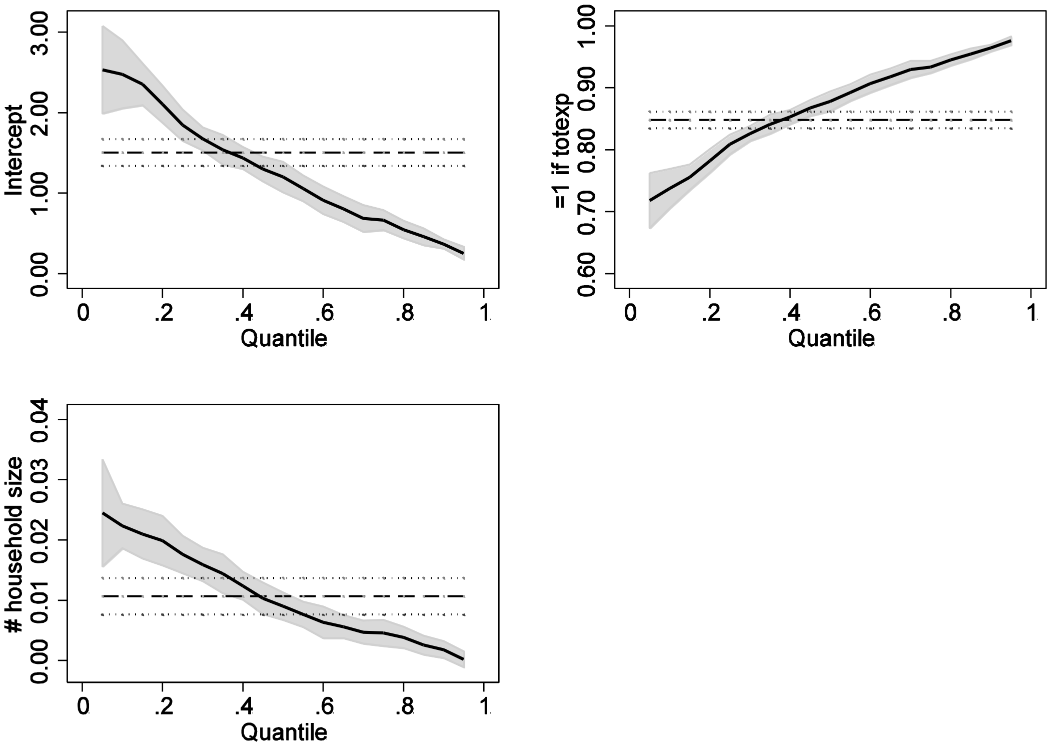

Figure 11: Quantile Regression Graph

The dashed horizontal lines are OLS (least squares) point estimates and dotted lines are confidence intervals which for obvious reasons do not change with the quantiles. The upper right plot shows that coefficients on total expenditures are positive and start at a value of approximately 0.71. The largest effect shows up at the highest quantile, so food elasticity hovers above 0.95. The lower left had side plot indicates that at higher quantiles the effect of the household size on food expenditure gets closer to almost zero. Since the dependent variable is in log, the coefficient of household size can be interpreted as semi elasticity. It should be noted that confidence intervals narrow down at extreme upper quantiles.

4.2.7 Health Expenditure Post-Harvest Data

Table 30: Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
lhealth	2123	8.526599	1.255419	3.401197	13.59237
ltotexp	4845	12.71506	.7200109	8.153692	15.39354
hhsize	4845	5.775851	3.161056	1	31

Both the mean and standard deviation values of dependent variable and total expenditure variable are not close. I am left with 2123 usable observations for the health expenditure, after dropping 2722 missing values. The household size varies between minimum of 1 and maximum of 31.

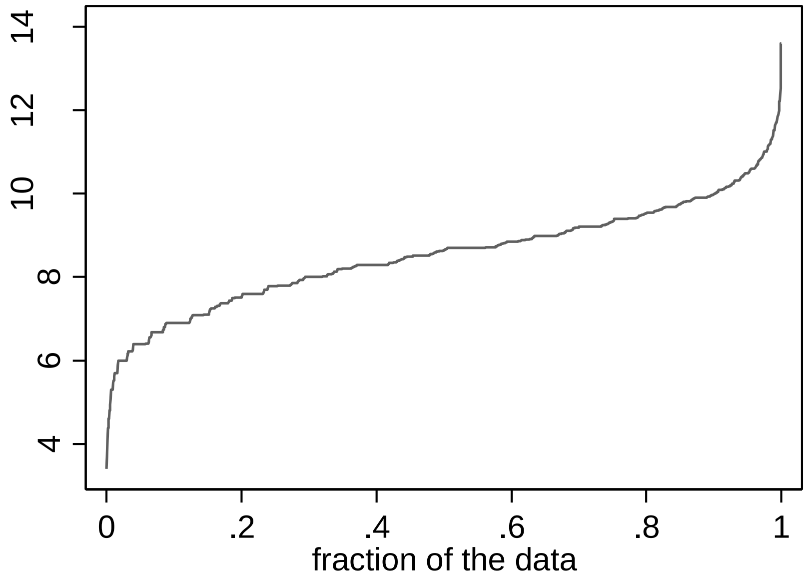

Figure 12: Quantiles of the Dependent Variable Graph

$q_{0.1}$ =7.0, $q_{0.25}$ =7.8, $q_{0.50}$ =8.8, $q_{0.75}$ =9.4, $q_{0.9}$ =9.9. These figures are approximate values from the figure above, and the distribution appears to be reasonably symmetric for at least 0.75<q<0.90

Table 31: Median Regression Estimate

```
Median regression                                    Number of obs =      2123
  Raw sum of deviations 2054.045 (about 8.639411)
  Min sum of deviations 1961.977                     Pseudo R2     =    0.0448
```

lhealth	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ltotexp	.4604187	.0439117	10.49	0.000	.3743041	.5465332
hhsize	.0175458	.0094917	1.85	0.065	-.0010681	.0361598
_cons	2.570044	.5500337	4.67	0.000	1.491382	3.648706

I estimated the median regression using the simplex logarithm with iterations rather than using gradient based optimization methods since my quantile function is not differentiable. All regressors came out highly statistically significant with expected signs. For the median (0.50 quantile) the estimated coefficient is 0.4604 which is the elasticity.

Table 32: OLS versus Quantile Estimates

Variable	OLS	QR_25	QR_50	QR_75	BSQR_50
ltotexp	0.506	0.520	0.460	0.506	0.460
	0.041	0.062	0.044	0.050	0.049
hhsize	0.007	0.044	0.018	-0.005	0.018
	0.009	0.015	0.009	0.011	0.010
_cons	1.971	0.841	2.570	2.782	2.570
	0.511	0.780	0.550	0.629	0.613

According to the table above, there is an obvious variation across quantiles. The leftmost column provides the least square estimates, followed by the quantile estimates and then the median estimates with bootstrap errors given in their rightmost quantile with 400 bootstrap replications. The standard errors are in the second row and are statistically significant for all variables. The highest quantile and the OLS estimate are the same in value for the log of total expenditure regressor. The household size regressor is insignificant for the least square and also at the 75^{th}quantile.

Table 33: Test Results for Heteroskedasticity

```
.
. * Test for heteroskedasticity in linear model using estat hettest
. quietly regress lhealth ltotexp hhsize

. estat hettest ltotexp hhsize , iid

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: ltotexp hhsize

         chi2(2)      =     3.13
         Prob > chi2  =   0.2092
```

After the transformation of the dependent variable and the total expenditures regressors, the Breusch-Pagan / Cook-Weisberg test fails to reject the null hypothesis of the homoskedasticity. Therefore heteroskedasticity is a natural consequence since the families used in the survey are from diverse backgrounds.

Table 34: Simultaneous Quantile Regression Estimates

```
Simultaneous quantile regression                    Number of obs =      2123
  bootstrap(400) SEs                                .25 Pseudo R2 =    0.0431
                                                    .50 Pseudo R2 =    0.0448
                                                    .75 Pseudo R2 =    0.0419
```

lhealth	Coef.	Bootstrap Std. Err.	t	P>|t|	[95% Conf.	Interval]
q25						
ltotexp	.5200495	.0686645	7.57	0.000	.3853927	.6547064
hhsize	.0435167	.0170985	2.55	0.011	.0099852	.0770483
_cons	.8407621	.8468331	0.99	0.321	-.8199484	2.501473
q50						
ltotexp	.4604187	.0467666	9.85	0.000	.3687055	.5521318
hhsize	.0175458	.0105376	1.67	0.096	-.0031193	.038211
_cons	2.570044	.590917	4.35	0.000	1.411207	3.728882
q75						
ltotexp	.5060709	.0503993	10.04	0.000	.4072336	.6049082
hhsize	-.0049589	.0115047	-0.43	0.666	-.0275205	.0176028
_cons	2.782217	.6148819	4.52	0.000	1.576382	3.988052

In the table above, the log of total expenditure is statistically significant across the quantiles, and as for the household size regressor, it is only significant at the 25^{th} and 50^{th}qountile, and even though it carries a counter intuitive sign in the 75^{th}quantile, its effect is insignificant at this quantile. And the response of health expenditure to changes in household sizes appears to decrease across the quantiles, with a negative sign in the highest conditional quantile.

Table 35: Table Results of Coefficient Equality across Quantiles

```
. * Test of coefficient equality across QR with different q
. test [q25=q50=q75]: ltotexp

 ( 1)  [q25]ltotexp - [q50]ltotexp = 0
 ( 2)  [q25]ltotexp - [q75]ltotexp = 0

       F(  2,  2120) =    0.98
            Prob > F =    0.3763

. test [q25=q50=q75]: hhsize

 ( 1)  [q25]hhsize - [q50]hhsize = 0
 ( 2)  [q25]hhsize - [q75]hhsize = 0

       F(  2,  2120) =    4.89
            Prob > F =    0.0076
```

For the table above, a formal test of coefficient equality is carried out since there is a noticeable difference between the values of the two explanatory variables, log of total expenditure and household size. The F test for the null of coefficient equality for total expenditure variable is not rejected at 1% level and strongly rejected for the household size at 1% level.

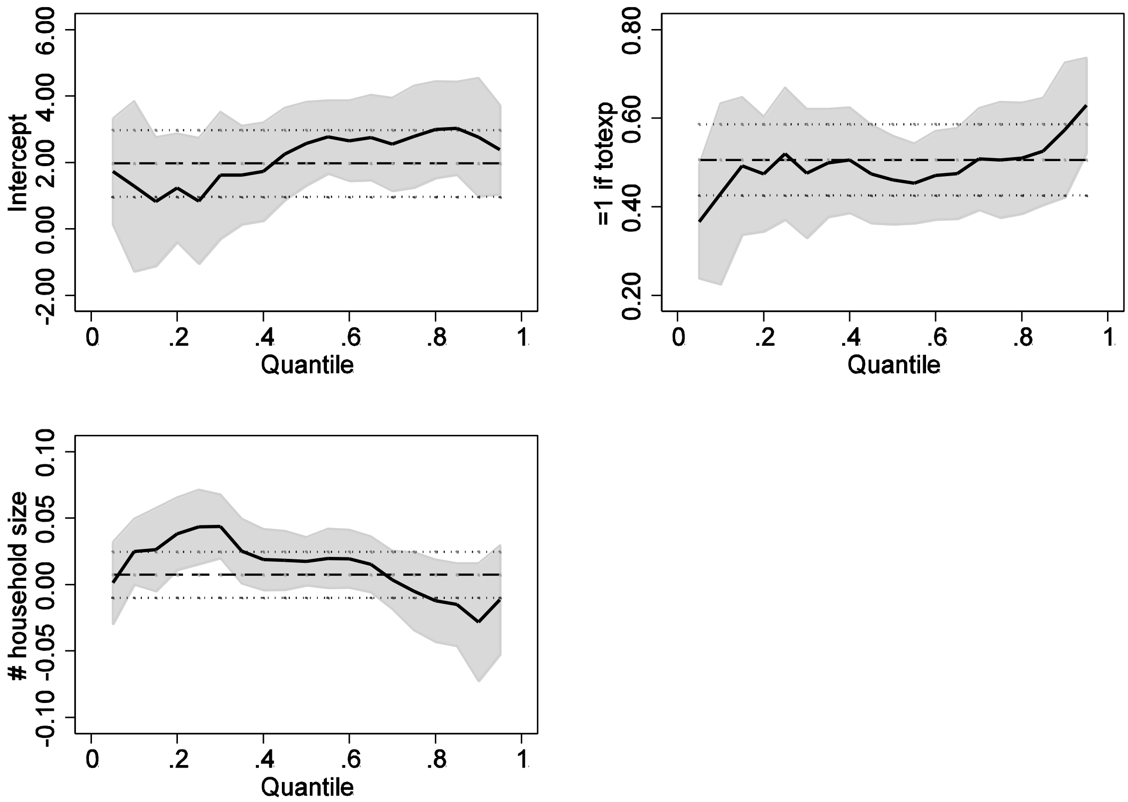

Figure 13: Quantile Regression Graphs

The upper right hand plot shows that coefficients of total expenditures are positive and starts at a value of approximately 0.38, and the highest effect shows up at the highest quantile so health expenditure elasticity with respect to total expenditure hovers above 0.60. The lower plot indicates that at higher quantiles, the effect of household size on health expenditure drops below 0.00 into the negative half.

4.2.8 Clothing Expenditure Post-Harvest Data

Table 36: Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
lclothing	3801	9.335646	1.011447	2.079442	13.18063
ltotexp	4845	12.71506	.7200109	8.153692	15.39354
hhsize	4845	5.775851	3.161056	1	31

There is a noticeable difference between the values of mean and standard deviations of the log of dependent variable and log of total expenditure variable. There are 3801 usable variables for clothing expenditure after dropping 1044 missing variables. The household size varies between minimum of 1 and maximum of 31.

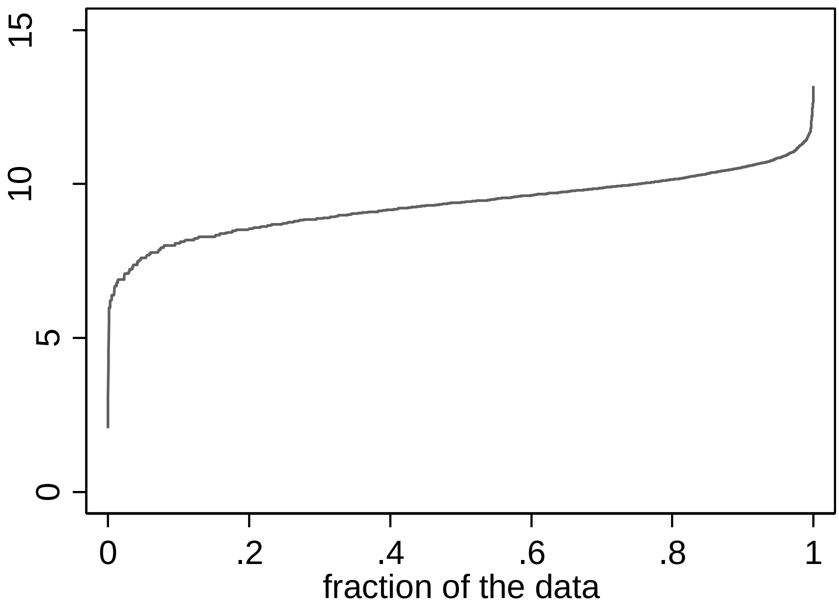

Figure 14: Quantiles of the Dependent Variable Graph

$q_{0.1}$ =8.0, $q_{0.25}$ =9.0, $q_{0.50}$ =9.5, $q_{0.75}$ =9.9, $q_{0.9}$ =10.6. The distribution appears to be reasonably symmetric for at least $0.25<q<0.75$.

Table 37: Median Regression Estimates

```
Median regression                                   Number of obs =      3801
  Raw sum of deviations 2961.949 (about 9.392662)
  Min sum of deviations 2625.964                    Pseudo R2     =    0.1134
```

lclothing	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ltotexp	.5728574	.0258588	22.15	0.000	.5221589	.623556
hhsize	.03904	.0056838	6.87	0.000	.0278965	.0501835
_cons	1.870279	.3226254	5.80	0.000	1.237743	2.502815

The table above reports the median regression. All regressors are highly significant with the expected signs. For the median quantile, the estimated coefficient is 0.572, which is the elasticity.

Table 38: OLS versus Quantile Estimates

Variable	OLS	QR_25	QR_50	QR_75	BSQR_50
ltotexp	0.570	0.557	0.573	0.578	0.573
	0.023	0.033	0.026	0.027	0.025
hhsize	0.039	0.034	0.039	0.052	0.039
	0.005	0.007	0.006	0.006	0.006
_cons	1.802	1.491	1.870	2.240	1.870
	0.284	0.414	0.323	0.332	0.314

According to the table above, the coefficients vary across quantiles. The first column to the left gives the least square estimates followed by the quantile estimates and lastly followed by the median bootstrap errors in their rightmost quantile with 400 bootstrap replications. The standard errors in the second row are statistically significant for all variables. For the household size regressor which is statistically significant, its impact increases across the quantiles thereby suggesting that the sensitivity of clothing expenditure to changes in household size is tied up with higher levels of clothing expenditures.

Table 39: Test Results for Heteroskedasticity

```
.
. * Test for heteroskedasticity in linear model using estat hettest
. quietly regress lclothing ltotexp hhsize

. estat hettest ltotexp hhsize , iid

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: ltotexp hhsize

         chi2(2)      =     7.60
         Prob > chi2  =   0.0224
```

The Breusch-Pagan / Cook-Weisberg test soundly rejects the null hypothesis of homoskedastic, because of the variation in families used in the survey; high level of heteroskedasticity is natural consequence.

Table 40: Simultaneous Quantile Regression Estimates

```
Simultaneous quantile regression                    Number of obs =      3801
  bootstrap(400) SEs                                .25 Pseudo R2 =    0.0865
                                                    .50 Pseudo R2 =    0.1134
                                                    .75 Pseudo R2 =    0.1449
```

lclothing	Coef.	Bootstrap Std. Err.	t	P>|t|	[95% Conf.	Interval]
q25						
ltotexp	.5570276	.030811	18.08	0.000	.4966198	.6174353
hhsize	.0344252	.006874	5.01	0.000	.020948	.0479023
_cons	1.491267	.3817814	3.91	0.000	.7427507	2.239783
q50						
ltotexp	.5728574	.0247334	23.16	0.000	.5243655	.6213494
hhsize	.03904	.0055915	6.98	0.000	.0280774	.0500025
_cons	1.870279	.3090075	6.05	0.000	1.264443	2.476116
q75						
ltotexp	.5780789	.0251906	22.95	0.000	.5286905	.6274672
hhsize	.052094	.00578	9.01	0.000	.0407618	.0634262
_cons	2.239771	.3125498	7.17	0.000	1.626989	2.852552

The table above shows the simultaneous quantile regression in which the log of total expenditure is statistically significant for all variables and the regressor household size is also statistically significant across the quantiles. The response of the clothing expenditure to changes in household size tends to increase at higher quantiles.

Table 41: Test Results for Coefficient Equality across Quantiles

```
. * Test of coefficient equality across QR with different q
. test [q25=q50=q75]: ltotexp

 ( 1)  [q25]ltotexp - [q50]ltotexp = 0
 ( 2)  [q25]ltotexp - [q75]ltotexp = 0

       F(  2,  3798) =    0.20
            Prob > F =    0.8174

. test [q25=q50=q75]: hhsize

 ( 1)  [q25]hhsize - [q50]hhsize = 0
 ( 2)  [q25]hhsize - [q75]hhsize = 0

       F(  2,  3798) =    3.25
            Prob > F =    0.0390
```

After carrying out the formal test of coefficient equality, the F test for the null of coefficient equality across the total expenditure is failed to reject at 1% level, but strongly rejected for the household size at 1% level.

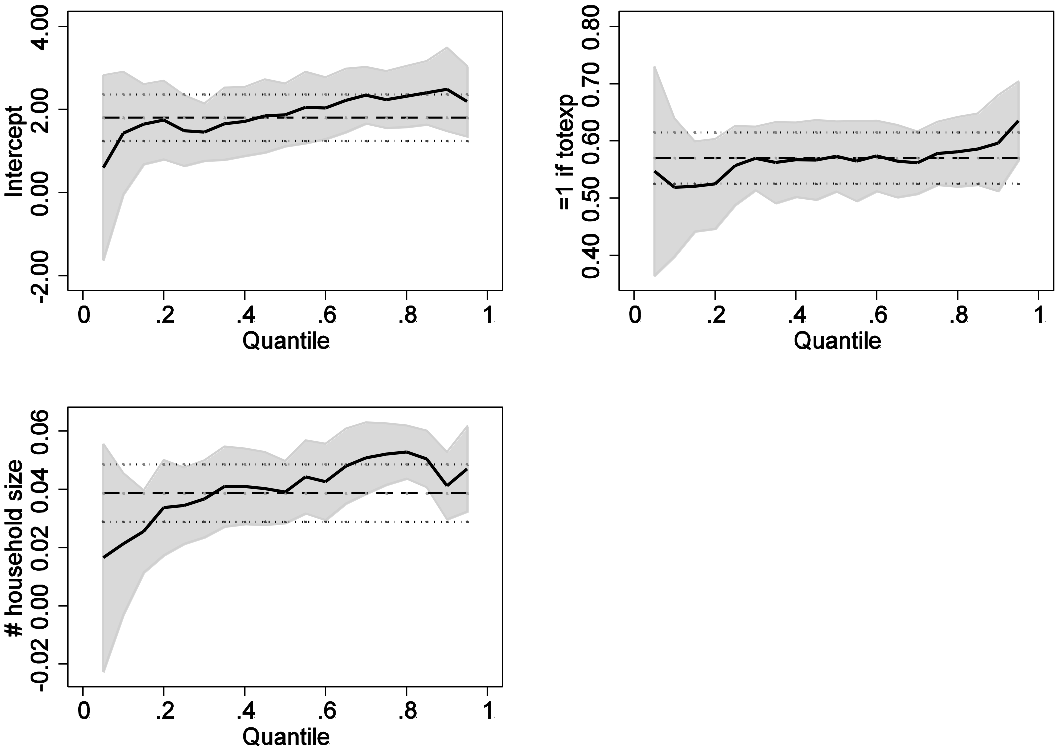

Figure 15: Quantile Regression Graphs

In the figure above, the upper right plot shows that coefficients on total expenditures are positive and starts a value around 0.56. The highest effect shows up at the highest quantile so clothing expenditure elasticity with respect to total expenditure hovers above 0.65. The lower plot indicates at the higher quantiles, the effect of household size on clothing expenditures gets larger.

4.2.9 Transportation Expenditure Post-Harvest Data

Table 42: Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
ltransp	2053	10.1846	1.030672	6.880727	14.65348
ltotexp	4845	12.71506	.7200109	8.153692	15.39354
hhsize	4845	5.775851	3.161056	1	31

There are 2053 usable observations for the transportation expenditure after removing 2792 missing values. The mean and standard deviations of the explained variable and the explanatory variables are noticeable different in value. The household size varies between minimum of 1 and maximum of 31.

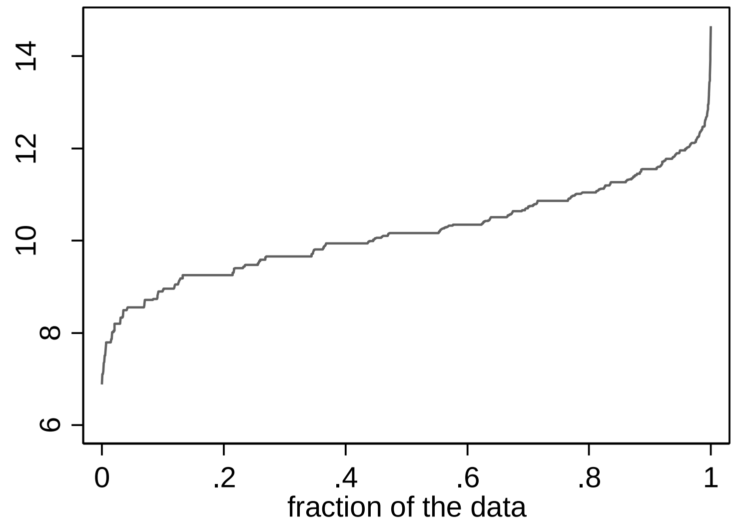

Figure 16: Quantiles of the Dependent Variable Graph

$q_{0.1}$ =9.2, $q_{0.25}$ =9.8, $q_{0.50}$ =10.1, $q_{0.75}$ =11.0, $q_{0.9}$ =11.7. The distribution appears to be widely dispersed.

Table 43: Median Regression Estimate

```
Median regression                                   Number of obs =       2053
  Raw sum of deviations 1652.951 (about 10.168595)
  Min sum of deviations 1385.782                    Pseudo R2     =     0.1616
```

ltransp	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ltotexp	.8782557	.0305818	28.72	0.000	.818281	.9382304
hhsize	-.0217596	.0064251	-3.39	0.001	-.0343599	-.0091593
_cons	-1.090834	.3877074	-2.81	0.005	-1.851175	-.3304922

The table above gives the median regression estimates. All regressors are statistically significant. The log of total expenditure bears the expected sign, but the household size carries a negative sign, thus reversing its effect.

Table 44: OLS versus Quantile Estimates

Variable	OLS	QR_25	QR_50	QR_75	BSQR_50
ltotexp	0.879	0.781	0.878	0.990	0.878
	0.031	0.044	0.031	0.046	0.039
hhsize	-0.023	-0.028	-0.022	-0.021	-0.022
	0.007	0.009	0.006	0.010	0.008
_cons	-1.111	-0.335	-1.091	-1.987	-1.091
	0.395	0.552	0.388	0.579	0.496

The table above gives the least square estimates in comparison with the quantile estimates and the median estimates with bootstrap errors. The first column to the left gives the least square estimates, followed by the quantile estimates and lastly by the median estimates errors given in their rightmost quantile with 400 bootstrap applications. The standard errors come in the second row and are significant for each of the variables. In the case of the household size, its values carry a counter intuitive signs, yet it remains statistically significant and its impact is much greater the lowest conditional quantile. This therefore means that the sensitivity of the transportation expenditure to changes in household size is tied up with the lower level of transportation expenditure.

Table 45: Test Results for Heteroskedasticity

```
.
. * Test for heteroskedasticity in linear model using estat hettest
. quietly regress ltransp ltotexp hhsize

. estat hettest ltotexp hhsize , iid

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: ltotexp hhsize

         chi2(2)      =    43.27
         Prob > chi2  =   0.0000
```

After converting the dependent variable and the total expenditure to the logarithmic forms, the Breush-Pagan / Cook-Weisberg test still soundly rejects the null hypothesis of the homoskedasticity. I therefore interpret this to mean that, since there is a high disparity in the families used in the survey, heteroskedasticity is imminent in the data.

Table 46: Simultaneous Quantile Regression Estimates

```
Simultaneous quantile regression                    Number of obs =      2053
  bootstrap(400) SEs                                .25 Pseudo R2 =    0.1320
                                                    .50 Pseudo R2 =    0.1616
                                                    .75 Pseudo R2 =    0.2011
```

ltransp	Coef.	Bootstrap Std. Err.	t	P>|t|	[95% Conf.	Interval]
q25						
ltotexp	.7810798	.0437268	17.86	0.000	.6953262	.8668334
hhsize	-.0278835	.0098833	-2.82	0.005	-.0472659	-.0085011
_cons	-.3353454	.5398078	-0.62	0.535	-1.393974	.7232836
q50						
ltotexp	.8782557	.0397171	22.11	0.000	.8003656	.9561459
hhsize	-.0217596	.0070392	-3.09	0.002	-.0355643	-.0079549
_cons	-1.090834	.5041205	-2.16	0.031	-2.079475	-.102192
q75						
ltotexp	.9902108	.0366921	26.99	0.000	.9182532	1.062168
hhsize	-.0212885	.0089831	-2.37	0.018	-.0389054	-.0036717
_cons	-1.986672	.4642429	-4.28	0.000	-2.897109	-1.076236

In the table above, both the explanatory variables, log of total expenditure and household size are statistically significant, although the household size bears a counter intuitive sign, this will not matter because of the significance level.

Table 47: Test Results of Coefficient Equality across Quantiles

```
. * Test of coefficient equality across QR with different q
. test [q25=q50=q75]: ltotexp

 ( 1)  [q25]ltotexp - [q50]ltotexp = 0
 ( 2)  [q25]ltotexp - [q75]ltotexp = 0

       F(  2,  2050) =   11.65
            Prob > F =    0.0000

. test [q25=q50=q75]: hhsize

 ( 1)  [q25]hhsize - [q50]hhsize = 0
 ( 2)  [q25]hhsize - [q75]hhsize = 0

       F(  2,  2050) =    0.29
            Prob > F =    0.7509
```

According to the table above, since the log of total expenditures and household size differ across quantiles, hence, a formal test of coefficient equality is needed. The F test for the null hypothesis of coefficient equality for the log of total expenditure is strongly rejected at 1% level while it is failed to reject for the household size regressor at the same 1% level.

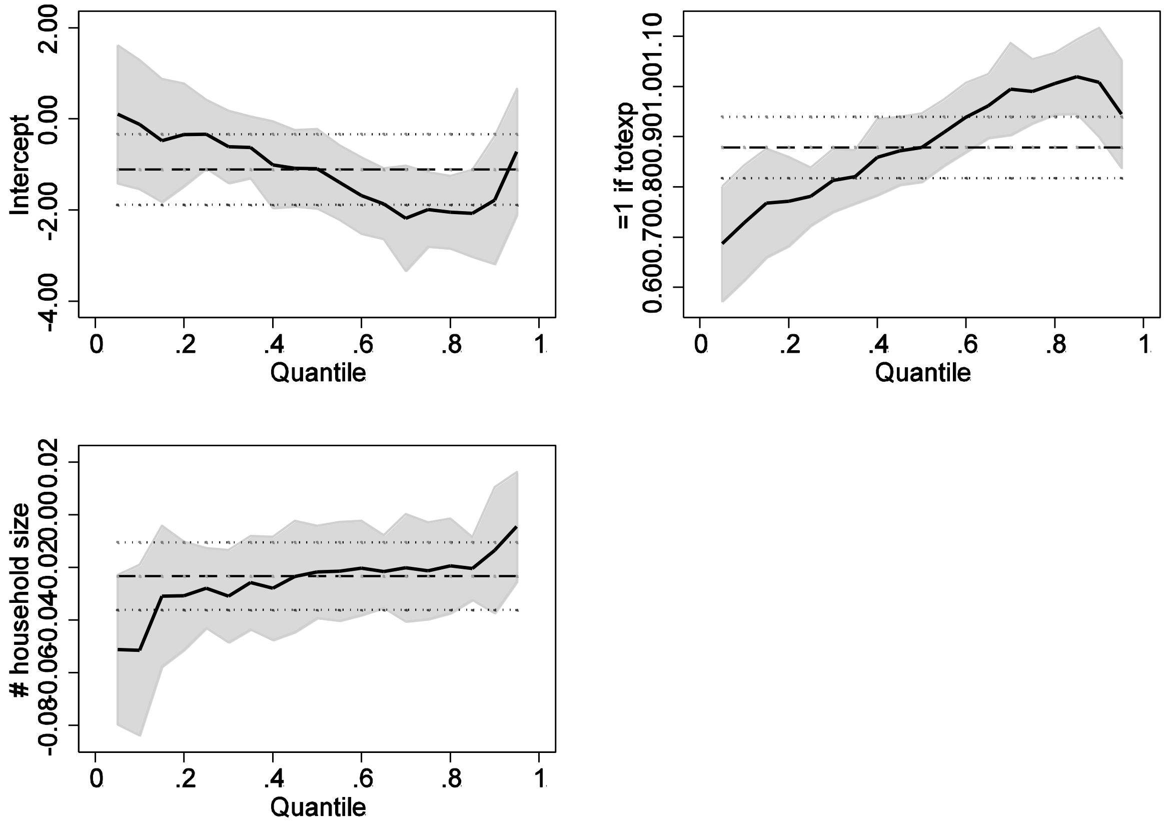

Figure 17: Quantile Regression Graphs

The graphs above are quantile regression graphs and the upper right hand plot shows that the coefficient of total expenditure are positive and starts at an approximate value of 0.69 and the highest effect shows up at around 8.6thquantile so the transportation expenditure elasticity with respect to total expenditure hovers above .901. The lower plot indicates that at the higher quantiles, the effect of household size on transportation expenditures gets larger.

The chi-sq statistic which is used to test for heteroskedasticity is statistically significant throughout the expenditure patter for the two farming periods, except in the health expenditure where the chi-sq statistic is insignificant thereby reducing the level of heteroskedasticity to minimal. The highly significant statistical level of the chi-sq indicates that the coefficients differ across the different quantile values; also the conditional quantiles are not identical, that is, not zero (Koenker, R. 2005).

Focusing on the test coefficient equality probability, we observe that the p-value shows a high significance level in both explanatory variables for the total food expenditure for both planting period. It came out insignificant for the health expenditure for both explanatory variables in the post planting data and for the harvest data, the household size regressor stands significant for the coefficient equality test. For the clothing expenditure, the probability is insignificant for both explanatory variables in the post-planting data set; the total expenditure variable stays insignificant also in the post-harvest data set while the household size is significant. In the case of the transportation expenditure, the probability of the log of total expenditure variable is statistically insignificant while the household size is constant, and in the post-harvest data, reverse is the case. Again this buttresses our initial finding with the chi-sq statistic that the coefficients differ across different quantile values.

The log of total expenditure which we have chosen as a proxy to measure the income level in the families is significant across the median and higher quantiles across the expenditure categories for both data sets and remains harmonious with our contemplation. The coefficient bears a sign that is in support with our insight that, if total expenditure increases by one extra dollar for instance, will increase the level of consumption of each expenditure category.

The household size variable with its responses across the median regression and quantiles also supports out intuition in that, it decreases as the quantiles increases for all the expenditure categories with the exception of clothing expenditure where the variable shows a positive increase across quantiles for both data sets. This infers that, basically, a one unit increase in the household size will increase the expenditure category by a certain amount of dollars for instance.

The use of QR asks the question, ‘‘How does the conditional mean of explained variable Y depend on the covariates of the explanatory variable X at each quantile?’’ Furthermore, QR results are robust in treatment of large outliers which results from large sample size like in our post-planting and post-harvest data in our study.

According to our empirical results so far, testament shows that both explanatory variables are influential, but the most influential determinant of household expenditure pattern is the total expenditure which is the proxy for income. This invariably means that for families to increase their share of spending for each expenditure categories, they either have to earn more, or keep a reduced household size.

Chapter 5

CONCLUSION AND POLICY RECOMMENDATIONS

5.1 Conclusion

The capital aim of this thesis has been to experimentally examine the household consumption pattern among Nigerian farm households employing farming data from the two farming seasons.

We observed a fuse of interesting relationship between our variables which are in accordance with theory of economics and our perceived contemplations.

Similar to the introductory part of this research paper, Nigerian economy solely depends on oil and gas sector which generates approximately 96% of export revenue, and about 48% of government revenues and a 14.7 percent of her Gross Domestic Product (GDP), while agriculture contributes 40.24 percent of GDP in 2010-2011. This high dominance in the export and government revenue by the oil and gas has shifted the governments' focus from providing enabling environment for the agriculture sector by giving incentives to farmers.

The estimated quantile regression results for the different expenditure categories give evidence in support of the proposition that during the post-planting period, the families experience a drop in income having had to employ labors, and rent machineries, buy seedlings, and even incurred transportation cost; thereby causing their income to fall which reduces their spending ability, especially in the case of

Nigeria where agricultural aid package is not evenly distributed or not even available in some cases.

The variable capturing the size of the families equally stands significant across the median and the lower quantile range of distributions. The estimation results are statistically significant and in accordance with my expectations which also is in line with the economic theory. The poverty level, increases at higher household size as expected thereby causing a rise in consumption.

5.2 Policy Recommendation

The main stumbling blocks of the agricultural sector in Nigeria are deep and of various categories. Nigeria is blessed with a good climate and fertile land for agriculture and was even once known as the food basket of Africa. Facilities such as incentives to attract potential farmers, machineries, world class seminars on how to be constructive and productive even as a farmer, thereby creating employment opportunities and increasing the social welfare of the citizens.

The oil and gas industry has been dominant in the Nigeria economic dealings since the 1970s when crude oil was first known to be known to be available in such a huge quantity that it hindered the once flourishing and prosperous agricultural sector. This hindrance came by as a result of the negligence on the side of the government and even made worse with the rising demand for crude oil and other related products. This thesis entrusts a strong macroeconomic management policy that will greatly reduce the cost of farming in Nigeria, thereby giving rise to an increase in the agricultural sector. It is known that there are problems facing the agricultural sector, but they can be dealt with and make forgotten.

Farmers on their own should not totally wait for the government to provide for everything, rather, they need to find alternative means of generating capital, because there is a positive relationship between capital availability and level of cultivation, and the more revenue they can generate. This may also prompt them to go into research and give them a competitive edge with farmers around the world. Therefore, farmers should take to financial industries set up mainly for giving loans towards this sort of purpose.

In the case that farmers are mainly subsistence makes it difficult for them to individually grow and overcome some certain hindrances. Collaboration amongst farmers by forming some sort of association will help them pool recourses collectively, and act as a team, they can in uniformity acquire their machineries, send some of their members for seminars; costs which will not be bared alone. With this kind of fusion, farmers become bigger and more equipped to handle minimal challenges of lack of machineries, and even lack of a voice and they can in turn stand a competitive chance in the global market even.

The national government has to play its role as well, most especially to a meaningful whole. Construction of pliable roads, research institutes to help farmers develop new and cheap ways of farming, deliberate policy formulation aimed at increasing the production level in the agricultural sector. The national government should also diversify the dependency of the nation's economy away from oil and gas along with its related produce. This in the long run will vigorously increase investment in the agricultural sector, thereby making it once again one of the main contributors to export revenues, and government revenue as a percentage of GDP which in turn will reduce unemployment and increase the social welfare of the people of the nation.

In addition, the financial institutions which are established for the sole purpose of giving credit facilities to farmers need be sufficiently financed and checked every now and then make sure these institutions take to stringent assiduity before providing giving loans and credit facilities to farmers, hence to reduce corruption to a minimum.

Increasing the tariff on imported agricultural products that can be locally produced will also be of immense help. Awareness campaigns should be done over the television stations, radio stations, in schools, offices, on the streets on the need to patronize locally cultivated agricultural produce. These will increase demand and increase productivity level in the agricultural sector.

If the government will upgrade her technological capacity, this will also help the agricultural sector because advanced technology is very paramount for an improved agricultural sector and Nigeria farmers are almost obsolete when compared with other farmers from developed countries. Because of the predominant subsistence farming style, most of the farmers cannot afford such big technological investment, and there are no available credit facilities to cover for such. We believe that by fostering the technological investment, this will raise productivity in numerous ways; helping to completely break through from the subsistence strategy era, increase productivity, reduce cost of production, time and man power.

Increased level of productivity through high investment in agriculture has been proven to be a significant way of providing economic growth and increasing living standard generally.

Lastly, putting in place good modern infrastructures, administering effectual and operative policies can definitely bring the nation's economy out of its sole dependence on oil and gas sector which will place it on its way of devout economic growth and preferment.

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